

PROJECT MANUAL FOR:

**UO HOUSING
CENTRAL KITCHEN & WOODSHOP**

**UNIVERSITY OF OREGON
EUGENE, OREGON**

Design Development

11 August 2014



Robertson | Sherwood | Architects PC

PROJECT TITLE PAGE

PROJECT TITLE:

UO HOUSING - CENTRAL KITCHEN & WOODSHOP

PROJECT #CP13-111

1793 1793 Columbia Street

Eugene, Oregon 97403

OWNER:

STATE OF OREGON, ACTING BY AND THROUGH THE BOARD OF TRUSTEES UNIVERSITY OF OREGON

UNIVERSITY HOUSING

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Eugene, Oregon 97403

Tel (541) 346-6794

Fax (541) 346-4268

Contact: David Opp-Beckman, Capital Construction Manager

CAMPUS PLANNING, DESIGN AND CONSTRUCTION

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Eugene, Oregon 97403

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Contact: Martina Oxoby, Planning Associate

Contact: Denise Stewart, Construction Project Manager

ARCHITECTS:

ROBERTSON/SHERWOOD/ARCHITECTS PC

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Eugene, Oregon 97401

Tel (541) 342-8077

Fax (541) 345-4302

Contact: Scott Stolarczyk, AIA, LEED AP

DESIGN/BUILD CONTRACTOR:

CHAMBERS CONSTRUCTION

3028 Judkins Road #1

Eugene, Oregon 97403
Tel (541) 687-9445
Fax (541) 687-9451
Contact: Brian Erickson, Project Manager

CIVIL ENGINEER:

KPFF CONSULTING ENGINEERS

1201 Oak Street
Eugene, Oregon 97401
Tel (541) 684-4902
Fax (541) 684-4909
Contact: Matt Keenan, PE

LANDSCAPE ARCHITECT:

CAMERON MCCARTHY LANDSCAPE ARCHITECTS

160 East Broadway
Eugene, Oregon 97401
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Fax (541) 485-7389
Contact: Matt Scheibe, ASLA

STRUCTURAL ENGINEER:

HOHBACH-LEWIN ENGINEERS

296 East 5th Avenue, Suite 302
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Tel (541) 349-1701
Fax (541) 349-1702
Contact: Vikki Bourcier, PE

MECHANICAL DESIGN-BUILD CONTRACTOR:

ALLIANT SYSTEMS

1600 NW 167th Place
Beaverton, Oregon 97006
Tel (503) 619-4000
Fax (503) 230-9238

Contact: Nick Scott, Project Manager

FOOD SERVICE DESIGNER

JLR DESIGN GROUP

557 Roy Street, Suite 175-A

Seattle, Washington 98109

Tel (206) 625-0070

Fax: (206) 625-0073

Contact: Deon Richards

ELECTRICAL DESIGN-BUILD CONTRACTOR:

ELECTRICAL CONSTRUCTION COMPANY

32758 Old Highway 34 SE

Albany, Oregon 97322

Tel (541) 812-6248

Fax (541) 926-4268

Contact: Glenn Anderson, Project Manager

DATE:

8 AUGUST 2014

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PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
- B. Geotechnical Report: Entitled Geotechnical Investigation, dated June 11, 2013 prepared by GRI.
 - 1. Copy is included in the Project Manual.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
 - 3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF AVAILABLE PROJECT INFORMATION

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: UO Housing - Central Kitchen & Woodshop.
- B. Owner's Name: University Housing.
- C. Architect's Name: Robertson/Sherwood/Architects pc.
- D. The Project consists of the construction of a new kitchen and woodshop building located in Eugene, Oregon.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on guaranteed maximum price as described in the Owner-Contractor Agreement.
- B. Substantial Completion: Execute the Work to achieve Substantial Completion by December 12, 2015.
- C. Final Completion: Achieve Final Completion within 30 consecutive calendar days following the date of Substantial Completion.

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion.
 - 1. Movable cabinets.
 - 2. Furnishings.
 - 3. Small equipment.
 - 4. Shelving.
 - 5. Lockers.
 - 6. Landscape office workstations.
- B. Owner will furnish the following items for installation by Contractor (OFCI):
 - 1. Section 08 71 00 - Door Hardware:
 - a. Door hardware as scheduled.
 - 2. Division 26:
 - a. Emergency (Blue) Phone.
 - 3. Section 12 93 00 - Site furnishings:
 - a. Bench.
 - b. Bike racks.
 - 4. Section 11 14 00 - Food service equipment:
 - a. Food service equipment
 - 5. Section 11 52 13 - Projection Screens:
 - a. Projection Screen at Conference Room 109A.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the new building upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to project site.
- B. Arrange use of site and premises to allow:
 - 1. Work by Others.
 - 2. Work by Owner.

- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

ADMINISTRATIVE REQUIREMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electronic document submittal process.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Progress photographs.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Dates for applications for payment.
- B. Section 01 10 00 - Summary: Summary of Work.
- C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 - Closeout Submittals: Project record documents.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 ELECTRONIC DOCUMENT SUBMITTAL PROCESS**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
 - 2. It is Contractor's responsibility to submit documents in PDF format.
 - 3. Unless approved in advance by the Architect, paper document transmittals will not be reviewed.
 - 4. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

3.02 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice to Proceed.
- B. Attendance Required:
 - 1. Owner.
 - 2. Owner's Project Manager.
 - 3. Architect.
 - 4. Contractor.
 - 5. Major Subcontractors.
- C. Agenda:
 - 1. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.

2. Designation of personnel representing the parties to Contract and Architect.
3. Designation of personnel representing the parties to Contract and Architect.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
5. Scheduling.
6. Use of premises by Owner and Contractor.
7. Owner's requirements and occupancy prior to completion.
8. Construction facilities and controls provided by Owner.
9. Temporary utilities provided by Owner.
10. Security and housekeeping procedures.
11. Schedules.
12. Application for payment procedures.
13. Procedures for testing.
14. Procedures for maintaining record documents.
15. Requirements for start-up of equipment.
16. Inspection and acceptance of equipment put into service during construction period.

- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Owner's Project Manager, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.

4. Structural framing in progress and upon completion.
 5. Enclosure of building, upon completion.
 6. Final completion, minimum of ten (10) photos.
- E. Take photographs as evidence of existing project conditions as follows:
1. Surrounding site and street conditions.
 2. Adjacent buildings close to property lines.
- F. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: On photo CD.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - CLOSEOUT SUBMITTALS.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.

- B. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a copy of approved submittal form.
- B. Transmit each submittal with approved form.
- C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- F. Schedule submittals to expedite the Project, and coordinate submission of related items.
- G. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- H. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- I. Provide space for Contractor and Architect review stamps.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

END OF SECTION

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. References and standards.
- B. Quality assurance submittals.
- C. Mock-ups.
- D. Control of installation.
- E. Tolerances.
- F. Testing and inspection services.
- G. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008.
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2013a.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2012.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2013c.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.

1.04 SUBMITTALS

- A. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date specified in the individual specification sections, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform code required and specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 1. Test samples of mixes submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.
- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 1. Observer subject to approval of Architect.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Vehicular access and parking.
- E. Field offices.

1.02 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.
 - 3. Email: Account/address reserved for project use.
 - 4. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.

1.03 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.05 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.06 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.08 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 12 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 1. Protection of existing trees from damage.

1.02 DEFINITIONS

- A. Designated Trees: As indicated on Drawings.
- B. Critical Root Zone (CRZ): The CRZ for trees 4 inches in caliper or smaller shall be an area with a radius at least 5 feet from the trunk. The CRZ for trees over 4 inches in caliper shall be an area with a radius of at least 1 foot 6 inches from the trunk for every 1 inch of caliper size.
- C. Zone of Protection: CRZ and as indicated on Drawings.

1.03 POSTING

- A. When directed, post Designated Trees with Notice sign provided by Owner's Representative. Attach sign to tree with twine or staples, no nails. Maintain and protect the Notice sign until completion of construction. Obtain approval of Owner's Representative prior to removal of sign.

1.04 NOTICE

- A. Notify all workers, including subcontractors, of the requirements to protect Designated Trees using Notice provided.

1.05 PROTECTIVE FENCING

- A. Install protective fencing around Designated Trees and where shown on Drawings prior to commencement of any work. Fencing to be a minimum 6 foot chain link, with fence posts securely anchored. Maintain during construction. Adjustments to fence locations are to be approved by the Owner's Representative prior to performing any work within the Zone of Protection.

1.06 CONSTRUCTION FENCING

- A. No construction activities are permitted within the protective fencing without prior approval of the Owner's Representative.
- B. Prior to removal of Construction Fencing perform a mandatory meeting for the remaining exterior trades to ensure tree protection measures are met.

1.07 ZONE OF PROTECTION

- A. No storage, stockpiling, parking, etc. is permitted within the Zone of Protection.
- B. Post notices on fencing listing prohibited activities without prior approval. Notice to remain in place until authorization is granted by the Owner's Representative.
- C. Submit requests to work within the Zone of Protection to Owner's Representative.
- D. The following activities are prohibited in the Zone of Protection without written approval from the Owner's Representative:
 1. Removal or moving protective fencing
 2. Parking and driving of vehicles
 3. Storing equipment or materials
 4. Excavations
 5. Flooding and cleanup of equipment, tools, etc.
 6. Operation of equipment
 7. Staging of materials

- 8. Trenching
- 9. stockpiling
- 10. Altering drainage

1.08 TRENCHING AND EXCAVATION

- A. All trenching and excavation within the Critical Root Zone is to be performed with the use of an air spade or by hand. Obtain Owner's Representative approval of trenching and excavation locations and methods prior to performing any work.

1.09 ROOT PRUNING

- A. Prune roots encountered during construction with an approved root-pruning device. Make clean, vertical cuts. Do not leave split or frayed ends. Obtain Owner's Representative approval prior to cutting roots larger than 1 inch in diameter. Backfill exposed roots with specified Planting Soil as soon as practical.

1.10 TREE CANOPY PRUNING

- A. Prune canopies of Designated Trees impacted by construction only upon approval of Owner's Representative. All canopy pruning must be performed by a certified arborist. Canopy pruning must be approved in advance by consulting arborist hired by Owner.

1.11 MULCH

- A. Provide four (4) inch deep mulch within CRZ and/or Zone of Protection as directed.

1.12 WATERING

- A. Water trees if required by Owner's Representative. Watering will be required if it is judged that root removal is necessary for construction and threatens the survival of the tree. Use a slow drip or soaker hose to provide one-inch water per week until completion of construction.

1.13 PROHIBITED ACTIVITIES

- A. Cutting of roots larger than 1 1/2 inch diameter or larger without approval.
- B. Damaging tree bark, branches.
- C. Removal of protective fencing or notice posted on trees prior to approval of Owner's Representative.
- D. Activities prohibited within the Zone of Protection (without prior approval) are, but not limited to: construction, operation of machinery, storage of materials, paving, grading, cutting, filling, travel within, dumping, disposal of liquids, and parking of vehicles or equipment.

1.14 DAMAGE

- A. Actual tree damage such as trunk scoring and broken limbs or damaged roots inside the Zone of Protection will be assessed according to the percentage of loss of tree value. Percentage of tree value will be determined by the Owner's Representative. Tree value will be determined from "Evaluation of Landscape Trees, Shrubs, and Other Landscape Plants" by International Society of Arboriculture.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations and procedures.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Document 00 21 13 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 01 10 00 - Summary - : Lists of products to be removed from existing building.
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 60 01 - Substitution Request Form.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Notice to Proceed.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
- C. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste.
 - 6. Are made of vegetable materials that are rapidly renewable.
 - 7. Have a published GreenScreen Chemical Hazard Analysis.
 - 1. Overall Project Requirement: Provide materials amounting to a minimum of 2.5 percent of the total value of all materials and products used on the project.
 - a. This provision is applicable to LEED Credit MR 6; show quantity on LEED report.
 - 2. LEED Submittals: State unit cost, renewable material content percentage, quantity installed, total material cost, and total renewable material value; attach evidence of contents from either manufacturer or an independent agency.
 - 3. Overall Project Requirement: Provide products with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial recycled content constitutes at least 10 percent of the total value of all products installed, except mechanical and electrical components.
 - a. This provision is applicable to LEED Credit MR 4; show quantity and calculations on LEED report.
 - 4. LEED Submittals: State unit cost, post-consumer and post-industrial content percentages, quantity installed, total material cost, and total recycled content value; attach evidence of contents from either manufacturer or an independent agency.
 - 5. Overall Project Requirement: Provide a minimum of 50 percent of all wood-based materials made of sustainably harvested wood.
- D. Interchangeable Components: Provide interchangeable components of the same manufacture for components being replaced.
- E. Motors: Specific motor type is specified in individual specification sections.
- F. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- G. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with Section 01 16 01.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. After date of contract, the Owner may, at its option, consider formal requests from Contractor for substitution of products for those specified. One or more of the following conditions must be documented:
 - 1. Compliance with final interpretation of code requirements or insurance regulations.
 - 2. Unavailability of a specified Product through no fault of the Contractor.
 - 3. Inability of specified Product to perform properly or fit in designated place.
 - 4. Manufacturer's or fabricator's refusal to certify or guarantee performance of a specified product.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. Submit requests for substitution on Form following this Section.
- E. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure:
 - 1. Submit three copies of Request for Substitution Form, Section 01 60 01 for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. During bidding, Architect will make notification of acceptance as noted on Addenda.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 01 10 00 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Prevent contact with material that may cause corrosion, discoloration, or staining.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: Robertson/Sherwood/Architect pc
132 East Broadway - Suite 540
Eugene, Oregon 97401

PROJECT: UO – Central Kitchen & Woodshop
1793 Columbia Street
Eugene, Oregon

SPECIFIED ITEM: _____
Section Paragraph Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product descriptions, 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.

The 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 to or superior to specified item.

| | |
|---|--|
| Submitted by: _____ Signature: _____ Firm: _____ Address: _____ _____ Date: _____ Tel: _____ Fax: _____ Attachments: _____ | For use by Architect: <input type="checkbox"/> Approved <input type="checkbox"/> Approved as noted. <input type="checkbox"/> Not Approved <input type="checkbox"/> Received too late By: _____ Date: _____ _____ For use by Owner's Representative: <input type="checkbox"/> Approved <input type="checkbox"/> Approved as noted. <input type="checkbox"/> Not Approved <input type="checkbox"/> Received too late By: _____ Date: _____ |
|---|--|

EXECUTION AND CLOSEOUT REQUIREMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior and exterior enclosures.
- D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For survey work, employ a land surveyor registered in Oregon and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of examination, preparation and installation procedures.
 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on Drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.

- I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 2. Grid or axis for structures.
 3. Building foundation, column locations, ground floor elevations.
- K. Periodically verify layouts by same means.
- L. Maintain a complete and accurate log of control and survey work as it progresses.
- M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-conforming work.
- C. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site weekly and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.

- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.

3.14 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.

- B. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Demolition and construction waste management and recycling goals.
- B. Administrative and procedural requirements for the development and execution of a construction waste management plan.

1.02 CONSTRUCTION WASTE MANAGEMENT GOALS

- A. The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- B. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
- C. Diversion Goal: A minimum 75% of total project waste shall be diverted from the landfill.
- D. With regard to these goals the Contractor shall develop, for the Owner and Architect's review, a Waste Management Plan for this Project.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Submit a Construction Waste Management Plan.
- C. Submit periodic and final summary report of waste materials recycled, salvaged and landfilled.
- D. Submit weight tickets for all waste materials removed from the site during demolition and construction.

1.04 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Draft Waste Management Plan: Prior to the Pre-Construction Conference, or prior to any waste removal, whichever occurs sooner, the Contractor shall meet with the Owner designated representative(s) and Architect to discuss preparation of a Draft Waste Management Plan. The Draft Plan shall contain the following:
 - 1. Analysis of the proposed jobsite waste to be generated. Include the types of material to be generated and estimated quantity of each material (in tons).
 - 2. Landfill options: Estimated cost of disposing of all project waste in transfer station(s)/landfill(s), name of transfer station(s)/landfill(s) where Project waste would normally be disposed of and tipping fees. Estimated cost of transportation and other relevant costs and fees.
 - 3. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. The list of these materials is to include, at a minimum, the following materials:
 - a. Concrete
 - b. Asphalt
 - c. Bricks
 - d. Concrete Masonry Units (CMU)
 - e. Land Cleaning Debris - Land clearing debris shall not contribute to Diversion Goal achievement.
 - f. Clean dimensional wood
 - g. Plywood, OSB, and particle board
 - h. Cardboard
 - i. Paper
 - j. Metals
 - k. Gypsum Wallboard
 - l. Carpet

- m. Paint
 - n. Plastic
 - o. Glass
 - p. Rigid foam insulation
 - q. Beverage Containers
4. Material Handling Procedures: A description of the means by which any waste materials identified in item (3) above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
 - a. The facility diversion rate shall be required for facilities hauling and processing commingled waste in accordance with the LEED-NC v.2.2 Credit Interpretation Request (CIR) Ruling dated 12/02/2005. Identifying the facility diversion rate by means of visual inspection is not acceptable per CIR Ruling dated 1/29/2009.
 - b. Reference: <http://www.usgbc.org/LEED/Credit/CIRDDetails.aspx?RequirementID=675>
 5. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials. The final destination must be approved by Owner designated representative(s).
 6. Source Reduction: List processes that minimize waste such as working with suppliers to take back or buy back substandard, rejected or unused items and to deliver supplies using returnable pallets and containers. Also include procedures to minimize breakage, mishandling, contamination, and other factors that reduce job site waste.
 7. Meetings: A description of the regular meetings to be held to address waste management. Contractor shall conduct Construction Waste Management meetings. Meetings shall include subcontractors affected by the Waste Management Plan as well as Owner designated representative(s). At a minimum, waste management goals and issues shall be discussed at the following meetings:
 - a. Pre-bid meeting.
 - b. Pre-construction meeting.
 - c. Regularly scheduled job-site meetings.
 8. Indicate any instance where compliance with requirements of this specification does not appear to be possible and request resolution from the Owner and Architect.
- B. Waste Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft Waste Management Plan and prior to any waste removal at the site, schedule and conduct a follow-up meeting. The purpose of the meeting is to review the Draft Waste Management Plan and discuss procedures, schedules and specific requirements for waste materials recycling and disposal. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve potential compliance problems with requirements. Record minutes of the meeting, identifying all conclusions reached and matters requiring further resolution.
1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the waste management program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.
- C. Final Construction Waste Management Plan: Make any revisions to the Draft Waste Management Plan agreed upon during the review meeting and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 IMPLEMENTATION OF CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.

- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- D. Separation facilities: The Contractor shall lie out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
- E. Hazardous Waste: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.
- F. Application for Progress Payments: The Contractor shall submit with each Application for Progress Payment a Summary of Waste Generated by the Project. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The Summary shall be submitted on a form acceptable to the Owner and shall contain the following information:
 - 1. The amount of waste (in tons) landfilled from the Project, the identity of the transfer station/landfill, the total amount of tipping fees paid at the landfill, the transportation cost, and the total disposal cost. Include manifests, weight tickets, receipts, and invoices.
 - 2. For each material recycled, reused, or salvaged from the Project, the amount (in tons), the date removed from the jobsite, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material. Attach manifests, weight tickets, receipts, and invoices.
- G. Closeout: At the end of the project the Contractor shall submit a Final Waste Management Report. The Report shall be submitted on a form acceptable to the Owner and shall contain the following information:
 - 1. The total amount of waste landfilled from the Project, the identity of the transfer station/landfill, the total amount of tipping fees paid at the landfill, the transportation cost, and the total disposal cost.
 - 2. The total amount (in tons) of each material recycled, reused, or salvaged from the Project, the receiving party, and net cost savings or additional costs resulting from separating and recycling (versus landfilling) each material. The total amount of all materials recycled in tons and the total net cost savings or additional costs.
 - 3. The total percentage of material recycled in tons.

END OF SECTION

CLOSEOUT SUBMITTALS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.

- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.

4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.
- E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

- H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photocopies of warranties and bonds.
- N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

LEED REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General requirements and procedures for compliance with certain U.S. Green Building Council (USGBC) LEED® prerequisites and credits needed for the Project to obtain LEED Gold certification.
- B. Other LEED prerequisites and credits needed to obtain LEED certification are dependent on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.
- C. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification are dependent on the Architect's design and other aspects of the Project that are not part of the Work of this contract.

1.02 RELATED REQUIREMENTS

- A. It should be assumed that all section may include requirements intended to achieve LEED credits.
- B. Section 01 74 19 - Construction Waste Management and Disposal
- C. Section 01 81 19 - Construction Indoor Air Quality.
- D. Divisions 02 through 48 Section for LEED Requirements specific to the Work of each of these Sections. These requirements may or may not include reference to LEED.
- E. Section 01 91 13 - General Commissioning Requirements

1.03 DEFINITIONS

- A. LEED-NC 2009: Leadership in Energy and Environmental Design - Green Building Rating System for New Construction and Major Renovations version 2009. LEED is a national rating system for green buildings created by the US Green Building Council and administered by the Green Building Certification Institute. All references to LEED throughout the Construction Documents shall mean LEED-NC.
- B. Reused Material: Salvaged, refurbished or reused materials, products and furnishings that have been returned to active use in the same or related capacity as their original use.
- C. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer or post-industrial), or after consumer use (post-consumer) as defined by ISO 14021.
 - 1. Scraps, spills or other waste from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in the further production of the same product are not recycled materials.
 - 2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.
- D. Regional Materials: Materials that are harvested (extracted or recovered), processed and manufactured within a radius of 500 miles from the Project location.
- E. Rapidly Renewable Materials: Materials considered to be agricultural products, both fiber and animal, that take 10 years or less to grow or raise, and to harvest in an ongoing and sustainable fashion. Rapidly renewable materials include products made from straw, jute, flax, bamboo, cotton, vegetable oil, wool or sunflower seed hulls.
- F. Chain-of-Custody Certificate: A certificate signed by a manufacturer certifying a wood product was obtained from forests certified by a Forest Stewardship Council (FSC) accredited certification body to comply with FSC 1.2, "Principals and Criteria." Certificates shall include evidence that the mill and distributor are certified for chain-of-custody by a FSC-accredited certification body.

- G. Composite Wood and Agrifiber Board: Manufactured materials made from wood or agricultural fibers manufactured with bonding agents. Composite wood materials include particle board, medium density fiberboard (MDF), plywood, strawboard, wheatboard, panel substrates and door cores.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. General: Submit additional LEED related submittals included in other Sections of the Specifications.
- C. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
- D. Project Construction Materials Cost Data: Provide the necessary material cost data required to complete the LEED-Online calculators, including the total Project materials cost and itemized costs of specific materials being tracked for LEED Materials and Resources credits. The total project construction materials cost includes all materials contained in CSI MasterFormat™ 2004 Edition Divisions 03 through 10 and 32 (Sections 32 10 00 - Paving, 32 30 00 - Site Improvements, and 32 90 00 - Planting). All material costs exclude labor and equipment. The total materials cost is exclusive of Specialties, Conveying Systems and Mechanical and Electrical components.
- E. LEED Action Plans: Within 30 days of Notice to Proceed submit the following action plans:
 1. Credit MRc2 - Construction Waste Management: Construction waste management plan complying with Section 01 74 19 - Construction Waste Management and Disposal.
 2. Credit EQc3.1 - Construction IAQ Management Plan: Construction indoor air quality management plan complying with Section 01 81 19 - Construction Indoor Air Quality.
- F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports summarizing progress in construction and purchasing activities related to the following credits:
 1. Credit MRc2 - Construction Waste Management: Construction waste reduction progress reports complying with Section 01 74 19 - Construction Waste Management and Disposal.
 2. Credit MRc4 - Recycled Content: Summary of product data and material costs collected for all recycled content materials that have been purchased or installed.
 3. Credit MRc5 - Regional Materials: Summary of manufacturer's information and material costs collected for all regional materials that have been purchased or installed.
 4. Credit MRc7 - Certified Wood: Summary of product data and material costs collected for all FSC-certified wood products that have been purchased or installed.
 5. Credit EQc3 - Construction IAQ Management Plan: Construction indoor air quality management reports complying with Section 01 81 19 - Construction Indoor Air Quality.
 6. Credit EQc4 - Low-Emitting Materials: Summary of product data collected for all adhesives, sealants, paints, coatings, flooring, composite wood materials and laminating adhesives used to fabricate composite wood assemblies that are installed inside of the building's moisture barrier.
- G. LEED Documentation Submittals: For each Section of the Specification, submit the following for each applicable LEED Credit.
 1. Pre-requisite SSp1 - Construction Activity Pollution Prevention:
 - a. Graphical erosion and sedimentation control site plan
 - b. Written specifications or executive summary that outlines the specific implemented measures and best practices employed on site.
 - c. Corroborating progress records such as time/date stamped digital photographs, inspection logs or formal reports.
 - d. Credit SSc7.2 - Heat Island Effect, Roof: Cut sheets and product data for roofing materials indicating reflectance and emittance, or solar reflectance index. Reflectance must be measured according to ASTM E903-96, ASTM E1918-97, or ASTM C1549-04. Emittance must be measured according to ASTM E408-71 or ASTM C1371-04. SRI must be calculated according to ASTM E1980-01).

- e. Credit SSc8 - Light Pollution Reduction: Cut sheets for all exterior light fixtures indicating lamp lumen data and shielding and cut-off information.
- f. Credit MRc2 - Construction Waste Management:
 - 1) Complete LEED Submittal Template.
 - 2) Comply with Section 01 74 19 - Construction Waste Management and Disposal.
 - 3) Construction waste management plan.
 - 4) Itemized waste hauling certificates/receipts for all waste removed from the Project site and documentation of recycling recovery rate for off-site sorting facilities (if waste is commingled).
- g. Credit MRc4 - Recycled Content:
 - 1) Complete LEED Submittal Template.
 - 2) Cut sheet, product literature or letter from manufacturer that clearly indicates the percentage by weight of post-consumer and pre-consumer (post-industrial) recycled content.
 - 3) Material cost.
- h. Credit MRc5 - Regional Materials:
 - 1) Complete LEED Submittal Template.
 - 2) Cut sheet, product literature or letter from manufacturer indicating the location of harvest, processing and manufacturer.
 - 3) Material cost.
- i. Credit MRc7 - Certified Wood:
 - 1) Complete LEED Submittal Template.
 - 2) Copies of vendor invoices for each certified wood product.
 - 3) FSC chain-of-custody certificates for each certified wood product with chain-of-custody number indicated.
 - 4) Material cost.
- j. Credit IEQc3.1 - Construction IAQ Management Plan, During Construction:
 - 1) Complete LEED Submittal Template.
 - 2) Comply with Section 01 81 19 - Construction Indoor Air Quality.
 - 3) Cut sheets indicating MERV values for filtration media used during construction.
 - 4) Time/Date stamped digital photographs highlighting the IAQ Management Plan practices, labeled to identify the highlighted approach. At least 18 photographs - six photographs taken on three different occasions during construction.
- k. Credit IEQc3.2 - Construction IAQ Management Plan, After Construction:
 - 1) Narrative outlining the building flush-out procedures, including start and finish dates and mechanical system settings. If possible, providing trend log from DDC system for flush-out period.
 - 2) If IAQ testing is performed in place of building flush-out, provide specifications and documentation demonstrating conformance with IAQ testing procedures per credit requirements.
- l. Credit IEQc4.1 - Low-Emitting Materials, Adhesives and Sealants:
 - 1) Complete LEED Submittal Template.
 - 2) Product data and Material Safety Data Sheets (MSDS) for all adhesives and sealants used inside the building's moisture barrier indicating the Volatile Organic Compound (VOC) content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2). Indicate VOC content in grams/liter (g/l).
 - 3) List of all installed adhesives and sealants including manufacturer, quantity used in gallons and VOC content.
- m. Credit IEQc4.2 - Low-Emitting Materials, Paints and Coatings:
 - 1) Complete LEED Submittal Template.
 - 2) Product data and Material Safety Data Sheets (MSDS) for all paints and coatings used inside the building's moisture barrier indicating the VOC content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2). Indicate VOC content in grams/liter (g/l).
 - 3) List of all installed paints including manufacturer, quantity used in gallons and VOC content.

- n. Credit IEQc4.3 - Low-Emitting Materials, Flooring Systems:
 - 1) Complete LEED Submittal Template.
 - 2) Cut sheets or letter from manufacturer clearly indicating that all carpet products meet the CRI Green Label Plus Test Program requirements.
 - 3) Cut sheets or letter from manufacturer clearly indicating that all carpet cushion products meet the CRI Green Label Test Program requirements.
 - 4) Product data and Material Safety Data Sheets (MSDS) for all carpet adhesives indicating the Volatile Organic Compound (VOC) content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2 for IEQc4.1). Indicate VOC content in grams/liter (g/l).
 - 5) Cut sheets or letter from manufacturer clearly indicating that all hard surface and resilient flooring is certified compliant with the FloorScore standard or equivalent.
 - 6) Product data and Material Safety Data Sheets (MSDS) for all sealers, stains and finishes applied on-site to concrete, wood, bamboo and cork flooring indicating the Volatile Organic Compound (VOC) content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2 for IEQc4.2). Indicate VOC content in grams/liter (g/l).
 - 7) Product data and Material Safety Data Sheets (MSDS) for all tile setting adhesives and grouts indicating the Volatile Organic Compound (VOC) content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2 for IEQc4.1). Indicate VOC content in grams/liter (g/l).
- o. Credit IEQc4.4 - Low-Emitting Materials, Composite Wood:
 - 1) Complete LEED Submittal Template.
 - 2) Cut sheets clearly indicating the bonding agents used for each composite wood and agrifiber product and assembly, as well as all laminating adhesives used on and off-site, demonstrating that no added urea-formaldehyde resins are used in these products."

PART 2 - PRODUCTS

2.01 SUMMARY OF REFERENCED STANDARDS

- A. Credit SSc7.2 - Heat Island Effect, Roof
 - 1. Solar Reflectance Index (SRI) must meet the following:

| Roof Type | Slope | SRI |
|-------------------|----------------|-----|
| Low-Sloped Roof | less than 2:12 | 78 |
| Steep-Sloped Roof | more than 2:12 | 29 |
- B. Credit MRc4 - Recycled Content:
 - 1. This product must contain a minimum post-consumer and post-industrial recycled content.
- C. Credit MRc5 - Regional Materials:
 - 1. This product must be sourced by a manufacturer or supplier that harvests, extracts, processes and manufactures the product within 500 miles of the project site.
- D. Credit MRc7 - Certified Wood:
 - 1. This product must contain Forest Stewardship Council Pure Certified wood.
 - 2. Forest Stewardship Council website: <http://www.fsc.org/>
- E. Credit IEQc4.1: Adhesives and Sealants
 - 1. Adhesives and sealants used on the interior of the building during construction shall comply with the VOC limits of the South Coast Rule #1168 by the South Coast Air Quality Management District, dated July 1, 2005 and rule amendment date of January 7, 2005 (www.aqmd.gov/rules/reg/reg11/r1168.pdf <<http://www.aqmd.gov/rules/reg/reg11/r1168.pdf>>). VOC limits in grams per liter for adhesives and sealants used on interior of building are as follows:

| Welding and Installation | VOC Limit (g/L) |
|--|-----------------|
| Indoor Carpet Adhesives | 50 |
| Carpet Pad Adhesives | 50 |
| Wood Flooring Adhesives | 100 |
| Rubber Flooring Adhesives | 60 |
| Subfloor Adhesives | 50 |
| Ceramic Tile Adhesives | 65 |
| VCT and Asphalt Tile Adhesives | 50 |
| Dry Wall and Panel Adhesives | 50 |
| Cove Base Adhesives | 50 |
| Multipurpose Construction Adhesives | 70 |
| Structural Glazing Adhesives | 100 |
| PVC Welding | 510 |
| CPVC Welding | 490 |
| ABS Welding | 325 |
| Plastic Cement Welding | 250 |
| Adhesive Primer for Plastic | 550 |
| Contact Adhesives | 80 |
| Special Purpose Contact Adhesives | 250 |
| Structural Wood Member Adhesives | 140 |
| Sheet Applied Rubber Lining Operations | 850 |
| Top and Trim Adhesives | 250 |

2. VOC limits in grams per liter for adhesives and sealants used on interior of building are as follows:

| Substrates | VOC Limit (g/L) |
|-----------------------------|-----------------|
| Metal to Metal | 30 |
| Plastic Foams | 50 |
| Porous Material Except Wood | 50 |
| Wood | 30 |
| Fiberglass | 80 |
| | |
| Sealants | |
| Architectural | 250 |
| Other | 250 |
| | |
| Sealant Primers | |
| Architectural - Nonporous | 250 |
| Architectural - Porous | 775 |
| Other | 750 |

3. Aerosol adhesives used on the interior of the building shall comply with the VOC limits of Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000. VOC limits in percent by weight for aerosol adhesives used on interior of building are as follows.

| Aerosol Adhesives | VOC Limit (g/L) |
|----------------------------------|--------------------|
| General Purpose Spray Mist | 65% VOCs by weight |
| General Purpose Web Stray | 55% by weight |
| Special Purpose Aerosol Adhesive | 70% by weight |

4. Limits on VOCs in grams per liter for carpet adhesives shall comply with the VOC limits shown below:

| | |
|------------|-----------------|
| Adhesives | VOC Limit (g/L) |
| Total VOCs | 50 |

F. Credit IEQc4.2: Paints and Coatings

1. Paints applied on the interior of the building shall comply with Green Seal Product Specific Environmental Requirements (www.greenseal.org/standard/paints.htm). The Green Seal standard is intended for paints and anti-corrosive paints. Both interior and exterior paints are addressed by the standard, but only limits for interior paints apply to a LEED project. Architectural paints coating and primers applied to interior walls as well as Anti-corrosive paints applied to interior ferrous metal shall not exceed the VOC limits set forth in Green Seal Standard GS-11 and GS-03, respectively. Limits on VOCs in grams per liter for paints and anti-corrosive paints are as follows:

| Interior Paint Coatings | VOC Limit (g/L minus water) |
|--|-----------------------------|
| Flat Coating or Flat Primer (GS-11-93) | 50 |
| Non-Flat Coating or Non-Flat Primer (GS-11-93) | 50 |
| Anti-Corrosive/Anti-Rust Paint (GS-03-97) | 100 |

2. Clear wood finishes, floor coatings, stain, sealers and shellac applied to interior elements during construction shall comply with the VOC limits set forth in South coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, dated January, 2004.

| Other Interior Coatings | VOC Limit (g/L minus water) |
|--|-----------------------------|
| Sealers and Undercoater | 100 |
| Concrete Curing Components | 100 |
| Waterproofing Sealers | 100 |
| Waterproofing Concrete / Masonry Sealers | 100 |
| Floor Coatings | 50 |
| Japan/Faux Finishing Coatings | 350 |
| Magnesite Cement Coatings | 450 |
| Stains | 100 |
| Clear Wood Finish: Lacquer | 275 |
| Clear Wood Finish: Sanding Sealer | 275 |
| Clear Wood Finish: Varnish | 275 |
| Clear Brushing Lacquer | 275 |
| Pigmented Lacquer | 275 |
| Shellac: Clear | 730 |
| Shellac: Pigmented | 550 |
| Wood Preservatives | 350 |
| Low-Solids Coatings | 120 |

G. Credit IEQc4.3: Flooring Systems:

1. Carpets installed within the building during construction shall meet the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
2. Carpet cushion installed within the building during construction shall meet these requirements of the Carpet and Rug Institute Green Label program.
3. Carpet adhesives shall meet the requirements of IEQc4.1: VOC limit of 50 g/l.
4. Hard surface and resilient flooring installed within the building must be certified as compliant with the FloorScore (or equivalent) standard by an independent third-party. Flooring products covered by FloorScore include vinyl, linoleum, laminate flooring, wood flooring, rubber flooring and wall base.

5. Finishes, such as sealers and stains, applied to concrete, wood, bamboo and cork flooring shall comply with the VOC limits set forth in South coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, dated January, 2004.
 6. Tile setting adhesives and grout shall comply with the VOC limits set forth in South coast Air Quality Management District (SCAQMD) Rule 1168, effective date of July 1, 2005 and rule amendment date of January 7, 2005.
- H. Credit IEQc4.4: Composite Wood
1. Composite wood and agrifiber products, including laminating adhesives, installed inside the exterior moisture barrier shall contain no added urea-formaldehyde resins.
- I. Credit IEQc5 - Indoor Chemical and Pollutant Source Control:
1. Provide MERV 13 or greater air filtration media on all supply air.

PART 3 EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT

- A. Credit MRc2.1 and MRc2.2: Comply Section 01 74 19 - Construction Waste Management.

3.02 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

- A. Credit IEQc3.1:
1. Comply with the recommended Control measures of the SMACNA IAQ Guidelines for Occupied Buildings under Construction, 1996, Chapter 3.
 2. Protect stored on-site or installed absorptive materials from moisture damage.
 3. If permanently installed air handlers are used during construction, filtration media with a MERV of 8 shall be used at each return air grille.
 4. Replace all filtration media immediately prior to occupancy.
- B. Credit IEQc3.1 and IEQc3.2: Comply with Section 01 81 19 - Construction Indoor Air Quality.

END OF SECTION

CONSTRUCTION INDOOR AIR QUALITY**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Construction indoor air quality (IAQ) goals and includes
- B. Administrative and procedural requirements for the development and execution of a construction air quality management plan.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for installation, maintenance and removal of temporary utilities, controls, and facilities during construction.
- B. Section 01 81 13 - LEED Requirements: Special requirements for LEED certification.
- C. Section 01 60 00 - Product Requirements: Procedures for storage of interior materials to prevent exposure to moisture and pollutants.

1.03 IAQ MANAGEMENT SUMMARY

- A. The Owner has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.
- B. Protect the ventilation system components during construction and clean contaminated components after construction is complete.
- C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. IAQ Management Plan: Construction and pre-occupancy phases of the project.
- C. Photographs: Time/Date stamped digital photographs documenting construction IAQ management measures implemented during construction, such as duct protection measures and measures to protect on-site stored or installed absorptive materials from moisture. At least eighteen (18) such photographs - at least six photographs taken on at least three different occasions during construction- must be provided.
- D. Product Data: Cut sheets of filtration media used during construction with MERV values highlighted.

1.05 CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

- A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
 - 1. During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction 1995, Chapter 3,
 - 2. Protect stored on-site or installed absorptive materials from moisture damage.
- B. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.

1. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
 - a. Fit all return air grilles with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
 - b. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
 - c. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
 - d. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
 - e. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
 - f. Replace all filtration media prior to occupancy.
 2. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.
 3. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
 - a. Erect some type of barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.
 4. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
 - a. Store building materials in a weather tight, clean area prior to unpacking for installation.
 - b. Check for possible damage to building materials from high humidity.
 - c. Clean all coils, air filters, and fans before testing and balancing procedures are performed.
 5. Scheduling: Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.
 - a. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.
 - b. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60% or perform IAQ Testing in accordance with LEED-NC v2009 IEQc3.2 Requirements. The flush-out will require auxiliary fans connected to the ventilation system.
- C. Draft IAQ Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting, and identify all conclusions reached and matters requiring further resolution.
1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.
- D. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (C) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 IMPLEMENTATION OF IAQ MANAGEMENT PLAN

- A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and the IAQ Management Plan for the Project.
- B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agenda.
- C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.
- D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

END OF SECTION

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section describes work associated with commissioning of selected systems including commissioning meetings, construction checks, equipment start-up, functional testing, operations and maintenance manuals, and operator training.
- B. Work Provided Under Separate Contract: Owner's Commissioning Authority (CA) will supervise commissioning activities and provide the following commissioning services:
 - 1. Develop commissioning plan.
 - 2. Assist Contractor to incorporate commissioning activities into Project Construction Schedule.
 - 3. Conduct commissioning meetings.
 - 4. Review project submittals.
 - 5. Develop Construction Checklists and Functional Test Plans.
 - 6. Observe Construction checks and start-up of selected equipment.
 - 7. Supervise and document functional testing.
 - 8. Review O&M manuals and as-built documents.
 - 9. Coordinate operator training.
 - 10. Prepare final commissioning report.
- C. Contractor shall provide the following services:
 - 1. Assign individuals representing Contractor and mechanical, electrical, controls, and low voltage subcontractors as members of Commissioning Team.
 - 2. Incorporate commissioning activities in Contractor's construction schedule.
 - 3. Assist CA in development of Construction Checklists.
 - 4. Execute Construction Checklists.
 - 5. Perform Equipment Start-up.
 - 6. Perform contractor directed verification of automatic controls, communications, and fire and life safety systems and provide required verification documentation.
 - 7. Assist CA in development of Functional Test Plans.
 - 8. Assist CA with Functional Testing.
 - 9. Provide Operations & Maintenance documentation.
 - 10. Perform operator training and supervise training performed by manufacturer's representative.
 - 11. Provide submittals, product data, shop drawings, and design documents as specified to comply with LEED requirements.
- D. Contractor shall provide related services as directed, including, but not limited to:
 - 1. Access to the Work
 - 2. Incidental labor, facilities, and equipment to assist CA in conducting commissioning activities.
 - 3. Completion of required submittals.
 - 4. Coordination of Work with activities of CA.

1.02 RELATED SECTIONS

- A. 22 08 00 – COMMISSIONING OF PLUMBING
- B. 23 08 00 – COMMISSIONING OF HVAC
- C. 26 08 00 – COMMISSIONING OF ELECTRICAL

1.03 DEFINITIONS

- A. CA: Commissioning Authority (CA) is the Individual responsible for supervising commissioning work.

- B. Construction Phase Commissioning Plan: Document prepared by the CA that guides commissioning work through construction, verification, and warranty periods. The plan will include a listing of commissioning team members, systems to be commissioned, narrative description of the commissioning tasks and responsibilities, and a draft copy of the commissioning forms to be executed by the Contractor.
- C. Construction Phase: Phase of the project during which the facility is constructed and equipment is installed and started. During the Construction Phase, the Contractor completes construction checklists, performs equipment start-up, performs TAB work, submits O&M manuals, and performs control system verification. The Construction Phase generally ends at Substantial Completion.
- D. Verification Phase: Phase of the project during which functional testing and operator training is performed. The Verification Phase generally begins at Substantial Completion and ends at Final Completion.
- E. Leadership in Energy and Environmental Design (LEED): LEED is a certification program administered by the U.S. Green Building Council (USGBC) that promotes sustainable construction practices. LEED has developed a rating system used to certify construction projects. Where indicated, work under this project must conform to standards set forth by the LEED rating system as specified herein.
- F. Online Commissioning System: The CA will maintain an online commissioning system, which serves as a central location for accessing commissioning documents such as the Owner's Project Requirements, Commissioning Plan, status reports, design reviews, submittal reviews, schedules, and Issues Log. The online system provides current project information to authorized project team members through general internet access. The site URL is <https://www.swecx.com>. The Issues Log portion of the site allows for the Owner's Construction Manager, Architect, and General Contractor to provide comments, document actions, and indicate resolutions.

1.04 SUBMITTALS

- A. Designated Commissioning Team Representatives: Submit list of names and contact information for individuals representing Contractor and Subcontractor as members of Commissioning Team.
- B. Construction Schedule: Submit updated project construction schedule to CA monthly. Incorporate time and duration of Commissioning activities, as provided by CA, into the construction schedule
- C. Construction Submittals and Shop Drawings: Provide as required to perform commissioning work.
 1. Contractor to provide CA a copy of submittal log. CA will review log and identify submittals that are associated with equipment and systems being commissioned and required to be submitted to the CA.
 2. Contractor to provide one copy of each submittal or shop drawing to the Owner's Representative, including all resubmissions, required by the CA at the same time submittals are provided to the Design Team. CA will review submittals concurrently with the Design Team and provide review comments to the Design Team. The Design Team will consolidate review comments into a single submittal review response to be provided to the Contractor.
 3. Contractor to provide a copy of Design Team submittal review comments to the CA.
- D. Engineering Data: Provide shop drawings, product data, performance data, engineering data, installation and start-up data, operation and maintenance information, schematics, wiring diagrams, programming manuals, and similar information as necessary for completion of the Work of the Section in accordance with Commissioning Schedule.

- E. Construction Checklists: Complete and submit to CA for certification. Attach copies of all manufacturers' field or factory performance and start-up test documentation provided for associated equipment or systems.
- F. Control Verification Reports: Complete and submit to CA for certification.
- G. Operator Training Schedule: Contractor shall submit training schedule listing all required training sessions as specified and in accordance with Training Plans. Training schedule shall include date and time of training, location, and name and qualification of trainer, and facilities needed for training. Training Schedule to be submitted to Owner's Authorized Representative four weeks prior to substantial completion.
- H. Operations and Maintenance Manuals: Furnish one copy of draft and final Operations and Maintenance Manuals for review by CA. Deliver two manuals to CA or provide access to manuals at project site. CA will return manuals to Contractor upon completion of CA review.
- I. LEED Documentation: Contractor to provide electronic copies of work products and other items as specified to support development of Systems Manual.
 - 1. Provide documentation for fire protection; plumbing; heating, ventilating, and air-conditioning; electrical; communications; electronic safety and security systems, and building support systems being commissioned.
 - 2. Provide the following documentation for each system where appropriate.
 - a. General system description
 - b. System schematic process diagram including equipment, process piping and ductwork, major components, control input and output devices, and relevant component designations coordinated with parts list and other design documentation
 - c. Systems plans and sections required to show general arrangement
 - d. Parts list
 - e. Sensor and actuator calibration schedule
 - f. Wiring diagrams for power, control, and monitoring
 - g. Automatic control system sequence of operations revised to accurately reflect as-constructed conditions. Sequence of operations narrative shall be complete and accurate and have proper grammar and spelling
 - h. Electronic copy of final automatic control system programming and configuration parameters. Documentation shall clearly display all programming sequences and parameters in an understandable and printable format. Compiled controller configurations files are not acceptable.
 - i. Electronic copy of programming manuals that provide complete and detailed information for the access, programming, operation, monitoring, troubleshooting, maintenance, and repair of systems, equipment, and controls

1.05 QUALITY ASSURANCE

- A. Provide qualified mechanics and technicians to provide required commissioning services. Technicians shall have knowledge of the Work and experience with installation and operation of the general systems and components involved to assist in commissioning activities. Individuals shall be adequately equipped to effectively assist the CA as necessary. Upon request submit names and qualifications of technicians to CA for approval.
- B. Provide qualified instructors to perform operator training. Instructor shall be knowledgeable in the specific equipment and systems involved. Upon request submit names and qualifications of technicians to CA for approval.
- C. Commissioning work shall be provided as set forth by the LEED NC 2009 rating system in accordance with the following requirements:
 - 1. Energy & Atmosphere, Prerequisite 1 - Fundamental Commissioning
 - 2. Energy & Atmosphere, Credit 3 - Enhanced Commissioning

1.06 SEQUENCING

- A. Schedule adequate time as determined by CA for execution of Commissioning Plan.
- B. CA will conduct a Commissioning Process Meeting approximately 30 days after Contractor received Notice-to-Proceed and after all subcontractors are identified.
- C. CA will prepare a Construction Phase Commissioning Plan approximately 30 days after Commissioning Process Meeting.
- D. Provide construction submittals and shop drawings to CA as described above in SUBMITTALS.
- E. Provide engineering data as required by CA to prepare Construction Checklists within four weeks after date of approved submittal.
- F. CA will conduct an initial commissioning coordination meeting approximately 30 days before equipment begins to arrive at the project site to coordinate commissioning activities and execution of construction checklists. Additional commissioning coordination meetings will be scheduled as necessary throughout the process to discuss commissioning schedule and coordination among trades.
- G. Perform Construction Checks as equipment is received, installed, and placed in operation. Construction checks shall be performed as work is completed. For example, equipment inspection shall be performed upon receipt of equipment on site, installation inspection shall be performed when equipment is set in place and anchored, and so on.
- H. Submit schedule for operator training to Owner's Authorized Representative and CA four weeks prior to Substantial Completion. Schedule shall include time and duration of each required training session.
- I. Submit fire alarm system control verification report two weeks prior to Fire Marshall's acceptance test.
- J. Submit control verification reports three weeks after Substantial Completion.
- K. Functional testing will be scheduled after construction checklists; testing, adjusting, and balancing report; and control verification reports have been submitted and accepted. Contractor shall provide written notice that systems are completely operational and ready for functional testing. Functional testing may proceed prior to acceptance if the CA and Owner's Authorized Representative determines that deficiencies will not significantly affect system performance and timing is critical. The CA will provide notification to Contractor, Architect, and Owner's Authorized Representative a minimum of one week prior to performing functional testing.
- L. Submit draft operations and maintenance manuals to Owner's Authorized Representative 30 days prior to substantial completion.
- M. Operator training shall be performed within a 30-day period following Substantial Completion.
- N. Troubleshooting, corrections, and retesting shall be completed within 3 months of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide specialized test equipment including manufacturer's proprietary test equipment, as necessary for commissioning of mechanical, plumbing and electrical systems and components. Comply with requirements of individual technical Sections of Division 22, 23, and 26. Common test equipment such as temperature, pressure, speed, and electrical power measuring devices shall be provided by CA.

PART 3 EXECUTION**3.01 APPLICATION**

- A. Commissioning Meetings: Commissioning Team shall attend meetings as required by CA including Commissioning Process Meeting, submittal review meetings, and coordination meetings prior to construction checks; adjusting and balancing; and functional testing. Commissioning team shall attend troubleshooting meetings as required to resolve issues identified in submittal reviews and commissioning reports.
- B. Construction Checklists:
1. Provide equipment installation, start-up, and operating information requested by the CA as required to develop Construction checklists.
 2. Perform construction checks for all equipment being commissioned as described in Construction Checklists prior to equipment start-up. The Contractor shall designate responsibility for completing construction checks among subcontractors. The designated subcontractor shall initial and date each item on checkout sheets as completed and submit executed forms to CA for certification. All items listed in the Construction Checklists shall be complete prior to certification unless the incomplete item does not affect safe and reliable equipment operation. If such an item is identified, a description of the incomplete work must be attached to the Construction Checklists. Equipment requiring construction checkout shall not be started until the Construction Checklists are fully executed by the Contractor.
 3. Contractor shall maintain "Cx Submittal Status Report". CA will furnish Excel status report spreadsheet that will be used to monitor completion of construction checklists.
 4. Contractor shall startup equipment as described in construction checklists. Where required, provide manufacturer's agent to perform start-up as specified in Divisions 22, 23, and 26.
 5. Fully executed Construction Checklists shall be submitted to the CA for certification.
 6. CA will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
 7. CA shall perform a recheck of selected equipment. If minor discrepancies are identified, Contractor shall recheck all similar systems and resubmit Construction Check forms for certification. If major discrepancies are identified, CA shall perform Construction Checks, and Contractor shall compensate Owner for additional commissioning costs by Contract modification.
- C. Control Verification Reports:
1. Perform control system verification and prepare verification reports as specified in Divisions 23 and 26. Verification shall be performed by manufacturer's authorized installation contractor. Verification report shall include a description of the incomplete work.
 2. Submit completed Control Verification Reports to the CA for acceptance.
 3. CA will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
- D. Functional Tests:
1. Assist CA in performing Functional Tests, which shall generally include operating equipment and systems as necessary for testing. The CA will record test measurements and documentation of results.
 2. CA will document all unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
 3. CA shall retest selected systems once to verify that corrective work is complete. Retests will be performed after notification from the Contractor that work is complete. If corrective work is not complete and additional retesting is required, Contractor shall compensate Owner for costs of additional CA testing sessions by Contract modification.

- E. Operations & Maintenance Manuals: Contractor shall provide complete operation and maintenance information for all equipment and systems being commissioned. Information shall be suitably bound, organized, and comprehensive. CA will review and provide written review comments to the Owner's Authorized Representative.
- F. Operator Training: Instruct Owner's operating personnel in operation and maintenance of mechanical and electrical equipment and all systems being commissioned.
1. Instruct Owner in proper operation and maintenance of equipment and systems. Instruction shall generally include topics listed in manufacturer's operations and maintenance manual. Operator instructions shall cover all aspects of manual, automatic, and safety controls. Contractor shall also instruct the Owner in the general configuration of systems and location of equipment and components. Equipment shall be fully operational prior to instruction.
 2. Contractor shall furnish training by equipment manufacturers where specifically required. Manufacturer's field start-up and adjustment will not fulfill manufacturer's training requirement.
 3. Contractor shall coordinate operator training with the Owner's Authorized Representative and CA as follows:
 - a. Training Plan: The CA shall develop an Operator Training Plan, which provides details regarding the type and amount of training required. The plan will include a Training Record and an Evaluation section to be executed at the completion of each training session.
 - b. Training Schedule: Contractor shall develop a training schedule for approval by the Owner's Authorized Representative.
 - c. Training Record and Evaluation Section: The Training Record and Evaluation section included on the Training Plan provide documentation of the attendees, duration, and quality of each training session. The Contractor shall complete Training Record after each training session. The Owner's Authorized Representative will complete the evaluation section of the Training Plan and the completed plan shall be returned to the CA. Training will not be accepted until the Training Plan is returned to the CA with the Record and Evaluation sections fully executed.
- G. Issues Resolution: Unresolved issues will be listed in the project online Issues Log. Refer to Online Commissioning System in Article 1.03, Definitions above. Each issue will be identified with an identification number. The Issues Log will include a description of the unresolved condition, identify the responsible individual(s), and describe suggested corrective action. The Contractor will periodically access the On-line Commissioning System to monitor the status of commissioning issues, and shall diligently complete all tasks that are identified as the responsibility of the Contractor. The Contractor shall modify on-line issue status when each item is completed and provide a description of corrective action performed. Contractor and related subcontractors shall attend commissioning meetings to review the Issues Log and coordinate resolution of issues as required by the CA.

3.02 QUALITY CONTROL

- A. Provide mechanics that are experienced with the Work and installed components of each system to assist in completion of the commissioning activities.
1. Work necessary to provide systems complying with performance requirements of the contracts is the Contractor's responsibility.
- B. Manufacturer's Field Services: Provide manufacturer's representatives with expertise in components and systems. Where required, manufacturer's representative shall perform start-up, testing, and maintenance training of Owner's facilities staff including classroom and onsite instruction.

3.03 ACCESS TO WORK

- A. Contractor shall provide facilities and access for CA to perform work including but not limited to:
1. Keys, security passes, passwords, codes, etc.
 2. Ladders
 3. Lifts where work is more than 12 feet above floor level
 4. Removal of ceiling tiles, partitions, panels, or other fixed construction necessary for completion of work
 5. Proprietary programming and metering equipment

END OF SECTION

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Agency.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 03 30 00 - Cast-in-Place Concrete.
- D. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute; 2010.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 2011.
- D. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute; 2004.
- E. ASME A17.1 - Safety Code for Elevators and Escalators; The American Society of Mechanical Engineers; 2010.

1.04 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in Oregon.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:

1. Materials and Resources Credit 7 - FSC Certified Wood.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 1. Materials and Resources Credit 4 - Recycled Content.
 2. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347, ACI 301, and ACI 318.

2.02 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.03 REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.04 FORMWORK AT UNDULATING EDGES

- A. Flexible Plastic Edging: Flexible edging capable of obtaining 12" minimum diameter without kinks.
 1. Plastic Flexi-Form by Frank Wall Enterprise, LLC: www.frankwall.com.
 2. Ketter Forms by Ketter Forms, LLC: www.ketterforms.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 FORMWORK ACCESSORIES

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
- C. Form Release Agent: Colorless mineral oil that will not stain concrete, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.
- D. Filler Strips for Exposed Corners: Rigid plastic type; 3/4 x 3/4 inch size; maximum possible lengths.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- F. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 PREPARATION

- A. Paint layout of irregular shaped concrete edges on prepared base for approval prior to installing forms.

3.03 EARTH FORMS

- A. Earth forms are not permitted.

3.04 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on drawings.
- F. Provide chamfer strips on exposed external corners of columns and walls.
- G. Coordinate this section with other sections of work that require attachment of components to formwork.
- H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.05 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.07 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.08 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.
- C. Camber slabs and beams in accordance with ACI 301.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.10 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

CONCRETE REINFORCING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Agency.
- B. Section 03 10 00 - Concrete Forming and Accessories.
- C. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- B. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; 2004.
- C. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2013.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2013.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; American Welding Society; 2011.
- G. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2009.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.
 - 1. Maintain one copy of each document on project site.
- B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:

1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (60,000 psi).
 1. Plain billet-steel bars.
 2. Unfinished.
- B. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, plain type.
 1. Flat Sheets.
 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
- D. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.
- E. Epoxy Adhesive: Two component epoxy.
 1. See Structural Drawings.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 1. Review locations of splices with Architect.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as indicated on Structural Drawings.
- E. Support and secure against displacement by formwork construction or concrete placement. Support with chairs, runners, bolsters, spacers, and hangers as required.
- F. Install welded wire fabric in large pieces as practical. Lap adjoining pieces at least two full mesh. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- G. Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wiring and tying. Comply with requirements of ACI 318 for minimum lap of spliced bars, except as indicated otherwise.
- H. Install rebar with epoxy adhesive as indicated on Drawings. Follow manufacturer's published instruction for preparation, mixing and placement of epoxy adhesive. Coordinate special inspection requirements. Do not substitute epoxy anchors for cast-in anchors without specific approval.

3.02 SPECIAL REINFORCEMENT

- A. Slab Re-Entrant Corners: Provide one each, 48 inch long, No. 5 bar diagonally across corner.

3.03 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 40 00, will inspect installed reinforcement for conformance to contract documents before concrete placement.
- B. Testing and Inspection: Special inspections required by Code.

END OF SECTION

CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete materials.
- B. Floors and slabs on grade.
- C. Concrete footings.
- D. Concrete foundation walls.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads, light pole bases, and flagpole bases.
- G. Concrete curing.
- H. Underslab vapor barrier.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Agency.
- B. Section 01 50 00 - Temporary Facilities and Controls: Recycling concrete truck wash-down waste.
- C. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- D. Section 03 20 00 - Concrete Reinforcing.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010.
- C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2013.
- L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- M. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- O. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- R. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2013.
- S. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).
- T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- U. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Concrete Mix Design Data: For each strength with history.
- D. Floor Joint Layout Drawings: Submit layout for all joints, coordinate with joints in finishes.
- E. Samples: Submit samples of underslab vapor retarder to be used.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 FORMWORK**

- A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT

- A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I - Normal and Type II - Moderate Portland type.
 - 1. Acquire all cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33.
 - 1. Acquire all aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Slag: Ground granulated blast-furnace slag, ASTM Grade 100 or 120.
- E. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
 - 2. Permeance: 0.04 minimum.
 - 3. Products:
 - a. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): www.insulationsolutions.com.
 - b. Stego Industries, LLC; Stego Wrap Vapor Barrier 15-mil (Class A): www.stegoindustries.com.
 - c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com.
 - d. 15 Mil Husky Yellow Guard by Poly-America: www.yellowguard.com.
 - e. Moistop Ultra 15 by Fortifiber Building Systems Group: www.fortifiber.com.
 - f. Vaporblock VB15 by Raven Industries: www.ravenefd.com.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Snap Tie Plugs: Preformed, non-shrink grout plugs to fill holes left by form ties; size to flush with wall surface; compatible permanent adhesive.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C 1059 Type II.
- B. Epoxy Bonding System:
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

- D. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch thick and 4 inches deep; tongue and groove profile.

2.07 CURING MATERIALS

- A. Curing and Sealing Compound: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C309; UV resistant; approved for use with colored concrete.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Type A Concrete: Provide concrete to the following characteristics for typical concrete, except exterior slabs on grade:
 1. Compressive Strength (28 days): See General Structural Notes on Drawings
 2. Minimum Cement Content: 5 sacks per cubic yard
 3. Maximum Water/Cement Ratio: 0.5; 0.45 at interior slabs on grade
 4. Fly Ash or Slag Content: 15 percent minimum, 25 percent maximum, of cementitious materials by weight.
 5. Aggregate size: 3/4-in maximum.
- E. Type B Concrete: Provide concrete to the following characteristics for exterior slabs on grade:
 1. Compressive Strength (28 days): 3,500 psi.
 2. Minimum Cement Content: 5 sacks per cubic yard
 3. Maximum Water/Cement Ratio: 0.38
 4. Fly Ash or Slag Content: 15 percent minimum, 25 percent maximum, of cementitious materials by weight.
- F. Provide 4 percent, +/- 1 percent, air entraining agent to concrete mix for work exposed to exterior.
- G. Use set retarding admixtures during hot weather only when approved by Architect.
- H. Use accelerating admixtures in cold weather only when approved by Architect. Use of admixtures will not relax cold weather placement requirements.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 2. Use latex bonding agent only for non-load-bearing applications.
- B. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends. Coordinate vapor retarder installation with installation of reinforcing specified in Section 03 20 00. Repair damaged vapor retarder before concrete placement.

1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

- A. Locate joints as indicated on the Drawings or as approved by Architect.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
- E. Place floor slabs in checkerboard or saw cut pattern on approved Floor Joint layout Plan.
- F. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 1. Exposed Concrete Floors: 1/4 inch in 10 ft.
 2. Under Seamless Resilient Flooring: 1/4 inch in 10 ft.
 3. Under Carpeting: 1/4 inch in 10 ft.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Interior Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting and resilient flooring.
 2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- E. Exterior Concrete Paving: Finish to requirements of ACI 302.1R, and as follows:
 1. Sidewalks: Medium broom finish to match approved sample.

3.07 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
 - 2. High early strength concrete: Not less than 4 days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
- E. Sealer: Apply sealer/hardener to exterior horizontal concrete surfaces; apply as recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- H. Special inspections required by Code.

3.09 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

END OF SECTION

STRUCTURAL STEEL FRAMING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Structural steel framing members, support members.
- B. Grouting under base plates.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Agency.
- B. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2011.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
- E. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2013.
- F. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).
- G. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.
- H. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.
- I. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2008.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- L. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections not detailed.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
- B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Design connections not detailed on the drawings under direct supervision of a Professional Engineer experienced in design of this work and licensed in Oregon.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
 - 2. Indoor Environmental Quality Credit 4.3 - Low-Emitting Materials: Flooring Systems.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles, Plates, and Channels: ASTM A 36/A 36M (unless noted otherwise on Structural Drawings).
- B. Cold-Formed Structural Tubing/Hollow Steel Sections (HSS): ASTM A500, Grade B.
- C. Carbon Steel Anchor Bolts, Machine Bolts and Threaded Rods: ASTM A 307.
- D. Welding Materials: AWS D1.1; E70XX, type required for materials being welded. CVN 20 ft-lbs at -20 degrees F for welds at structural flange.
- E. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations as specified in Section 01 81 13.01 and Section 01 81 13.02.

2.02 FABRICATION - GENERAL

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal joined members by continuous welds. Grind visually exposed welds smooth.
- C. Fabricate connections for bolt, nut, and washer connectors.
- D. Develop required camber for members.

2.03 SHOP FINISH - NON-EXPOSED STEEL

- A. Surface Preparation: Clean surfaces in accordance with SSPC SP 1, Solvent Cleaning; prepare galvanized surfaces in accordance with primer manufacturer's instructions.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

- A. Welded Connections: Visually inspect all shop-welded connections and test at least 25 percent of welds using one of the following:
 1. Radiographic testing performed in accordance with ASTM E94.
 2. Ultrasonic testing performed in accordance with ASTM E164.
 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on shop drawings.
- D. Do not field cut or alter structural members without approval of Architect.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. At exposed locations, trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Welded Connections: Provide testing of any unidentified steel members and Special Inspection per OSSC Chapter 17.
- C. Refer to Structural Drawings.

END OF SECTION

METAL FABRICATIONS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel items, including:
 1. Angle at exterior door openings.
 2. Other work as indicated on Drawings.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wall framing.
- B. Section 09 90 00 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 LEED REQUIREMENTS

- A. LEED Project Goals:
 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 1. Materials and Resources Credit 4 - Recycled Content.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 1. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MATERIALS - STEEL**

- A. Steel Angles, Channel and Plates: ASTM A36/A36M.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Screws: Compatible with materials and to provide adequate anchorage and support.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Door Frames for Overhead Door Openings: Angle sections; galvanized finish.

2.04 FINISHES - STEEL

- A. Galvanizing of Steel Members: Galvanize after fabrication to ASTM A 123/A 123M requirements. Provide minimum 2.0 oz/sq ft galvanized coating.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 PREPARATION

- A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

PIPE AND TUBE RAILINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

1.03 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- C. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.05 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
 - 1. Wall and Guard Rails: 1-1/2 inches diameter, round; or as indicated on Drawings.

2.02 STEEL RAILING SYSTEM

- A. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: No exposed bolts or screws.
- D. Galvanizing: In accordance with requirements of ASTM A123/A123M.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.
- D. Welded Joints:
 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 STEEL FINISHES

- A. Galvanizing of Steel Members: Galvanize after fabrication to ASTM A 123/A 123M requirements. Provide minimum 2.0 oz/sq ft galvanized coating.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

ROUGH CARPENTRY**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Structural floor, wall, and roof framing.
- E. Floor sheathing / underlayment.
- F. Preservative treated wood materials.
- G. Miscellaneous framing and sheathing.
- H. Wood nailers associated with roofing and flashing.
- I. Concealed wood blocking, nailers, and supports.
- J. Miscellaneous wood nailers, furring, and grounds.
- K. Composite wood bumper rails and corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 06 17 33 - Wood I-Joists.
- B. Section 06 17 36 - Metal-Web Wood Joists.
- C. Section 06 18 00 - Glued-Laminated Construction.
- D. Section 07 90 05 - Joint Sealers: Sill sealer for exterior sill plates.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.
- D. PS 1 - Structural Plywood; 2009.
- E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; National Institute of Standards and Technology, U.S. Department of Commerce; 2010.
- F. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
- C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 4x6 inch in size illustrating wood grain, color, and general appearance.

1.05 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
 - 1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
- B. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- C. Fire-Rated and Acoustical-Rated Construction: Comply with installation requirements for systems as indicated on Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 5 - Regional Materials.
 - 2. Materials and Resources Credit 7 - FSC Certified Wood.
 - 3. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: 19 percent, maximum.
- C. Stud Framing (2 by 2 through 2 by 6); S4S:
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: See Structural Drawings.
- D. Beams (4 x 5 and larger):
 - 1. Species: Douglas Fir-Larch.
 - 2. Grade: See Structural Drawings.
- E. Posts:
 - 1. Species: Douglas Fir-Larch.

- 2. Grade: See Structural Drawings.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.
- G. Miscellaneous Blocking, Furring, and Nailers:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.
- H. Lumber to Receive Preservative Pressure Treatment:
 - 1. Species: Hem-fir or Douglas fir, S-Dry.
 - 2. Grade: No. 2.

2.03 STRUCTURAL COMPOSITE LUMBER

- A. Structural Composite Lumber: Factory fabricated joists, beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer; See Structural Drawings.
 - 1. Laminated Strand Lumber (LSL): Timberstrand 1.55E. See Structural Drawings.
 - 2. Manufacturers:
 - a. Weyerhaeuser: www.weyerhaeuser.com.

2.04 EXPOSED BOARDS

- A. Exposed Wood:
- B. Exposed Composite Boards: Composite wood and plastic composition.
 - 1. Size: 0.875 x 5.5 inch.
 - 2. Edges: Eased.
 - 3. Surfacing: Smooth.
 - 4. Product:
 - a. Select by Trex: www.trex.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 CONSTRUCTION PANELS

- A. Roof Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
 - 1. Face Grade: CD at concealed locations; BC at exposed locations at Kitchen; CD at Woodshop.
 - 2. Size: 4 feet wide by 8 feet long.
 - 3. Span Rating: See Structural Drawings.
 - 4. Thickness: See Structural Drawings.
- B. Wall Sheathing: APA PRP-108, Rated Sheathing, Exterior Exposure Class, and as follows:
 - 1. Span Rating: See Structural Drawings.
 - 2. Thickness: See Structural Drawings.
 - 3. Face Grade: CD at concealed locations; CD at Wood Shop; BC at Kitchen.
- C. Shear Wall Sheathing: Structural Plywood or Oriented strand board wood structural panel, conforming to requirements of PS 1 or PS 2.
 - 1. Span Rating: See Structural Drawings.
 - 2. Thickness: See Structural Drawings.
 - 3. Face Grade: CD at concealed locations; CD at Wood Shop; BC at Kitchen.

2.06 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

1. For contact with preservative treated wood, provide minimum G185 galvanizing per ASTM A 653/A 653M.
 2. See Structural Drawings.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood, provide minimum G185 galvanizing per ASTM A 653/A 653M.
 2. See Structural Drawings.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 2. Treat lumber in contact with roofing, flashing, or waterproofing.
 3. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- D. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- E. Install structural members full length without splices unless otherwise specifically detailed.
- F. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.
- G. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.
- I. Coordinate installation of sill sealer with Section 07 90 05 - Joint Sealers; set exterior wall sill plates with sill sealer.

3.04 COMPOSITE BOARDS (WALL BUMPERS, CORNER GUARDS)

- A. Install bumper rails continuous and level where indicated on Drawings; bevel joints and exposed ends.
- B. Install corner guards where indicated on Drawings; single pieces without joints.
- C. Attach with counter-sunk screws attached to studding.

3.05 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
 1. Cabinets and shelf supports.
 2. Wall brackets.
 3. Handrails.
 4. Grab bars.
 5. Towel and bath accessories.
 6. Wall-mounted door stops.
 7. Chalkboards and marker boards.
 8. Joints of rigid wall coverings that occur between studs.

3.06 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.07 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 1. At long edges provide solid edge blocking where joints occur between roof framing members.
 2. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
 2. Exposed Location: Provide uniform layout of fasteners.

3.08 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

METAL-WEB WOOD JOISTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Joists for roof framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joist configurations, bearing and anchor details, bridging and bracing .
- C. Shop Drawings: Indicate framing system, sizes and spacing of joists, loads and joist cambers, required openings for web penetrations, framed openings . Submit design calculations.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design joists under direct supervision of a Professional Structural Engineer experienced in design of this product type and licensed in Oregon.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for loads, seismic zoning, other governing load criteria and fire retardant requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect joists from warping or other distortion by stacking in vertical position, braced to resist movement.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 5 - Regional Materials.
 - 2. Materials and Resources Credit 7 - FSC Certified Wood.
 - 3. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Joists:
 - 1. Red-L by RedBuilt: www.redbuilt.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Lumber:
 - 1. Grade: As required by design.
 - 2. Moisture Content: Between 7 and 9 percent.
 - 3. Lumber fabricated from old growth timber is not permitted.
- B. Wood Chord Members: Single top and bottom chord.
- C. Web Members: Cold rolled steel tubing, electrogalvanized, accurately die stamped, electrically welded.
- D. Connecting Pins: Electrogalvanized structural carbon steel.
- E. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, maximum moisture content of 19 percent.
- B. Fasteners: Electrogalvanized steel, type to suit application.
- C. Bearing Plates: Electrogalvanized, unfinished steel.

2.04 FABRICATION

- A. Fabricate joists to achieve structural requirements indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install joists in accordance with manufacturer's instructions.
- B. Set members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Install permanent bridging and bracing.
- E. Install headers and supports to frame openings required.
- F. Frame openings between joists with lumber in accordance with Section 06 10 00.
- G. Coordinate installation of sheathing/decking.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

GLUED-LAMINATED CONSTRUCTION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glue laminated wood beams.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood framing and supports.

1.03 REFERENCE STANDARDS

- A. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber; American Institute of Timber Construction; 2007.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- D. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.
- E. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
- C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings .

1.05 QUALITY ASSURANCE

- A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect members to AITC requirements for not wrapped.
- B. Leave individual wrapping in place until finishing occurs.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 1. Materials and Resources Credit 5 - Regional Materials.
 2. Materials and Resources Credit 7 - FSC Certified Wood.
 3. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 GLUED-LAMINATED UNITS**

- A. Glued-Laminated Units - Exposed: Fabricate in accordance with AITC 117 Industrial grade.

1. Verify dimensions and site conditions prior to fabrication.
 2. Cut and fit members accurately to length to achieve tight joint fit.
 3. Fabricate member with camber built in.
 4. Do not splice or join members in locations other than those indicated without permission.
 5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.
- B. Glued-Laminated Units - Concealed: Fabricate in accordance with AITC 117 Industrial grade.
1. Verify dimensions and site conditions prior to fabrication.
 2. Cut and fit members accurately to length to achieve tight joint fit.
 3. Fabricate member with camber built in.
 4. Do not splice or join members in locations other than those indicated without permission.
 5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.02 MATERIALS

- A. Lumber: Douglas Fir lumber conforming to WWPA grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
1. See General Structural Notes on Drawings.
 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connections and Brackets: ASTM A 36/A 36M weldable quality, galvanize per ASTM A123/A123M.
1. Products as indicated on Drawings by Simpson Strong-Tie: www.strongtie.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

2.03 FABRICATION

- A. Combination Symbol: As indicated on Drawings.
- B. Fabricate glue laminated structural members in accordance with AITC Industrial grade for concealed members.
- C. Verify dimensions and site conditions prior to fabrication.
- D. Cut and fit members accurately to length to achieve tight joint fit.
- E. Fabricate member with camber built in.
- F. Do not splice or join members in locations other than those indicated without permission.
- G. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports are ready to receive units.
- B. Verify sufficient end bearing area.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Lift members using protective straps to prevent visible damage.
- B. Set structural members level and plumb, in correct positions or sloped where indicated.
- C. Provide temporary bracing and anchorage to hold members in place until permanently secured.
- D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

ARCHITECTURAL WOOD CASEWORK**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Specially fabricated plastic laminate faced cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2006, 8th Ed., Version 2.0.
- E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- G. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Premium quality, unless other quality is indicated for specific items.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 7 - FSC Certified Wood.
 - 3. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
 - 4. Indoor Environmental Quality Credit 4.4 - Low-Emitting Materials: Composite Woods and Agrifiber Products.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 CABINETS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Grades as indicated.
- B. Plastic Laminate Faced Cabinets: Custom grade, except as modified below.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Composite wood products including, but not limited to, plywood, fiber board, particle board, and hardboard shall not contain any added urea-formaldehyde.

2.03 LUMBER MATERIALS

- A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as follows:
 - 1. Concealed Surfaces: Species Douglas fir.

2.04 PANEL MATERIALS

- A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; exterior glue type as recommended for application.
 - 1. Concealed locations.
 - 2. Backing for countertops with sinks.
 - 3. Core for shelving.
- B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
 - 1. Backing for plastic laminate faced cabinet components, except shelving.
- C. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.
 - 1. Drawer bottoms.
 - 2. Cabinet backs.

2.05 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
 1. Horizontal Surfaces: HGL, 0.039 inch nominal thickness, colors as selected, satin finish.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as selected, satin finish.
 3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 COUNTERTOPS

- A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded and turn-down edge as indicated on Drawings..
- B. Plastic Laminate Countertops with Sinks and Over Dishwashers: Plywood substrate covered with HPDL, conventionally fabricated, with turn-down edge.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 1. Color: As selected by Architect from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.

2.08 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated self rests, zinc-plated finish, for nominal 1 inch spacing adjustments.
 1. Products:
 - a. Model 255 Standard and Model 256 Shelf Rest by Knape & Vogt: www.kv.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Adjustable Shelf Supports (Open Wall Shelving): Standard back-mounted system using heavy-duty surface mounted metal shelf standards with double slots and coordinated cantilevered shelf brackets to support 18 inch deep shelves, zinc plated finish, for nominal 1 inch spacing adjustments.
 1. Products:
 - a. Model 85 Standard and Model 185-18 Bracket by Knape & Vogt: www.kv.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Drawer and Door Pulls: "U" shaped wire pull, bronze with satin finish, 4 inch centers.
 1. Products:
 - a. Model 117.50.610 by Hafele: www.hafeleus.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Catches: Magnetic, adjustable.
 1. Products:
 - a. EDP# 71 0300 by The Stanley Works: www.stanleyworks.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Silencers: Resilient type, adhesive set; clear; adhesive set.
- G. Drawer Slides:

1. Type: Full extension.
 2. Static Load Capacity: Heavy Duty grade.
 - a. Pencil and Box Drawers: 100 pound capacity.
 - b. File Drawers: 200 pound capacity.
 3. Mounting: Side mounted.
 4. Stops: Integral type.
 5. Features: Provide self closing/stay closed type.
 6. Products:
 - a. Accuride International, Inc: www.accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Hinges: Semiconcealed interleaf casework type, steel with satin finish.
1. Products:
 - a. Class 1592-4 by Stanley Hardware: www.stanleyhardware.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.09 FABRICATION

- A. Cabinet Style: Flush overlay.
- B. Cabinet Doors and Drawer Fronts: Flush style.
- C. Drawer Construction Technique: Dovetail joints.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Base Cabinet: Provide with adjustable feet.
- F. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- G. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- H. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- I. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- J. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SHEET WATERPROOFING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sheet membrane waterproofing.
- B. Drainage panels.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 23 - Fill.
- B. Section 03 3000 - Cast-In-Place Concrete: Concrete substrate.

1.03 REFERENCE STANDARDS**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Contractor shall correct defective Work within a two year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.
- C. Provide 20 year manufacturer warranty for waterproofing failing to resist penetration of water , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MEMBRANE MATERIALS**

- A. Composite Laminate Membrane: Comprised of 0.056 inch thickness of rubberized asphalt and a 0.040 inch thickness of polyethylene film; 0.060 inch total thickness; self-adhering.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Sealant: As recommended by membrane manufacturer.
- D. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- E. Surface Primer: Recommended by membrane manufacturer for substrate.
- F. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.02 ACCESSORIES

- A. Sealant: Recommended by membrane manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- E. Pre-strip wall cracks over 1/16 inch width with 8 inch wide membrane.
- F. Apply primer at a rate recommended by membrane manufacturer. Protect primer from rain or frost until dry.

3.03 INSTALLATION - MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

- G. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.
- H. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.04 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

3.05 SCHEDULE

- A. Interior stemwalls where change in finish floor elevation occurs.
- B. Other Locations: As indicated on Drawings.

END OF SECTION

THERMAL INSULATION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Board insulation at over roof sheathing.
- B. Batt insulation in exterior wall construction.
- C. Batt and foam insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.
- B. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over roof sheathing or roof structure.
- C. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.
- D. Section 09 21 16 - Gypsum Board Assemblies: Acoustical insulation.

1.03 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 FOAM BOARD INSULATION MATERIALS**

- A. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1, non-reinforced foam core.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
 - 3. Compressive Strength: 16 psi
 - 4. Board Size: 48 x 96 inch.
 - 5. Board Thickness:
 - a. Roof: 4 inch; 2 layers of 2 inch.
 - 6. Thermal Resistance:
 - a. Roof: R-value of 24.
 - 7. Board Edges: Square.
 - 8. Manufacturers:
 - a. Atlas Roofing Corporation: www.atlasroofing.com.
 - b. GAF Materials Corporation: www.gaf.com.
 - c. Hunter Panels, LLC: www.hpanels.com.
 - d. Rmax Inc.: www.rmax.com.

2.02 BATT INSULATION MATERIALS

- A. Batt Insulation: Flexible preformed high density batt or blanket, complying with ASTM C 665; friction fit.
 - 1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 2. Formaldehyde Content: Zero.
 - 3. Thermal Resistance:
 - a. Walls: R of 21.
 - 4. Width: 16 and 24 inch as indicated on Drawings.
 - 5. Facing: Unfaced.
 - 6. Manufacturers:
 - a. Eco-Batt by Knauf Insulation GmbH: www.knaufinsulation.us.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FOAM INSULATION MATERIALS

- A. Spray Foam Insulation: Two-component, spray-applied polyurethane closed cell foam that creates a seamless, monolithic barrier for protection against water vapor and air on the interior of steel stud walls.

2.04 ACCESSORIES

- A. Sheet Vapor Retarder: Specified in Section 07 25 00.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of irregularities or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION OVER ROOF SHEATHING OR ROOF STRUCTURE

- A. Installation of board insulation over sloped roof structure or roof sheathing is specified in Section 06 10 00.
- B. Install in two layers; one layer of rigid insulation over vapor retarder; second layer with staggered joints.

3.03 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Coordinate work of this section with requirements for vapor retarder specified in Section 07 25 00.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

WEATHER BARRIERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Weather-resistant, air barrier sheet, self-adhered (WRB) - Walls.
- B. Under floor barrier sheet.
- C. Vapor Retarder: Interior walls and ceilings.
- D. Vapor Retarder: Roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Rigid and batt insulation.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Sheet metal flashing and window sill pans to be sealed to weather barrier system.
- C. Section 07 90 05 - Joint Sealers: Sealant materials and installation techniques.

1.03 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- B. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation.

1.05 MOCK-UP

- A. Provide a mock-up, 10 feet long by 10 feet high, illustrating installation procedures and techniques.
- B. Accepted mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after the date of Substantial Completion.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 WEATHER BARRIER MATERIALS**

- A. Weather Resistant Barrier (WRB) (Exterior Wall): Composite primary water-resistive air barrier sheet and drainage matrix membrane; zero VOC; mechanically attached vapor permeable water-resistive sheet membrane consisting of multiple layers of UV stabilized spun-bonded polypropylene and preformed polypropylene mesh; 50 perms per ASTM E 96 Method B; Air Leakage: < 0.0019 cfm/sq.ft. per ASTM E 2178 and < 0.000034 cfm/sq.ft. per ASTM E 283
1. WrapShield HS® Water-Resistive Vapor Permeable Air Barrier and Drainage Matrix sheet by VaproShield, LLC: www.vaproshield.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VAPOR RETARDER MATERIALS

- A. Vapor Retarder - Interior, : 3-ply laminated combination of 2 layers of rubber modified high-density polyethylene and high-strength cord grid, black color.
1. Water Vapor Permeance: 0.037 perm, maximum, when tested in accordance with ASTM E96/E96M.
 2. Products:
 - a. Stego by Stego Industries, LLC: www.stegoindustries.com.
 - b. Griffolyn Type 65 by Griffolyn Division of Reef Industries, Inc: www.reefindustries.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Sheet Rubber Asphalt Barrier Membrane - Roof: Rubberized asphalt bonded to sheet polyethylene, self-adhesive, complying with ASTM D 1970.
1. Thickness: 40 mil (0.040 inch), nominal.
 2. Water Vapor Permeance: 0.05 perm, maximum, when tested in accordance with ASTM E96/E96M.
 3. Water Absorption: Less than 0.12 percent per ASTM D 570.
 4. Elongation: 200 percent per ASTM D 412.
 5. Tensile Strength: 400 psi minimum per ASTM D412, Composite.
 6. Products:
 - a. Carlisle Coatings and Waterproofing, Inc.; CCW-705 Air and Vapor Barrier Sheet: www.carlisle-ccw.com.
 - b. CCW-705 Self-Adhering Air & Vapor Barrier by Carlisle Coatings and Waterproofing, Inc: www.carlisle-ccw.com
 - c. Perm-A-Barrier by W.R. Grace & Company: www.grace.com.
 - d. Blueskin SA by Henry Company: www.henry.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Vapor Retarder Tape: Approved self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material.
- D. Joint Tape: As recommended by coating manufacturer and suitable to the substrate.

2.03 SEALANTS

- A. Sealant: As recommended by membrane manufacturer.
- B. Sealant Backers: As specified in Section 07 90 05.
- C. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.04 ACCESSORIES

- A. Substrate Primer: Low VOC content primer compatible with membrane and substrate.
- B. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- E. Mechanically Fastened Sheets - Vapor Retarder On Interior:
 1. When insulation is to be installed in assembly, install vapor retarder over insulation.
 2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.
 3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
 4. Seal entire perimeter to structure, window and door frames, and other penetrations.
 5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.
- F. Self-Adhesive Sheets:
 1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
 2. Lap sheets shingle-fashion to shed water and seal laps air tight.
 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
 4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
 5. At wide joints, provide extra flexible membrane allowing joint movement.
- G. Openings and Penetrations in Weather Barriers:
 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. Do not cover installed weather barriers until required inspections have been completed.
- B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- C. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not allow membrane to be exposed to weather for more than 30 days before covering.

END OF SECTION

FIBER CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber cement siding.
- B. Fiber cement trim.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Exterior framing.
- B. Section 07 21 00 - Thermal Insulation: Exterior wall insulation.
- C. Section 07 25 00 - Weather Barriers: Weather barrier under siding.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Fabricated metal trim for installation in this Section.
- E. Section 07 90 05 - Joint Sealers.
- F. Section 09 90 00 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.
- B. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- D. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 SIDING**

- A. Fiber Cement Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C 1186 Type A Grade II; with machined edges, for nail attachment.
 - 1. Style: Board, square edges (not beveled).
 - 2. Texture: Simulated cedar grain.
 - 3. Length: 12 ft, nominal.
 - 4. Width (Height): 5-1/4 inches (4 inch exposure).
 - 5. Thickness: 5/16 inch, nominal.
 - 6. Finish: Factory applied primer.
 - 7. Warranty: 50 year limited; transferable.
 - 8. Approved Products:
 - a. Smooth Lap Siding by James Hardie Building Products, Inc : www.jameshardie.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Fiber Cement Panel Siding: Siding panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C 1186 Type A Grade II; with machined edges, for screw attachment.
 - 1. Texture: Simulated cedar grain.
 - 2. Length (Height): 96 inches, nominal.
 - 3. Width: 48 inches.
 - 4. Thickness: 5/16 inch, nominal.
 - 5. Finish: Factory applied primer.
 - 6. Warranty: 50 year limited.
 - 7. Approved Products:
 - a. Hardie Panel Siding by James Hardie Building Products, Inc: www.jameshardie.com
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Metal Trim: Pre-finished steel, See Section 07 62 00 - Sheet Metal Flashing and Trim; profiles as indicated on Drawings.
- C. Extruded Aluminum Trim: Profiles as indicated on Drawings; chemical conversion coat finish per ASTM ND 1730-67, Type B.
 - 1. J-Trim: FCP-J-CHANNEL by Fry Reglet Corporation.
- D. Siding Fasteners: Corrosion resistant; length as required to penetrate minimum 2 inch.
- E. Bug Screen: Galvanized wire mesh screen.
- F. Joint Sealer: As specified in Section 07 90 05.
- G. Primer: Standard with manufacturer, compatible with finish specified in Section 09 90 00.

2.03 SHOP FINISH

- A. Fiber Cement Panel and Board Siding:
 - 1. Shop applied primer.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that weather barrier/substrate has been installed completely and correctly.

- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install siding panels and boards in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with all terms necessary to maintain warranty coverage.
 - 2. Use trim details indicated on Drawings.
 - 3. Touch up all field cut edges before installing.
 - 4. Pre-drill nail holes if necessary to prevent breakage.
- B. Install metal trim as indicated on Drawings.
- C. Joints in Panel Siding: Install flashing in horizontal joints between successive courses of vertical siding; locate only as indicated on Drawings.
- D. Do not install siding less than 6 inches from surface of ground nor closer than 2-1/2 inch to roofs, patios, porches, and other surfaces where water may collect.
- E. Paint field cut edges to match face finish.
- F. After installation, seal all joints. Seal around all penetrations. Paint all exposed cut edges.
- G. Finish Painting: Specified in Section 09 90 00.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

THERMOPLASTIC MEMBRANE ROOFING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Thermoplastic roofing membrane, adhered conventional application.
- B. Insulation, flat and tapered.
- C. Roof stack boots and walkway pads.

1.02 RELATED SECTIONS

- A. Section 07 2500 - Weather Barriers: Vapor retarder in roof assembly.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashing, splash pans, and reglets.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, adhesives and fasteners.
- C. Shop Drawings: Indicate joint or termination detail conditions and conditions of interface with other materials.
- D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. FM Global Submittal: Submit a RoofNav Contractor Package or an Application for Acceptance of Roofing System (FM Form EMV 2688) with details of installation and materials to FM Global for review and approval
- G. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Manufacturer Qualification: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Applicator Qualifications: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

1.05 PERFORMANCE REQUIREMENTS

- A. Classified by Underwriters Laboratories as a Class A roofing material for use in construction of Class A roofing assemblies.
- B. Meet test requirements for FM Class 1A fire and I-60 wind resistance.

1.06 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. Verify conditions are acceptable for installation of work of this section.

1.07 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 sunlight.
- D. Store materials in their original undamaged packaging; maintain storage conditions in accordance with the manufacturer's requirements.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with installation of associated counterflashing installed by other sections as the work of this section proceeds.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply insulation or membrane during unsuitable weather.
- B. Do not apply membrane when ambient temperature is below 40 degrees F or above 100 degrees F.
- C. Do not apply roofing membrane or insulation to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. Provide 20 year manufacturer's no-dollar-limit (NDL) material and labor warranty to cover failure of system to prevent penetration of water.

1.11 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Sustainable Sites Credit 7.2 - Heat Island Reduction: Roofs.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 ROOFING SYSTEM

- A. Approved Systems:
 - 1. Fully Adhered Hi-Tuff EP by Stevens Roofing Systems: www.stevensroofing.com.
 - 2. UltraPly TPO by Firestone Building Products: www.firestonebpco.com.
 - 3. EverGuard Freedom TPO HW by GAF Materials Corporation: www.gaf.com.
 - 4. UltraGard SRT-80FR by Johns Manville: www.jm.com.
 - 5. GenFlex TPO-80 by GenFlex Roofing Systems: www.genflex.com.

6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORY MATERIALS

- A. Pipe Boot: Pre-molded type, stainless steel clamping ring; standard with roofing manufacturer.
- B. Membrane Flashing: 0.055 inch thick, TPO membrane.
- C. Membrane Adhesive: Manufacturers standard type.
- D. Sealant: Roofing membrane manufacturer approved type, for use as water cut-off mastic, pitch-box sealer, and to seal membrane to metal.
- E. Cut-Edge Sealant: Membrane manufacturer approved type, to seal exposed cut edges of reinforced membrane.
- F. Seam Cleaner: Membrane manufacturer approved type, to remove contaminants from the surface of the membrane where hot-air welding is to occur.
- G. Mechanical Fasteners: Type and size recommended by membrane manufacturer; non-corrosive material.
- H. Termination Bar: Type recommended by membrane manufacturer.
- I. Walkway Pads: Reinforced TPO membrane, minimum 80 mil thickness; non-slip finish.

2.03 INSULATION AND ACCESSORIES

- A. Extruded Polystyrene Board Insulation: Rigid cellular foam, complying with ASTM C 578 with the following characteristics:
 - 1. Compressive Strength: 15 psi.
 - 2. Thermal Resistant Value: Minimum R-4.0 per inch thickness, Long Term Thermal Resistance.
 - 3. Board Size: 48 x 96 inch.
 - 4. Non-tapered Board Thickness: Minimum 1 inch.
 - 5. Tapered Board Thickness: 1/4 inch taper per foot; minimum 1 inch thickness or as indicated on Drawings; minimum R-19 average thermal resistance.
 - 6. Manufacturers:
 - a. Insulfoam by Premier Industries.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Separator Board: Glass mat-faced, water and moisture-resistant gypsum board, UL Class A fire-rated, with the following characteristics:
 - 1. Compressive Strength: 500 psi.
 - 2. Board Size: 48 x 96 inch.
 - 3. Thickness: 1/4 inch.
 - 4. Board Edges: Square.
 - 5. Products:
 - a. Dens-Deck Prime by Georgia Pacific: www.gp.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Slip Sheet: Approved by membrane manufacturer; use if required by membrane manufacturer.
- D. Tapered Edge Strips: High density fiber board.
- E. Mechanical Fasteners: Type and spacing as required by insulation manufacturer to meet performance requirements and deck conditions; large disk washers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.

- B. Verify that surfaces to be bonded to are dry, clean and free of debris. Suitable surfaces are smooth, solid masonry, and metal, plus insulation board fastened to the specific manufacturer's recommendations for receiving adhered roofing membranes and accepted by membrane manufacturer for adhered application.
- C. Verify vapor retarder installed under Section 07 25 00 is complete.
- D. Verify that positive roof slope exists in all areas.
- E. Correct unsuitable conditions before proceeding with installation. Commencing installation signifies acceptance by the installer of the substrate.

3.02 INSULATION INSTALLATION

- A. Take care to prevent damage to vapor retarder; repair damage as it occurs.
- B. Handle and secure insulation boards so as to not damage or rupture the facer and surface. Cut out damaged areas and replace with structurally sound insulation, properly secured in place.
- C. Install boards in multiple layers with offsetting joints between layers.
- D. Install boards with the longest dimension perpendicular to the direction of the membrane seams and with end joints staggered. Butt boards as closely as possible with no gaps over 1/4 inch.
- E. Mechanically attach boards:
 1. Use fastener pattern and spacing in accordance with approved submittals.
 2. Provide additional fasteners as necessary to conform to the substrate surface geometry.
 3. Provide additional fastening at corners and perimeter as recommended by FM Global.
- F. Tapered Insulation:
 1. Install over board insulation.
 2. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions and Factory Mutual requirements.
 3. Provide a smooth transition between tapered and flat areas; if necessary, install tapered edge strips at termination of tapered insulation boards.
- G. Install separator board over installed insulation in accordance with roofing and insulation manufacturers instructions.

3.03 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Install TPO cover strips at "T" laps.
- D. Fully Adhered Application:
 1. Apply adhesive to substrate at rate recommended by manufacturer.
 2. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints.
 3. Fully adhere one roll before proceeding with the adjacent roll.
- E. Overlap edges and ends and seal seams by heat welding, minimum 3 inches. Seal permanently waterproof.
- F. At intersections with vertical surfaces:
 1. Extend field sheet to intersection of vertical surfaces and curbs; mechanically fasten at minimum 12 inches on center.
 2. Extend and fully adhere flexible membrane up a minimum 12 inches onto vertical surfaces.
 3. Fully adhere flexible flashing over membrane and up to reglets or over top of parapet coping; adhere membrane to outside face of coping plate.
- G. At roof penetrations: Mechanically fasten field membrane at minimum 12 inches on center; seal flanges and flashings with flexible flashing.

- H. Coordinate installation of roof drains, sumps and related flashing.

3.04 WALKWAYS

- A. Install pads in accordance with roofing manufacturer's instructions.
- B. Clean and prepare membrane
- C. Position walkway pad, cut as necessary.
- D. Do not cover membrane seams with walkway pad. When installed adjacent to a seam, keep the pad a minimum of 2 inches from the edge of the seam on the bottom sheet of the completed lap and a minimum of 6 inches from the edge of the seam when located on the top sheet of a completed lap.
- E. Install pads to allow roof drainage.
- F. Weld perimeter of walkway pad to the membrane following standard welding procedures. Allow periodic breaks in the weld of 1 to 2 inches at pad edge to prevent the accumulation of water under the pad.

3.05 PROTECTION AND CLEANING

- A. Protect membrane in progress and completed membrane from foot and vehicular traffic. Install protective cover as necessary to prevent damage.
- B. Clean soiled surfaces, remove trash and debris, and leave project site in a clean condition.

END OF SECTION

SHEET METAL FLASHING AND TRIM**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and other items indicated in Schedule.
- B. Reglets and accessories.
- C. Fabricated metal trim at fiber cement siding.

1.02 RELATED REQUIREMENTS

- A. Section 07 46 46 - Fiber Cement Siding: Fiber cement siding.
- B. Section 07 72 00 - Roof Accessories: Roof-mounted items.
- C. Section 07 90 05 - Joint Sealers.
- D. Section 08 91 00 - Louvers: Exterior louvers.

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. ASTM A 53 - Standard Specification for Pipe, Steel, Black, Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- I. NACM - US National Association of Chain Manufacturers.
- J. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples, 4 x 4 inch in size illustrating material of typical standing seam, external corner, and internal corner.
- D. Samples: Submit two samples 4 x 4 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual and CDA Copper in Architecture Handbook requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; replace work at not cost to Owner.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 SHEET MATERIALS**

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; multiple colors as selected.
- B. Pre-Finished Aluminum: ASTM B 209 (ASTM B 209M); 0.032 inch thick; plain finish shop pre coated with fluoropolymer coating of color as selected.
 - 1. PVDF (Fluoropolymer Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors
- C. Stainless Steel: ASTM A 666 Type 304, soft temper, 0.0187 inch thick; smooth No. 4 finish.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Primer: Galvanized iron type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Sealant: Type B - MS Polymer specified in Section 07 90 05.
- E. Plastic Cement: ASTM D4586, Type I.
- F. Downspout Nozzle: Cast bronze; NPT thread; 4 inch size, coordinate with plumbing.
 - 1. No. 1770 by Jay R. Smith Mfg. Co: www.jrsmith.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.04 GUTTER FABRICATION

- A. Gutters: SMACNA Architectural Sheet Metal Manual, Rectangular profile.
- B. Downspouts: Rectangular profile, minimum 3 inch diameter.
- C. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Similar to SMACNA Figure 1-18A.
- D. Seal metal joints watertight.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Downspouts:
 - 1. Secure downspouts in place using metal brackets, straps and fasteners as indicated on Drawings.
- F. Slope gutters 1/4 inch per foot minimum.

3.04 SCHEDULE

| LOCATION | METAL TYPE | THICKNESS | FINISH |
|----------|------------|-----------|--------|
|----------|------------|-----------|--------|

SHEET METAL FLASHING AND TRIM - 07 62 00

| | | | |
|----------------------------|----------------------|-------------|---------------|
| A. Metal Flashing: | Prefinished Steel | 22 Gage | Fluoropolymer |
| B. Reglet / Flashing: | Prefinished Steel | 22 Gage | Fluoropolymer |
| C. Aluminum Flashing: | Prefinished Aluminum | 0.025 inch | Fluoropolymer |
| D. Siding Trim / Flashing: | Prefinished Steel | 22 Gage | Fluoropolymer |
| E. Splash Pans: | Stainless Steel | 0.0187 inch | No. 4 |
| F. Wall Base Flashing: | Stainless Steel | 0.0187 inch | No. 2 |
| G. Downspouts: | Prefinished Steel | 22 Gage | Fluoropolymer |
| H. Gutters: | Prefinished Steel | 22 Gage | Fluoropolymer |

END OF SECTION

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants and joint backing.
- B. Precompressed foam sealers.
- C. Preconstruction testing.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders:
- B. Section 08 80 00 - Glazing: Glazing sealants and accessories.
- C. Section 09 21 16 - Gypsum Board Assemblies: Acoustic sealant installation.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Manufacturer's Installation Instructions: Indicate special procedures.
- D. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in Quality Assurance below.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, including the following:
 1. Confirmation that joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.
- C. Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants. Submit no fewer than four pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrate.
 2. Schedule sufficient time for testing and analyzing results to prevent delaying Work.
 3. For materials failing tests, obtain joint sealant manufacturer's written instruction for corrective measures including use of specially formulated primers.

1.06 FIELD CONDITIONS

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

1.07 COORDINATION

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

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year extended correction period for sealant work.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

1.09 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - Academic Building and Site LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 SEALANTS**

- A. Type A - Elastomeric Sealant: ASTM C920; multi-component polyurethane, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type; color as selected; meeting the following minimum requirements:
 - 1. Elongation: 25 percent
 - 2. Service Temperature Range: -40 to 180 degrees F.
 - 3. Shore A Hardness Range: +40
 - 4. Products:
 - a. Dynatred by Pecora Corporation: www.pecora.com
 - b. Vulkem 227 by Tremco: www.tremcosealants.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type B - MS Polymer Sealant: ASTM C920, Type S, Grade NS, Class 25; single or 2-part component silyl-terminated polyether, moisture curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type; multiple colors as selected to match adjacent materials; meeting the following minimum requirements.
 - 1. Elongation: 100 percent
 - 2. Service Temperature Range: -40 to 220 degrees F
 - 3. Shore A Hardness Range: 20 to 35
 - 4. Products:
 - a. Sonolastic 150 by Sonneborn Building Products: www.chemrex.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Type C - Acoustical Sealant (Exposed): ASTM C834; single component latex, non-staining, non-bleeding, non-sagging type; multiple colors to match adjacent materials.
 - 1. Products:
 - a. AC20 FTR Acoustical and Insulation Sealant by Pecora Corporation: www.pecora.com.
 - b. Sheetrock Acoustical Sealant by United States Gypsum Co: www.usg.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

- D. Type D - Acoustical Sealant (Concealed): Single component latex, non-staining, non-bleeding, non-hardening, non-skinning, non-sagging type; synthetic rubber type.
 - 1. Products:
 - a. BA-98 by Pecora Corporation.
 - b. Tremco Acoustical Sealant by Tremco: www.tremcosealants.com.
 - c. Acoustical Sealant by United States Gypsum Co: www.usg.com.
 - d. #313 Sound Control Sealant by The W.W. Henry Company: www.wwhenry.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Type E - Silicone Sealant: Single component, mildew resistant, acid curing, silicone sealant; Class 25.
 - 1. Products:
 - a. 786 Mildew Resistant by Dow Corning Corporation: www.dowcorningsealants.com.
 - b. Sanitary SCS1700 by GE Silicones: www.gesilicones.com.
 - c. Tremsil 200 by Tremco: www.tremcosealants.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GASKETS AND CLOSURES

- A. Sill Seal: Foam gasket, self-adhering membrane.
 - 1. Triple Guard Energy Sill Sealer by Protecto Wrap: www.protectowrap.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Threshold Tape: Rubberized adhesive membrane with foam; waterproof.
 - 1. Protecto Premium Dual Guard Threshold Tape by Protecto Wrap: www.protectowrap.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.
- C. Verify that preconstruction testing has been completed.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.

- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 1. Width/depth ratio of 2:1.
 2. Neck dimension no greater than 1/3 of the joint width.
 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints concave.
- I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
- J. Sill Sealer: Coordinate with installation of exterior wall framing.
- K. Threshold Seals: Coordinate with installation of exterior door thresholds.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION

- A. Protect sealants until cured.

3.06 SCHEDULE

- A. Type A - Elastomeric:
 1. Interior concrete slab joints.
 2. Exterior concrete paving joints.
- B. Type B - MS Polymer:
 1. Sheet metal work.
 2. Exterior and interior perimeter of steel door and window frames.
 3. Perimeter of window frames.
 4. Joints at cabinet bases and floor.
 5. Other joints indicated on Drawings.
- C. Type C - Acoustical Sealant:
 1. Perimeter of gypsum board in acoustical wall, and corner intersections.
 2. Perimeter of penetrations in acoustical walls and ceilings.
 3. Perimeter of suspended acoustical ceiling wall angles.
- D. Type D: Acoustical Sealant:
 1. Under stud track or plate at acoustical walls, 2 beads continuous.
 2. Concealed perimeter of gypsum board in acoustical walls and corner intersections.
 3. Concealed perimeter of penetrations in acoustical walls.
- E. Type E - Silicone Sealant:
 1. Perimeter of plumbing fixtures.
- F. Gaskets, Sealers and Closures:
 1. Under exterior wall sill plates.
 2. Under exterior door thresholds.
 3. As indicated on Drawings.

END OF SECTION

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Fire-rated steel doors and frames.
- C. Thermally insulated steel doors.
- D. Thermally broken exterior steel frames.
- E. Accessories, including relite frames.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Framed openings.
- B. Section 08 14 16 - Flush Wood Doors.
- C. Section 08 71 00 - Door Hardware.
- D. Section 08 80 00 - Glazing: Glass for doors and relites.
- E. Section 09 21 16 - Gypsum Board Assemblies: Framed openings and acoustical insulation.
- F. Section 09 90 00 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003 (R2008).
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- E. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.
- F. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- G. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- H. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames:
 - 1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
 - 2. Windsor Republic Doors: www.republicdoor.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
 - 1. ADA Compliant: Comply with ANSI/ICC A117.1 and Oregon Structural Specialty Code.
 - 2. Door Top Closures: Flush with top of faces and edges.
 - 3. Door Edge Profile: Beveled on both edges.
 - 4. Door Texture: Smooth faces.
 - 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 - 6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 - 7. Galvanizing for Exterior: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
 - 8. Finish: Factory primed, for field finishing.

2.03 STEEL DOORS

- A. Exterior Doors :
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
 - 2. Core: Polystyrene or Polyurethane.
 - 3. Thickness: 1-3/4 inches.
 - 4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 - 5. Insulating Value: U-value of 0.09, when tested in accordance with ASTM C 1363 or ASTM C 518.
 - 6. Weatherstripping: Separate, see Section 08 71 00.
- B. Interior Doors, Non-Fire-Rated:
 - 1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
 - 2. Core: Cardboard honeycomb.

3. Thickness: 1-3/4 inches.
 4. Finish: Factory primed, for field finishing.
- C. Interior Doors, Fire-Rated:
1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
 2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
 - a. Provide units listed and labeled by UL.
 - b. Attach fire rating label to each fire rated unit.
 3. Core: As required for rating.
 4. Thickness: 1-3/4 inch.
 5. Finish: Factory primed, for field finishing.

2.04 STEEL FRAMES

- A. General:
1. Comply with the requirements of grade specified for corresponding door.
 - a. Frames for Exterior Doors: Comply with frame requirements specified in ANSI A250.8 for Level 3 Doors, 14 gage.
 2. Finish: Factory primed, for field finishing.
 3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
 4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
1. Thermal Break: True thermally-broken frame profile.
 2. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 3. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
- D. Interior Door Frames, Fire-Rated: Fully welded type.
1. Fire Rating: Same as door, labeled.

2.05 ACCESSORY MATERIALS

- A. Relite Frames: Cold rolled galvanized steel, 16 gage; split frame type to accept insulated glass unit; through door security bolt attachment; shop-primed finish.
1. FGS-DBL by Anemostat Door Products: www.anemostat.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Glazing: As specified in Section 08 80 00 .
- C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions. Do not install silencers on door to receive gasket seals.
- D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.
- E. Jamb Anchors: Provide welded floor anchor at each jamb.
- F. Frame Clips: Provide frame clips appropriate for wall width and material.

2.06 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, baked on.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
- B. Coat inside of other frames to be grouted with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard .
- B. Coordinate frame anchor placement with wall construction.
- C. Coordinate installation of acoustical insulation in acoustical/sound-rated walls.
- D. Coordinate installation of hardware.
- E. Install relite frames in doors as recommended by manufacturer for a secure and waterproof assembly.
- F. Coordinate installation of glazing.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry: Interior door and relite frames.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.
- C. Section 08 71 00 - Door Hardware.
- D. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- B. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2006, 8th Ed., Version 2.0.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Specimen warranty.
- E. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.
- F. Samples: Submit two samples of door veneer, 8 x 10 inch in size illustrating wood grain, stain color, and sheen.
- G. Manufacturer's Installation Instructions: Indicate special installation instructions.
- H. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Provide warranty for the following term:
 - 1. Interior Doors: Life of installation.
- D. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

1.09 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 7 - FSC Certified Wood.
 - 2. Indoor Environmental Quality Credit 4.4 - Low-Emitting Materials: Composite Woods and Agrifiber Products.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors: Core and veneer sourced from United States:
 - 1. Graham Wood Doors: www.grahamdoors.com.
 - 2. Lynden Door: www.lyndendoor.com.
 - 3. Algoma Hardwoods, Inc: www.algomahardwoods.com.
 - 4. Eggers Industries: www.eggersindustries.com.
 - 5. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
 - 6. Oregon Door Co: www.oregondoors.com.
 - 7. Vancouver Door, Inc: www.vancouverdoorco.com.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. High Pressure Decorative Laminate Faced Doors:
 - 1. Ampco Products, Inc: www.ampco.com.
 - 2. Poncraft Door Co: www.poncraft.com.
 - 3. VT Industries, Inc: www.vtindustries.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

- A. All Doors - General: Comply with the following limitations:
 - 1. Wood products including, but not limited to, plywood, fiber board, particle board and hardboard, shall not contain any added urea-formaldehyde.

- B. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
 - 3. High Pressure Decorative Laminate Faced Doors: 5-ply unless otherwise indicated.
- C. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations .
 - 2. Face Veneer: White Birch veneer facing, AWI Grade A, with factory transparent finish .
 - 3. High pressure decorative laminate finish where indicated on drawings.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified by quality standard, quarter sliced, book veneer match, running assembly match; unless otherwise indicated.
 - 1. Vertical Edges: Same species as face veneer.
 - 2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.
- B. High Pressure Decorative Laminate Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; color(s) as indicated; satin finish.

2.05 ACCESSORIES

- A. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
- C. Provide solid blocks at lock edge for hardware reinforcement.
 - 1. Provide solid blocking for other throughbolted hardware.
- D. Fit door edge trim to edge of stiles after applying veneer facing.
- E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
 - 1. Exception: Doors to be field finished.
- G. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
 - 1. Transparent:
 - a. System - 11, Polyurethane, Catalyzed.
 - b. Stain: As selected by Architect.
 - c. Sheen: Satin.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.
- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

ACCESS DOORS AND PANELS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall access door and frame units.
- B. Ceiling access door and frame units.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Openings in partitions and ceilings.
- B. Section 09 22 26 - Suspension Systems: Openings in suspended gypsum ceilings.
- C. Section 09 90 00 - Painting and Coating: Field paint finish.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Manufacturer's Installation Instructions: Indicate installation requirements.
- D. Project Record Documents: Record actual locations of all access units.

1.04 PROJECT CONDITIONS

- A. Coordinate the work with other work requiring access doors.

1.05 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 ACCESS DOORS AND PANELS**

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

2.02 ACCESS DOOR UNITS - WALLS AND CEILINGS - INTERIOR

- A. Type AP: Door and Frame Units: Formed steel.
 - 1. Frames and flanges: 0.058 inch steel; profile compatible with wall construction.
 - 2. Door Panels (Non-rated): 0.070 inch single thickness steel sheet.
 - 3. Door Panels (Rated): 0.070 inch double steel sheet with integral non-combustible insulation filler.
 - 4. Size: As indicated on Drawings.
 - 5. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Hinge: 175 degree stainless steel piano hinge with removable pin.
 - c. Lock: Screw driver slot for quarter turn cam lock, typical.
 - d. Prime coat with baked on primer.

2.03 ACCESS DOOR UNITS - WALLS - EXTERIOR

- A. Type APX: Door and Frame Units: Formed galvanized steel.
 - 1. Frames and flanges: 0.03 inch steel; profile compatible with wall construction.
 - 2. Door Panels: 0.03 inch single thickness steel sheet.
 - 3. Size: As indicated on Drawings.
 - 4. Special Reinforcing: Torx security screws.
 - 5. Core: Insulated, minimum R-7.7.
 - 6. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Latch/Lock: Tamperproof tool-operated cam latch; tool approved by Owner.
 - c. Gasketing: Extruded neoprene, around the perimeter of the door panel.
 - 7. Prime coat with baked on primer.
 - 8. Manufacturers:
 - a. Karp Associates, Inc: www.karpinc.com.
 - b. Milcor Inc: www.milcorinc.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FABRICATION

- A. Weld, fill, and grind joints to ensure flush and square unit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.
- C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead sectional doors, manually operated.
- B. Operating hardware and supports.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Steel support opening frame.
- B. Section 06 10 00 - Rough Carpentry: Rough wood framing for door opening.
- C. Section 07 90 05 - Joint Sealers: Perimeter sealant and backup materials.
- D. Section 08 71 00 - Door Hardware: Lock cylinders.

1.03 REFERENCE STANDARDS

- A. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- B. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; Door & Access Systems Manufacturers' Association, International; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Show component construction, anchorage method, and hardware.
- D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
- E. Operation Data: Include normal operation, troubleshooting, and adjusting.
- F. Maintenance Data: Include data for transmission, shaft and gearing, lubrication frequency, spare part sources.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum three years of experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.

- 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Door Corporation; Product Model 422: www.overheaddoor.com.
- B. Other Acceptable Manufacturers:
 - 1. Cornell Iron Works: ww.cornelliron.com.
 - 2. The Cookson Company Inc: www.cooksondoor.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DOOR COMPONENTS

- A. Steel Doors: Flush steel, insulated; low headroom operating style with track and hardware; complying with DASHA 102, Commercial application.
 - 1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
 - 2. Door Nominal Thickness: 2 inches thick.
 - 3. Exterior Finish: Pre-finished with baked enamel of color as selected.
 - 4. Interior Finish: Pre-finished with baked enamel of color as selected.
 - 5. Operation: Chain hoist.
 - 6. Internal Insulation: Polystyrene, minimum R-7.35.
- B. Door Panels: Flush steel construction; outer steel sheet of 0.018 inch thick, flat profile; inner steel sheet of 0.018 inch thick, flat profile; core reinforcement of 0.06 inch thick sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; insulated.

2.03 DOOR COMPONENTS

- A. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- B. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
 - 1. For Manual Operation: Requiring maximum exertion of 25 lbs force to open.
- C. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.
- D. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- E. Head Weatherstripping: EPDM rubber seal, one piece full length.
- F. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.
- G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch.
- B. Maximum Variation from Level: 1/16 inch.
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

- A. Clean doors and frames and glazing.
- B. Remove temporary labels and visible markings.

3.07 PROTECTION

- A. Protect installed products from damage during subsequent construction.
- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

DOUBLE-ACTING TRAFFIC DOORS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Double-acting self-closing swinging traffic doors.
- B. Door accessories.
- C. Door frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Wall-mounted door stops.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's technical information for each type of door specified, including details about materials, components, profiles, gaskets, and finishes; include:
 - 1. Preparation and installation instructions and methods.
 - 2. Storage and handling requirements and recommendations.
 - 3. Operation and maintenance data.
- C. Shop Drawings: Show installation details of doors and frames, including elevations and attachment.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing type of work specified in this section with not less than three years of documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in manufacturer's original unopened packages with label legible and intact.
- B. Store doors at project site on edge or in upright position, under cover and elevated above grade, following manufacturer's instructions.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty for molded polyethylene doors against damage due to worker-ridden vehicle traffic; state limitations in executed warranty.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 7 - FSC Certified Wood.
 - 2. Indoor Environmental Quality Credit 4.4 - Low-Emitting Materials: Composite Woods and Agrifiber Products.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.

2. Materials and Resources Credit 5 - Regional Materials.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 RIGID AND SEMI-RIGID TRAFFIC DOORS

- A. Molded Polyethylene Double-Acting Traffic Doors Type ____: Integrally molded polyethylene plastic faces and edges with urethane foam fill.
 1. Thickness: 1-1/2 inches.
 2. Faces: 1/8 inch minimum thickness; textured or pebble finish.
 3. Construction: Manufacturer's standard construction reinforced for durability and rigidity, with all edges, cut-outs, and hardware preparations factory fabricated; provide view window cut-outs with joints sealed independently of glazing or trim.
 4. Hardware Preparations: Factory reinforce, machine, and prepare for all hardware including field installed items; provide solid blocking for each hardware item; make field cutting, drilling or tapping unnecessary.
 5. Bumpers: Provide spring bumpers on both sides of doors.
 6. Color: As selected by Architect from manufacturer's standard selection.
 7. Manufacturers:
 - a. Chase Doors : www.chasedoors.com.
 - b. Rubbair Door, Inc : www.rubbair.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Door Assemblies: Provide double-acting, self-closing pairs of doors for installation in frame provided by others; factory fabricated and finished, complete with hinges and specified accessories.
 1. Door Swing: Minimum of 90 degrees each direction.
 2. Hinges: V-cam gravity hinges at top and pivots at bottom; mounted on bottom of header and on top of floor; maximum rise 1-1/2 inches; vertical and horizontal adjustment in the field; manufacturer's standard lower hinge guards.
 3. Hinge Guards: Manufacturer's standard material and configuration, to protect lower hinges from damage.
 4. Exposed Metal Parts: Either stainless steel, extruded aluminum, or powder coated.
 5. View Windows: Provide view window in each door panel unless otherwise indicated, centered in door width, and 48 inches, maximum, from finish floor to bottom of viewing area.
 6. Dimensional Tolerances: Plus or minus 1/4 inch in width and height of each panel.
- C. View Windows: Factory installed glazing in molded or extruded black thermoplastic or rubber gasket; centered in door width; use single glazing unless otherwise indicated.
 1. Single Glazing: Acrylic glazing sheet, 1/4 inch thick, clear.
- D. Impact Plates: Surface applied; factory installed.
 1. Bumper Plates: 30 inches high, mounted 18 inches above bottom of door.
 2. Push Plates: 12 inches high by 12 inches wide, mounted at leading edge of door with centerline at 48 inches above floor.
- E. Spring Bumpers: Teardrop style, polyethylene; projecting 3 inches from door panel.
 1. Height: 6 inches.

2.02 ACCESSORY COMPONENTS

- A. Frames: Provide doors pre-hung in frames by door manufacturer; tubular steel welded frame.
- B. Provide tamper proof fasteners and other hardware as recommended by manufacturer for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that jambs and frames are square and plumb.
- B. Verify that opening is ready to receive work and opening dimensions and clearances are as indicated on drawings.
- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
- D. Commencement of work by installer is acceptance of opening conditions.

3.02 INSTALLATION

- A. Install doors with clearances, anchors, hardware, and accessories according to the manufacturer's instructions and as specified.
- B. Install doors plumb, level, and properly aligned.

3.03 ADJUSTING

- A. Clean and lubricate operating parts.
- B. Adjust doors to open and close smoothly and freely without binding and for proper fit of seals.

3.04 CLEANING

- A. Clean surfaces using methods as recommended by manufacturer.

END OF SECTION

VINYL WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vinyl-framed, factory-glazed windows.
- B. Operating hardware.
- C. Insect screens.
- D. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; American Architectural Manufacturers Association/Window & Door Manufacturers Association/Canadian Standards Association; 2011.
- B. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.
- C. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2010.
- D. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- E. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
- F. NFRC 400 - Procedure for Determining Fenestration Product Air Leakage.
- G. NFRC 500 - Procedure for Determining Fenestration Product Condensation Resistance Values.

1.04 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements:
- B. Forced Entry Resistance: Conform to ASTM F588 requirements for performance level 10 for window type B.
- C. System Design: Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of window.
- D. Deflection: Limit member deflection to 1/200 of the longer dimension with full recovery of glazing materials.
- E. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- F. Water Leakage: None, when measured in accordance with ASTM E331.
- G. Design Temperature Range: 120 F degrees.

1.05 ADMINISTRATIVE REQUIREMENTS

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.09 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

1.11 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Windows:
 - 1. Endurance Series by VPI Quality Windows: www.vpiwindows.com.
 - 2. Cascade Series by Cascade Windows: www.cascadewindows.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VINYL WINDOWS

- A. Vinyl Windows: Factory fabricated frame and sash members of extruded hollow ultra-violet-resistant polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, and anchorage and attachment devices.

1. Configuration: As indicated on drawings, with horizontal sliding sash.
 2. Color: White.
 3. Size to fit openings with minimum clearance around perimeter of assembly but still providing adequate space for perimeter seals.
 4. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.
 6. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of extruded PVC, fitting tightly into frame assembly.
- B. Performance Requirements: Provide products that comply with the following:
1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 Class R Performance Grade 15.
 2. Grade Substantiation: Either AAMA Certification Label or independent test report itemizing compliance will constitute acceptable evidence of compliance.

2.03 COMPONENTS

- A. Glazing: Double glazed, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
- B. Windows: Extruded, hollow, tubular, ultra-violet resistant polyvinyl chloride (PVC) with integral color; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
1. Performance Requirements: AAMA/WDMA/CSA 1001/I.S.2/A440 Class CW.
 2. Configuration: Fixed, non-operable, non-operable, and outward projecting bottom, and single hung sash; multiple ganged units as indicated on Drawings.
 3. Color: Evertone Adobe.
- C. Frames: 3-1/2 inch wide x 2-3/4 inch deep profile; applied glass stops of screw fastened type.
- D. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit; provide wickets at non-rotary operated units.
- E. Insect Screens: Woven fiberglass mesh; 14/18 mesh size.
1. Color: Gray.
- F. Operable Sash Weather Stripping: Resilient PVC; permanently resilient, profiled to effect weather seal.
- G. Fasteners: Stainless steel.
- H. Glass and Glazing Materials: As specified in Section 08 80 00 of Types described below:
1. Glass in Exterior Lights: ISGU, Insulated safety glass units..

2.04 SEALANT MATERIALS

- A. Perimeter Sealant and Backing Materials: Type B - MS Polymer as specified in Section 07 90 05.

2.05 HARDWARE

- A. Sash lock: Lever handle with cam lock.
- B. Operator at Interior Washed Operable Windows: Lever action handle fitted to projecting sash arms with limit stops.
- C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

2.06 FABRICATION

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal steel reinforcement where required for structural rigidity.

- B. Form sills in one piece. Slope sills for wash.
- C. Form snap-in glass stops, closure molds, weather stops, and flashings of extruded PVC for tight fit into window frame section.
- D. Form weather stop flange to perimeter of unit.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- I. Double weatherstrip operable units.
- J. Factory glaze window units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.02 INSTALLATION

- A. Install window units in accordance with manufacturers instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- G. Install operating hardware.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

DOOR HARDWARE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Installation of Owner furnished door hardware.
- B. Installation of hardware for wood and hollow steel doors.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Description of Owner Furnished Contractor Installed items.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.
- C. Section 08 14 16 - Flush Wood Doors.
- D. Section 08 38 15 - Double-Acting Doors: Hardware furnished with door.

1.03 REFERENCE STANDARDS

- A. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
- B. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data (By Owner): Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
- C. Hardware Schedule (By Owner): Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
- D. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Accept delivery of Owner Furnished hardware.

1.07 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

PART 2 PRODUCTS**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- E. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
 2. For steel doors and frames: See Section 08 11 13.
 3. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.02 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.03 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.04 PROTECTION

- A. Protect finished Work under provisions of Section 01 70 00.
- B. Do not permit adjacent work to damage hardware or finish.

HARDWARE SETS**4.01 HARDWARE GROUPS**

- A. Group 1 - Office (109B-A, 109C-A, 109D-A, 111-A)
 - 3 Ea Hinges
 - 1 Ea Lockset, Office
 - 1 Ea Stop, Wall
- B. Group 2 - Office (101-B)
 - 3 Ea Hinges
 - 1 Ea Lockset, Office
 - 1 Ea Stop, Overhead
- C. Group 3 - Passage (101-H, 106-A, 109A-A, 117-C)
 - 3 Ea Hinges
 - 1 Ea Lockset, Passage
 - 1 Ea Stop, Overhead
- D. Group 4 - Passage (112-A)
 - 3 Ea Hinges
 - 1 Ea Lockset, Passage
 - 1 Ea Stop, Overhead

- | | | | |
|----|---|------|---------------------------------|
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| E. | Group 5 - Passage (112-A) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Passage |
| | 1 | Ea | Stop, Wall |
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| F. | Group 6 - Storage (H102-C, 128-A) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Storage |
| | 1 | Ea | Stop, Overhead |
| G. | Group 7 - Restroom (101D-A, 103-A, 104-A, 107-A, 108-A) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Mortise Latchset with Indicator |
| | 1 | Ea | Stop, Wall |
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| H. | Group 8 - Storage, Fire Rated (121A-A) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Storage |
| | 1 | Ea | Closer |
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| I. | Group 9 - Storage, Fire Rated (121A-A) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Storage |
| | 1 | Ea | Closer |
| | 1 | Ea | Stop, Wall |
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| J. | Group 10 - Entry/Access Control (102-A, H102-A, H102-B) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, for keyless entry |
| | 1 | Ea | Closer |
| | 1 | Ea | Stop, Wall |
| | 1 | Set | Seals |
| | 1 | Ea | Door Bottom Seal |
| K. | Group 11 - Pair/Passage/Interior (101-E/D, 101-G/G, 101B-A/B) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Passage |
| | 1 | Ea | Stop, Overhead |
| | 1 | Ea | Coordinator |
| | 1 | Sets | Seals |
| | 1 | Ea | Door Bottom Seal |
| L. | Group 12 - Pair/Passage/Interior (117-A/B) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Lockset, Passage |
| | 1 | Ea | Stop, Overhead |
| | 1 | Ea | Coordinator |
| M. | Group 13 - Double Acting Pair/Interior (110A-A/B, 116-C/D) | | |
| | 3 | Ea | Hinges |
| | 1 | Ea | Protection Plates |

???

- N. Group 14 - Entry/Exterior/Access Control/Hollow Metal Door (101-A, 118A-A, H101-A)
- | | | |
|---|-----|---------------------------|
| 3 | Ea | Hinges |
| 1 | Ea | Lockset for Keyless Entry |
| 1 | Ea | Stop, Overhead |
| 1 | Ea | Top Drip |
| 1 | Set | Seals |
| 1 | Ea | Door Bottom Seal |
| 1 | Ea | Threshold |
- O. Group 15 - Entry/Exterior/Exit Only (101-C)
- | | | |
|---|-----|------------------|
| 3 | Ea | Hinges |
| 1 | Ea | Lockset |
| 1 | Ea | Stop, Overhead |
| 1 | Ea | Top Drip |
| 1 | Set | Seals |
| 1 | Ea | Door Bottom Seal |
| 1 | Ea | Threshold |
- P. Group 16 - Entry/Exterior/Access Control/Aluminum Storefront (109-A)
- Q. Group 17 - Double Acting/Exterior (116-A/B, H105-A/B)
- R. Group 18 - Exterior/Exit Only/Fire Rated (126-A)
- S. Group 19 - Exterior/Pair/Exit Only/Fire Rated (127-A/B)
- T. Group 20 - Wire Partition Gates/Secure (121-B, exterior storage area)
- U. Group 21 - Wire Partition Gates/Non-secured (113-A, 115-B)

END OF SECTION

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Sealant and back-up material.
- B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed exterior doors.
- C. Section 08 14 16 - Flush Wood Doors: Glazed doors.
- D. Section 08 43 13 - Aluminum-Framed Storefronts: Storefront system.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- E. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- F. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 PERFORMANCE REQUIREMENTS

- A. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with Oregon Structural Specialty code.
 - 1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
 - 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 - 3. Thicknesses listed are minimum.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 12 inch in size of glass units, showing coloration and design.
- E. Certificates: Certify that products meet or exceed specified requirements.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.08 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.09 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

1.11 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 GLAZING TYPES

2.02 GLASS MATERIALS

- A. Float Glass: All glazing is to be float glass unless otherwise indicated.
 - 1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
 - 3. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.
- B. Clear Float Glass (Type CG): Clear, annealed.
 - 1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 - 2. Comply with ASTM C 1048.
 - 3. Thickness: 1/4 inch (6 mm) minimum.
- C. Clear Safety Glass (Type CSG): Clear; fully tempered.
 - 1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select) and ASTM C 1048.
 - 2. Comply with 16 CFR 1201 test requirements for Category II.

3. Thickness: 1/4 inch (6 mm) minimum.
- D. Low E Glass : Float type, annealed and tempered, clear.
 1. High performance, triple silver layer Low E coating.
 2. 1/4 inch (6 mm) minimum thick.

2.03 SEALED INSULATING GLASS UNITS

- A. Sealed Insulating Glass Units: Types as indicated.
 1. Locations: Exterior, except as otherwise indicated.
 2. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 3. Edge Spacers: Stainless steel, bent and soldered corners.
 4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 5. Purge interpane space with dry hermetic air.
- B. Insulated Glass Units (Type IGU): Double pane with glass to elastomer edge seal.
 1. Outer pane of Low E clear glass (1/4 inch thick), and inner pane of clear glass
 2. Place low E coating on No. 2 surface within the unit.
 3. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 4. Purge interpane space with dry hermetic air.
 5. U Value (Center of Glass): 0.29 maximum.
 6. Shading Coefficient: 0.31 maximum.
 7. Solar Heat Gain Coefficient: 0.27.
 8. Visible Light Transmittance: 64 percent.
 9. Total unit thickness of 1 inch minimum.
 10. Product:
 - a. LoE3-366 insulated glass units with XL Edge by Cardinal Glass Industries:
www.cadinalcorp.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Insulated Safety Glass Units (Type ISGU): Double pane with glass to elastomer edge seal.
 1. Outer pane of Low E clear safety glass (1/4 inch thick), inner pane of clear safety glass (3/16 inch thick).
 2. Place low E coating on No.2 surface within the unit.
 3. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 4. Purge interpane space with dry hermetic air.
 5. U Value: 0.29 maximum.
 6. Shading Coefficient: 0.31 maximum.
 7. Solar Heat Gain Coefficient: 0.27.
 8. Visible Light Transmittance: 64 percent.
 9. Total unit thickness of 1 inch minimum.
 10. Product:
 - a. LoE3-366 insulated glass units with XL Edge by Cardinal Glass Industries:
www.cadinalcorp.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Silicone, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; size as required; black color.
- D. Glazing Gaskets: As specified in Section 08 43 13 - Aluminum-Framed Storefront System.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION**3.03 INSTALLATION - ALUMINUM STOREFRONT**

- A. Method recommended by aluminum storefront manufacturer to meet specified performance requirements.

3.04 INSTALLATION - HOLLOW METAL DOORS

- A. Method recommended by hollow metal door manufacturer.

3.05 INSTALLATION - WOOD DOORS AND RELITES - DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.06 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Exterior wall framing.
- B. Section 07 46 46 - Fiber Cement Siding: Exterior wall finish.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Section 07 90 05 - Joint Sealers.
- E. Section 08 11 13 - Hollow Metal Doors and Frames: Frames to accept louvers.

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.
- C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Product Data: Provide data on actuator.
- D. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.
- E. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- F. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.06 PROJECT CONDITIONS

- A. Coordinate work of this section with installation of metal siding.
- B. Coordinate work of this section with installation of mechanical ductwork .

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 1. See Section 01 81 13.01 - Academic Building and Site LEED Requirements.
 2. See Section 01 81 13.02 - Housing Building LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13.01 - Academic Building and Site LEED Requirements.
 2. See Section 01 81 13.02 - Housing Building LEED Requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fixed Wall Louvers:
 1. Type K6844 by The Airolite Company: www.airolite.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

- A. Louvers, General: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
 2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
 3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 4. Screens: Provide bird screens at intake and exhaust louvers.
- B. Stationary Louvers : Horizontal blade, extruded aluminum construction, with concealed intermediate mullions.
 1. Free Area: 50 percent, minimum.
 2. Blades: Drainable; 45 degree angle.
 3. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
 4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
 5. Finish: Fluoropolymer coating, finished after fabrication.
 6. Color: As selected from manufacturer's standard colors.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), .
- B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

2.04 ACCESSORIES

- A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- B. Fasteners and Anchors: Galvanized steel.
- C. Head and Sill Flashings: See Section 07 62 00.
- D. Sealant: Type B - MS Polymer Sealant, as specified in Section 07 90 05.

2.05 FINISHES

- A. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Coordinate with installation of flashings by others.
- C. Install louvers level and plumb.
- D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Install perimeter sealant and backing rod in accordance with Section 07 90 05.
- G. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

LOUVERED EQUIPMENT ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Louvered aluminum screens for concealing rooftop equipment.
- B. Fasteners and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Superstructure support and bracing of rooftop screens and grilles.
- B. Section 07 54 00 - Thermoplastic Membrane Roofing: Treating penetrations for support of rooftop screens.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2010.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Storage and handling requirements and recommendations.
 2. Installation methods.
- C. Shop Drawings: Include plans, sections, and details of connections and bracing.
 1. Include structural calculations indicating compliance with wind loading requirements.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available finishes, colors, and textures.
- E. Verification Samples: For each product specified, two samples, minimum size 8 inches square, representing actual product configuration, color, and texture.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Comply with manufacturer's instructions for handling of grille and screen products.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Submit manufacturer's standard ten-year finish warranty.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Vert-a-Cade Model VC-301 by Construction Specialties: www.c-sgroup.com.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROOFTOP EQUIPMENT SCREENS - GENERAL

- A. Wind Resistance: Design grilles and screens, including superstructure support system, to withstand positive and negative wind loading in accordance with applicable building code.

2.03 LIGHTWEIGHT LOUVERED ALUMINUM SCREEN PANELS

- A. Construction: Panels comprising interlocking aluminum box beam frames packed with polystyrene insulation and reinforced as necessary with aluminum I-beams, with fixed horizontal aluminum louvers inserted into vertical frame members.
 - 1. Box Beam Frames and Louvers: Roll-formed aluminum sheet, alloy 3005-H26 per ASTM B209 (ASTM B209M), 0.025 in thick.
 - 2. I-Beam Inserts: Extruded aluminum, alloy 6063-T6 per ASTM B221 (ASTM B221M), 0.052 in typical wall thickness.
 - 3. Fasteners: Self-tapping stainless steel screws or aluminum pop rivets.
 - 4. Accessories and Installation Hardware: High quality stainless steel or other non-corrosive materials.
- B. Box Beam Frames: Face width of 2-1/2 in and depth of 1-5/8 in.
- C. Louver Blades: Roll-formed into beveled-edge design, 1-3/4 in wide, and spaced at 1-1/4 in on center.
- D. Aluminum Finish: Low gloss polyester enamel paint, roller coated over pretreated aluminum and baked at 400 degrees F.
 - 1. Color: As selected from manufacturer's standard colors.
- E. Overall Screen Configuration: Dimensions, details, and layout as indicated on the drawings.

2.04 EXTRUDED HORIZONTAL LOUVERS

- A. Construction: Individual extruded aluminum louvers in inverted overlapping configuration, with blade supports attached to and supported by custom superstructure.
- B. Louver Blades: Alloy 6063-T5 or 6063-T6, per ASTM B 221 (ASTM B 221M), 0.80 inch thick, 4 inches deep, spaced at 6-3/4 inches on center, and configured to block sightlines from grade.
- C. Aluminum Finish: Factory finish louvers and accessories with a high-performance organic coating, as follows:
 - 1. Organic Coating: Clean and prime exposed aluminum surfaces and apply a fluoropolymer 2-coat finish conforming to AAMA 2605, with a minimum dry film thickness of 1.2 mil.
 - 2. Color: As selected from manufacturer's standard colors.
- D. Overall Screen Configuration: Dimensions, details, and layout as indicated on the drawings.

2.05 ACCESSORIES

- A. Miscellaneous Trim: Aluminum sheet, alloy 3005-H26 or equivalent per ASTM B209 (ASTM B209M), formed to shapes indicated and finished to match other components.
- B. Superstructure: As specified in Section 05 50 00.
- C. Fasteners: Self-tapping stainless steel screws, as approved by manufacturer of rooftop equipment screens.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install rooftop equipment screens in accordance with manufacturer's printed instructions and approved shop drawings.
- B. Form tight joints and fit exposed connections accurately.
- C. Provide all necessary fastenings and anchors required for a complete installation. Install units plumb, level, and in proper alignment with adjacent work.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Protect metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry or dissimilar metals.
- C. Touch-up, repair or replace damaged products before date of Substantial Completion.

END OF SECTION

GYPSUM BOARD ASSEMBLIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Acoustic insulation.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood framing and plywood sheathing.
- B. Section 07 21 00 - Thermal Insulation.
- C. Section 07 90 05 - Joint Sealers: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2012.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- D. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.
- E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- F. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- H. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Perform in accordance with ASTM C 840.
- B. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum three years of documented experience.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
 - 3. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.

- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut. Gypsum panel products shall both be manufactured and contain at least a portion of assembly contents that has been recovered or extracted within 500 miles of Project site.
 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
 - a. Mold-resistant board is required at all locations.
 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

2.03 ACCESSORIES

- A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced. 3-1/2 and 5-1/2 inch as indicated on Drawings; 1.5 - 3.0 lb density; formaldehyde free; NRC 0.90.
 1. Knauf Wall and Ceiling Liner by Knauf Insulation GmbH: www.knaufinsulation.us.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Acoustic Sealant: As specified in Section 07 90 05.
- C. Gasket Tape: Closed-cell neoprene gasket tape, 1/4 and 3/4 inch thicknesses.
- D. Control Joints: ASTM C1047, galvanized steel or rolled zinc, "v" joint with removable cover.
 1. Zinc Expansion Control Joint by ClarkDietrich: www.clarkdietrich.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
 1. Types: Corner, casing, control, or as indicated or needed for finished appearance.
- F. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners.
 2. Ready-mixed vinyl-based joint compound.
- G. High Build Drywall Surfacers: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

1. Place in acoustical walls as indicated on Drawings; thickness as indicated.
 2. Place blankets firmly pressed in place against back of wall finish.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Place two beads continuously on substrate before installation of perimeter framing members.
 2. Place continuous bead at perimeter of each layer of gypsum board.
 3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.
 4. Apply also as indicated on Drawings.

3.03 BOARD INSTALLATION

- A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Acoustical Walls:
1. Single-Layer Walls: Install with long direction parallel to furring channels; hold panel 1/8 to 1/4 inch off floor and ceiling to accommodate sealant application; secure with 1 inch Type S screws spaced 12 inches on center.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.05 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive eggshell, semi-gloss or gloss paint finish and other areas specifically indicated.
 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
 4. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical Units: Panels.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Acoustical sealant.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2002.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2008e1.
- D. CISCA - Acoustical Ceilings: Use and Practice.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 12 inch (300 mm) long, of suspension system main runner, cross runner, and perimeter molding.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Regulatory Submittal (Deferred Permit Submittals): Submit seismic design and details sealed by a Professional Structural Engineer licensed in Oregon to code agency for review and approval.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented.

1.07 PERFORMANCE REQUIREMENTS

- A. Suspension System: Rigidly secure ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.
- B. Seismic Standard: Provide acoustical ceiling system designed and installed to withstand effects of earthquake motions according as follows:
 - 1. Seismic Restraint: ASTM E 580.

2. Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4.
3. Oregon Structural Specialty Code.
4. Comply with ASCE 7-02 Seismic Design Category D.

1.08 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.09 PROJECT CONDITIONS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustical units after interior wet work is dry.

1.10 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Provide 100 sq ft of each type of acoustical unit for Owner's use in maintenance of project.

1.11 LEED REQUIREMENTS

- A. LEED Project Goals:
 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 1. Materials and Resources Credit 4 - Recycled Content.
 2. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Panels, Type ACP-1: Mineral fiber, ASTM E 1264 Type III, Form 2, Pattern CD, acoustically transparent finish, with the following characteristics:
 1. Size: 24 x 48 inches.
 2. Thickness: 5/8 inches.
 3. Composition: Wet-formed mineral fiber.
 4. Fire Rating: Class A.
 5. Light Reflectance: 0.82 percent, determined as specified in ASTM E 1264.
 6. NRC Rating: 0.65, determined as specified in ASTM E 1264.
 7. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E 1264.
 8. Edge: Square.
 9. Surface Color: White.
 10. Surface Pattern: Medium, non-directional, texture.
 11. Suspension System: Exposed grid Type 1.
 12. Product:
 - a. Cortega by Armstrong World Industries, Inc: www.armstrong.com/ceilings.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Acoustical Panels, Type ACP-2: Mineral fiber, ASTM E 1264 Type IX, Form 2, Pattern G, acoustically transparent finish, with the following characteristics:
 1. Size: 24 x 24 inches.
 2. Thickness: 5/8 inches.

3. Composition: Wet-formed mineral fiber; sag-resistant; anti mold/mildew and bacteria treatment.
4. Fire Rating: Class A.
5. Light Reflectance: 0.89 percent, determined as specified in ASTM E 1264.
6. Ceiling Attenuation Class (CAC): 33, determined as specified in ASTM E 1264.
7. Surface Finish: Factory-applied vinyl latex paint.
8. Edge: Square.
9. Surface Color: White.
10. Surface Pattern: Smooth texture.
11. Suspension System: Exposed grid Type 2.
12. Product:
 - a. Kitchen Zone, Item No. 673 by Armstrong World Industries, Inc: www.armstrong.com/ceilings.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- B. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled; intermediate-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: White painted.
 4. Product:
 - a. Prelude XL by Armstrong World Industries, Inc: www.armstrong.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Exposed Aluminum Suspension System Type 2: Extruded aluminum; intermediate-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Finish: PVC, white color.
 3. Products:
 - a. Clean Room by Armstrong World Industries, Inc: www.armstrong.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Hold-Down Clips: Manufacturer's standard retention clip.
- D. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 90 05.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions, Oregon Structural Specialty Code for seismic restraint, and Cisca's "Guidelines for

Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4, and as supplemented in this section.

- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Install in bed of acoustical sealant or bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to longest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install units after above-ceiling work is complete.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Install acoustical panels on top of radiant ceiling panels.
- H. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- I. Where round obstructions occur, provide preformed closures to match perimeter molding.
- J. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

RESILIENT FLOORING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Resilient sheet flooring.
- B. Resilient base.
- C. Transition strips.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-In-Place Concrete: Concrete floor substrate.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board wall substrate.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2010e1.
- B. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2009).
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Verification Samples: Submit two samples, 2 x 2 inch in size illustrating color and pattern for each resilient flooring product specified.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Flooring Material: 100 square feet of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect roll materials from damage by storing on end.

1.06 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.07 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Provide 100 sq ft of flooring, 50 lineal feet of base, of each type and color specified.

1.08 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
 - 2. Indoor Environmental Quality Credit 4.3 - Low-Emitting Materials: Flooring Systems.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 SHEET FLOORING**

- A. Vinyl Sheet Flooring (SV): Heterogeneous sheet, transparent or translucent vinyl wear layer over interlayer and backing, and:
 - 1. Minimum Requirements: Comply with ASTM F 1303, Type I, with Class B plastic backing.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Printed Interlayer: Standard with manufacturer.
 - 4. Wear Layer Thickness: 0.020 inch minimum.
 - 5. Total Thickness: 0.080 inch minimum.
 - 6. Static Load Resistance: 175 psi minimum.
 - 7. Seams: Heat welded.
 - 8. Product:
 - a. Abode by Armstrong World Industries, Inc: www.armstrong.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Vinyl Sheet Safety Flooring: Homogeneous sheer, slip resistant particulate suspended evenly throughout thickness.
 - 1. Total Thickness: 0.10 inch
 - 2. Sheet Width: 79 inches.
 - 3. Static Load Resistance: 2000 psi minimum per ASTM F 970.
 - 4. Pattern: Marbleized, color as selected.
 - 5. Seams: Heat welded.
 - 6. Product:
 - a. Altro Designer 25 by Altro: www.altrofloors.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RESILIENT BASE

- A. Resilient Base (RB) and Stair Stringers: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Satin.
 - 4. Length: Roll.
 - 5. Color: To match Roppe 194 Burnt Umber.
 - 6. Accessories: Premolded end stops.
 - 7. Manufacturers:
 - a. Burke Flooring: www.burkemercer.com.
 - b. Johnsonite, a Tarkett Company; Product ____: www.johnsonite.com.
 - c. Roppe Corp: www.roppe.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- C. Transition Strip (SSV) to CPT): Rubber.
 1. Model CTA-XX-A by Johnsonite: www.johnsonite.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 1. Resilient Strips: Attach to substrate using adhesive.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.
- B. Seams are prohibited in toilet rooms and custodial closets.
- C. Double cut sheet at seams.
- D. Lay flooring with tightly butted seams, without any seam sealer .
- E. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.
- C. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.06 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

PAINTING AND COATING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, electrical equipment, and sprinkler piping, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. On the roof and outdoors, paint all equipment that is exposed to weather or to view, including that which is factory-finished.
 - d. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - e. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 6. Floors, unless specifically so indicated.
 - 7. Ceramic and other tiles.
 - 8. Glass.
 - 9. Acoustical materials, unless specifically so indicated.
 - 10. Concealed pipes, ducts, and conduits.
- E. See Schedule - Surfaces to be Finished, at end of Section.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Shop-primed items.
- B. Section 08 11 13 - Hollow Metal Doors and Frames: Shop-primed items.

1.03 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on gloss thick paper, 8-1/2 x 11 inch in size.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.

- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.06 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide one room as a mockup, illustrating coating colors, texture, and finish; include door and frame.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.09 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Supply 1 gallon of each color; store where directed.
- C. Label each container with color in addition to the manufacturer's label.

1.10 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:

1. Indoor Environmental Quality Credit 4.2 - Low-Emitting Materials: Paints and Coatings.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- C. Paints, Primer Sealers, Block Fillers:
 1. Base Manufacturer: Miller Paint Co. and Sherwin-Williams Co.as noted below.
 2. Other Approved Manufacturers of similar products:
 - a. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
 - b. Benjamin Moore & Co: www.benjaminmoore.com.
 - c. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - d. Miller Paint Co.: www.millerpaint.com.
 - e. Sherwin-Williams Company: www.sherwin-williams.com.
 - f. Rodda Paint Company: www.roddapaint.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content: All paints, coatings and associated primers applied at the interior side of building envelop weather proofing barrier shall not exceed limits specified in Section 01 81 13.

2.03 PRODUCTS

- A. Exterior Galvanized Metal Primer:
 1. Miller Paint Co., Acrimetel DTM Primer/Finish 5000 (100 g/L VOC).
 2. Sherwin-Williams Co., Pro-Cryl Universal Primer (<100 g/L VOC).
- B. Exterior Rust Inhibiting Metal Primer:
 1. Miller Paint Co., Quick Dry Metal Primer 358 (436 g/L VOC).
 2. Sherwin-Williams Co., All Surface Enamel A41 Series (132 g/L VOC)
- C. Interior Ferrous Metal Primer (Non-Corrosive/Anti-Rust):
 1. Miller Paint Co., Acrimetel DTM Primer/Finish 5000 (<100 g/L VOC).
 2. Sherwin-Williams Co., Pro-Cryl Universal Primer (<100 g/L VOC).

- D. Interior Galvanized Metal Primer:
 1. Sherwin-Williams Co., Pro-Cryl Universal Primer (<100 g/L VOC).
- E. Interior Wood Primer:
 1. Sherwin-Williams Co., ProMar 200 Primer (0 g/L VOC)
- F. Interior Acrylic Latex Primer:
 1. Miller Paint Co., Acro Pure Interior Primer 6440 (6 g/L VOC).
 - 2.
- G. Exterior Acrylic Latex - Low Luster/Satin:
 1. Miller Paint Co., Acro Pure 1450 (6 g/L VOC).
 2. Sherwin-Williams Co.,
- H. Exterior Alkyd Enamel - Semi-Gloss
 1. Miller Paint Co., Premium Spar Enamel 2510 Series (355 g/L VOC)
 2. Sherwin-Williams Co.,
- I. Interior Acrylic Latex Enamel - Semi-Gloss:
 1. Miller Paint Co., Acro Pure 2850 Series (Less than 6 g/L VOC).
 2. Sherwin-Williams Co.,
- J. Interior Acrylic Latex Enamel - Egg-Shell Gloss)
 1. Miller Paint Co., Acro Pure 4650 Series (6 g/L VOC).
 2. Sherwin-Williams Co.,
- K. Interior Acrylic Latex Enamel - Flat:
 1. Miller Paint Co., Acro Pure 6450 Series (6 g/L VOC).
 2. Sherwin-Williams Co.,
- L. Interior Alkyd Enamel - Semi-Gloss:
 1. Miller Paint Co., Evolution 1750 Series (50 g/L VOC).
 2. Sherwin-Williams Co.,
- M. Interior Catalyzed Acrylic Epoxy System - Semi-Gloss:
 1. Sherwin-Williams, Pro Industrial Zero VOC Catalyzed Acrylic Epoxy (0 g/L VOC).
- N. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Cultured Stone Masonry: 12 percent or as recommended by sealer manufacturer.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- L. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
- M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL WORK

- A. Paint shop-primed equipment, where indicated.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Finish equipment, piping, conduit, and exposed duct work in utility areas in colors according to the color coding scheme indicated.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

3.07 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
 - 3. Stainless steel items.
- B. Paint the surfaces described below under Schedule - Paint Systems.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
 - 3. Paint shop-primed items occurring in finished areas.
 - 4. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 5. Paint dampers exposed behind louvers, grilles, to match face panels.
 - 6. Paint interior of ductwork black behind all grilles.

3.08 SYSTEMS SCHEDULE - EXTERIOR

- A. Galvanized Steel:
 - 1. Prepare surfaces.
 - 2. One coat Exterior Galvanized Metal Primer.
 - 3. Two coats Exterior Alkyd Enamel, Semi-Gloss.
 - 4. Colors: As selected.
- B. Ferrous Metal:
 - 1. Prepare surfaces.
 - 2. One coat Exterior Rust Inhibiting Primer.
 - 3. Two coats Exterior Alkyd Enamel, Semi-Gloss.
 - 4. Colors: As selected.
- C. Fiber Cement Siding and Extruded Aluminum Trim:
 - 1. Prepare surfaces.
 - 2. Touch-up shop primer on siding.

3. One coat primer on extruded aluminum trim.
4. Two coats Exterior Acrylic Latex, Low Luster/Satin.
5. Colors: As selected.

3.09 SYSTEMS SCHEDULE - INTERIOR

- A. Gypsum Wall Board, Walls (EN):
 1. Prepare surfaces.
 2. One coat Interior Latex Primer / Sealer.
 3. Two coats Acrylic Latex Enamel, Egg-Shell Gloss.
 4. Colors: As selected.
- B. Gypsum Wall Board, Ceilings and Soffits (EN):
 1. Prepare surfaces.
 2. One coat Interior Latex Primer.
 3. Two coats Acrylic Latex Enamel, Flat.
 4. Colors: As selected.
- C. Gypsum Wall Board at Toilet/Shower Room (EP):
 1. Prepare surfaces.
 2. One coat Epoxy Primer.
 3. One coat Epoxy Top Coat.
 4. Color: As selected.
- D. Plywood (EP) in Kitchen:
 1. Prepare surfaces.
 2. One coat Epoxy Primer.
 3. One coat Epoxy Top Coat.
 4. Color: As selected.
- E. Plywood in Wood Shop:
 1. Prepare surfaces.
 2. One coat wood primer.
 3. Two coats _____.
 4. Color: As selected.
- F. Galvanized Steel (EN):
 1. Prepare surfaces.
 2. One coat Interior Galvanized Metal Primer.
 3. Two coats Interior Acrylic Latex Enamel, Semi-Gloss.
 4. Colors: As selected.
- G. Ferrous Metal (EN):
 1. Prepare surfaces.
 2. One coat Interior Metal Primer.
 3. Two coats Interior Acrylic Latex Enamel, Semi-Gloss.
 4. Colors: As selected.

END OF SECTION

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Installation of Owner Furnished building monument sign.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Description of work by Owner: Monument sign.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Flat Signs:
 1. APCO Graphics, Inc: www.apcosigns.com.
 2. ASI Sign Systems: www.asisign.com.
 3. InPro; Aspen produced in one piece photopolymer media: www.inprocorp.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE

- A. Material: Moisture resistant, non-glare photopolymer; one piece construction; integral raised 1/32 inch tactile text with Grade 2 Braille on 0.118 inch thick base.
- B. Accessibility Compliance: All signs are required to comply with ADA Standards for Accessible Design and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- C. All Signage Types: Unless otherwise indicated:
 1. Character Font: Helvetica, Arial, or other sans serif font.
 2. Character Case: Upper case only.
 3. Background Color: Color as selected.
 4. Character Color: Contrasting color as selected.
- D. Sign Text and Images: Tactile and braille.
 1. Fire Riser Room: Text.
 2. Unisex Restrooms: Text and unisex pictogram and wheelchair.
 3. Exits: Text at Doors.
- E. Size: 6 inch wide x 8 inch high; radius corners.

2.03 ACCESSORIES**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate interior signs where indicated:
 1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
- D. Install Owner Furnished monument sign in accordance with Owner standards.
- E. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION

TOILET, BATH, AND LAUNDRY ACCESSORIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Accessories for toilet rooms, showers, and utility rooms.
- B. Grab bars.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates, and above ceiling framing.

1.03 REFERENCE STANDARDS

- A. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2013.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
- D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.05 COORDINATION

- A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Stainless Steel Sheet: ASTM A 666, Type 304.
- C. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.
- D. Mirror Glass: Float glass, ASTM C 1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C 1503.
- E. Adhesive: Two component epoxy type, waterproof.

- F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

2.02 FINISHES

2.03 TOILET ROOM ACCESSORIES

- A. Toilet Paper Dispenser: Surface mounted type; Owner furnished.
- B. Paper Towel Dispenser: Wall mounted type; Owner furnished.
- C. Soap Dispenser: Wall mounted type; Owner furnished.
- D. Mirrors: Stainless steel framed, 6 mm thick tempered glass mirror.
 - 1. Size: As scheduled.
 - a. MR-1: 24 inch x 36 inch.
 - 2. Frame: 1/2 inch x 1/2 inch x 1/4 inch channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 4. Product:
 - a. Model B-1658 Series by Bobrick Washroom Equipment Inc: www.bobrick.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Seat Cover Dispenser: Surface mounted type; Owner furnished.
- F. Grab Bars: Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length / Configuration:
 - a. GB-A: 36 inch; straight.
 - b. GB-B: 42 inch; straight.
 - c. GB-C: 18 inch; straight.
 - 2. Product:
 - a. Model B-5806 Series by Bobrick Washroom Equipment Inc: www.bobrick.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Shelf: Wall mounted type; Owner furnished.
- H. Wall Hook: Surface mounted type; Owner furnished.

2.04 SHOWER AND TUB ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
 - 1. Product:
 - a. Model B-6047 by Bobrick Washroom Equipment Inc: www.bobrick.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Shower Curtain:
 - 1. Material: Nylon reinforced vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: 42 x 72 inches, hemmed edges.
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 4. Color: White.
 - 5. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
 - 6. Product:
 - a. Model 204-2 by Bobrick Washroom Equipment Inc: www.bobrick.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: 3, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
 - 4. Length: 36 inches.
 - 5. Product:
 - a. Model B-224 by Bobrick Washroom Equipment Inc: www.bobrick.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Sections 06 10 00 and 09 21 16 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
- D. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

3.04 SCHEDULE

- A. Unisex Toilet Room:
 - 1. Mirror.
 - 2. Soap Dispenser.
 - 3. Toilet Tissue Dispenser with Shelf.
 - 4. Seat Cover Dispenser.
 - 5. Paper Towel Dispenser.
 - 6. Grab Bars, One Set.
 - 7. Wall Hook.
- B. Unisex Toilet/Shower Room:
 - 1. Mirror.
 - 2. Soap Dispenser.
 - 3. Toilet Tissue Dispenser with Shelf.
 - 4. Seat Cover Dispenser.
 - 5. Paper Towel Dispenser.
 - 6. Grab Bars, One Set.
 - 7. Wall Hook.
 - 8. Shower Curtain Rod.
 - 9. Shower Curtain.

- C. Custodial Room:
 - 1. Combination Utility Shelf/Mop and Broom Holder.
 - 2. Waste Receptacle (By Owner).
- D. Break Room:
 - 1. Paper Towel Dispenser.

END OF SECTION

FIRE PROTECTION SPECIALTIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate wall bracket mounted measurements.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.07 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business; Cleanguard: www.ansul.com.
 - 2. JL Industries, Inc: www.jlindustries.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
 - 1. Class B:C.
 - 2. Size 10.
 - 3. Size and classification as scheduled.
 - 4. Finish: Baked enamel, red color.

2.03 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure wall mounted brackets rigidly in place.
- C. Place extinguishers on wall brackets.

END OF SECTION

PEST CONTROL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Boric acid treatments.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Interior wall framing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on materials and products specified.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Boric Acid Powder:
 1. BorActin Insecticide Powder (EPA Reg. No. 73079-4) by Rockwell Labs Ltd:
www.rockwelllabs.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Verify that conditions are as required by product manufacturer.

3.02 PREPARATION

- A. Vacuum clean voids in areas and remove any loose particles, dust or other materials or conditions that could affect installation.

3.03 INSTALLATION

- A. Install boric acid powder in accordance with manufacturer's instructions.
- B. Install at interior base of stud walls immediately prior to enclosure at the following locations:
 1. Toilet Rooms.
 2. Shower Rooms.
 3. Kitchens and Accessory Areas.
 4. Exterior wood framed walls.
 5. Other areas as indicated on Drawings.
- C. Coordinate with installation of wall surfacing.

3.04 CLEANING

- A. Clean and remove all traces of powder from surfaces outside of concealed spaces and voids where powder has been installed.

END OF SECTION

LOADING DOCK BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Dock bumpers of reinforced rubber with attachment frame.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Placement of bumper anchors into concrete.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate unit dimensions, method of anchorage, and details of construction.
- C. Manufacturer's Installation Instructions: Indicate special installation requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Dock Bumpers:
 1. Blue Giant Equipment Corporation: www.bluegiant.com.
 2. Durable Corp: www.durablecorp.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Bumpers: Fabric reinforced rubber pads, ozone resistant, laminated and compressed in position with two galvanized steel rods with threaded ends, washers and nuts; between 3 x 2-1/2 x 1/4 inch galvanized steel angle end plates:
 1. Projection From Wall: 4-1/2 inches.
 2. Vertical Height: 10 inches.
 3. Length: 15 inches.
- B. Attachment Hardware: 3/4 inch diameter galvanized bolts and expansion shields.

2.03 LEED REQUIREMENTS

- A. LEED Project Goals:
 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 1. Materials and Resources Credit 4 - Recycled Content.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 1. See Section 01 81 13 - LEED Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that anchor placement is acceptable.

3.02 INSTALLATION

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.

C. Secure angle end frames to concrete.

END OF SECTION

RESIDENTIAL APPLIANCES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Kitchen/break room appliances.

1.02 RELATED REQUIREMENTS

- A. Section 20 50 00 - General Mechanical Provisions: Plumbing connections.
- B. Section 26 05 00 - Common Work Results for Electrical: Electrical connections.

1.03 REFERENCE STANDARDS

- A. Energy Star - U.S. Environmental Protection Agency (EPA), product rating program.
- B. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS**2.01 KITCHEN APPLIANCES**

- A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator : Free-standing, top-mounted freezer, frost-free.
 1. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by DOE.
 3. Features: Include glass shelves.
 4. Finish: Porcelain enameled steel, color white.
 5. Size: 28 inch wide x 32 inch deep x 68 inches high.
 6. Manufacturers:
 - a. Model W8RXEGMW by Whirlpool Corp: www.whirlpool.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Microwave : Countertop.
 1. Capacity: 1.6 cubic ft.

2. Power: 1,200 watts.
 3. Features: Include turntable and undercabinet mounting kit.
 4. Finish: White.
 5. Manufacturers:
 - a. Model WMC30516AW by Whirlpool Corp: www.whirlpool.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Dishwasher, : Undercounter.
1. Height: To fit 34 inch high counters.
 2. Width: 24 inches.
 3. Controls: Solid state electronic.
 4. Racks: 2, nylon.
 5. Cycles: 5, including normal.
 6. Features: Include rinse aid dispenser, optional no-heat dry, and optional water temperature boost.
 7. Interior Tub Finish: Stainless steel.
 8. Door Finish: Stainless steel.
 9. Manufacturers:
 - a. Model WDF550SAAS by Whirlpool Corp: www.whirlpool.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust operating equipment to efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

END OF SECTION

FOOD SERVICE EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foodservice equipment.

1.02 RELATED SECTIONS

- A. Refer to General Conditions, Supplementary Conditions, and applicable provisions of Division 1 for additional instructions.
- B. Refer to Division 22 - Mechanical; for applicable provisions and sections regarding mechanical services, including, but not limited to, rough-ins, grease traps, steam traps, drain traps, atmospheric vents, valves, pipes and pipe fittings, ductwork, and other materials necessary to complete final connections to individual items as specified in this Section; not work of this Section.
- C. Electrical services, including, but not limited to, rough-ins, wiring, disconnects and other materials necessary to complete final connections to individual items as specified in this Section; not work of this Section..
- D. Work included in other Sections - Provision of all wall, floor, and/or ceiling/roof openings, recesses, sleeves, and/or conduits; and equipment pads, as required for installation of items included in this section. Also sealing of these openings, recesses, sleeves, etc., after installation of the equipment items, as required. Not work of this Section.

1.03 DEFINITIONS

- A. Furnish - Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
- B. Install (set in place) - Operations at Project Site including actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, finishing, curing, protecting, cleaning, and similar operations; ready for final utility connections by other Sections as appropriate.
- C. Provide - Furnish and install complete, ready for intended use.

1.04 LAWS, ORDINANCES AND STANDARDS

- A. STANDARDS: Except as otherwise indicated, comply with the following standards as applicable to the manufacture, fabrication, and installation of the work of this Section:
 1. Air Conditioning and Refrigeration Institute (A.R.I.): Comply with the applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components and installation.
 2. American National Standards Institute (A.N.S.I.): Comply with A.N.S.I. A40.4 and A40.6 for water connection air gaps and vacuum breakers.

3. American Society of Heating, Refrigeration and Air Conditioning Engineers (A.S.H.R.A.E.): Comply with the applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components and installation
4. American Society for Testing and Materials (A.S.T.M.): Comply with A.S.T.M. C1036 for flat glass.
5. American Society for Testing and Materials (A.S.T.M.): Comply with A.S.T.M. C1048 for heat-treated flat glass - Kind HS, Kind FT coated and uncoated glass.
6. American Welding Society (A.W.S.): Comply with A.W.S. D1.1 structural welding code.
7. National Electric Code (N.E.C.): Comply with N.F.P.A. Volume 5 for electrical wiring and devices included with foodservice equipment, A.N.S.I. C2 and C73, and applicable N.E.M.A. and N.E.C.A. standards.
8. National Electrical Manufacturers Association (N.E.M.A.): Comply with N.E.M.A. LD3 for high-pressure decorative laminates.
9. National Fire Protection Association (N.F.P.A.): Comply with the applicable sections of the N.F.P.A. for exhaust hood, ventilators, duct and fan materials, hoods fire suppression systems, construction and installation; as well as, local codes and standards.
10. National Sanitation Foundation (N.S.F.): Comply with the latest Standards and Revisions established by N.S.F. Provide N.S.F. Seal of Approval on each applicable manufactured item, and on items of custom fabricated work. (UL Sanitation approval and seal may be accepted if acceptable to local code jurisdictions.)
11. Sheet Metal and Air Conditioning Contractor's National Association (S.M.A.C.N.A.): Comply with the latest edition of S.M.A.C.N.A. guidelines for seismic restraint of kitchen equipment, and the applicable local regulatory agencies requirements.
12. Underwriters Laboratories (U.L.): For electrical components and assemblies provide either U.L. labeled products or, where no labeling service is available, "recognized markings" to indicate listing in the UL "Recognized Component Index". (Canadian Standards Association or alternate testing lab's seals may be accepted if acceptable to local code jurisdictions.)
13. UL 300 Standard: Wet chemical fire suppression systems for exhaust hoods/ventilators shall comply with these requirements.
14. American with Disabilities Act (ADA): Comply with requirements, as applicable to this Project.
15. Refrigeration Service Engineers Society (R.S.E.S.): Comply with the applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components and installation; and the 1995 requirements of the Montreal Protocol Agreement.

16. All refrigerants used for any purpose shall comply with the 1995 requirements of the Montreal Protocol Agreement, and subsequent revisions and amendments. No CFC refrigerants shall be allowed on this Project.
17. All refrigeration components installation, repairs, and/or associated work on any refrigeration system, self-contained or remote, shall be performed by a Certified Refrigeration Mechanic.
18. Comply with all applicable local codes, standards and regulations and any special local conditions (example only: City of Los Angeles Testing Lab requirements).
19. Backflow prevention assemblies must be applied per WAC 246-290-490.
20. Backflow prevention equipment will be applied as required in UPC 603.4.13 and devices will be required to be from the current list of approved devices for use in Washington State.
21. The UPC states that integral air gaps or vented backflow assembly be installed. An integral air gap is preferred. However if a backflow assembly is installed it must be a reduced pressure backflow assembly per AWWA Cross Connection Control Manual as cited under WAC 246-290-490 and installed so that it can be tested annually. If this is an integral assembly, Equipment supplier must provide information as to how it can be tested annually.

1.05 CONTRACTOR'S QUALIFICATIONS

- A. In addition to requirements of Related Sections 1.02.A submit evidence of compliance with the following qualifications and conditions.
 1. Five (5) years minimum continuous operation under the same company name and ownership.
 2. Evidence of Company financial stability, and financial ability to complete this Project without endangering that stability.
 3. List of comparable size and scope projects completed in the last five (5) years, with Owner's contact name and telephone number.
 4. Have manufacturer's authorization to purchase, distribute, and install all items specified with this Project.
 5. Maintain a staff or have access to personnel with a minimum of five (5) years experience in the installation of comparable size and scope projects.
 6. Maintain or have access to a fabrication shop meeting NSF standards and labeling requirements. (UL Sanitation approval and seal may be accepted if acceptable to local code jurisdictions.) If other than the Contractor's own fabrication shop, they shall have five (5) years minimum experience in the fabrication of comparable size, scope, and level of quality projects; and the Contractor shall submit their company name and credentials to the Architect, which shall have the right of approval or disapproval.

7. Maintain a staff or have access to personnel experienced in the preparation of professional style shop drawings and submittals.
 8. Maintain or have access to manufacturer's authorized service personnel together with readily available stock of repair and replacement parts.
- B. Any sub-contractor employed by this Contractor, for this Project, shall comply the same qualification requirements.

1.06 SUBSTITUTIONS

- A. Submit bids for the specific manufacturer and model, size, capacity and accessories, as specified or shown on the drawings.
- B. Requests for substitutions must be submitted and approved in writing by the Architect. All substitutions and request for substitutions shall comply with conditions and requirements as stated in Section 012513.
- C. If custom fabricated items are submitted and accepted as a substitute to standard manufactured items, these items shall meet the specifications of the specified manufactured items, and in general, the fabrication sections which follows.

1.07 DISCREPANCIES

- A. Where discrepancies are discovered between the drawings and the specifications, regarding quality or quantity, the higher quality or the greater quantity shall be included in the Bid Proposal. Notify the Architect, in writing, of any discrepancies discovered; and await clarification prior to proceeding with the items or areas in question.

1.08 SUBMITTALS

- A. Rough-In Drawings:
 1. Submit one (1) digital set for approval. After approval, reproduce and supply the required number of corrected distribution prints for record and construction purposes.
 2. Submit 1/4 inch scale rough-in drawings for approval. These drawings shall be dimensioned; showing location of ducts, stubs, floor and wall sleeves, for ventilation, plumbing, steam, electrical, refrigeration lines, and concrete base and curb dimensions as required for equipment so supported. Provide plumbing and electrical rough-in drawings on separate sheets.
 3. Site-verify mechanical, electrical and ventilating rough-in and sleeve locations.
 4. Maintain one record set with any related corrections, revisions, additions, deletions, changes, etc. noted during construction and installation; and provide an "as-built" set in reproducible transparency form at the completion of this phase of the Project.
 5. The Contractor shall be responsible for the accuracy of the information on their submittals.

6. In the event rough-ins have been accomplished before award of this contract, the Contractor shall check the existing facility and make adjustments to their equipment to suit building conditions and utilities, where possible. If not possible, so state in a letter with reasons, and an alternate method and pricing, to the Owner, Architect and JLR Design Group.

B. Shop Drawings:

1. Submit one (1) digital set for approval. After approval, reproduce and supply the required number of corrected distribution prints for record and construction purposes.
2. Submit shop drawings for items of custom fabrication included in this contract. Shop drawings shall be submitted at 3/4 inch and/or 1-1/2 inch scale and shall show dimensions, materials, details of construction, installation and relation of adjoining work requiring cutting or close fitting. Shop drawings shall also indicate reinforcements, anchorage and related work required for the complete installation of fixtures.
3. Before proceeding with the fabrication of any item, the Contractor shall be responsible for verifying and coordinating all dimensions and details, with site dimensions and conditions.

C. Product Data Manuals:

1. Submit one (1) digital sets of manufacturer's specifications sheets with complete and specific information; including model numbers, options and accessories provided, exact utility requirements, and similar information on all items of standard manufacture. Distribute one additional copy of installation and start-up instructions to the Installer. Mark each data sheet with the applicable project equipment item number. Each data sheet to include N.E.M.A. plug and receptacle configuration for applicable items, where applicable.

- D.** Architect's/Consultant's review of drawings, shop details, product data brochures, and service and parts manuals is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract documents, or departures therefrom. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing their work in a safe, satisfactory, and professional manner.

1.09 OPERATION AND MAINTENANCE DATA MANUALS

- A.** Service And Parts Manuals: Three (3) bound sets of service and parts manuals shall be furnished for items of standard manufacture before final acceptance of installation by Owner. Manuals to be in alphabetical order, according to manufacturer.
- B.** Service Agency List: Submit, with the service and parts manuals, a complete list of local service agencies for included manufacturers, complete with telephone numbers.
- C.** Provide video tapes for maintenance, training, operation, etc where available from the manufacturer.

1.10 SCHEDULE

- A. General: Time is of the essence in this agreement and acceptance constitutes a guarantee that the Contractor can and will obtain materials, equipment and manpower, upon notice to proceed, to permit overall completion of the entire building project on schedule. The Contractor shall coordinate their work with the progress schedule, as prepared and updated periodically by the General Contractor or Construction Manager.
- B. Unanticipated delays, not within the realm of control of the Contractor, shall be noted in a written notification to the Foodservice Consultant and the Architect, immediately upon the Contractor's realization that delays are imminent.
- C. Failure of manufacturers to meet promised delivery dates will not grant relief to the Contractor for failure to meet schedules; unless the Contractor can establish, in writing, that orders were received by the manufacturer, with reasonable lead times.
- D. Extra charges resulting from special handling or air shipment in order to meet the schedule will be paid by the Contractor if insufficient time was allowed in placing factory orders.

1.11 PRODUCT HANDLING

- A. Delivery Of Materials: Deliver materials (except bulk materials) in manufacturer's containers fully identified with manufacturer's name, trade name, type, class, grade, size, color and item number.
- B. Storage Of Materials, Equipment And Fixtures: Contractor is responsible for receiving and warehousing of equipment and fixtures, until ready for installation. Store materials, equipment and fixtures in sealed containers. Store off the ground and under cover, protected from damage.
- C. Handling Materials And Equipment: Verify and coordinate conditions at the building site, particularly door and/or wall openings, and passages, to assure access for all equipment. Pieces too bulky for existing facilities shall be hoisted or otherwise handled with apparatus as required. All special handling equipment charges shall be arranged for and paid for by the Contractor.

1.12 PRODUCT PROTECTION

- A. The Contractor is responsible, during the progress of the project, to protect their equipment against theft or damage, until final acceptance by the Owner. Items delivered to the job site at the Owner's or Contract Manager's request before the site is ready for installation; should be signed for, as delivered by the Owner or Contract Manager.
- B. Use all means reasonable to protect the materials of this Section before, during, and after installation; and to protect the associated work and materials of the other trades.
- C. Pre-fabricated walk-in boxes, on-site and installed in advance of the rest of the equipment, are not to be available for or used as general storage by other trades; and should be locked before leaving the site. Damage and theft resulting from the failure to secure boxes shall be repaired or replaced at Contractor's own expense.

1.13 WARRANTY

- A. Unless otherwise noted in Related Sections 1.02.A, items furnished shall be fully guaranteed against defects in workmanship and material(s) for one full year after issue of Certificate Of Occupancy, or the equivalent. Should a Temporary Certificate Of Occupancy be issued for partial completion of work, the items furnished within that designated area shall be under warranty from the date of issue of that Certificate. Repairs and replacements will be made by the Contractor or their service agent without charge to the Owner, and within a reasonable time.

PART 2 - PRODUCTS**2.01 EQUIPMENT**

- A. Equipment schedule: Refer to schedule on Foodservice Drawings and Itemized Specifications for equipment included in this Section.

2.02 MATERIALS

- A. Metals:
1. Stainless Steel: AISI Type 302/304, hardest workable temper, No.4 directional polish.
 2. Galvanized Steel Sheet: ASTM A526, except ASTM A527 for extensive forming; ASTM A525, G90 zinc coating, chemical treatment.
 - a. Where painted finish is indicated, provide mill phosphatized treatment in lieu of chemical treatment.
 3. Steel Sheet: ASTM A569 hot-rolled carbon steel.
 4. Galvanized Steel Pipe: ASTM A53 or ASTM A120, welded or seamless, schedule 40, galvanized.
 5. Steel Structural Members: Hot rolled or cold formed, carbon steel unless stainless steel is indicated.
 - a. Galvanized Finish (G.I.): ASTM A123 hot-dipped zinc coating, applied after fabrication.
 6. Aluminum: ASTM B209/B221 sheet, plate and extrusions (as indicated); alloy, temper and finish as determined by manufacturer/fabricator, except 0.40-mil natural anodized finish on exposed work unless another finish is indicated.
- B. Plastic Laminate: NEMA LD3, Type 2, 0.050" thick, except Type 3, 0.042" for post-forming smooth (non-textured). Color and texture as selected by the Architect/ Interior Designer.
1. Comply with N.S.F. No. 35.

2. Veneered with approved waterproof and heatproof cement. Rubber base adhesives are not acceptable.
3. Applied directly over close grained plywood, such as solid Mahogany or solid Birch, of selected, smooth, sanded stock to ensure a smooth ripple-free laminated surface; or commercial grade furniture particle board, Cortron or equal.
4. If specified plywood or particle board is unavailable, submit specifications and sample of alternate material for approval.
5. Exposed faces and edges shall be faced with 1/16 inch (1.6mm) thick material. Corresponding backs are to be covered with approved backing and balancing sheet material. No unfinished exposed plywood/particle board will be acceptable.

C. Insulation:

1. For low temperature applications, such as ice bins, cold pans, or fabricated under counter freezers, use urethane, rigid board foam or foamed-in-place; not less than 2 inches (50mm) thick, except that vertical surfaces of cold pans and ice bins may be 1 inch (25mm) thick. Insulation shall be bonded at joints, to prevent condensation on exterior.
2. At counter tops, subject to heat from cooking equipment and refrigeration compressors, use 1 inch (25mm) thick B&Z Products (1-800-999-0890) Marinite I, or equal, to insulate underside of top.
3. Marinite material shall be added between freezer or refrigerator, and 14 gauge (2.0) stainless steel top.
4. All insulation shall be fully encased or enclosed.

D. Joint Materials:

1. Sealants: 1-part or 2-part, polyurethane or silicone based, liquid elastomeric sealant, non-solvent release type, Shore A hardness of 30, except 45 if subject to traffic.
2. Backer Rod: For 3/8 inch or larger joints, shall be polyurethane rod stock, larger than joint width.
3. Gaskets: Solid or hollow (but not cellular) neoprene or polyvinyl chloride; light grey, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

E. Paint And Coatings:

1. Provide the types of painting and coating materials which, after drying or curing, are suitable for use in conjunction with foodservice, and which are durable, non-toxic, non-dusting, non-flaking, mildew resistant, and comply with governing regulations for foodservice.
2. Galvanize Repair Paint: MIL-P-21035.

3. Bituminous Paint: Sound deaden internal surfaces of metal work, and underside of metal counters and tables between work top and underbracing.
4. Pretreatment: SSPC-PT2 or PT3, of FS TT-C490.
5. Primer Coating for Metal: FS TT-P-86, type suitable for baking, where indicated.
6. Enamel for Metal: Synthetic type, FA TT-P-491, type suitable for baking, where indicated.

2.03 FABRICATED PRODUCTS

A. Hardware:

1. General: Manufacturer's standard, but not less than ANSI 156.9 Type 2 (Institutional), satin finish stainless steel or dull chrome finish on brass, bronze, or steel.
2. Hinged Door Hardware: Hinged doors shall be mounted with heavy duty N.S.F. approved hinges with Component Hardware Group, Model No. P62-1010 pulls, or equal. Catches shall be heavy-duty magnetic type, except as otherwise indicated..
3. Drawer Hardware: Slides to be 200 pounds minimum capacity per pair, 300 series stainless steel, full extension, side-mounting, self-closing type, with stainless steel ball-bearings and positive stops; Component Hardware Group Series S52, or equal. Pulls shall be Component Hardware Group, Model No. P62-1012, or equal.
4. Sliding Door Hardware: Sliding doors shall be mounted on large, quiet ball bearing rollers in 14-gauge (2.0mm) stainless steel overhead tracks, and be removable without the use of tools. Bottom of cabinet shall have stainless steel guide-pins and not channel tracks for doors.
5. All hardware shall be identified with manufacturer's name and number, so that broken or worn parts may be replaced.

B. Casters:

1. Type and size as recommended by caster manufacturer, N.S.F. approved for the type and weight of equipment supported; but not less than 5 inch (127mm) diameter heavy-duty, ball-bearing, solid or disc wheel with non-marking grease proof rubber, neoprene or polyurethane tire; unless otherwise specified. Minimum width of tread shall be 1-3/16 inch (30mm). Minimum capacity per caster shall be 250 pound (113.4kg), unless otherwise noted in itemized specifications.
2. Solid material wheels to be provided with stainless steel rotating wheel guard.
3. To be sanitary, have sealed wheel and swivel bearings and polished plated finish per N.S.F.

4. Unless otherwise indicated, equip each item with two (2) swivel-type casters and two (2) fixed casters. Provide foot brakes on two (2) casters on opposite corners of equipment.
5. Unless equipment item is equipped with another form of all-around protective bumper, provide circular rotating bumper above each caster, 5 inch (127mm) diameter tire of light grey synthetic rubber (hollow or closed-cell) on cadmium-plated disc.

C. Plumbing Fittings, Trim And Accessories:

1. General: Where exposed or semi-exposed, provide bright chrome plated brass or polished stainless steel units. Provide copper or brass where not exposed.
2. Vacuum Breakers: Provide with foodservice equipment as listed in the itemized specifications.
3. Water Outlets: At sinks and at other locations where water is supplied (by manual, automatic or remote control), furnish commercial quality faucets, valves, dispensers or fill devices, of the type and size indicated, and as required to operate equipment and fixtures as indicated.
4. Waste Fittings: Except as otherwise indicated, furnish 2 inch (50mm) remote-lever waste valve, and 3-1/2 inch (89mm) strainer basket.

D. Electrical Materials:

1. General: Provide standard materials, devices and components as recommended by the manufacturer or fabricator, selected and installed in accordance with N.E.M.A. standards and recommendations; and as required for safe and efficient use and operation of the foodservice equipment, without objectionable noise, vibration and sanitation problems.
2. Before ordering equipment, confirm with the serving electrical utility, pertinent electrical requirements, such as actual voltages available, number of phases and number of wires in the system.
3. Electrical work for fabricated equipment shall be completely wired to a junction or pull box, wholly accessible, mounted on the equipment. Wiring shall be labeled for outlet or item served. Verify local requirements for U.L. Listing on complete assembly, and provide if required.
4. Components shall bear the U.L. label or be approved by the prevailing authority.
5. Custom fabricated refrigerator units shall be provided with vapor tight light receptacles, shatterproof lamps and automatic switches. Wiring shall be concealed.
6. Controls and Signals: Provide recognized commercial grade signals, on-off push buttons or switches, and other speed and temperature controls as required for operation; complete with pilot lights and permanent signs and graphics to assist the user of each item. Provide stainless steel cover plates at control and signal

- electrical boxes. Controls and switches are to be located out of heat zones, easily accessible, and in locations that preclude accidental contact by employees.
7. Internal Wiring of Fixtures and Equipment:
 - a. The Contractor shall be responsible for internal wiring of electrical devices, built into or forming an integral part of fabricated equipment items. Wiring to be in metal conduit, to an accessible pull-box, tagged for intended use. Refer to Section 16 Specifications for color coding of wiring.
 - b. Each standard item shipped in sections, shall be properly connected internally, and verified by the Contractor.
 - c. Furnish dish washers and conveyors internally wired to junction box or distribution panel as specified; including push button switches, motors, immersion heaters, solenoids, etc.
 - d. Where light fixtures are specified or detailed as part of counters, cases or fixtures; light fixtures, lamps and shields shall be furnished and installed. Warm white lamps shall be provided, unless otherwise specified. If fluorescent light fixtures are specified, ballasts shall be provided and shields shall be included. Shields shall be provided for all light fixtures.
 - e. Exposed flexible steel conduit on kitchen equipment, shall be neoprene jacketed Seal-Tite conduit equal to Anaconda type "UA". U.L. approved, complete with approved liquid-tight connectors on each end; designed to provide electrical grounding continuity.
 - f. Exposed electrical conduit used in kitchen wet area applications, except for flexible connections, shall be rigid galvanized steel. Thinwall conduit (EMT) shall not be permitted for wet areas. Exposed outlet boxes shall be liquid-tight type, with threaded hubs.
 8. Convenience and Power Outlets:
 - a. Make cutouts and install appropriate boxes or outlets in fabricated fixtures, complete with wiring, conduit, outlet and stainless steel cover plate.
 - b. Outlets and plugs shall conform to N.E.M.A. standards.
 - c. Electrical outlets and devices shall be first quality "Specification Grade".
 - d. GFCI outlets shall be furnished in all kitchen areas.
 - e. All electrical outlets for specified equipment shall not be GFCI outlets.
 9. Plugs and Cords: Where cords and plugs are provided, they shall comply with National Electrical Manufacturer's Association (N.E.M.A.) requirements. Indicate N.E.M.A. configuration for each applicable item.

10. Heating Equipment:
 - a. Electric and heating equipment shall be so installed as to be readily cleanable or removable for cleaning.
11. Motors: Totally enclosed type, except drip-proof type where not exposed to a dust or moisture condition; ball bearings, except sleeve bearings on small timing motors; windings impregnated to resist moisture; horse-power and duty-cycle ratings as required for the service indicated.
12. Power Characteristics: Refer to Section 16 Specifications for project power characteristics. Also, refer to individual equipment requirements, for loads and ratings.

2.04 FABRICATION OF METALWORK

- A. General Fabrication Requirements:
 1. Remove burrs from sheared edges of metalwork, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal, at not less than the minimum radius required to avoid grain separation in the metal. Maintain flat, smooth surfaces, without damage to finish.
 2. Reinforce metal at locations of hardware, anchorages and accessory attachments; wherever metal is less than 14 gauge (2.0mm), or requires mortized application. Conceal reinforcements to the greatest extent possible. Weld in place, on concealed faces.
 3. Exposed screws or bolt heads, rivets and butt joints made by riveting straps under seams and then filled with solder, will not be accepted. Where fasteners are permitted, provide Phillips head, flat or oval head machine screws. Cap threads with acorn nuts, unless fully concealed in inaccessible construction; and provide nuts and lockwashers unless metal for tapping is at least 12 gauge (2.5mm). Match fastener head finish with finish of metal fastened.
 4. Where components of fabricated metal work are indicated to be galvanized, and involve welding or machining of metal heavier than 16 gauge (1.6mm), complete the fabrication and provide hot-dip galvanizing of each component, after fabrication, to the greatest extent possible (depending upon available dip-tank sizes). Comply with ASTM A123.
 5. Welding And Soldering:
 - a. Materials 18-gauge (1.27mm), or heavier, shall be welded.
 - b. Seams and joints shall be shop welded or soldered as the nature of the material may require.
 - c. Welds must be ground smooth and polished to match original finish.
 - d. Where galvanizing has been burned off, the weld shall be cleaned and touched up with high grade aluminum paint.

6. Provide removable panels for access to mechanical and electrical service connections, which are concealed behind or within foodservice equipment, but only where access is not possible and not indicated through other work.
7. Closures: Where ends of fixtures, splashbacks, shelves, etc., are open, fill by forming the metal, or welding sections, if necessary, to close entire opening flush to walls or adjoining fixtures.
8. Rolled Edges: Rolled edges shall be as detailed, with corners bullnosed, ground and polished.
9. Coved Corners: Stainless steel foodservice equipment shall have 1/2 inch (13mm) or larger radius coves in horizontal and vertical corners, and intersections, per N.S.F. standards.

B. Metal And Gauges:

1. Except as otherwise indicated, fabricate exposed metalwork of stainless steel; and fabricate the following components from the gauge of metal indicated, and other components from not less than 20 gauge (0.8mm) metal:
 - a. Table and counter tops: 14 gauge.
 - b. Sinks and drainboards: 14 gauge.
 - c. Shelves: 16 gauge.
 - d. Front drawer and door panels: 18 gauge (double-pan type).
 - e. Single pan doors and drawer fronts: 16 gauge.
 - f. Enclosed base cabinets: 18 gauge.
 - g. Enclosed wall cabinets: 18 gauge.
 - h. Exhaust hoods and ventilators: 18 gauge.
 - i. Pan-type insets and trays: 16 gauge.
 - j. Removable covers and panels: 18 gauge.
 - k. Skirts and enclosure panels: 18 gauge.
 - l. Closure and trim strips over 4" wide: 18 gauge.
 - m. Hardware reinforcement: 12 gauge.
 - n. Gusset plates: 10 gauge.

C. Work-Surface Fabrication:

1. Fabricate metal work surfaces by forming and welding, to provide seamless construction; using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide waterproof gasketed draw-type joints with concealed bolting.
2. Reinforce work surfaces 30 inches on center both ways, with galvanized or stainless steel concealed structural members. Reinforce edges which are not self-reinforced, by formed edges.

D. Metal Top Construction:

1. Metal tops shall be one-piece welded construction, including field joints. Secure to a full perimeter galvanized steel channel frame cross-braced not farther than 2'-6" (760mm) on center. Fasten top with stud bolts or tack welds. If hat sections are used in lieu of channels, close ends.
2. Properly designed draw fastening, trim strip, or commercial joint material to suit requirement shall be used, only if specified.

E. Structural Framing:

1. Except as otherwise indicated, provide framing of minimum 1 inch (25mm) pipe-size round pipe or tube members, with mitered and welded joints and gusset plates, ground smooth. Provide 14 gauge (2.0mm) stainless steel tube for exposed framing, and galvanized steel pipe for concealed framing.
2. Where indicated, flange rear and end edges up to form splashes integrally with top, with vertical and horizontal corners covered of not less than 1/4 inch (6mm) radius, die formed. Turn back splashes 1 inch to wall across top and ends with rounded edge on break, unless otherwise specified.
3. For die-crimped edges, use inverted "V" 1/2 inch (13mm) deep inside and 2 inch (38mm) deep on outside, unless otherwise shown. For straight down flanges, make 1-3/4 inch (45mm) deep on outside. For bullnose edges, roll down 1-3/4 inch (45mm).
4. Edges: die-formed, integral with top. For rounded corners, form to 1 inch radius, weld, and polish to original finish.

F. Field Joints: For any field joint required because of size of fixture; butt-joint, reinforce on underside with angles of same material, bolt together with non-corrosive bolts and nuts, field weld, grind and polish.

G. Pipe Bases: Construct pipe bases of 1-5/8 inch (41mm) diameter 18 gauge (1.2mm) stainless steel tubing. Fit legs with polished stainless steel sanitary adjustable bullet feet to provide for adjustment of approximately 1-1/2 inch (38mm), without exposing threads. Space legs to provide ample support for tops, precluding any possibility of buckling or sagging, and in no case more than 6'-0" centers.

H. Legs And Crossrails

1. Equipment legs and crossrails shall be 1-5/8 inch (41mm), 16-gauge (1.59mm) stainless steel tubing.
2. Welds at cross rails shall be continuous and ground smooth. Please note; tack welds are not acceptable.
3. Bottom of legs shall be swedged inward and fitted with a stainless steel bullet-type foot with not less than 2 inch (50mm) adjustment.
4. Free standing legs shall be pegged to floor with 1/4 inch (6mm) stainless steel rod.
5. Components:
 - a. Stainless Steel Gusset: Stainless steel exterior to fit 1-5/8 inch (41mm) tubing, with allen screw for fastening and adjustment. Not less than 3 inches (76mm) diameter at top and 3-3/4 inch (95mm) long. Outer shell 16-gauge (1.6mm) stainless steel, reinforced with 12-gauge (2.5mm) mild steel insert welded interior shell, or approved equal.
 - b. Stainless Steel Low Counter Legs: Stainless steel exterior 5-3/4 inch (146mm) minimum, 7 inch (178mm) maximum length with stainless steel 3-1/2 inch (89mm) square plate with four counter-sunk holes, welded to top for fastening.
 - c. Stainless Steel Adjustable Foot: Stainless steel 1-1/2 inch (38mm) diameter tapered at bottom to 1 inch (25mm) diameter, fitted with threaded cold rolled rod for minimum 1-1/2 inch (38mm) diameter x 3/4 inch (19mm) threaded bushing plug welded to legs, or approved equal. Push-in foot not acceptable.
6. Legs shall be fastened to equipment with gussets, as follows:
 - a. Sinks: Reinforced with bushings and set screw.
 - b. Metal Top Tables and Dish Tables: Welded to galvanized steel channels, 14-gauge (1.98mm) or heavier, anchored to top with screws through slotted holes.
 - c. Wood Top Tables: Welded to stainless steel channels, 14-gauge (1.98mm) or heavier, anchored to top with screws through slotted holes.

I. Shelves:

1. Construct solid shelves under pipe base tables of 16 gauge stainless steel, with 1-1/2 inch turned down and under edges on exposed sides, and 2 inch turn up against walls or equipment. Fully weld to pipe legs.
2. In fixtures with enclosed bases, turn up shelves on back and sides with 1/4 inch (6mm) (minimum) radius and feather slightly to ensure a tight fit to enclosure panels.

J. Sinks:

1. Construct sinks of 14 gauge stainless steel with No.4 finish inside and outside.
2. Form back, bottom and front of one piece, with ends and partitions welded into place. Partitions: double thickness, 1 inch minimum space between walls. Multiple compartments shall be continuous on the exterior, without applied facing strips or panels.
3. Cove interior vertical and horizontal corners of each tub not less than 1/4 inch radius, die formed. Outer ends of drainboards to have roll rim risers not less than 3 inches high.
4. Drill faucet holes in splashes 2-1/2 inches below top edge. Verify center spacing with faucet specified.
5. Sink insets shall be deep drawn of 16-gauge (1.59mm), or heavier, polished stainless steel. Weld into sink drainboards with 1-1/2 inch x 1-1/2 inch x 14 gauge stainless steel angle brackets; securely welded to sinks and galvanized cross angles spot welded to underside of drainboards to form an integral part of the installation.
6. The bottom of each compartment shall be creased such as to ensure complete drainage to waste opening. Slope bottom of sink bowls toward outlet.

K. Drains, Wastes and Faucets:

1. Furnish and install Fisher model 22322 stainless steel rotary drain assembly with connected overflow assembly, in die-drawn inset type sinks and bain marie sinks.
2. Other custom fabricated sinks shall be furnished with Fisher model 22322 stainless steel rotary drain assembly, with S/S cap nut over overflow outlet. Waste connection shall have 2 inch (50mm) external thread size, with 1-1/2 inch (38mm) internal thread size.
3. Rotary Handle: Of sufficient length to extend to front edge of sink. No riveting, screws or soldering permitted to fit drains to sinks, with all parts of drains easily removable for servicing and replacement.
4. Water pans for steam tables shall be fitted with 1 inch (25mm) drains with chrome-plated brass stand pipes.
5. All faucets furnished with equipment included in this Section shall be lead free and comply with NSF Standard #61, Section #9; such as manufactured by Fisher, or T&S. Where the itemized specifications list a faucet by manufacturer and model, the Contractor shall verify that the listed faucet complies with this requirement. If the listed faucet does not comply, the Contractor shall submit a similar model which does comply, from the same manufacturer where available; or from one of the above manufacturers.

L. Workmanship:

1. Best quality in the trade. Field verify dimensions before fabricating; conform all items to dimensions of building; neatly fit around pipes, offsets and other obstructions.
2. Fabricate only in accordance with approved shop drawings, showing pipes, obstructions to be built around, and location of utilities and services.

M. Enclosures:

1. Provide enclosures, including panels, housings, and skirts for service lines, operating components and mechanical and electrical devices associated with the foodservice equipment, except as specifically indicated to be "open".
2. Where equipment is exposed to customer view, provide enclosure of service lines, operating components and mechanical and electrical devices.

N. Casework:

1. Enclosure: except as otherwise indicated, provide each unit of casework (base, wall, overhead and free-standing) with a complete-enclosure metal cabinet, including fronts, backs, tops, bottoms, and sides.
2. Bases shall be made of 18-gauge (1.27mm) stainless steel sheets reinforced by forming the metal.
3. Ends, partitions and shelves are stainless steel.
4. Unexposed backs and structural members are galvanized.
5. Vertical ends and partitions are single wall, with a 2 inch (50mm) face.
6. Sides and through partitions are flush with bottom rail, welded at intersections.
7. Shelves: Provide adjustable standards for positioning and support of shelves in casework; except bottom shelf of cabinet mounted on legs or as specified. Turn back of shelf units up 2 inches, and hem. Turn other edges down to form open channel. Reinforce shelf units to support 40 pounds per square foot loading, plus 100 percent impact loading.
8. Bottom front rail of bases set on masonry platform shall be continuously closed and sealed to platform.

O. Doors:

1. Metal doors shall be double-cased stainless steel. Outer pans shall be 18-gauge (1.27mm) stainless steel with corners welded, ground smooth and polished. Inner pan shall be 20-gauge (.95mm) stainless steel fitted tightly into outer pan with a sound-deadening material such as Celotex or styrofoam used as a core. The two pans shall be tack welded together and joints solder filled. Doors shall finish approximately 3/4 inch (19mm) thick, and be fitted with flush recessed type stainless steel door pulls.

2. Wood doors shall be fabricated as detailed. If formica or other plastic surfaces are used, sides and backs must be laminated.
3. Hinged doors shall be mounted on heavy-duty N.S.F. approved hinges, or as noted on plans or specifications.

P. Drawer Assemblies:

1. Assemblies shall consist of removable drawer body mounted in a ball bearing slide assembly with fully enclosed housing.
2. Slide assembly consists of one pair of 200 pound stainless steel roller bearing extension slides, with side and back enclosure panels, front spacer angle, two drawer carrier angles, secured to slides and stainless steel front.
3. Drawer bodies for general storage are to be 20 inches x 20 inches (508mm x 508mm), with 18 gauge stainless steel or Royalite containers.
4. Drawers intended to hold food products shall be removable type with 12 x 20 (305mm x 508mm) stainless steel food pans, in a stainless steel assembly.
5. Drawer fronts are double cased, 3/4 inch (19mm) thick, with 18 gauge (1.27mm) stainless steel welded and polished front pan. Steel back pan is tightly fitted and tack welded. Sound deaden with rigid insulation material.
6. Provide drawers with replaceable soft neoprene bumpers; or for refrigerated drawers, a full perimeter soft gasket.

Q. Closed Base: Where casework is indicated to be located on a raised-floor base, prepare casework for support without legs, and for anchorage and sealant application, as required for a completely enclosed and concealed base.

R. Support from Floor: Equip floor supported mobile units with casters, and equip items indicated as roll-out units, with manufacturer's standard one-directional rollers. Otherwise, and except for closed-base units, provide pipe or tube legs, with adjustable bullet-design feet for floor supported items of fabricated metalwork. Provide 1-1/2 inch adjustment of feet (concealed threading).

S. Shop Painting:

1. Clean and prepare metal surfaces to be painted; remove rust and dirt. Apply treatment to zinc coated surfaces, which have not been mill phosphatized. Coat welded and abraded areas of zinc coated surfaces, with galvanize repair paint.
2. Apply 1.5 mil (dry film thickness) metal primer coating, followed by 2, 1.0 mil (dry film thickness) metal enamel finish coatings.
3. Bake primer and finish coatings in accordance with paint manufacturer's instructions for a baked enamel finish.

- T. Sound Deadening:
 - 1. Sound deaden underside of metal tops, drainboards, undershelves, cabinet interior shelves, etc., above the underbracing/reinforcing/framing only.

2.05 REFRIGERATION EQUIPMENT

- A. General:
 - 1. Furnish either single or multiple compressor units, as specified or recommended by the manufacturer for the sizes and variations between connected evaporator loads as indicated.
 - 2. Furnish units of the capacities indicated, arranged to respond to multiple-evaporator thermostats and defrosting timers. Include coils, receivers, compressors, motors, motor starters, mounting bases, vibration isolation units, fans, dryers, valves, piping, insulation, gauges, winter control equipment and complete automatic control system.
 - 3. Refrigerant: Precharge units with type or types recommended by manufacturer for services indicated, with quick-disconnects type connections where specified, ready to receive refrigerant piping runs to evaporators and (where remote) to condensers. All refrigerant and associated components shall comply with the 1995 requirements of the Montreal Protocol Agreement. No CFC refrigerants or associated components shall be allowed on this Project. HFC refrigerants and components shall be used where available. HCFC refrigerants and components, with a minimum 2010 phase-out date, and intermediate replacement refrigerants are to be used only when HFC refrigerants are not available. Contractor shall be responsible for coordinating with manufacturers.
 - 4. The minimum outdoor operating ambient temperature for design of units is -10 degrees Fahrenheit, or as applicable for extreme low local conditions. The maximum indoor design temperature for operation of compressor units is 95 degrees Fahrenheit. The maximum outdoor ambient design temperature shall be determined with prevailing conditions at mounting location(s) of compressor(s), such as sun exposure, limited ventilation, high fences/walls, roof color and materials, local climatic extremes, etc.; but in no case shall it be less than 100 degrees Fahrenheit.
- B. Components:
 - 1. Coils: Coils for fabricated refrigerators shall have vinyl plastic coatings, stainless steel housings; and shall be installed in such a manner as to be replaceable.
 - 2. Expansion Valves: Remote refrigeration system shall be complete with thermostatic expansion valves at the evaporator.
 - 3. Thermometers:
 - a. Fabricated refrigerated compartments to be fitted with flush dial thermometers, with chrome plated bezels.

- b. Thermometers shall be adjustable, and shall be calibrated after installation.
 - c. Thermometers shall have an accuracy of ± 2 degrees Fahrenheit (1 degree Centigrade).
- 4. Hardware:
 - a. Refrigerator hardware for fabricated refrigerator compartments shall be heavy-duty components.
 - b. Self closing hinges.
 - c. Latches to be magnetic edge mount type, unless specified or detailed otherwise.
- 5. Locks: Doors and drawers for walk-in coolers/freezers, and reach-in refrigerated compartments, both fabricated and standard, shall be fitted with cylinder locking type latches, and provided with master keys.
- C. Cold Pans: Ice pans, refrigerated pans and cabinets shall be provided with breaker strips, where adjoining top or cabinet face materials, to prevent transfer of cold.
- D. All open top mechanically cooled custom fabricated or standard buy-out refrigerators and/or cold pans shall comply with NSF Standard #7 requirements, as of April 1, 1998. The Contractor shall verify that the specified unit complies with this requirement; or shall submit a similar model, which does comply, from the same manufacturer where available.
- E. Ventilation Of Refrigerated Equipment:
 - 1. Adequate ventilation shall be provided for custom fabricated equipment with integral refrigeration condensing units, both built-in and drop-in. If flow through ventilation cannot be provided, provide flow direction partitions and an additional fan capable of cooling the condensing unit.
 - 2. If, in the opinion of the Contractor, additional room ventilation is required to ensure correct operating temperatures of standard buy-out, custom fabricated, or remote refrigeration condensing units, or compressor rack assemblies, they shall so state in a letter to the Architect, for evaluation and decision.

2.06 MISCELLANEOUS MATERIALS AND FABRICATION

- A. Nameplates: Whenever possible, locate nameplates and labels on manufactured items, in accessible position, but not within customer's normal view. Do not apply name-plates or labels on custom fabricated work, except as required for compliance with governing regulations, insurance requirements, or operator performance.
- B. Manufactured Equipment Items: Furnish items as scheduled or herein specified. Verify dimensions, spaces, rough-in and service requirements, and electrical characteristics, before ordering. Provide trim, accessories and miscellaneous items for complete installation.

- C. Insert Pans:
1. General: Cut-outs, openings, drawers, or equipment specified or detailed to hold stainless steel insert pans shall be provided with a full complement of pans as follows:
 - a. One (1) stainless steel, 20-gauge (0.95mm) minimum, solid insert pan for each space, sized per plans, details, or specifications.
 - b. Where pan sizes are not indicated in plans, details, or specifications, provide one full-size pan for each opening.
 - c. Provide maximum depth pan to suit application and space.
 2. Provide 18-gauge (1.27mm) removable stainless steel adapter bars where applicable.
 3. All cut-outs and openings, or equipment specified or detailed to hold stainless steel insert pans, shall be provided with a hinged stainless steel removable night cover.
- D. Tray Slides: Before fabrication of counters with tray slides, verify:
1. Size and shape of tray. Edge of tray shall not overhang outer support/slider by more than 2". If edge of tray exceeds this dimension, notify Architect, in writing, for evaluation and adjustment, if necessary.
 2. Configuration of corners, turns, and shape of tray slides for proper support and safe guidance of trays.
 3. Tray slide to be capable of supporting 200 pounds per linear foot, live load.
- E. Self-leveling dispensers: Verify type and make of ware, dimensions and weight; and submit to the dispenser manufacturer, for proper sizing and calibration of dispensers.
- F. Carbon dioxide (CO²) equipment: Where equipment requires connection with compressed CO² cylinder for operation, provide 2-cylinder manifold and control system (integral with equipment) with proper connectors for Department of Transportation (DOT) approved type cylinders, complete with cylinder safety devices and supports.
- G. Reasonable quietness of operation of equipment is a requirement, and the Contractor will be required to replace or repair any equipment producing out-of-the-ordinary intolerable noise. This also includes providing and installing bumpers and gaskets for doors and drawers on fabricated and standard manufactured items, and sound insulation where feasible.

PART 3 EXECUTION**3.01 SUPERVISION**

- A. A competent supervisor, representing the Contractor, shall be present at all times during progress of the Contractor's work.

3.02 SITE EXAMINATION

- A. Verify site conditions under the provisions of the General Conditions, Supplementary Conditions and applicable provisions of Division 1 Sections. Notify the Architect, in writing, of unsatisfactory conditions for proper installation of foodservice equipment.
- B. Verify wall, column, door, window, and ceiling locations and dimensions. Fabrication and installation should not proceed until dimensions and conditions have been verified and coordinated with fabrication details.
- C. Verify that wall reinforcement or backing has been provided, and is correct for wall supported equipment. Coordinate placement dimensions with wall construction Section.
- D. Verify that ventilation ducts are of the correct characteristics, and in the required locations.
- E. Verify that utilities are available, of the correct characteristics, and in the required locations.

3.03 INSTALLATION

- A. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.
- B. Install items in accordance with manufacturer's instructions.
- C. Set each item of non-mobile and non-portable equipment securely in place, leveled and adjusted to correct height. Anchor to supporting substrate where indicated, and where required for sustained operation and use without shifting or dislocation. Conceal anchorages wherever possible. Adjust counter tops and other work surfaces to a level tolerance of 1/16 inch (maximum offset, and plus or minus on dimension, and maximum variation in 2'-0" run from level or indicated slope). Provide anchors, supports, bracing, clips, attachments, etc., as required to comply with the local seismic restraint requirements. The Guidelines For Seismic Restraint Of Kitchen Equipment, as prepared for the Sheet Metal Industry Fund of Los Angeles and endorsed by S.M.A.C.N.A., should be followed.
- D. Complete field assembly joints in the work (joints which cannot be completed in the shop) by welding, bolting-and-gasketing, or similar methods as indicated and specified. Grind welds smooth and restore finish. Set or trim flush, except for "T" gaskets as indicated.
- E. Provide closure plates and strips where required, with joints coordinated with units of equipment.

- F. Provide sealants and gaskets all around each unit to make joints airtight, waterproof, vermin-proof, and sanitary for cleaning purposes.
- G. Joints up to 3/8 inch wide, to be stuffed with backer rod, to shape sealant bead properly, at 1/4 inch depth.
- H. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8 inch radius.
- I. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
- J. Provide sealant filled or gasketed joints up to 3/8 inch joint width. Wider than 3/8 inch, provide matching metal closure strips, with sealant application each side of strips. Anchor gaskets mechanically, or with adhesives to prevent displacement.
- K. Treat enclosed spaces, inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at a rate of 4 ounces per square foot.
- L. Insulate to prevent electrolysis between dissimilar metals.
- M. Cut and drill components for service outlets, fixtures, piping, conduit, and fittings.
- N. Coordinate the installation of approved dry pendant sprinkler head in each cooler and freezer. Sprinkler heads should be installed in coolers/freezers only if required by local codes.
- O. Verify and coordinate the mounting heights of all wall shelves and equipment, with equipment located below them, for proper clearances.
- P. Coordinate with the Plumbing and Electrical Divisions, and provide holes in food service equipment for plumbing and electrical service to and through the fixtures, as required. This includes welded sleeves, collars, ferrules, or escutcheons. These services are to be located so that they do not interfere with intended use and/or servicing of the fixture.

3.04 ADJUSTING

- A. Test and adjust equipment, controls and safety devices to ensure proper working order and conditions.
- B. Repair or replace equipment which is found to be defective in its operation, including units which are below capacity or operating with excessive noise or vibration.

3.05 CLEANING AND RESTORING FINISHES

- A. After completion of installation, and completion of other major work in foodservice areas, remove protective coverings and clean foodservice equipment, internally and externally.
- B. Restore exposed and semi-exposed finishes, to remove abrasions and other damages; polish exposed metal surfaces and touch-up painted surfaces. Replace work, which cannot be successfully restored.

- C. Polish glass, plastic, hardware and accessories, fixtures and fittings.
- D. Wash and clean equipment, and leave in a condition ready for the Owner to sanitize and use.
- E. Clean casework, counters, shelves, hardware, fittings and fixtures.

3.06 TESTING, START-UP AND INSTRUCTIONS

- A. Begin the start-up of equipment after service lines have been tested, balanced, and adjusted for pressure, voltage and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
- B. Make arrangements for demonstration of foodservice equipment operation and maintenance, in advance with the Owner/Operator.
- C. Demonstrate foodservice equipment, to familiarize the Owner and the Operator on operation and maintenance procedures, including periodic preventative maintenance measures required. Include an explanation of service requirements and simple on-site service procedures, as well as, information concerning the name, address and telephone number of qualified local source of service. The individual performing the demonstration shall be knowledgeable of operating and service aspects of the equipment.
- D. Provide a written report of the demonstration, to the Owner, outlining the equipment demonstrated and malfunctions or deficiencies noted. Indicate individuals present at demonstration.
- E. Final Cleaning: After testing and start-up, clean the foodservice equipment, and leave in a condition ready for the Owner to sanitize and use.

3.07 CLEAR AWAY

Throughout the progress of their work, the Contractor shall keep the working area free from debris, and shall remove rubbish from premises resulting from work being done by them. At the completion of their work, the Contractor shall leave the premises in a clean and finished condition.

PART 4 ITEMIZED SPECIFICATIONS

| | | |
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| Item 1 | Walk-in Receiving Freezer <u>American Panel</u> | One (1) Required |
| Item 2 | Freezer Coils <u>Cold Zone</u> | Three (3) Required |
| Item 3 | High Density Shelving <u>Metro, Model Top Track</u> | One (1) Lot Required |

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| Item 4 | Thaw Cooler <u>American Panel</u> | One (1) Required |
| Item 5 | Thaw Cooler Coil <u>Cold Zone</u> | One (1) Required |
| Item 6 | Walk-in Receiving Cooler <u>American Panel</u> | One (1) Required |
| Item 7 | Receiving Cooler Coils <u>Cold Zone</u> | Two (2) Required |
| Item 8 | High Density Shelving <u>Metro, Model Top-Track</u> | One (1) Lot Required |
| Item 9 | Reach-in glass Doors <u>Styline</u> | Two (2) Required |
| Item 10 | Refrigeration System Rack <u>Cold Zone, Model ET-6ED-G</u> | One (1) Required |
| Item 11 | Receiving Desk | One (1) Required By Owner |
| Item 12 | Scales | One (1) Required By Owner |
| Item 13 | Dunnage Racks <u>Metro, Model HDP55C</u> | Four (4) Required |
| Item 14 | Prep Room Coils <u>Cold Zone</u> | Three (3) Required |
| Item 15 | Spare Number | |
| Item 16 | High Density Shelving <u>Metro, Model Top-Track</u> | One (1) Lot Required |
| Item 17 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | Two (2) Required |
| Item 18 | Roll-in Refrigerator <u>True, Model STR2RRI-2S</u> | One (1) Required |

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| Item 19 | Table Custom built. | One (1) Required |
| Item 20 | Table Custom built. | One (1) Required |
| Item 21 | Shelf Custom built. | One (1) Required |
| Item 22 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 23 | Adjustable Prep Table | One (1) Required Existing |
| Item 24 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 25 | Table Custom built. | One (1) Required |
| Item 26 | Vacuum Marinator <u>Ultra Source, Model LT-15</u> | Two (2) Required |
| Item 27 | Meat/Cheese Slicer/Stand | One (1) Required Existing |
| Item 28 | Spare Number | |
| Item 29 | Vegetable Wash Sink/Pre-Rinse <u>Power Soak, Model 50PSP84L4B1</u> | One (1) Required |
| Item 30 | Roll-in Refrigerator <u>True, Model STR2RRI-2S</u> | One (1) Required |
| Item 31 | Table Custom built | One (1) Required |
| Item 32 | Table Custom built. | One (1) Required |
| Item 33 | Shelf Custom built. | One (1) Required |

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| Item 34 | Table Custom built. | One (1) Required |
| Item 35 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 36 | Table w/Sink & Wall Shelf Custom built. | One (1) Required |
| Item 37 | Vertical Cutter/Mixer <u>Hobart, Model HCM450</u> | One (1) Required |
| Item 38 | Roll-in Racks | Two (2) Required Existing |
| Item 39 | Pressure Washer <u>Spray Master Technologies, Model SMT-600W</u> | Two (2) Required |
| Item 40 | Mobile Bread Carts | One (1) Lot Required Existing |
| Item 41 | Mobile Food Transport Carts | One (1) Lot Required Existing |
| Item 42 | Cook/Chill Tank <u>Groen, Model CKWJ-100</u> | One (1) Required |
| Item 43 | Pump/Fill Station <u>Groen, Model CKPF/3</u> | One (1) Required |
| Item 44 | Vacuum Clipper <u>Groen, Model, Model CKCVE</u> | One (1) Required |
| Item 45 | Exhaust Hood <u>Gaylord, Model ELX-GBDAV-90</u> | One (1) Required |
| Item 46 | Make-up Air Plenum <u>Gaylord, Model PBW</u> | One (1) Required |
| Item 47 | Fire Protection System <u>Ansul, Model R-102</u> | One (1) Required |
| Item 48 | Tilting Kettle w/Incline Agitator <u>Groen, Model INA/2-100TW</u> | One (1) Required |

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| Item 49 | Trench Drain <u>BSI, Model FT-AS-NL</u> | One (1) Required |
| Item 50 | Stationary Kettle (80 gal.) | One (1) Required Existing |
| Item 51 | Trench Drain <u>BSI, Model FT-AS-NL</u> | Two (2) Required |
| Item 52 | Stationary Kettle (80 gal.) | One (1) Required Existing |
| Item 53 | Trench Drain <u>BSI, Model FT-AS-NL</u> | One (1) Required |
| Item 54 | Control Panel <u>Groen, Model CKCP-1 HMI</u> | One (1) Required |
| Item 55 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 56 | Condensing Unit <u>Groen, Model</u> | One (1) Required |
| Item 57 | Air Compressor | One (1) Required Existing |
| Item 58 | Spare Number | |
| Item 59 | Unifiller (Compact) (Compressed Air) <u>Unifiller, Model Powerlift</u> | One (1) Required |
| Item 60 | Unifiller (Compressed Air) <u>Unifiller, Model SPOT Depositor</u> | One (1) Required |
| Item 61 | Kettle Filler <u>Fisher, Model 5440</u> | One (1) Required |
| Item 62 | Spare Number | |
| Item 63 | Table Custom built. | Two (2) Required |

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| Item 64 | Blast Chiller <u>Omni Temp, Model OTBC-30-SS-2</u> | One (1) Required |
| Item 65 | Refrigeration System Part of Item 10. | One (1) Required |
| Item 66 | Table Custom built. | One (1) Required |
| Item 67 | Dough Baller | One (1) Required Existing |
| Item 68 | Mobile Proofers | One (1) Lot Required Existing |
| Item 69 | Revolving Tray Oven <u>Picard, Model RE-8-32</u> | One (1) Required |
| Item 70 | Oven Duct | One (1) Required By Mechanical |
| Item 71 | Rotating Rack Oven <u>Revent, Model 726U-E</u> | One (1) Required |
| Item 72 | Oven Duct | One (1) Required By Mechanical |
| Item 73 | Table Custom built. | Two (2) Required |
| Item 74 | Mixer (60 qt.) | One (1) Required Existing |
| Item 75 | Baker's Table | Two (2) Required Existing |
| Item 76 | Ingredient Bins | One (1) Lot Required Existing |
| Item 77 | Mixer (70 qt.) | One (1) Required Existing |
| Item 78 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 79 | Mixer (30 qt.) | One (1) Required Existing |

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| Item 80 | Pre-Mixing Table Custom built. | One (1) Required |
| Item 81 | Table w/Sink Custom built. | One (1) Required |
| Item 82 | 3 Compartment Sink <u>Advance Tabco, Model K7-CS-29</u> | One (1) Required |
| Item 83 | Spare Number | |
| Item 84 | Reach-in Refrigerator <u>True, Model STR2R-2S</u> | One (1) Required |
| Item 85 | Reach-in Refrigerator <u>True, Model STR2R-2S</u> | One (1) Required |
| Item 86 | Roll-in Refrigerator <u>True, Model STR2RRI-2S</u> | Two (2) Required |
| Item 87 | Spare Number | |
| Item 88 | Spare Number | |
| Item 89 | Spare Number | |
| Item 90 | Spare Number | |
| Item 91 | Spare Number | |
| Item 92 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | Two (2) Required |
| Item 93 | Exhaust Hood <u>Gaylord, Model ELX-GBDAV-66</u> | One (1) Required |
| Item 94 | Make-up Air Plenum <u>Gaylord, Model PBW</u> | One (1) Required |
| Item 95 | Fire Protection System <u>Ansul, Model R-102</u> | One (1) Required |
| Item 96 | Smoker <u>Cook Shack</u> | One (1) Required |

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| Item 97 | Combi Oven/Steamer | One (1) Required Existing |
| Item 98 | Bake Oven <u>Doyon, Model JA28G</u> | One (1) Required |
| Item 99 | Spare Number | |
| Item 100 | Exhaust Hood <u>Gaylord, Model ELX-GBDAV-66</u> | One (1) Required |
| Item 101 | Make-up Air Plenum <u>Gaylord, Model PBW</u> | One (1) Required |
| Item 102 | Combi Oven/Steamer <u>Alto-Shaam, Model CTC20-20G</u> | One (1) Required |
| Item 103 | Combi Oven/Steamer <u>Alto-Shaam, Model CTC20-20G</u> | One (1) Required |
| Item 104 | Combi Oven/Steamer <u>Alto-Shaam, Model CTC20-20G</u> | One (1) Required |
| Item 105 | Combi Oven/Steamer | One (1) Required Existing |
| Item 106 | Water Filter System <u>Everpure, Model High Flow CSR Quad 7FC</u> | One (1) Required |
| Item 107 | Table Custom built. | One (1) Required |
| Item 108 | Table Custom built. | One (1) Required |
| Item 109 | Eye Wash Station <u>Guardian, Model G1814</u> | One (1) Required |
| Item 110 | Spare Number | |
| Item 111 | Spare Number | |
| Item 112 | Exhaust Hood <u>Gaylord, Model ELX-GBDAV-A-60</u> | One (1) Required |

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| Item 113 | Make-up Air Plenum <u>Gaylord, Model PBW</u> | One (1) Required |
| Item 114 | Fire Protection System <u>Ansul, Model R-102</u> | One (1) Required |
| Item 115 | Convection Oven | One (1) Required Existing |
| Item 116 | Tilting Skillet (23 gal.) | One (1) Required Existing |
| Item 117 | Tilting Skillet (30 gal.) | One (1) Required Existing |
| Item 118 | Tilting Skillet (40 gal.) | One (1) Required Existing |
| Item 119 | Stationary Kettle | One (1) Required Existing |
| Item 120 | Trench Drain <u>BSI, Model FT-AS-NL</u> | Two (2) Required |
| Item 121 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 122 | Spare Number | |
| Item 123 | Spare Number | |
| Item 124 | Exhaust Hood <u>Gaylord, Model ELXC-GBDAV-A-54</u> | One (1) Required |
| Item 125 | Make-up Air Plenum <u>Gaylord, Model PBW</u> | One (1) Required |
| Item 126 | Fire Protection System <u>Ansul, Model R-102</u> | One (1) Required |
| Item 127 | Hood Control Panel. <u>Gaylord, Model GPC-7000</u> | One (1) Required |
| Item 128 | Spreader <u>Jade Range, Model JTPR-18</u> | One (1) Required |

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| Item 129 | Char-Broiler <u>Jade Range, Model JTRH-48B</u> | One (1) Required |
| Item 130 | Char-Broiler <u>Jade-Range, Model JTRH-48B</u> | One (1) Required |
| Item 131 | Spreader <u>Jade Range, Model JTPR-18</u> | One (1) Required |
| Item 132 | 4 Burner Range <u>Jade Range, Model JTRH-4</u> | One (1) Required |
| Item 133 | 4 Burner Range <u>Jade Range, Model JTRH-4</u> | One (1) Required |
| Item 134 | Spreader <u>Jade Range, Model JTPR-18</u> | One (1) Required |
| Item 135 | Fryer System <u>Pitco, Model SSH60-D</u> | One (1) Required |
| Item 136 | Dump Station <u>Pitco, Model BNB-SG18</u> | One (1) Required |
| Item 137 | Table w/Sink Custom built. | One (1) Required |
| Item 138 | Spare Number | |
| Item 139 | Table Custom built. | One (1) Required |
| Item 140 | Spare Number | |
| Item 141 | Spare Number | |
| Item 142 | Spare Number | |
| Item 143 | Spare Number | |
| Item 144 | Spare Number | |
| Item 145 | Storage Shelving <u>Metro, Model Super Erecta</u> | One (1) Lot Required |

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| Item 146 | Beverage Cooler <u>American Panel</u> | One (1) Required |
| Item 147 | Cooler Coil <u>Cold Zone</u> | One (1) Required |
| Item 148 | Heated Holding Carts | One (1) Lot Required Existing |
| Item 149 | Spare Number | |
| Item 150 | Storage Shelving <u>Metro, Model Super Erecta</u> | One (1) Lot Required |
| Item 151 | Mop Sink <u>Advance Tabco, Model 9-OP-28</u> | One (1) Required |
| Item 152 | Cooler Shelving <u>Metro, Model Metro Max Q</u> | One (1) Lot Required |
| Item 153 | Spare Number | |
| Item 154 | Eyewash Station <u>Guardian, Model G1814</u> | One (1) Required |
| Item 155 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 156 | Pot / Pan Shelving <u>Metro, Model PR48ES</u> | One (1) Lot Required |
| Item 157 | Pre-Rinse <u>Fisher, Model 2211WB</u> | One (1) Required |
| Item 158 | Pot Wash Sink Assembly <u>Power Soak,</u> | One (1) Required |
| Item 159 | Utensil Rack <u>Advance Tabco, Model SW-84</u> | One (1) Required |
| Item 160 | Spare Number | One (1) Required |
| Item 161 | Dishwasher <u>Champion, Model EUCCW</u> | One (1) Required |

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| Item 162 | Booster Heater <u>Champion, part of Item 161</u> | One (1) Required |
| Item 163 | Vent Ducts Custom built. Part of Item 161 | Two (2) Required |
| Item 164 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 165 | Soiled Dish Table Custom built. Refer to details on Sheet FS5.2 | One (1) Required |
| Item 166 | Conveyor <u>Avtec, Model CISW</u> | One (1) Required |
| Item 167 | Disposer <u>In-Sinkerator, Model SS-300</u> | One (1) Required |
| Item 168 | Hose Reel <u>Fisher, Model 2980</u> | One (1) Required |
| Item 169 | Spare Number | |
| Item 170 | Spare Number | |
| Item 171 | Mobile Carts | One (1) Lot Required Existing |
| Item 172 | Tables | One (1) Lot Required Existing |
| Item 173 | Hand Sink <u>Advance Tabco, Model 7-PS-82</u> | One (1) Required |
| Item 174 | Beverage Counter w/ Sink Custom built. Refer to details on Sheet FS5.2 | One (1) Required |
| Item 175 | Coffee Urn (10 gal.) <u>Curtis, Model RU-1000-12</u> | Two (2) Required |
| Item 176 | Coffee Urn (3 gal.) <u>Custis, Model RU-300-20</u> | One (1) Required |

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| Item 177 | Tea Brewer (3 gal.) <u>Curtis, Model TCTS10600</u> | Two (2) Required |
| Item 178 | Coffee Grinder | One (1) Required Verify |
| Item 179 | Juice Dispenser | Two (2) Required Vendor provided |
| Item 180 | Water Filter System <u>Everpure, Model Coldrink 4-7FC System</u> | One (1) Required |
| Item 181 | Spare Number | |
| Item 182 | Ice Bin <u>Follet, Model DEV2650SG-72</u> | One (1) Required |
| Item 183 | Ice Cuber <u>Manitowoc, Model IY-1004A</u> | One (1) Required |
| Item 184 | Ice Cuber <u>Manitowoc, Model IY-1004A</u> | One (1) Required |
| Item 185 | Spare Number | One (1) Required |
| Item 186 | Trench Drain <u>BSI,LLC, Model FT-AS-NL</u> | One (1) Required |
| Item 187 | Spare Number | |
| Item 188 | Spare Number | |
| Item 189 | Cook / Chill Bank (32-degrees) <u>American Panel</u> | One (1) Required |
| Item 190 | Cooler Coils <u>Cold Zone</u> | Two (2) Required |
| Item 191 | Refrigerated Holding Cooler <u>American Panel</u> | One (1) Required |
| Item 192 | Cooler Coil <u>Cold Zone</u> | One (1) Required |

FOOD SERVICE EQUIPMENT – 11 40 00

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| Item 193 | Holding Freezer <u>American Panel</u> | One (1) Required |
| Item 194 | Freezer Coil <u>Cold Zone</u> | One (1) Required |
| Item 195 | Hose Bibb | Five (5) Required Mechanical |
| Item 196 | Temperature Monitoring System <u>E-Control</u> | One (1) Required |
| Item 197 | Floor Washer <u>SMT, Model Hummer Jet Jr.</u> | One (1) Required |
| Item 198 | Spare Number | |
| Item 199 | Spare Number | |
| Item 200 | Wall Flashing Custom built. Refer to details on Sheet FS5.2 | One (1) Lot Required |
| Item 201 | Corner Guards Custom built. Refer to details on Sheet FS5.2 | One (1) Lot Required |
| Item 202 | Security Fence Custom built. | Two (2) Required |
| Item 203 | Air Curtain Doors <u>Mars, Model LPV2 72-1U</u> | Three (3) Required |

END OF SECTION 114000

FOODSERVICE EQUIPMENT**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Food service equipment.
- B. Connections to utilities.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2014.
- C. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001
- D. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on appliances; indicate configuration, sizes, materials, finishes, locations, and utility service connection locations, service characteristics, and wiring diagrams.
- C. Samples: Submit two samples, 4 x 4 inch in size illustrating equipment and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Operation Data: Provide operating data for the specified equipment .
- F. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules .
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of standard products of the type specified.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for utility requirements.
- B. Products Requiring Electrical Connection: Listed and classified by UL (EAUED) as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products clear of floor in a manner to prevent damage.
- B. Coordinate size of access and route to place of installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work of this section within a five year period after Date of Substantial Completion.

- C. Provide five year manufacturer warranty for replacement or repair of scheduled equipment, refrigerant and compressors, including disconnection and removal of defective unit, and connection of replacement unit.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Equipment: Refer to schedule on Drawings.
 1. All Equipment Eligible for Energy Star Rating: Energy Star Rated.
 2. Cooler and Freezer Units: Listed by UL standards..
 3. Electrical Wiring and Components and Self-Contained Refrigeration Systems: Conform to UL standards.
 4. Exhaust Hoods: Comply with NFPA 96 and SMACNA (KVS).
- B. Installation Accessories: Provide all rough-in hardware, supports and connections, attachment devices, closure trim, and accessories required for complete installation.

2.02 FINISHES

- A. All Components: Shop finish.
- B. Metal (Except Stainless Steel): Degrease and phosphate etch, prime and apply minimum two coats factory baked epoxy, color as selected.
- C. Stainless Steel: No. 4 finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify ventilation outlets, service connections, and supports are correct and in required location.
- B. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install items in accordance with manufacturers' instructions.
- B. Insulate to prevent electrolysis between dissimilar metals.
- C. Weld and grind joints in steel work tight, without open seams, where necessary due to limitations of sheet sizes or installation requirements.
- D. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.
- E. Use anchoring devices appropriate for equipment and expected usage.
- F. Provide sealant to achieve clean joint with adjacent building finishes and between abutting components.

3.03 ADJUSTING

- A. Adjust equipment and apparatus to ensure proper working order and conditions.
- B. Remove and replace equipment creating excessive noise or vibration.

3.04 CLEANING

- A. Remove masking or protective covering from stainless steel and other finished surfaces.
- B. Wash and clean equipment.
- C. Polish glass, plastic, hardware, accessories, fixtures, and fittings.

3.05 CLOSEOUT ACTIVITIES

- A. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct Owner in operating procedures and maintenance.
 - 1. Test equipment prior to demonstration.
 - 2. Individual Performing Demonstration: Fully knowledgeable of all operating and service aspects of equipment.

3.06 PROTECTION

- A. Remove protective coverings from prefinished work.
- B. Protect finished work from damage.

3.07 FOOD SERVICE EQUIPMENT SCHEDULE

- A. Refer to Schedule on Drawings.
- B. Controls: Provide control switch or starter on each motor driven appliance or heating element, in accordance with UL requirements.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.
- E. Cord and Plug: Provide unit with 6 foot cord and plug for connection to electric wiring system including grounding connector.
- F. Cord and Plug: Provide suitable length of three wire cord with plugs to match building receptacles.
- G. Provide internal wiring for equipment, including electrical devices, wiring controls, and switches to a common junction box.
- H. Provide lamps for fixtures in equipment.
- I. Provide automatic door switches for refrigeration units.
- J. Provide equipment with connection terminals, so that connections for services can be made. Where receptacles are specified for custom equipment, supply cut-outs and outlet boxes set in place and accessible for connection to electrical source.
- K. Plumbing Connections: Coordinate with Division 22.

END OF SECTION

PROJECTION SCREENS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Installation of Owner Furnished projection screens.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Description of Owner Furnished Contractor Installed items.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking in walls and ceilings.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store in a protected, clean, dry area with temperature maintained above 50 degrees F. Stack according to manufacturer's recommendations.

1.04 FIELD CONDITIONS

- A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

PART 2 PRODUCTS**2.01 PROJECTION SCREENS**

- A. Projection Screens: Owner Furnished Contractor Installed.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate is finished and ready to accept screen installation.
- B. If substrate preparation is the responsibility of another installer, notify Contractor of unsatisfactory preparation before proceeding.
- C. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install plumb and level.
- D. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SITE FURNISHINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of Owner Furnished benches.
- B. Installation of Owner Furnished bike racks.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Description of Owner Furnished Contractor Installed items.
- B. Section 03 30 00 - Cast-In-Place Concrete: Concrete substrate.

PART 2 PRODUCTS

2.01 METAL FURNISHINGS

- A. Bench: Owner Furnished Contractor Installed.
- B. Bike Racks: Owner Furnished Contractor Installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that mounting surfaces, preinstalled anchor bolts, or other mounting devices are properly installed; and ready to receive site furnishing items.

3.02 INSTALLATION

- A. Install site furnishings in accordance with manufacturer's instructions.
- B. Place level and secure in place.

END OF SECTION

COMMISSIONING OF PLUMBING**PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes Commissioning activities required for work of Division 22 Sections including but not limited to construction checks, equipment start-up, functional testing, and operator training.
 - 1. Comply with Section 01 91 13 – General Commissioning Requirements for Commissioning activities for Division 22 work.

1.02 SEQUENCING

- A. Provide written notification to Commissioning Authority CA in advance of significant project dates as directed and as listed below.
 - 1. Two weeks prior to start-up of hot water heaters
 - 2. Four weeks prior to installation of lay-in ceiling tiles or other partial concealment of equipment to be commissioned
 - 3. Four weeks prior to any system being ready for balancing

1.03 SUBMITTALS

- A. Provide submittals of systems being commissioned to Owner's Authorized Representative as required by Section 01 91 13.
- B. LEED Documentation: Contractor to provide electronic copies of work products and other items as specified to support development of Systems Manual. Refer to Section 01 91 13 for specific submittal requirements.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 CONSTRUCTION CHECKLISTS**

- A. Contractor shall execute as required by Section 01 91 13. Construction Checklists for each system being commissioned will be prepared by CA during construction.

3.02 FUNCTIONAL TESTING

- A. Contractor shall assist CA with functional testing as required by Section 01 91 13. Functional Test Plans for each system being commissioned will be prepared by CA during construction, and will generally include a rigorous verification of instrument calibration, equipment performance, package equipment control system operations, automatic control sequence of operations, fire and life safety sequences, and operator interface functions. CA will supervise and document functional testing. Contractor shall provide qualified technicians to assist CA during on-site testing and perform the following functions.
 - 1. Operate equipment and systems as necessary to conduct testing.
 - 2. Manipulate control parameters to simulate test conditions as detailed in Functional Test Plans.
 - 3. Provide proprietary hardware and software as needed to interface with manufacturers packaged control systems.
- B. Labor required for retesting due to failure of equipment, or systems not performing in accordance with Contract Documents shall be provided at no additional cost to Owner.

3.03 OPERATIONS AND MAINTENANCE TRAINING

- A. Provide operation and maintenance instruction to Owner's personnel as required by Division 01 and 22.

3.04 SCHEDULE OF SYSTEM BEING COMMISSIONED

- A. Commission systems and equipment listed below including associated equipment, piping, and control systems.
- B. Plumbing Systems:
 - 1. Domestic water heaters
 - 2. Plumbing pumps

END OF SECTION

COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes Commissioning activities required for work of Division 23 Sections including but not limited to construction checks, equipment start-up, functional testing, and operator training.
 1. Comply with Section 01 91 13 – General Commissioning Requirements for Commissioning activities for Division 23 work.

1.02 SEQUENCING

- A. Provide written notification to Commissioning Authority (CA) in advance of significant project dates as directed and as listed below.
 1. Two weeks prior to start-up of air handling units, air-conditioning units, exhaust fans, boilers and pumps
 2. Four weeks prior to installation of lay-in ceiling tiles or other partial concealment of equipment to be commissioned
 3. Four weeks prior to any system ready for balancing

1.03 SUBMITTALS

- A. Provide control system custom software, hardware, and technical manuals as necessary for development of Commissioning activities. Control system submittals include but are not limited to operating sequences, point database, workstation remote access, on-site custom programming/editing software, and programming and operations manual as necessary for development of Commissioning activities. Submit a minimum of 12 weeks prior to equipment start-up.
- B. Provide sample control verification report to Commissioning Authority 12 weeks prior to substantial completion. Submittal shall show format and content of Final Verification Report.
- C. Provide submittals of systems being commissioned to Owner's Authorized Representative as required by Section 01 91 13.
- D. Provide electronic copies (or hard copies where appropriate) of control system final configuration parameters, programs, databases, files, and electrical data as necessary to reconfigure and/or replace control components upon device failure.
- E. LEED Documentation: Contractor to provide electronic copies of work products and other items as specified to support development of Systems Manual. Refer to Section 01 91 13 for specific submittal requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide all necessary control hardware, software, and temporary licenses to enable Commissioning Authority to conduct activities and to fully access any electronic control systems furnished for this project. Commissioning Authorities' laptop computer may be used for access if software and hardware systems provided are compatible with existing computer configuration, otherwise furnish laptop computer where required for duration of project.

- B. Provide minimum of two HVAC control operator interface sites for both on-site and remote access as described below:
1. Commissioning Authority Access Functions: Review and modification of control programming, monitoring of control system operations, review and modification of software database, setup and monitoring trend data in tabular and graphical formats.
 2. Remote Access: Remote access using Internet and shall include all functions described above.
 3. Provide credentials for Commissioning Authority. Security access level shall be suitable to perform necessary commissioning functions.
 4. Provide labor required to install hardware and software on personal computers at Commissioning Authority's office. Software will be manufacturer's most recent version and will be compatible with the CA's personal computers. Provide Commissioning Authority with two hours training after fully functional remote access is established.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's Representative to execute Construction Checklists and perform operational training as specified in Division 23 including the following systems:
1. Boilers
 2. Packaged rooftop air-conditioners
 3. Variable frequency drives
 4. Building Automation System

3.02 CONSTRUCTION CHECKLISTS

- A. Contractor shall execute as required by Section 01 91 13 Construction Checklists for each system commissioned will be prepared by Commissioning Authority during construction.

3.03 CONTROL VERIFICATION REPORTS

- A. Building Automation System: BAS control contractor shall perform verification of the function and performance of control hardware and software. Provide verification report demonstrating proper system installation and operation. Verification report shall include the following:
1. Network Communication: Verify that all network devices properly communicate on network. Verify communication speed and reliability is acceptable.
 2. Input and Output Verification:
 - a. Verify that all input and output points are indicating properly. Verification tests shall be "end-to-end" meaning field measurement to workstation graphic display value.
 - b. Calibrate all analog inputs. Acceptance accuracy shall be as specified for product accuracy. Repair or replace all devices that do not conform to specified accuracy.
 - c. Operate all analog outputs from 0% to 100% of operating range. Verify that controlled device operates over the entire output range and that maximum and minimum operating conditions are achieved.
 - d. Valves and dampers shall close fully and provide tight shutoff. Leakage rates shall not exceed specified values.
 - e. Verify that all digital outputs operate controlled devices.
 3. Sequence of Operation Verification: Systematically verify automatic control sequence of operation functions in field after installation is complete. Verification shall include:
 - a. Time scheduling
 - b. Operating modes
 - c. Tune and adjust control loops and control sequences to optimize efficiency and performance. Control loops shall be stable and maintain desired setpoints.

4. Trending: Confirm trending utilities storage of operating data as required to verify operation and performance of control modes, sequence, and loops. Meet with Owner and CA to review configuration, parameter interval, and duration prior to trend setup.
5. Operator Interface: Review function of operator interface. Confirm that graphic operator interface accurately depicts as-constructed system configuration and that all required content is displayed and functions as intended.
6. Alarms: Confirm alarm utilities are configured as required, alarm conditions are displaying in alarm logs, on graphic displays, and provide annunciation and reporting as required. Meet with Owner and CA to review configuration parameters prior to alarm utility setup.
7. Coordination: Assist balancing contractor with development of control setpoints and parameters as specifically indicated or otherwise required to provide Sequence of Operation. Setpoints would include but would not be limited to actuator positions required to provide minimum ventilation rates, supply air pressure setpoints for variable air volume air distribution systems, and terminal unit calibration parameters.
8. Controls Verification Report: After system operation is completely verified, provide written certification to Owner that systems have been fully tested, are operating according to specifications and ready for functional testing. Include documentation to the Commissioning Authority detailing verification results. Report shall include:
 - a. Updated control construction drawings and equipment data that incorporates all changes made during construction
 - b. Printed as-built control code
 - c. Printed point data base
 - d. Input/Output Verification Log: Submit point verification log including point identification, control system readout value, verification measurement, and required calibration offset where applied.
 - e. Sequence of Operation Verification: Submit verification test report listing complete text of control sequence and test results. Verify all specified control sequences.
 - f. Trend Logs: Submit printed trend reports for the following:
 - i. Time schedules. Seven-day log demonstrating that equipment operates according to programmed time schedules.
 - ii. Automatic control sequences. Trends shall be set-up as follows:
 - (i) Analog Control: Points that modulate over time shall be sampled at appropriate intervals and durations to demonstrate proper operating sequences. For example, a discharge temperature control loop would require trending during the morning warm-up mode and normal daytime operation mode. Each trend shall include all measured variables, control output signal, actual output signal, and controlled variable.
 - (ii) Digital Control: Dual-state control or monitoring points shall be recorded as COV (+) or change of value meaning that the changed parameter only needs to be recorded after the value changes from its previous state. A minimum of one week of samples shall be provided to properly demonstrate equipment cycles, modes, and schedules.
 - g. Include trend graphs as described below:
 - i. Lines shall be labeled and shall be distinguishable from each other by using either different line types, or different line colors.
 - ii. Indicate engineering units of the y-axis values; e.g., degrees F., inches w.g., Btu/lb, percent wide open, etc.
 - iii. The y-axis scale shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.
 - iv. All points trended for one HVAC subsystem; e.g., air handling unit, chilled water system, etc. shall be trended during the same trend period.
 - v. Each graph shall be clearly labeled with HVAC subsystem title, date, and times.
 - h. List of incomplete work.

9. Demonstration: Demonstrate operation of control system to Engineer, Commissioning Authority, and Owner including:
 - a. Menu functions
 - b. Point overrides
 - c. Control loop response after point modification
 - d. Alarm response time

3.04 FUNCTIONAL TESTING

- A. Contractor shall assist Commissioning Authority with functional testing as required by Section 01 91 13. Functional Test Plans for each system being commissioned will be prepared by Commissioning Authority during construction, and will generally include a rigorous verification of instrument calibration, equipment performance, packaged equipment control system operations, automatic control sequence of operations, fire and life safety sequences, and operator interface functions. Commissioning Authority will supervise and document functional testing. Contractor shall provide qualified technicians to assist Commissioning Authority during on-site testing and perform the following functions.
 1. Operate equipment and systems as necessary to conduct testing.
 2. Manipulate control parameters to simulate test conditions as detailed in Functional Test Plans.
 3. Access control programming and database as required to verify control configuration or to correct observed deficiencies.
 4. Create graphic displays and/or trend report as required to document test results.
 5. Provide proprietary hardware and software as needed to interface with manufacturer's packaged control systems.
- B. Labor required for retesting due to failure of equipment, or systems not performing in accordance with Contract Documents shall be provided at no additional cost to Owner.

3.05 OPERATIONS AND MAINTENANCE TRAINING

- A. Provide operation and maintenance instruction to Owner's personnel as required by Division 01 and 23.

3.06 SCHEDULE OF SYSTEMS BEING COMMISSIONED

- A. Commission systems and equipment listed below including associated equipment, piping, ductwork, and control systems.
- B. HVAC Systems: HVAC systems, equipment, and controls

END OF SECTION

COMMISSIONING OF ELECTRICAL**PART 1 GENERAL****1.01 SUMMARY**

- A. Section includes Commissioning activities required for work of Division 26 Sections including but not limited to construction checks, equipment start-up, functional testing, and operator training.
 1. Comply with Section 01 91 13 – General Commissioning Requirements for Commissioning activities for Division 26 work.

1.02 SEQUENCING

- A. Provide written notification to Commissioning Authority (CA) in advance of significant project dates including but not limited to the following:
 1. Two weeks prior to Manufacturer's start-up of lighting control system

1.03 SUBMITTALS

- A. Provide submittals of systems being commissioned to Owner's Authorized Representative as required by Section 01 91 13 COMMISSIONING REQUIREMENTS.
- B. LEED Documentation: Contractor to provide electronic copies of work products and other items as specified to support development of Systems Manual. Refer to Section 01 91 13 for specific submittal requirements.

PART 2 PRODUCTS

NOT USED

PART 3 - EXECUTION**3.01 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Manufacturer's representative to perform construction checks and operational training as specified in Division 26 including the following systems:
 1. Lighting Control System

3.02 CONSTRUCTION CHECKLISTS

- A. Contractor shall perform as required by Section 01 91 13. Construction checklists for each system being commissioned will be prepared by Commissioning Authority during construction.
 1. Perform voltage and amperage measurements for mechanical equipment as required in Section 22 08 00 and 23 08 00.

3.03 LIGHTING CONTROL VERIFICATION REPORT

- A. Control Contractor shall perform construction checks, start-up, and verification of automatic lighting control system. Provide verification report demonstrating proper system installation and operation. Verification shall include the following:
 1. Equipment Startup: All equipment being controlled shall be initially started and tested as required by the manufacturer. All required manufacturer installation and start-up checklists shall attached to the construction checklists.
 2. Communication Network Startup: Verify that all lighting control panels properly communicate on network. Verify communication speed and reliability is acceptable.
 3. Software Verification: All programs and software functions shall be verified for proper sequence of operation.

4. Controls Verification Report: After system operation is completely verified, provide written certification to Owner that systems have been fully tested and are operating according to specifications and ready for functional testing. Include report to the CA detailing verification results and the dates, times and person(s) performing startup. Report shall include:
 - a. Device Calibration Log
 - b. Lighting Relay Control Panels
 - 1) Provide date, time, panel designation, and panel location.
 - 2) Provide a list of all programmed time schedules.
 - 3) Provide a list of all sweep times, sweep control on or off, and relays that are swept off.
 - 4) Provide a list of all group load assignments.
 - 5) Provide all photocell control parameters and setpoints.
 - 6) Provide a checkout document indicating the following:
 - a. Lighting relay panel designation
 - b. Relay number
 - c. Relay description
 - d. Power circuit feeding relay
 - e. Verified relay operation
 - f. Verified time schedule control
 - g. Verified sweep control
 - h. Verified photocell control
 - c. Low Voltage Switches
 - 1) Provide a verification document indicating the following:
 - a) Switch location
 - b) Verified switch operation
 - c) Verified switch override operation
 - d. Occupancy Sensors
 - 1) Provide a verification document indicating the following:
 - a) Room or space designation
 - b) Manufacturer
 - c) Model
 - d) Technology type
 - e) DIP settings
 - f) Trigger settings
 - g) Time delay settings
 - h) Sensitivity settings
 - i) Verified sensor operation
 - e. Daylight Compensation Systems
 - 1) Provide a verification report indicating the following:
 - a) Provide date and time.
 - b) Room or space designation
 - c) Manufacturer
 - d) Model
 - e) Light level maintained at the work plane
 - f) Average light level with all electric lights off and no window obstruction
 - g) Average light level with electric lights on and no window obstruction
 - h) Average light level with electric lights on and at minimum output with no window obstruction
 - i) Average light level with electric lights on and at maximum output with no window obstruction
 - j) Average light level with electric lights on at maximum output at night or with windows obstructed
 - k) Average light level with electric lights on at minimum output at night or with windows obstructed
 - l) Provide all parameters and settings for all devices.
 - f. Digitally Addressable Lighting Interface Systems

- 1) Calibration Log
 - a) Provide date, time control system readout, means of verification, verification measurement, and calibration parameters for each analog input.
- 2) Point Summary Log
 - a) Attach printed log showing detailed descriptive data and configuration parameters for all points.
- 3) Operational Trend Logs: Include trend logs as follows:
 - a) Trend data for all analog and digital points.
 - i. Analog Control: Points that modulate over time shall be sampled at appropriate intervals and durations to demonstrate properly operating sequences. Provide one sample every 5 minutes for at least one week.
 - ii. Digital Control: Dual-state control or monitoring points shall be recorded as COV (change of value). A minimum of one week of samples shall be provided to properly demonstrate equipment cycles, modes, and schedules.
5. Demonstration: Demonstrate operation of control system to Engineer, CA, and Owner including:
 - a. Menu functions
 - b. Relay overrides
 - c. Programming of relays, time schedules

3.04 FUNCTIONAL TESTING

- A. Contractor shall perform testing as directed by Commissioning Authority and as required by Section 01 91 13. Functional Test Plans for each system being commissioned will be prepared by Commissioning Authority during construction. Provide an allowance of on-site labor hours per trade for assisting Commissioning Authority with Functional Testing as listed below. Labor required for retesting due to failure of equipment or systems to perform in accordance with Contract Documents shall be provided at no additional cost to Owner.

3.05 OPERATIONS AND MAINTENANCE TRAINING

- A. Provide operation and maintenance instruction to Owner's personnel as required by Division 01 and 26.

3.06 SCHEDULE OF SYSTEMS BEING COMMISSIONED

- A. Commission systems and equipment listed below including associated equipment and control systems.
 1. Automatic Lighting Control System

END OF SECTION

EARTH MOVING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Preparing subgrades.
- B. Backfilling for buildings and structures.
- C. Base course for concrete slabs-on-grade.
- D. Base course for concrete walks and pavements.

1.02 RELATED SECTIONS

- A. Document 00 3100 - Available Project Information: Geotechnical Report.
- B. Section 01 40 00 - Quality Requirements: Independent testing agency.
- C. Section 03 30 00 - Cast-In-Place Concrete.
- D. Section 32 84 00 - Irrigation.
- E. Section 32 93 00 - Landscaping.

1.03 REFERENCES

- A. AASHTO M 288-2000 - Geotextile Specifications.
- B. ASTM D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
- C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- E. ASTM D 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil Placed by the Rubber Balloon Method.
- G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- H. ASTM D 2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- I. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- J. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- K. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- L. ASTM D 4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics.
- M. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
- N. ODOT - Oregon Department of Transportation.

1.04 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

- B. Site Information: Research public utility records and verify existing utility locations prior to ordering any material. Notify the Architect immediately if any discrepancies are found in the project survey.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) 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.
- D. Select Fill: Per Geotechnical Report; ¾ inch or 1 inch minus, clean, well graded, crushed gravel or rock.
- E. Backfill and Fill:
 - 1. Satisfactory soil materials.
- F. Loam: See Section 32 93 00 - Landscaping.
- G. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefin, polyesters, or polyamide; and with the following minimum properties determined according to ASTM D 4759, and AASHTO M 288-2000 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf; ASTM D 4632.
 - 2. Tear Strength: 75 lbf; ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf; ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D 4491.
 - 5. Permittivity: Greater than 0.10 sec. -1
 - 6. Apparent Opening Size: Less than 0.6 mm

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, freezing temperatures or frost, and other hazards created by earthwork operations. Provide protective insulating materials as necessary.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

3.02 SUBGRADE INSPECTION

- A. Proof-roll subgrade before filling or placing aggregate with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.03 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 or utility pipe as directed by Architect.

3.04 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.

3.05 BACKFILLS AND FILLS

- A. Backfill: Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Remove if not used.
 7. Removing temporary shoring and bracing, and sheeting.
 8. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.06 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, reference Section 32 93 00 soil material.
 2. Under walks and pavements, use select fill.
 3. Under steps and ramps, use select fill.
 4. Under footings and foundations, use select fill.

3.07 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 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 3 percent and is too wet to compact to specified dry unit weight.

3.08 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.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 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 lawn 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 95 percent.

3.09 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.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1/2-inch for subgrade and 1/4-inch for finish grading
 2. Walks: 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.

3.10 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
 1. Shape subbase and base course to required crown elevations and cross-slope grades.
 2. Compact subbase and 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 698.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. 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.
- D. 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:
- E. When testing agency reports that subgrades, fills, or backfill have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.12 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

3.14 PLACEMENT SCHEDULE

- A. Under Footings and Foundations:
 - 1. 6 inch thick Select Fill, compacted to minimum 95 percent maximum dry density per ASTM D 698.
 - 2. Geotextile.
 - 3. Compact subgrade to minimum 95 percent maximum dry density per ASTM D 698.
- B. Under Slabs-on-Grade and Concrete Walks:
 - 1. 8 inch thick Select Fill, compacted to minimum 95 percent maximum dry density per ASTM D 698.
 - 2. Compact subgrade to minimum 95 percent maximum dry density per ASTM D 698.

END OF SECTION

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Preparing subgrades
 2. Excavating and backfilling for buildings and structures.
 3. Drainage course for concrete slabs-on-grade.
 4. Base course for concrete walks & pavements.
 5. Base course or asphalt paving.
 6. Excavating and backfilling for utility trenches.
 7. Drainage fill for infiltration facilities.
 8. Growing media for rain gardens.

1.2 SUBMITTALS

- A. Product Data.
- B. Aggregate Sieve Analysis.
- C. Growing media: (at least 14 days in advance of construction).
1. Documentation for the two analyses described in article 2.1.N.1 and 2.1.N.2 of this specification (particle gradation with calculated coefficient of uniformity; and pH) shall be performed by an accredited laboratory with certification maintained current. The date of the analyses shall be no more than 90 calendar days prior to the date of the submittal. The report shall include the following information:
 - a. Name and address of the laboratory.
 - b. Phone contact and e-mail address for the laboratory.
 - c. Test data, including the date and name of the test procedure.
 2. A compost technical data sheet from the compost vendor. The analysis and report must conform to the sampling and reporting requirements of the US composting Council Seal of Testing Assurance (STA) program. The analysis shall be performed and reported by an approved independent STA program laboratory and be no more than 90 calendar days prior to the date of submittal.
 3. Two gallon-sized bags of the blended material.
 4. A description of the location, equipment, and method proposed to mix the material.
- D. Infiltration test results.

1.3 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course, or subgrade, and concrete, or hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subgrade: Surface or elevation remaining after completing excavation, or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- K. Drainage Fill: Free draining, open-graded aggregate course used to support pervious pavement or in drainage zones in flow-through planters, vegetated stormwater facilities and infiltration galleries.
- L. Growing media: Non-native soil mixture made up of sand, loam, and compost; used on surface stormwater facilities.
- M. Unified Soil Classification System:
1. GW: Well-graded gravels; gravel/sand mixtures with little or no fines.
 2. GP: Poorly-graded gravels; gravel/sand mixtures with little or no fines.
 3. GM: Silty gravels; poorly-graded gravel/sand/silt mixtures.
 4. GC: Clayey gravels; poorly-graded gravel/sand/clay mixtures.
 5. SW: Well-graded sands; gravelly sands with little or no fines.
 6. SP: Poorly-graded sands; gravelly sands with little or no fines.
 7. SM: Silty sands; poorly, graded- sand/gravel/silt mixtures.
 8. SC: Clayey sands; poorly-graded sand/gravel/clay mixtures.
 9. ML: Inorganic silts; sandy, gravelly, or clayey silts.
 10. CL: Lean clays; inorganic, gravelly, sandy, or silty, low to medium-plasticity clays.
 11. OL: Organic, low-plasticity clays and silts.
 12. MH: Inorganic, elastic silts; sandy, gravelly or clayey elastic silts
 13. CH: Fat clays; high-plasticity, inorganic clays.
 14. OH: Organic, medium to high-plasticity clays and silts
 15. PT: Peat, humus, hydric soils with high organic content.

1.4 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
- C. Site Information: Research public utility records and verify existing utility locations prior to ordering any material. Notify the Architect immediately if any discrepancies are found in the project survey.
- D. See Geotechnical report titled Geotechnical Investigation by GRI dated June 11, 2013 for additional information and requirements.

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.
- D. Base Course: 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 or use Oregon Standard Specifications for Construction 1-inch-0-inch or 3/4-inch-0-inch BASE AGGREGATE.
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 3-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve or use Oregon Standard Specifications for Construction 3/4-inch—0-inch BASE AGGREGATE.
- G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; except with 100 percent passing a 1-1/2-inch sieve and less than 2% passing the No. 200 sieve. May use 3/4-to-1/4 inch crushed rock. See “Subdrainage and Floor Support” section of Geotechnical Report.
- H. Backfill and Fill:
1. Satisfactory soil materials
 2. Initial trench backfill: Use OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION (3/4-inch – 0-inch) base aggregate.
- I. Drainage Fill: Angular, granular material with a maximum particle size of 2 inches and shall meet Oregon Standard Specification 00430.11. The material shall be free of roots, organic material, and other unsuitable materials; have less than 2 percent passing the No. 200 sieve (washed analysis); and have at least two mechanically fractured faces.
- J. Growing Media: A loose and friable material blend of loamy soil, sand and compost that is 30-40 percent compost (by volume) and meets the following other criteria:
1. Particle Gradation: A sieve analysis of the complete blended material shall be conducted per ASTM C117/C136, AASHTO T11/T27, or ASTM D422/D140 and meet the following gradation criteria:

| Sieve Size | Percent Passing |
|------------|-----------------|
| 1-inch | 100 |
| #4 | 75-100 |
| #10 | 40-100 |
| #40 | 15-50 |
| #100 | 5-25 |
| #200 | 5-15 |

The blend shall have a coefficient of uniformity (D60/D10) equal to or greater than 6 to ensure it is well graded.

2. Acidity: pH of the blended material shall be tested and be between 6 and 8.

3. Compost: The compost shall be derived from plant material and provided by a member of the US Composting Council Seal of Testing Assurance (STA) program. See www.compostingcouncil.org for a list of local providers. The compost shall be a result of biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. The material shall be well composted, free of viable weed seeds, and stable with regard to oxygen consumption and carbon dioxide generation. The compost shall have no visible free water and produce no dust when handled. It shall meet the following criteria, as reported by the US Composting Council STA Compost Technical Data Sheet provided by the vendor.
 - a. 100 percent of the material must pass through a ½ inch screen.
 - b. The pH of the material shall be between 6 and 8.
 - c. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight.
 - d. The organic matter content shall be between 30 and 70 percent (dry weight basis).
 - e. Soluble salt content shall be less than 6.0 mmhos/cm.
 - f. Maturity indicator shall be greater than 80 percent for Germination and Vigor.
 - g. Stability shall be 'Stable' to 'Very Stable'.
 - h. Carbon/Nitrogen (C/N) ratio shall be less than 25:1.
 - i. Trace metals test result= 'Pass.'
4. Blend: The material shall be well mixed and homogenous. It shall be free of wood pieces, plastics, and other foreign matter. There shall be no visible free water.
5. Infiltration: The blended material shall have a minimum infiltration rate of 2 inches per hour. Contractor shall provide the Engineer with a 2 quart sample for initial testing.

2.2 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 to comply with local practice or requirements of authorities having jurisdiction or 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.
- B. Tracer Wire: 12 AWG minimum solid copper insulated High Molecular Weight Polyethylene (HMW PE) tracer wire or approved equal. The tracer wire insulation shall be green for sewer pipe and blue for waterlines and be a minimum of 45 mil. thick. Joints or splices shall be waterproof. The wire shall be rated for 30 Volt.
- C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
 2. Tear Strength: 40 lbf; ASTM D 4533.
 3. Puncture Strength: 220 lbf; ASTM D 4833.
 4. Apparent Opening Size: No. 40; ASTM D 4751.
 5. Permativity (minimum): .5 sec⁻¹; ASTM D 4491.
- D. Separation Fabric: Woven geotextile, specifically manufactured as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 1. Grab Tensile Strength: 180 lbf; ASTM D 4632.
 2. Tear Strength: 68 lbf; ASTM D 4533.
 3. Puncture Strength: 371 lbf; ASTM D 4833.
 4. Apparent opening size: No. 30; ASTM D 4751.

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. Provide protective insulating materials as necessary.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, as required by 1200-CN permit during earth moving operations.
- D. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- E. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- F. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
- G. Protect all areas designated to be infiltration facilities from foot or equipment traffic and surface water runoff. Do not use proposed infiltration facilities to dispose of surface water runoff during construction. Under no circumstances shall material and equipment be stored on top of the installation area. Contractor shall not backfill facility until Engineer has inspected it and signed off.
- H. Protect all areas designated to receive pervious pavers or pervious pavement from excessive compaction.

3.2 EXPLOSIVES

- 1. Explosives: Do not use explosives.

3.3 EXCAVATION

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions without prior approval by the Architect.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 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.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: 6 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade and bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course. Hand excavate for bell of pipes.
 2. Excavate utility structures to provide 6 inches clearance (enlarge as needed) to allow for compaction of backfill material.

3.7 EXCAVATION FOR STORMWATER INFILTRATION FACILITIES

- A. Excavate facilities to the indicated gradients, lines, depths, and elevations. All excavations shall be performed with the lightest practical excavation equipment. Excavation equipment shall not be operated within the limits of the facility.
- B. To help prevent subgrade soil contamination and clogging by sediment, facility construction shall be delayed until all other construction within its drainage basin is completed and the drainage area stabilized. Provide additional sediment control measures such as diversion berms around the facility as needed. Additional excavation and backfill required to restore any infiltration rate lost due to clogging or over-compaction during construction shall be performed by the contractor at no cost to the owner.

3.8 SUBGRADE INSPECTION

- A. Proof-roll subgrade with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Do not proof-roll subgrade in infiltration facilities.
- B. Soft pockets and areas of excess yielding that have been identified shall be scarified and moistened or aerated, or removed and replaced with suitable soil materials to the depth required. Re-compact and retest until specified compaction is obtained.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILLS AND FILLS

- A. Backfill: Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing 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.

3.12 UTILITY TRENCH BEDDING

- A. Place bedding 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.

3.13 UTILITY TRENCH BACKFILL

- A. Trenches under Footings: Backfill trenches excavated under footings with satisfactory soil or approved backfill to within 18 inches from the bottom of footings elevation; fill remaining trench excavation with concrete up to the elevation of bottom of footings. Concrete is specified in "Cast-in-Place Concrete."
- B. Place and compact initial trench backfill material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- C. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- D. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- E. Install tracer wire in a continuous fashion above the utility in such a manner as to be able to properly trace utility lines without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire. Bring tracer wire to the surface at every box, vault, drainage structure, or manhole.

3.14 DRAINAGE FILL

- A. Compaction of the native soil subgrade should be limited in order to prevent a reduction in the permeability of the soil.
 1. Where erosion of subgrade has caused accumulation of fine materials and/or surface ponding, this material shall be removed with light equipment and underlying soils scarified to a minimum depth of 3 inches with a York rake or equivalent and light tractor.
 2. Where subgrade has been compacted due to construction traffic, subgrade shall be scarified or removed to a depth sufficient to match the naturally occurring insitu state. Add additional base course material to meet design grades at no cost to the owner.
 3. Bring subgrade of base course to line, grade, and elevations indicated. Fill and lightly re-grade any areas damaged by erosion, ponding, or traffic compaction before the placing of stone.
- B. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches. Secure in place to prevent wrinkling.
- C. Place drainage fill and compact by tamping with a plate vibrator, and screed to depth indicated. For drainage fill that exceeds 8 inches in compacted thickness, place fill in layers of equal thickness, with no compacted layer more than 8 inches or less than 4 inches thick.
- D. Place drainage geotextile over compacted drainage fill, overlapping ends and edges at least 12 inches.

3.15 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 base course.
 3. Under steps and ramps, use base course.
 4. Under building slabs, use drainage course.
 5. Under footings and foundations, use drainage course.
 6. Under and around utility structures, use engineered fill.

3.16 STORMWATER INFILTRATION FACILITY FILL

- A. Growing media shall be placed in loose lifts, not to exceed 8 inches each.
- B. Placement of the growing media will not be allowed when the weather is too wet as determined by the owner's representative.
- C. Contractor shall schedule infiltration test with KPFF after stormwater facility has been completed. If an infiltration test has not been completed prior to punchlist walk-through, it must be completed during punchlist walk-through.
 1. Growing media must be saturated prior to beginning infiltration test.
 2. Stormwater planter must be filled up to overflow elevation or with 6" of water, whichever is less.
 3. Engineer will time infiltration rate.
 4. If the stormwater facility does not meet project infiltration requirements and City of Eugene stormwater facility requirements, it will not be accepted, and the growing media must be reinstalled.

3.17 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 3 percent and is too wet to compact to specified dry unit weight.

3.18 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.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 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 percent.
- D. Growing media shall be compacted with a water-filled landscape roller. It shall not otherwise be mechanically compacted.

3.19 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.
- 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 1/2 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.

3.20 SUBBASE AND 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. Shape base course to required crown elevations and cross-slope grades.
 2. 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.
 3. 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 698.

3.21 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.22 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. 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.
- C. 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.
- D. Testing Agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, 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 each 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 each 150 feet or less of trench length, but no fewer than two tests.

- E. With the approval of the Engineer, proof-roll testing of subgrade and/or aggregate base may be substituted for other compaction testing.
- 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.

3.23 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- D. Weather permitting and as approved, stormwater infiltration facility plants shall be installed as soon as possible after placing and grading the growing media in order to minimize erosion and further compaction.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
 - 3. Pavement-marking paint.
- B. **Related Requirements:**
 - 1. Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, aggregate subbase and base courses, and aggregate pavement shoulders.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Section 0744 of the 2008 Oregon Standard Specifications for Construction for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expect 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 and Surface Course:

| <u>Dense Graded Mixes</u> | <u>Surface Temperature</u> |
|---------------------------|----------------------------|
| Less than 2 inches | 60 degrees F |
| 2 inches – 2 1/2 inches | 50 degrees F |
| Greater than 2 1/2 inches | 40 degrees F |

- 3. If placing asphalt between March 15 and September 30, temperature may be lowered 5 degrees F.
 - 4. Do not use field burners or other devices to heat the pavement to the specified minimum temperature.
- 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 and 55 deg F for water-based materials, and not exceeding 95 deg F.
- C. Thermoplastic Pavement-Markings: Proceed with pavement markings only on clean, dry surfaces, minimum ambient or surface temperature shall be 50 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Conform to the requirements of 00744 of the 2008 Oregon Standard Specifications for Construction.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22 or PG 70-22.
- B. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- C. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
 - 1. Color: As Indicated.
- D. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
 - 1. Color: As Indicated.
- E. Thermoplastic Pavement Markings: Type B-HS Pre-formed, fused thermoplastic film conformed to the requirements of 00867 of the 2008 Oregon Standard Specifications for Construction.
 - 1. Color: As Indicated.
- F. Glass Beads: AASHTO M 247, Type 1.
- G. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 6 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, ¾ inch diameter, 10-inch minimum length.
- H. Wheel Stops: Solid, integrally colored, 96 percent recycled HDPE or commingled postconsumer and postindustrial recycled plastic; UV stabilized 4 inches high by 6 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized Steel, ¾ inch diameter, 10-inch minimum length.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense-graded, 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. Provide mixes conforming to section 00744 of the 2008 Oregon Standard Specifications for Construction.
 - 3. Base Course: Level 2, ½ inch dense, HMAC.
 - 4. Surface Course: Level 2, ½ inch dense, HMAC.

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. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply tack coat uniformly to vertical asphalt surfaces. Apply 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.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Asphalt and sand seal edges where new asphalt concrete meets existing pavement.

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. 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.
- C. 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.
- D. 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 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in 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 a 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 or 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.
- 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. Cold Milling: Test with a 12 foot (3.7 meter) straightedge furnished and operated by the Contractor, as directed. The variation from the top of the ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed 1/4 inch.
- B. 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.
- C. 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. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
4. Difference between adjacent panels: 1/8 inch.

3.8 PAVEMENT MARKING

- A. Do not apply pavement-marking paint or thermoplastic material until layout, colors and placement have been verified with architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.
- E. Install thermoplastic pavement markings as indicated on the drawings per the requirements of section 00850 and 00867 of the 2008 Oregon Standard Specifications for Construction.

3.9 WHEEL STOPS

- A. Install wheel stops with dowels.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests 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.

3.11 WASTE HANDLING

- 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 SUMMARY**

- A. Section Includes:
 1. Driveways.
 2. Parking lots.
 3. Curbs and gutters.
 4. Sidewalks.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. 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. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 1. Cementitious materials.
 2. Steel reinforcement and reinforcement accessories.
 3. Admixtures
 4. Curing compounds
 5. Applied finish materials.
 6. Bonding agent or epoxy adhesive.
 7. Joint fillers.

1.3 QUALITY ASSURANCE

- A. 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."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.4 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, smooth exposed surfaces.
 1. Use flexible or curved forms for curves with a radius 100 feet or less.

- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 775/775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- D. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.
- E. Tie bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- F. 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.
 - 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.
- G. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

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, portland cement Type I or Type II
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 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.
- 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. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 3. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

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.
- 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.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D 175, asphalt-saturated cellulosic fiber in preformed strips.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements.

2.6 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N.
 - 1. Color: As indicated.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: As indicated.
- C. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
 - 1. Color: As indicated.
- D. Glass Beads: AASHTO M247, Type 1.

2.7 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete 2500-psi minimum compressive strength, 6 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate. Solid, integrally colored, 96 percent recycled HDPE, or commingled postconsumer and postindustrial recycled rubber or plastic; UV stabilized.
 - 1. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
- B. Use a qualified testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- C. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION**3.1 EXAMINATION AND PREPARATION**

- 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 loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
 - 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."
- C. Remove loose material from compacted subbase surface immediately before placing concrete.
- D. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 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.

3.3 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.

3.4 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 pavement, 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 pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint or install plastic dowel sleeves per manufacturer's recommendations.
- 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 isolation 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. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- 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, 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 grooved marks on concrete surfaces.
 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat 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.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and 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, placing, and consolidating concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- 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. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- I. 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.
- J. Screed paving surface with a straightedge and strike off.
- K. 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.

- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 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 mix designs.
- P. 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 to 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.

3.6 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. 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.
 - 2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- C. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a ¼ inch (6mm) radius. Repeat tooling of edges after applying surface finished. Eliminate tool marks on concrete surfaces.

3.7 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.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows.
 - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during 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 subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: ¼ inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed ¼ inch.
 - 4. Joint Spacing: ½ inch.
 - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 6. Joint Width: Plus 1/8 inch, no minus.
 - 7. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 8. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
 - 9. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
 - 10. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.

3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.10 WHEEL STOPS

- A. Securely attach wheel stops to paving with not less than two galvanized-steel dowels located at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- 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 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix 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 mix. 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 mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 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 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 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. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement 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****1.01 SECTION INCLUDES**

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases; concrete foundation for posts.
- C. Manual gates and related hardware.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.
- B. Section 08 71 00 - Door Hardware: Gate locking device.

1.03 REFERENCE STANDARDS

- A. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a.
- B. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2011.
- C. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework; 2012.
- D. ASTM F 1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates; 2005

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- D. Samples: Submit two samples of fence fabric, slat infill, 24 inch by 24 inch in size illustrating construction and colored finish.
- E. Manufacturer's Installation Instructions: Indicate installation requirements and .

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
 - 2. Materials and Resources Credit 5 - Regional Materials.
- C. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:
 - 1. See Section 01 81 13 - LEED Requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Chain Link Fences and Swing Gates:
 - 1. Permafused II by Master-Halco, Inc.: www.fenceonline.com.
 - 2. ColorBond I by Merchants Metals: www.merchantsmetals.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Posts, Rails, and Frames: ASTM F 1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 25 ksi.
- B. Wire Fabric: ASTM A392 zinc coated steel chain link fabric; 1-3/4 inch diamond mesh interwoven; minimum 11 gage wire; twisted tight top selvage, knuckle end closed bottom selvage.
- C. Concrete: Type specified in Section 03 30 00.

2.03 COMPONENTS

- A. Line Posts: 2.38 inch diameter.
- B. Corner and Terminal Posts: 2.38 inch.
- C. Swing Gate Posts: 3.5 inch diameter.
- D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
- E. Swing Gate Frame: 1.66 inch diameter for welded fabrication.
- F. Tension Wire: 6 gage thick steel, single strand.
- G. Tie Wire: Aluminum alloy steel wire.

2.04 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
- C. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates fork latch with gravity drop and padlock hasp .
- D. Privacy Slats: Vinyl strips, sized to fit fabric weave.

2.05 FINISHES

- A. Components and Fabric: Vinyl coating, black color as selected over coating of 1.8 oz/sq ft galvanizing.
- B. Accessories: Same finish as framing.
- C. Color(s): Black.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Fence Height: 6 feet or as indicated on Drawings.
- C. Space posts maximum 8 feet on center.
- D. Place fabric on outside of posts and rails.
- E. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- F. Line Post Footing Depth Below Finish Grade: Minimum 3 feet.
- G. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: Minimum 3 feet.
- H. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- I. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

- J. Install center brace rail on corner gate leaves.
- K. Do not stretch fabric until concrete foundation has cured 28 days.
- L. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- M. Position bottom of fabric 3 inches above finished grade.
- N. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- O. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- P. Install bottom tension wire stretched taut between terminal posts.
- Q. Do not attach the hinged side of gate to building wall; provide gate posts.
- R. Install gates with fabric to match fence. Install hardware.
- S. Install cantilever sliding gates and operators in accordance with manufacturer's instructions.

3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.
- C. Components shall not infringe adjacent property lines.

END OF SECTION

IRRIGATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of an electric solenoid controlled underground sprinkler system of PVC pipe and fittings with pop-up heads.
- B. Installation of Central Control system, control wires, shrub and lawn zones.

1.02 RELATED REQUIREMENTS

- A. Section 01 56 39 - Temporary Tree and Plant Protection
- B. Section 01 60 00 - Product Requirements
- C. Section 01 78 00 - Closeout Submittals
- D. Division 26 - Electrical
- E. Section 32 90 00 - Planting

1.03 REFERENCE STANDARDS

- A. ASTM D1784: Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- B. ASTM D1785: Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- C. ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- D. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- E. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004 (Reapproved 2009).

1.04 PROTECTION

- A. Protect existing improvements and growth in areas to remain undisturbed until completion of project. Leave area in similar condition as found.
- B. Protect utilities and maintain in continuous operation or in operational condition during work. Repair damage to known utilities at Contractor's expense.
- C. Use means necessary to protect materials of this Section before, during, and after installation and to protect installed Work and materials of other trades. In the event of damage immediately make repairs and replacements as directed by Owner's Representative.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with other trades affecting and affected by Work of this Section.
- B. Preinstallation Meeting: Convene one week (minimum) prior to commencing work of this Section to coordinate utility marking procedures.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's printed data covering products and installation instructions.

- C. Quality Assurance Data: Submit license information and project references including name and location of previous projects, date of installation, square footage of areas with irrigation work, description of irrigation system, and Owner's contact information.
- D. Record Documents: Record actual locations of installed irrigation components on a clean set of plans. Use white out and red ink to legibly re-draft as-built information.
 - 1. Produce and keep current throughout the project.
 - 2. Indicate two dimensions for valves, stub outs, and main line T's, L's, ends, elbow's, and change in direction, and for all wires splices.
 - 3. Submit to Owner's Representative for approval.
- E. Operation and Maintenance Data:
 - 1. Provide written instructions at System Demonstration for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
 - 2. Submit chart showing actual precipitation rates for each zone.
 - 3. Submit (2) laminated zone charts identifying each zone with zone number in color.
 - 4. Prepare a program for the irrigation controller for Spring/Summer; Summer; Summer/Fall using historical weather data and averages. Include start times, watering duration, day of week, repeat cycle mode, program mode, precipitation rates in inches per hour, and application quantities. Coordinate operation and programming with Owner's Representative.
- F. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Valve Keys for Manual Valves: One.
 - 3. Extra Valve Box Keys: One.
 - 4. Wrenches: One for each type head core and for removing and installing each type head.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing Work of this Section who has successfully completed a minimum of 5 comparable scale projects and have the following licenses:
 - 1. For Irrigation Work:
 - a. Valid Oregon Landscape Contractors license.
 - b. Valid Oregon Landscape Business license.
 - 2. For Plumbing Work:
 - a. Valid Oregon Plumbing license.
 - b. Valid Oregon Landscape Contractor license.
 - 3. Successfully completed at least 5 comparable scale projects.
 - a. Submit names, addresses, dates, owners and locations of previous projects if requested by Owner's Representative.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original unopened packaging with legible manufacturer's identification.
- B. Comply with manufacturer's recommendations for storage and protection.
 - 1. Store in a cool, dry place out of direct sunlight.
 - 2. Protect from damage by the elements and construction procedures.
 - 3. Store plastic pipe on firm, level supports.
 - 4. Store plastic pipe cement in cool location.

1.09 ENVIRONMENTAL CONDITIONS

- A. Temperature of mating surfaces of plastic pipe and fittings to be between 40 degrees fahrenheit and 100 degrees fahrenheit. Perform no PVC Solvent welding in rainy weather except under cover.

1.10 REVIEWS

- A. Request the following reviews by the Owner's Representative two days (min.) in advance:
 - 1. Irrigation Head Layout Review

2. Pressure Test and Mainline Installation
3. System Review
4. System Demonstration to Owner

B. Coordinate Reviews to coincide with regular progress meetings where possible.

1.11 MAINTENANCE

A. During period between system installation and Final Acceptance provide maintenance to assure proper operation of the irrigation system.

1.12 WARRANTY

- A. Warranty period shall be one year following Final Completion or one full operating season following Final Completion, whichever is longer.
- B. Contractor guarantees materials furnished under this Contract will be as specified and the Work will be free of defects in compliance with the Contract Documents.
- C. Irrigation system must be in proper working condition at the end of the warranty period. At no additional cost to the Owner replace Work of this Section as necessary to restore system to proper working condition following the Contract Documents.
- D. Visit and inspect Work at least once a month during warranty period and notify Owner's Representative in writing of any observed conditions requiring attention. Failure to provide such notification renders deficiencies the Contractor's responsibility to rectify.
- E. Contractor is not responsible for loss or damage to Work of this Section caused by unusually extreme weather, vandalism, or lack of Owner's maintenance during warranty period.

PART 2 PRODUCTS

2.01 IRRIGATION SYSTEM MATERIALS

- A. Use only new materials of brands and types shown on Drawings or specified herein.
- B. Similar materials must be products of one manufacturer unless otherwise approved.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PIPE MATERIALS

- A. Mainline Pipe: Schedule 40 PVC Pipe, Type 1, normal impact: IPS, NSF approved conforming to ASTM D1784, ASTM D1785.
- B. Lateral Line Pipe: Schedule 40 PVC Pipe, Type 1, normal impact: IPS, NSF approved conforming to ASTM D1784, ASTM D1785.
- C. Risers: One piece schedule 80 gray PVC Pipe, Type 1, threaded at both ends conforming to ASTM D1784 and ASTM D2464. No snap-risers.
- D. Fittings: Polyvinyl chloride type 1, white schedule 40 and gray schedule 80; ASTM D1784, ASTM D2466, or ASTM D2464, as applicable.
- E. Irrigation Sleeves: Schedule 40 PVC Pipe, Type 1, normal impact: IPS, NSF approved conforming to ASTM D1784, ASTM D1785.
- F. Swing Joint Assembly Pipe and Fittings: Double swing joint risers as detailed. Swing-Pipe, snap, and "Funny pipe" risers not acceptable.
- G. Flex Riser Assembly: 18 inch minimum, 3 feet maximum Swing-Pipe with transfer barb 90 degree ells at both ends and a marlex ell below the irrigation head.
- H. Electrical Conduit and Fittings:
 1. Underground: Plastic, Class 3, Federal Specification W-C-1094.
 2. Above Ground: Aluminum, Federal Specification WW-G-540.

- I. PVC Solvent Cement: NSF approved solvent for Class 1245-B&C PVC through 4 inches conforming to ASTM D 2564 for PVC pipe and fittings. Ensure that manufacturer's expiration date is not exceeded.
 - 1. At main lines: IPS Corporation Weld-On #705 PVC.
 - 2. At lateral lines: IPS Corporation Weld-On #705 PVC or #721 PVC.
- J. PVC Cleaner and Primer: Oatey Lo-V.O.C. Purple Primer #31903.

2.03 VALVES

- A. Isolation Valves - 3 inch and under: Threaded gate valve with resilient wedge sized to match mainline with wheel handle.
 - 1. Approved Products:
 - a. Kennedy model 8057, or approved.
- B. Control Valve Assembly:
 - 1. Automatic Control Valve: Globe type, 200 psi rated, threaded connections with cross type operating handle designed to receive operating key. Size according to Valve Schedule on Drawing.
 - a. For Irrigation Zones less than 5 GPM:
 - 1) Irritrol Model 700-1, or approved.
 - 2) Include Irritrol Omnireg Pressure Regulator Model OMR-100 (pressure regulating system).
 - b. For Irrigation Zones larger than 5 GPM:
 - 1) Toro P-220 Series, or approved.
 - 2) Include EZ Reg (pressure regulating system).
- C. Quick Coupling Valves:
 - 1. Approved Products:
 - a. Rain Bird 44 RC, or approved.
- D. Master Valve: 24V AC, normally open and flanged at both ends.
 - 1. Approved Products:
 - a. Size: 2 inch.
 - b. Model 410 by Bermad Manufacture. or approved.
- E. Flow Sensor: PVC tee type sensor.
 - 1. Approved Products:
 - a. Model TFS-150 by Toro, or approved.
- F. Manual Drain Valve: Globe or angle brass manual valve with non-floating seat disk that allows positive drainage.
 - 1. Approved Products:
 - a. Manufactured by Champion, or approved.
- G. Backflow Preventers: Double check valve assembly.
 - 1. Approved Products:
 - a. Size: 2 inch.
 - b. Model # DC4A-118-T2 by Apollo.

2.04 VALVE BOXES

- A. Valve box of suitable size with tee top type lid .
 - 1. Green box and lid.
- B. Install valves in the following valve boxes:
 - 1. Control Valve Assembly: (2) Carson 1419-12, T-Lid, or approved.
 - 2. Quick Coupling, Manual Drain, and Isolation Valves: Carson 910-10, T-Lid, or approved.
 - 3. Other Valves: Sized as applicable by Carson, or approved.

2.05 IRRIGATION HEADS

- A. Makes and models shown on Drawings, or approved.

2.06 WIRE

- A. Zone Control Wire: Install according to manufacturer's wire schedule for valve specifications. 14 gauge minimum, type AVG-UF, bearing U.S. approval.
- B. Communication Wire: Install according to manufacturer's central control requirements. Wire from controller to flow sensor must be a single, unspliced length.
 - 1. 14 gauge, PE 39 cable, 6 pair.
 - 2. Sentinel, or approved.
- C. Wire Connections: Direct bury splice Kit.
 - 1. DBR/Y by 3M.
 - 2. Scotch Lok 3570.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Utility Locate Wire: 14 gauge minimum, type AVG-UF, bearing U.S. approval, blue in color.

2.07 IRRIGATION CONTROLLER

- A. Wall mount control assembly in metal cabinet.
 - 1. Size: 24 Stations
 - 2. Enclosure: Stainless steel wall mount (large).
 - 3. Manufacturer/Model number: Toro Sentinel, Model SB24WS26U1, or approved.
- B. Contact: Rob Minster at HD Fowler: 541-607-0081.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 RETRO LINK ASSEMBLY (FOR RAINBIRD CONTROLLERS)

- A. Two (2) each Toro RLS-RB Sentinel Retro - Link Assembly. Deliver to Owner.

2.09 BACKFILL MATERIALS

- A. Pea Gravel: 3/4 x 1/2 inch washed round rock.
- B. Sand: Clean, fill sand free of clay, rocks, organic matter, or other deleterious material.
- C. Topsoil or Loam: See Section 32 90 00 - Planting.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that required utilities and sleeves are available, in proper location, and ready for use. Verify location, type, size, psi, and GPM of existing water lines, meters, and sleeves.
- B. Verify that surfaces and structures to receive Work are accurately sized and located, sound, secure, true, complete, and otherwise properly prepared.
- C. Verify electrical service and conduit for Irrigation Controller is properly sized and located.

3.02 PREPARATION

- A. System layout is diagrammatic. Route piping to avoid plants, ground cover, and structures. If field measurements differ slightly from Drawings modify work for accurate fit. If measurements differ substantially notify Owner's Representative prior to installation.
- B. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system and piping to minimize conflict with other work.
- C. Coordinate connections to existing irrigation system, including system shut down, new connections, system re-start, and scheduling of new irrigation zone run times with Owner's Representative.

- D. Irrigation Head Layout Review: Install flags at locations of irrigation heads and components shown on Drawings. Obtain Owner's Representative's approval and make adjustments to locations as directed. Coordinate marking of pipe trenches and location of valves prior to executing Work.

3.03 CUTTING OF PAVEMENT AND REPAIR

- A. Do no cutting of pavement for installation of Work without Owner Representative's approval.

3.04 MASTER VALVE AND FLOW SENSOR INSTALLATION

- A. Install where shown on Drawings in accordance with manufacturer's directions when making supply and central control component connections.

3.05 TRENCHING

- A. Excavate trenches with uniform bottom and remove rocks and sharp objects to provide firm, even, clean base for pipe. Width of trench to be 1.5 times the outside diameter of the pipe.
- B. Trench Depth:
 1. Minimum Cover over Installed Mainline Piping: 18 inches.
 2. Minimum Cover over Installed Lateral Line Piping: 12 inches.
 3. Minimum Cover over Installed Sleeves in Roadway: 24 inches.
 4. Minimum Cover over Installed Sleeves at other paving: 6 inches from bottom of paving.
- C. More than one pipe is permitted in the same trench provided that:
 1. Two pipes may be stacked vertically if 4 inches of Sand separates them.
 2. Three or more pipes must be laid 4 inches apart horizontally.
- D. Where excavation is performed to excess levels backfill with Sand to proper levels.
- E. Keep trenches dry and frost free. Provide and operate pumping equipment to keep excavations free from standing water.
- F. Protect existing vegetation to remain. Cut no roots over two inches in diameter without approval of Owner's Representative. Make cuts clean, straight, at right angles to roots. Paint cuts over 1-1/2 inches diameter with approved tree paint. Repair or replace damaged plant material.

3.06 SLEEVE INSTALLATION

- A. Sleeves may be jacked or pulled but cover requirements must be maintained. Jacking of PVC pipe is not permitted in rocky or bar run fills where there is potential for damage to pipes.
- B. Extend sleeves 12 inches beyond pavement edge or curb.
- C. Install level and perpendicular to sidewalks and pavement unless shown otherwise on drawings.
- D. Provide markers where sleeve ends are concealed.

3.07 PIPE BEDDING

- A. Mainline: Provide uniform bearing surface of Sand, 4 inches minimum depth, free of rocks and sharp objects under entire length of pipe.
- B. Lateral Line: Provide uniform bearing surface of clean topsoil, loam, or Sand. If rock or other deleterious materials are encountered bed pipe with 4 inches of Sand on all sides.

3.08 PIPE INSTALLATION

- A. Irrigation lines may be jacked or pulled but cover requirements must be maintained. Jacking of PVC pipe is not permitted in rocky or bar run fill or where there is potential damage to pipes.
- B. Install pipe in accordance with manufacturer's instructions and with the following minimum clearances around pipe:
 1. 2 inch diameter and smaller: 2 inches

2. 2-1/2 inch diameter and larger: 4 inches
 3. Between irrigation and other utilities: 1 foot
- C. Threaded Plastic Pipe Installation:
1. Do not use solvent cement on joints.
 2. Wrap threaded joints with teflon tape. Minimum 4 wraps of tape.
- D. Cemented Plastic Pipe Installation:
1. Cut ends square using approved pipe cutter and bevel cuts with deburring tool.
 2. Clean pipe of scale, sand, dirt, etc. prior to assembling.
 3. Avoid using an excess amount of primer and cement when making joints; particularly on the inside of female pipe ends and fittings.
 4. Wipe off excess cement continuously as it appears on the surface of the pipe after making joints.
 5. Allow fifteen minutes of cure time on joints before moving or handling. Assemble pipe before lowering into trench.
 6. Snake lines to allow for contraction.
 7. Transition pipe sizes at fittings and not bell end of pipes.
 8. Install thrust blocks at 90 degree corners and tees.

3.09 THRUST BLOCK INSTALLATION

- A. Install 2500psi thrust block at pipe corners, tees, ells, and stub outs.
1. Pipe 2 - 3 inches in diameter: 1 cubic foot.

3.10 VALVE INSTALLATION

- A. Install plumb and square, as detailed, and according to manufacturer's specifications.
- B. Manual Drain Valves:
1. Install at mainline low points and at outlet of control valves where laterals run uphill.
 2. Record locations on as-built drawings.
- C. Install 1 valve in each valve box assembly.
- D. Valve Sump: Install a minimum of 2 cubic feet of Pea Gravel below each valve. Allow for 4 inches clearance between bottom of valve and valve sump.

3.11 VALVE BOX INSTALLATION

- A. Install plumb and square with adjacent construction with one valve in each valve box assembly.
- B. At Control Valve Assemblies bolt two valve boxes together as detailed.
- C. Permanently label valve type and zone number on inside of valve box lid.
- D. Set top of valve boxes flush with lawn or mulch at plant beds unless otherwise noted.
- E. Provide 12 square inches (min.) of support on each side of valve box as detailed.

3.12 CONTROL WIRE INSTALLATION

- A. Install wires below irrigation mainline with multiple wires bundled together at 5 foot maximum intervals in a continuous run. Use coded and labeled wires for each valve. Notify Owner's Representative for approval prior if splices are required and locate in valve box.
- B. Provide 48 inches loop in wires at each valve where controls are connected and at 100 foot maximum intervals between. Coil wire around 1/2 inch rebar dowel inside of valve box.
- C. Make electrical joints waterproof using specified connectors. Enclose joints in valve boxes.
- D. Install wire in continuous runs with no splices unless approved.
- E. Show wire routes and approved splice locations on As-Built drawings.
- F. Install wires above grade or independent of the mainline in conduit.

3.13 CENTRAL CONTROL COMMUNICATION WIRE INSTALLATION

- A. Install continuous run of communication wire from Master Valve to Irrigation Controller. Follow same installation procedures as Control Wire Installation. No splicing of wire is permitted.
- B. Install (2) yellow Control Wires from controller to master valve in a single, unspliced length.

3.14 IRRIGATION CONTROL ASSEMBLY INSTALLATION

- A. Install Irrigation Control Assembly in accordance with manufacturer's specifications and applicable codes. Connect to 120V power supply at location shown on drawings and by Owner's Representative.

3.15 MAINLINE PRESSURE TEST AND INSPECTION

- A. Field inspection and testing will be performed under provisions of Section 01 40 00.
- B. Prior to backfilling and installing valves test irrigation mainline for leakage. Establish and maintain 100 psi pressure for 24 hours. Perform test a minimum of 24 hours after set-up of solvent weld. Notify Owner's Representative a minimum of 24 hours for review of pressure gauge at beginning and end of test period. Mainline will be accepted if pressure loss is less than 2 psi.
- C. Following the pressure test but prior to backfilling, notify Owner's Representative for review of pipe, fittings, joints, thrust blocks, bedding, control wire installation, valves, and other materials for installation and water tightness.
- D. After successful pressure test and mainline inspection begin backfilling and assembly of zones and system components.

3.16 BACKFILLING

- A. Remove debris, sharp rocks, and decayable matter from areas to be back filled before proceeding.
- B. Main Lines: Provide 6 inch Sand cover over piping then place Utility Locate Wire the entire length of pipes where control wires are not present. Backfill remainder of trench with Topsoil or Loam.
- C. Lateral Lines: Backfill trench with Topsoil or Loam. Protect piping from displacement.
- D. At Paved Areas: Backfill trench with Sand under paved areas.
- E. Compact backfill in 6 inch lifts to match density of surrounding material. Install backfill to match adjacent elevations.

3.17 FLUSHING

- A. Mainline: Open valves and thoroughly flush piping system under full water head after piping, risers, and valves are installed. Maintain flushing for three minutes. Close valves and cap risers immediately after flushing.
- B. Second Flushing: Flush a second time after installation of lateral lines and sprinklers prior to nozzle installation. Flush under full water head for three minutes. Install nozzles after flushing.

3.18 SPRINKLER HEAD INSTALLATION

- A. Install plumb with top of Topsoil/Loam or Mulch as detailed and at locations shown on drawings. Allow a maximum of 3 inches clearance between sprinkler head and adjacent lawn or planting edge.
- B. Install 1 cubic foot Pea Gravel sump on all low irrigation heads where drainage occurs at zone shutdown.

3.19 IRRIGATION AUDIT

- A. Coordinate Work with an independent Irrigation Auditor retained by the Facilities Services Project Manager. The following results will be provided to the Contractor performing Work of this Section

in a signed report by a certified irrigation auditor in good standing with the Irrigation Association (IA) and in accordance with the IA's Landscape Irrigation Auditor's Handbook.

1. Distribution uniformity for zones
 2. Precipitation rates for zones
 3. Catch can test of each zone with a drawing showing catch can locations
 4. Flow rates, static, and dynamic pressures at each zone
 5. Sentinel data summary spreadsheet.
- B. Coordinate scheduling of irrigation audit at plant beds with the Owner to occur prior to plant material installation.
- C. Provide Irrigation Auditor with marked up drawings, drawn at the original scale of the irrigation plan, showing as-built conditions including:
1. station numbers and locations
 2. sprinkler locations and type
 3. nozzle type and size
- D. Adjust head types, spacing, nozzles, etc. at irrigation zones to achieve a minimum distribution uniformity of:
1. 60% at fixed spray zones
 2. 70% at rotary zones

3.20 SYSTEM REVIEW

- A. Prepare and start system in accordance with manufacturer's instructions. Prior to notifying Owner's Representative for review of the system review zones and make adjustments to ensure full and even coverage.
- B. Notify Owner's Representative for review of system operation to determine if water afforded to all areas is complete, adequate, and uniform.
- C. Adjust system for full water coverage as directed.

3.21 SYSTEM DEMONSTRATION TO OWNER

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.

3.22 CLEANING

- A. Remove excess excavation, backfill materials, and other left over materials from the site. Clean improvements soiled by Work of this Section.

END OF SECTION

PLANTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Soil Material placement.
- C. New trees, plants, and ground cover.
- D. Mulch and Fertilizer.
- E. Maintenance.

1.02 RELATED REQUIREMENTS

- A. Section 01 56 39 - Temporary Tree and Plant Protection.
- B. Section 01 60 00 - Product Requirements.
- C. Section 01 70 00 - Execution and Closeout Requirements.
- D. Section 31 20 00 - Earth Moving.
- E. Section 32 80 00 - Irrigation.

1.03 DEFINITIONS

- A. Weeds: Any plant life not specified or scheduled. Includes seeds and roots.
- B. Plants: Living trees, plants, and ground cover specified in this Section, and described in ANSI Z60.1.

1.04 REFERENCE STANDARDS

- A. Quality definitions, grading tolerances, root system condition, caliper height, branching, budding: ANSI/ANLA Z60.1 - American Standard for Nursery Stock, latest edition.
- B. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2001.
- C. Nomenclature conforms to "Standardized Plant Names," 1942 Edition, published by J. Horace McFarland Co., or "New Sunset Western Garden Book," listed in these references are those used most commonly in the nursery trade.

1.05 Protection

- A. Protect existing improvements and growth in areas to remain undisturbed until completion of project. Leave in similar condition as found.
- B. Maintain benchmarks, monuments, and other reference points. Replace if disturbed or destroyed.
- C. Contact local utility companies for verification of the location of underground utilities within the project area prior to starting excavation. Protect utilities and maintain in continuous operation or in operational condition during work. Repair damage to known utilities or related facilities in an approved manner at Contractor's expense.
- D. Protect drainage inlets and underground drain lines from infiltration or clogging by soils and mulch during construction until Final Completion.
- E. Protect materials of this Section before, during, and after installation. Protect installed work and materials of other trades. In the event of damage make repairs to like new condition. If products are not repairable to like new condition provide replacement.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Maintenance Data: Include written instructions covering yearly recommended maintenance and care of plantings including fertilization, pest and disease control, weed control, mulching, and pruning.
- C. Quality Assurance Data: Submit license information and project references including name and location of previous projects, date of installation, square footage of areas with planting work, and Owner's contact information.
- D. Submit list of plant life sources within 14 calendar days of Agreement Date.
 - 1. Submit confirmation from supplier(s) that specified plant materials, meeting the specifications, have been secured.
 - 2. Include plant name, quantity, size, condition, and name of supplier.
- E. Product Data: Submit manufacturer's printed data for products and a list of suppliers.
- F. Sample: Submit a 2 quart sample of Soil Material with supplier's name and specific location of source. Approval of Soil Material by Owner's Representative is required prior to delivery to the site.
- G. Invoices: Within 2 days of delivery submit invoices, load tickets, and truck measures for Soil Material, Organic Material, and Mulch. Landscape areas will not be accepted until invoices are received by Owner's Representative.

1.07 QUALITY ASSURANCE

- A. Valid Oregon Landscape Contractor's license.
- B. Valid Oregon Landscape Business license.
- C. Herbicide applicators must have valid State of Oregon Herbicide Applicator's license.
- D. Installer Qualifications: Company specializing in installing and planting the plants with 5 projects of comparable scale successfully completed.
 - 1. Submit names, addresses, and dates of previous projects, owners.

1.08 COORDINATION

- A. Coordinate with other trades affecting and affected by Work of this Section.
- B. Pre-Installation Conference: Attend conference to coordinate Work of this Section and other related Sections.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- B. Protect and maintain plant life until planted.
- C. Deliver plant life materials immediately prior to placement. Keep plants moist.
- D. Deliver products in original unopened packaging with legible manufacturer's identification.
- E. Seed containers shall show manufacturer's guaranteed analysis of seed mixture, percentage of purity, year of production, date and location of packaging, name and trademark, and conformance with governing regulations.
- F. Plants may be rejected if:
 - 1. Ball of earth surrounding roots has been dried out, cracked, or broken.
 - 2. Burlap, staves, wire baskets, or ropes required in connection with transplanting have been displaced.
 - 3. Grower or nursery identification labels have been displaced prior to acceptance.

1.10 ENVIRONMENTAL CONDITIONS

- A. Do not install plant life when ambient temperatures is below 32 degrees F or above 90 degrees F.
- B. Do not install plant life when wind velocity exceeds 30 mph.
- C. Do not install plant life when soil becomes saturated.
- D. Install plant materials during periods which are normal for such work as determined by the following:
 - 1. Biological season
 - 2. Specified environmental conditions
 - 3. Accepted practice
 - 4. After all major construction work has been completed
- E. Planting Seasons:
 - 1. Trees: Bare root trees may be planted only between January 15th and March 15th unless otherwise approved.
 - 2. Seeding: Permitted between April 15 and October 15 unless otherwise approved.
 - 3. Other: Permitted during any period, except when prohibited by other portions of this Section.

1.11 Reviews

- A. Request the following reviews by the Owner's Representative a minimum of 2 days in advance:
 - 1. Subgrade preparation
 - 2. Soil Material placement
 - 3. Organic Material placement
 - 4. Finish grading
 - 5. Plant materials
 - 6. Plant material layout
 - 7. Planting mock-up
 - 8. Completion
- B. See Part 3 - Execution for review requirements.
- C. Coordinate all reviews to coincide with regular progress meetings where possible.

1.12 RECORD DOCUMENTS

- A. See Section 01 78 00 - Closeout Submittals
- B. Produce, keep current, and submit legible record documents on a clean set of plans and details supplied by the Owner's Representative. Use white-out and red ink to legibly re-draft actual locations of installed work.

1.13 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year warranty following Final Completion or one full growing season following Final Completion, whichever is later.
- C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.
- D. Inspection: Visit work at least once a month during warranty period. Notify Owner's Representative and Owner in writing of any observed conditions requiring attention. Failure to provide such notification renders any deficiencies the Contractor's responsibility to rectify.
- E. At the end of the warranty period, as directed by Owner's Representative and at no additional cost to the Owner:
 - 1. Replace work not surviving, in poor condition, or not exhibiting satisfactory growth.
 - 2. Lawns must be healthy, dense, uniform, well sodded, and reasonably weed free as judged by the Owner's Representative

3. Reset plant materials which have settled or become un-set
 4. Replace plant materials which appear to be a different species or variety than specified.
 5. Provide noxious weed eradication from imported Soil Material, if required and as specified herein.
 6. Complete warranty work within 30 days of warranty review.
- F. Contractor is not responsible for plant loss or damage to work during warranty period which is caused by unusually extreme weather, vandalism, or Owner's lack of maintenance.

PART 2 PRODUCTS

2.01 PLANTS

- A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.
- B. General:
1. Sizes, grades, and conditions are listed on Plant List. Quantities are shown for Contractor's convenience. Contract is responsible for providing plants drawn on drawings.
 2. Cold storage stock unacceptable.
 3. Free of disease, decay, injury, insects, or indication of strawberry root weevil.
 4. Full foliated when in leaf.
 5. Furnish balled and burlapped (B&B) stock with solid, properly wrapped and secured, natural ball. Stock 2 inch caliper and up to be transported and handled with root ball in wire basket.
 6. Furnish container stock with sufficient roots to insure healthy growth but not root bound. When plant is removed from container soil must hold together and roots must be visible but not encircling.
 7. Free from Weeds or strawberry root weevil.
 8. Field grown trees and shrubs must have been transplanted or root pruned at least once no more than two years prior to this Contract.
 9. Container stock may be substituted for Balled and Burlapped (B&B) or Bare Root (BR) stock at any time.
 10. Container or B&B stock must be substituted for BR stock if installation season prohibits use of BR stock.
- C. Trees shall have:
1. Single, straight, uniformly tapering trunks which are perpendicular to the ground, unless specified as multi-stemmed or otherwise on Plant List. Trees with co-dominant, damaged, crooked, or topped leaders will be rejected.
 2. Healthy and vigorous overall condition.
 3. Full and even branch distribution; structural scaffold branches at least 4 inches apart where they attach to the main trunk.
 4. Well developed root systems. Trees with more than 2 inches of root ball soil covering root flare will be rejected.
 5. Grafts near ground level.
 6. Minimum/maximum branching heights above the ground unless specified otherwise on Plant List:
 - a. 2 inch caliper tree: 5' - 7'
 - b. 1.5 inch caliper tree: 4' - 6'
 7. Conifers shall also have full, even branching to ground level and intact single leader.
 8. Trees shall be free of:
 - a. Major structural defects including, but not limited to, branches with narrow angle of attachment (less than 40 degrees to the trunk), bark with major branch unions, and trees with co-dominant leaders.
 - b. Poor pruning practices including, but not limited to, stubbed branches and topped leader.
 - c. Damage to the trunk, branches, and root system including, but not limited to, bark abrasions, sun scald, and disfiguring knots.
 9. Trees shall be freshly dug during the most recent favorable harvest season.

2.02 SOIL MATERIALS

- A. Topsoil: On-site soil, natural, fertile, friable; free of rock, clay, subsoil, clods, lumps, plants, roots, sticks, weeds, seeds, and other deleterious material, as approved. Re-use stockpiled Topsoil as practical.
- B. Imported Soil at Lawns: Imported, natural, fertile, friable; free of rock, clay, subsoil, clods, plants, roots, sticks, weeds, seeds, and other deleterious material including any evidence of horsetail. Shall conform to USDA soil texture class "sandy loam".
 - 1. Approved Products:
 - a. 'Ball Field Loam' by Eugene Sand and Gravel, or approved.
- C. Imported Soil at Plant Beds: Imported, blended, organic soil mix composed of loam, sand, and compost.
 - 1. Approved Products:
 - a. Primary Planting Soil by Rexius Inc, Eugene, Oregon.
 - b. Frugal Planting Soil by Lane Forest Products, Eugene, Oregon.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Imported Soil at Rain Gardens:
 - 1. Refer to Civil Engineer.

2.03 SOIL AMENDMENT MATERIALS

- A. Lawn Installation Fertilizer: Uniform composition, dry, and free flowing of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
 - 1. Nitrogen: 16 percent. (source of Nitrogen to be methyl-urea based)
 - 2. Phosphoric Acid: 16 percent.
 - 3. Soluble Potash: 16 percent.
 - 4. Do not use within 50 feet of water.
- B. Lawn Maintenance Fertilizer: Uniform composition, dry, and free flowing of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
 - 1. Nitrogen: 25 percent. (30% Nitrogen from slow release)
 - 2. Phosphoric Acid: 5 percent.
 - 3. Soluble Potash: 10 percent.
 - 4. Do not use within 50 feet of water.
- C. Plant Bed Maintenance Fertilizer: Uniform composition, dry, and free flowing of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
 - 1. Nitrogen: 16 percent. (Source of Nitrogen to be methyl-urea based)
 - 2. Phosphoric Acid: 16 percent.
 - 3. Soluble Potash: 16 percent.
 - 4. Do not use within 50 feet of water.
- D. Planting Tablets:
 - 1. Product: Sierra Chemical "Agriform" with 20-10-5 chemical analysis, or similar.
- E. Micorrhizal Fungi:
 - 1. MycroApply® All Purpose Granular by Micorrhizal Applications Inc, Grants Pass, Oregon (541-476-3985), or similar.
- F. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.
- G. Organic Material: 100% organic materials following guidelines and tested to meet the US Composting Council's seal of testing assurance.
 - 1. Products: Garden Compost by Rexius Inc or Lane Forest Products, Eugene, Oregon.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GRASS SEED

- A. Certified Oregon Blue Tag Free of Weed seed with dealer's statement analysis guarantee.

- B. Current or latest season's crop labeled in conformance with State and US Department of Agriculture laws and regulations:
 1. Purity: 98% by weight
 2. Germination: 90%
- C. Products:
 1. Lawn Seed:
 - a. Natural Knit by Ledebouer Seed LLC, 503-678-7333, Aurora, Oregon, or approved.

2.05 MULCH MATERIALS

- A. Mulch Material at Plant Beds:
 1. Products: Quarter Coarse Fir Bark from Lane Forest Products, Eugene, Oregon, or approved.

2.06 ACCESSORIES

- A. Wrapping Materials: Burlap.
- B. Stakes: 2 x 2 inch x 8 feet wood stakes, capable of at least 2 years ground burial, stained charcoal or black.
- C. Tree Ties: Chain lock tree ties, 1 inch wide, or approved.

2.07 HERBICIDE

- A. Broad Spectrum Non-Selective: Buccaneer Plus, or similar.
- B. Selective for Broadleaves: Speed Zone, Weed-B-Gone, or similar.
- C. Selective for Grasses: Envoy or similar.

2.08 SOURCE QUALITY CONTROL

- A. Provide testing of imported Soil Material to determine USDA classification.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to installation of Work of this Section, carefully inspect the work of others and verify that such work is complete to the point where this installation may properly commence.
- B. Verify that materials and surfaces to receive work specified herein are accurately sized, shaped, and located; sound, secure, true, complete, and otherwise properly prepared.
- C. Verify subgrades produce positive drainage and allow for placement of Soil Material, Ammendments, and Mulch to specified depths.
- D. Do not install Work of this Section until all unsatisfactory conditions have been corrected. Beginning Work of this Section signifies acceptance of existing conditions.

3.02 TOLERANCES

- A. Perform earthwork true to lines and grades, and to prevent ponding of water, with maximum variation in elevations of +/- 1/2 inch at subgrades and +/- 1/4 inch at finish grades.
- B. Compacted thickness of materials within 1/4 inch of specified thickness.

3.03 PREPARATION OF SUBGRADE

- A. Prepare subsoil to eliminate uneven areas or low spots. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots, stones, rock, and dirt clods. Remove contaminated subsoil.

- C. Scarify subsoil to a depth of 4 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- D. Verify subgrades, whether comprised of subgrade soil or fill drain freely. Test area by flooding with Owner's Representative present. Where water does not drain freely auger a 10 inch hole, minimum 1 per 1,000 square feet, through fill material and into subsoil, or minimum 4 feet deep into subsoil to establish positive drainage.
- E. Verify subgrades allow for placement of Soil Material, Amendments, and Mulch to depths specified.
- F. Notify Owner's Representative for Subgrade Preparation Review prior to placing Soil Material.

3.04 PLACING SOIL MATERIAL

- A. Soil Placement Schedule:
 - 1. At Plant Beds: 18 inches minimum depth.
 - 2. At New Lawns: 12 inches minimum depth.
 - 3. At Rain Gardens: Refer to Civil Drawings and Specifications.
 - 4. Place additional Soil Material as required to establish finish grades shown on drawings and to fill in depressions, blend grades, and produce positive drainage.
- B. Place Soil Material during dry weather and on dry unfrozen subgrade. Suspend Soil Material placement if subgrade or Soil Material become saturated.
- C. Phase Soil Material placement so that equipment does not travel over Soil Material already installed.
- D. Place Soil Material in a relatively dry state to depths specified at locations shown on Drawings:
 - 1. Remove stones, roots, grass, weeds, debris, and foreign material while spreading.
 - 2. Manually spread around existing trees, paving, and other structures to prevent damage.
 - 3. Establish levels, profiles, slopes, contours, and uniform gradients between given grade points as shown on Drawings.
 - 4. Eliminate uneven or low spots at lawns and plant beds.
 - 5. Fine grade Soil Material within specified tolerances.
- E. Use stock piled Topsoil in the following order of hierarchy:
 - 1. New Lawns.
 - 2. Plant Beds.
- F. Notify Owner's Representative for Soil Material Placement Review prior to proceeding with Work.

3.05 INITIAL WEED CONTROL

- A. Inspect plant beds and lawns for the presence of weeds. If weeds are present apply broad spectrum herbicide.
- B. During herbicide application ensure safety and environmental precautions are taken and best management practices are employed. Adjust procedures adjacent to waterways.

3.06 SOIL PREPARATION AND FINISH GRADING

- A. Remove debris, sticks, roots, clods, stones, and soils contaminated by petroleum products at plant beds and lawns. Rake smooth, eliminate uneven areas or low spots in Soil Material, and set grades for positive drainage.
- B. Scarify subgrade to a depth of 6 inches prior to placing Soil Material. Do not allow the subgrade to become compacted after scarifying.
- C. At plant beds:
 - 1. Apply herbicide to remove weeds as described in Initial Weed Control.
 - 2. If native stock piled topsoil is used:
 - a. Spread 3 inches Organic Material over entire plant bed. Organic Material must be incorporated immediately into plant beds, no stock piling is permitted.

- b. Notify Owner's Representative for Organic Material Placement Review prior to proceeding with tilling and planting.
 - c. Thoroughly rototill Organic Material into the top 6 inches of Soil Material, except within 10 feet of existing trees and Tree Protection zones where plants will be pocket planted.
 - 3. If imported Soil Material is used eliminate placement of Organic Material.
 - 4. Rake smooth and reset finish grades eliminating uneven or low spots in plant beds and setting grades for positive drainage. Ensure grades at edges of plant beds allow for placement of Mulch Material to specified depths and as detailed.
- D. At trees:
- 1. Use Imported Soil at Plant Beds for backfilling trees.
- E. At lawns:
- 1. Apply herbicide to remove weeds as described in Initial Weed Control.
 - 2. Spread Lawn Installation Fertilizer at the rate of 15 lbs per 1000 square feet.
 - 3. Rototill to a minimum depth of 4 inches, except within Tree Protection zones.
 - 4. Set finish grades to ensure that finish grade of lawn will be flush with surrounding surfaces.
 - 5. Establish a friable, fine textured seed bed free of bumps and depressions immediately before seeding.
 - 6. Firm seed bed with a lawn roller making passes in 2 directions.
- F. Notify Owner's Representative for Finish Grading Review prior to proceeding with Work.

3.07 SECOND WEED CONTROL

- A. After completion of Soil Preparation and finish grading commence irrigation of all plant beds, lawns, and erosion control grass areas. If weeds are present apply broad spectrum herbicide.
- B. Wait ten days minimum and inspect all plant beds and lawn areas for the presence of any additional weeds. If weeds are present, apply a second application of Herbicide to affected areas and delay planting until all weeds are dead.
- C. During herbicide application ensure safety and environmental precautions are taken and best management practices are employed. Adjust procedures adjacent to waterways.

3.08 INSTALLATION OF PLANT MATERIAL

- A. Plant Material Review: Notify Owner's Representative prior to the delivery of all trees and plant materials to the site but prior to installing plants. Owner's Representative will review quality of plant materials and reject plant materials not in compliance the the Plant List and Specifications. This review is preliminary. Final approval of plants materials will not be given until Completion Review.
- B. Plant Material Layout Review: Layout plant material (in containers or B&B) at plantbeds for review prior to installation. Notify Owner's Representative for review of plant material layout prior to commencement of planting. The plant material layout review may occur concurrently with the planting mock-up review. Adjust plant materials as directed.
- C. Planting Mock-Up Review: Notify Owner's Representative prior to commencement of planting. Install an initial 500 square feet sample of typical plantings for review. Adjust planting procedure as directed.
- D. Tree Planting:
 - 1. Soak container grown, B&B, and BR plants before planting.
 - 2. Remove extra soil on top of root ball to expose flare of first buttress root. Root flare must be visible at top of root ball.
 - 3. Dig individual planting holes circular with vertical sides as shown on Planting Detail.
 - 4. Save and thoroughly loosen soil removed from planting hole and use as backfill around tree. Backfill trees with specified mixture if additional Soil Material is needed.
 - 5. Sprinkle micorrhizal fungi to surface of planting holes at rate of 2-4 ounces per inch of stem caliper.
 - 6. Install Planting Tablet at trees at manufacturer's recommended high rate.

7. Lift trees by wire basket only. Do not lift trees by trunk or use trunk as a lever to position or move tree.
 8. Set B&B trees in the hole with the north marker facing north unless otherwise approved.
 9. Set root crown as shown on Planting Detail not less than 3 inches above surrounding finish grade.
 10. Cut and completely remove twine and other fasteners from root ball. Remove burlap from top half of root ball. Remove all burlap if not biodegradable. Neatly cut off broken or frayed roots.
 11. Remove top half of wire basket after planting.
 12. Stake trees as shown on Planting Detail.
- E. All other Plants:
1. Soak container grown, B&B, and BR plants before planting.
 2. Dig individual planting holes with circular and with vertical sides 1-1/2 inch shallower than depth of root ball.
 3. Dig holes for pocket-planted shrubs 3 times the diameter of the rootball.
 4. Sprinkle micorrhizal fungi to surface of planting holes at the following rates:
 - a. #SP4 container - 1 tablespoon
 - b. #1 container - 2 tablespoons
 - c. #3 container - 3 tablespoons
 - d. #5 container - 5 tablespoons
 5. Install Planting Tablet at shrubs and ground covers at manufacturer's recommended high rate.
 6. Cut circling roots with a sharp knife.
 7. Set root crowns 1-1/2 inch above surrounding grade and as detailed.
- F. Plants set too deeply will be rejected. Reset plants that have settled.
- G. Set Plants plumb and for best appearance.
- H. Carefully tamp soil under and around root balls and bare roots to prevent settlement.
- I. Backfill pocket-planted plants with Soil Material.
- J. Flood hole when half backfilled and tamp soil between bare roots.
- K. Complete backfilling and tamp soil between bare roots.
- L. Thoroughly water each plant and entire bed immediately after planting.
- M. Remove all tags, labels, strings, etc. from plants.
- N. Prune Plant Material to remove dead, broken, or damaged branches.
- O. Rake plant beds smooth, resetting finish grades for positive drainage and eliminating uneven or low spots.

3.09 MULCH INSTALLATION

- A. Install 3 inch minimum depth Mulch within 24 hours after planting at plant beds and trees as shown on drawings and details.
- B. Remove excess Mulch from foliage of plant materials and from bark of trees. Mulch must not be placed within 3 inches of tree trunks. Remove mulch from adjacent surfaces and produce edges shown on Details.

3.10 LAWN INSTALLATION

- A. Install lawns using one of the following methods:
 1. Hydroseeding:
 - a. Mix components are the following rates and apply uniformly and completely:
 - 1) Seed: 8 lbs per 1000 square feet
 - 2) Lawn Installation Fertilizer: 15 lbs per 1000 square feet

- 3) Sufficient hydromulch to keep areas moist during germination and protect seed from wind erosion.
- b. Ensure all equipment, including hoses, is clean and contains only the specified seed.
- B. Apply water with fine spray immediately after each area is sown.
- C. Provide a temporary barrier at the limits of newly planted lawns.

3.11 TREE PRUNING

- A. Perform pruning of trees as recommended in ANSI A300.
- B. Prune newly planted trees as required to remove dead, broken, and split branches.

3.12 MAINTENANCE

- A. At Plant Beds during period between installation and Final Completion:
 1. Water, fertilize, weed, reset unstable or disturbed plants, and perform other maintenance necessary to assure healthy growth.
 2. Install Plant Bed Maintenance Fertilizer at a rate of 6 lbs per 1000 square feet 45-60 days after installation. Adjust timing for seasonal requirements of plant materials.
 3. Thoroughly water immediately after applying Plant Bed Maintenance Fertilizer.
 4. Repair and regrade erosion damage .
 5. Provide continued weed control and removal until any weed problem is fully eradicated.
- B. At lawns during period between installation and Final Completion:
 1. Water, weed, mow, reseed, top dress, and fertilize as necessary to establish a healthy, dense, uniform, weed free stand of grass; maintain at 2 inches high. This includes unirrigated lawns, unless otherwise noted on drawings.
 2. Conduct first mowing after grass is firmly rooted and secure. Mow grass when it exceeds 2 inches in height, cutting no more than 1/3 of the grass height at a time. Remove all clippings.
 3. Maintain surfaces and supply additional Soil Material and Seed where necessary.
 4. After first mowing apply Lawn Maintenance Fertilizer at a rate of 8 lbs per 1000 square feet. Thoroughly water after application.
 5. Apply Herbicide (selective) to remove weeds.

3.13 CLEANING

- A. Remove excess materials from site. Protect drain inlets and underground piping as necessary and clean improvements soiled by Work of this Section.

3.14 COMPLETION REVIEW

- A. Notify Owner's Representative for Completion Review when Work of this Section is complete.

END OF SECTION

WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service, fire-service mains, and combined water service and fire-service mains.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Valves and accessories
 - 2. Water meters and accessories
 - 3. Backflow preventers and assemblies.
 - 4. Fire hydrants.
 - 5. Fire department connections.
 - 6. Pipe.
- B. Field quality-control test reports.
- C. Operation and maintenance data for the following:
 - 1. Water meters
 - 2. Valves
 - 3. Backflow preventers
 - 4. Hydrants
- D. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

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 unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of water-distribution service without Architect's written permission.

1.5 COORDINATION

- A. Coordinate connection to water main with EWEB.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, 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 and ASTM B 88, Type L, 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. PVC, AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket, and with spigot end.
 1. Comply with UL 1285 for fire-service mains if indicated.
 2. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Gaskets: AWWA C111, rubber.

2.2 JOINING MATERIALS

- A. Refer to Section 33 05 00 "Common Work Results for Utilities" 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.
- D. Soldering Flux: ASTM B 813, water-flushable type.
- E. Solder Filler Metal: ASTM B 32, lead-free type with .20 percent maximum lead content.

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. AWWA, 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. 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. Crane Co.; Crane Valve Group; Stockham Div.
 - e. East Jordan Iron Works, Inc.
 - f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
 - g. McWane, Inc.; Kennedy Valve Div.
 - h. McWane, Inc.; M & H Valve Company Div.
 - i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.
 - j. Mueller Co.; Water Products Div.
 - k. NIBCO INC.
 - l. U.S. Pipe and Foundry Company.
 - 3. Nonrising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.
 - 4. Nonrising-Stem, Resilient Wedge Gate Valve:
 - a. Description: ductile iron body bonnet and wedge. The wedge shall be encapsulated in rubber.
 - 1) Standard: AWWA C515.
 - 2) Minimum pressure rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior coating: Complying with AWWA C550.
 - 5. OS&Y, Rising Stem, Resilient-Seated Gate Valves.
 - a. Description: Ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C515.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.
 - 6. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

- a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Flanged.

- B. 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. 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).McWane, Inc.; Kennedy Valve Div.
 - e. McWane, Inc.; M & H Valve Company Div.
 - f. Mueller Co.; Water Products Div.
 - g. NIBCO INC.
 - h. U.S. Pipe and Foundry Company.
 - 3. UL/FMG, Nonrising-Stem Gate Valves:
 - a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.
 - 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig.
 - 3) End Connections: Flanged.
 - 4. OS&Y, Rising-Stem Gate Valves:
 - a. Description: Iron body and bonnet and bronze seating material.
 - 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig.
 - 3) End Connections: Flanged.

- C. Bronze 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Div.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Red-White Valve Corporation.
 - 3. OS&Y, Rising-Stem Gate Valves:
 - a. Description: Bronze body and bonnet and bronze stem.
 - 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig.
 - 3) End Connections: Threaded.
 - 4. Nonrising-Stem Gate Valves:

- a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
 - 1) Standard: MSS SP-80.

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.
- B. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 WATER METERS

- A. Water meters will be furnished by utility company.

2.7 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
 - 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Regulator Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Water Technologies, Inc.
 - f. Wilkins; a Zurn company.
 - 3. Standard: AWWA C511.
 - 4. Operation: Continuous-pressure applications.
 - 5. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
 - 6. Size: As shown on plans
 - 7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved, steel with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 - 8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 9. Configuration: Designed for horizontal, straight through flow.
 - 10. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
- B. Double-Check, Backflow-Prevention Assemblies:
 - 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:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Regulator Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Water Technologies, Inc.

- f. Wilkins; a Zurn company.
 - 3. Standard: AWWA C510.
 - 4. Operation: Continuous-pressure applications, unless otherwise indicated.
 - 5. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
 - 6. Size: As shown on plans
 - 7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved, steel with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 - 8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 9. Configuration: Designed for horizontal, straight through flow.
 - 10. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
- C. Double-Check Detector, Backflow-Prevention Assemblies:
- 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. Ames Fire & Waterworks; a division of Watts Regulator Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Water Technologies, Inc.
 - f. Wilkins; a Zurn company.
 - 2. Standard: AWWA C510.
 - 3. Operation: Continuous-pressure applications, unless otherwise indicated.
 - 4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
 - 5. Size: As shown on plans
 - 6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved, steel with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 - 7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 - 8. By-pass meter reading: gallons/min.
 - 9. Configuration: Designed for horizontal, straight through flow.
 - 10. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

2.8 WATER METER BOXES

- A. Water meter boxes will be furnished by EWEB.

2.9 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for H-20 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. Hatch: Diamond plate aluminum or galvanized steel door. See plans for model number and/or size.
 - 3. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
 - a. Dimension: 24-inch-minimum diameter, unless otherwise indicated.
 - 4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.
 - 5. Riser extensions: Provide riser extensions matching vault size as necessary to match proposed grades.

2.10 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. Available Manufacturers: Subject to compliance with requirements of the City of Eugene.
2. Description: Freestanding, with one NPS 5-1/2 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. Outlet Threads: NFPA 194, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
4. Operating and Cap Nuts: Pentagon, one piece design with weather cap or seals, 1-1/2 inches point to flat.
5. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise. Valve shall be in the up position when closed.
6. Exterior Finish: Safety yellow.
7. Lubricate operating stem; either an oil reservoir or pressure lubrication fitting.
8. The main valve's drain shall be of non-corrosive metal with rubber drain valve facings.
9. All packaging glands and seals shall be O-ring type.
10. Hydrant shall not have any type of cap retainer chains or devices.
11. Hydrant shall be a high profile design with 30 inch minimum dimension from the top of the hydrant to the bury line at approximately 3 inches below the break flange.

2.11 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire End & Croker Corporation.
 - c. Guardian Fire Equipment, Inc.
 - d. Kidde Fire Fighting.
 - e. Potter Roemer.
 - f. Reliable Automatic Sprinkler Co., Inc.
3. Description: Exposed, Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high brass sleeve; and round escutcheon plate.
 - a. Standard: UL 405.
 - b. Connections: Two NPS 2-1/2 inlets and one NPS 6 outlet.
 - c. Inlet Alignment: Inline, horizontal.
 - d. Finish Including Sleeve: Polished bronze.
 - e. Exterior Finish: Red or orange OSHA safety colors.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 31 20 00 "Earth Moving" 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.
- 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:
 - 1. Soft copper tube, ASTM B 88, Type K or ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Underground water-service piping NPS 4 and NPS 12 shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 2. NPS 4 to NPS 12: PVC, AWWA C900 Class 150 pipe; PVC, AWWA Class 150 ductile iron, mechanical-joint fittings; and gasketed joints.
- G. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical, or ductile-iron-pipe appurtenances joints.
 - 2. PVC, AWWA Class 150 pipe listed for fire-protection service ductile iron fittings of same class as pipe; and gasketed joints.
- H. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be ductile-iron, flanged-end pipe; ductile-iron-pipe appurtenances; and flanged 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. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
 - 3. 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, resilient seated, or UL/FMG, cast iron, OS&Y rising stem.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. See Section 33 05 00 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. 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."
- D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
- E. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- F. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.
- G. 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 within 5 feet of 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.
- 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, mechanical restraints, and other supports.

3.6 JOINT CONSTRUCTION

- A. See Section 33 05 00 "Common Work Results for Utilities" 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. 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.
 - 4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.7 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.
- 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.

3.8 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. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.

3.10 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick, concrete piers, or pipe supports.

3.11 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.

3.12 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891 and manufacturer's recommendations.

3.13 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. AWWA Fire Hydrants: Comply with AWWA M17.

3.14 CONNECTIONS

- A. Connect water-distribution piping to water main in accordance with utility provider's requirements.

3.15 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.

3.16 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 UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: gravity-flow, nonpressure and force-main, pressure sanitary sewerage outside the building, with the following components:
 - 1. Pipe and fittings.
 - 2. Nonpressure and pressure couplings.
 - 3. Cleanouts.
 - 4. Manholes.

1.2 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Cleanouts
 - 2. Pipe material.
 - 3. Mechanical plugs.
- 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. Field quality-control reports.

1.4 PROJECT CONDITIONS

- A. Site information: Research public utility records and verify existing utility locations prior to ordering any materials. Notify the Architect immediately if any discrepancies are found in the project survey.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.3 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, 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 C11, rubber.

2.4 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 solvent-cemented or 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 100, Class 150, and Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
 2. Fittings: Ductile iron, compact fittings complying with AWWA C153 for push-on joints and using AWWA C111, rubber gaskets.
 3. Gaskets: 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 Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 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. Cleanouts: At grade cleanouts shall have an adjustable sleeve-type housing, a threaded brass plug with counter sunk slot, and cast iron frame and cover.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fittings and riser to cleanout.

2.7 MANHOLES

- A. Standard Precast Concrete Manholes:
 1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints rubber gasketed 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 if site conditions warrant and/or as shown in plans.
 4. Base Section: 6-inch minimum thickness for floor slab and 5 inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
 5. Riser Sections: 5-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. Gaskets: ASTM C 443 (ASTM C443M), rubber or preformed plastic.
 8. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 9. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

10. Steps: FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP or 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-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
11. Adjusting Rings: Interlocking rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
12. 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; 23-inch ID by 3- to 7-inch riser, with 3 ¼ -inch- minimum-width flange and 24 ¾-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 or ASTM A 48/A 48M, Class 35 gray iron designed for heavy duty service 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: 3000 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. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 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: Uniform slope through manhole to match invert elevations per plans, minimum 2 percent.
2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 8 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.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Pipe couplings and 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. Unshielded or 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.
- B. Gravity-flow, Nonpressure Sewer Piping: Use any of the following pipe materials for each size range.
 - 1. NPS 4 to NPS 15: PVC sewer pipe and fittings gaskets, and gasketed joints.

3.3 PIPING INSTALLATION

- A. Install tracer wire directly over piping and at outside edges of underground structures. See Section 31 20 00 "Earth Moving" for tracer wire material requirements.
- B. 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.
- C. 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.
- D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- E. 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.
- F. Install gravity-flow, nonpressure, sewer piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1percent unless otherwise indicated.
 - 2. Install piping with 36-inch minimum cover.
 - 3. Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 4. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
- G. 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.
- H. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.4 PIPE JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Section 33 05 00 "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Join PVC corrugated sewer piping according to ASTM D 2321.
 - 2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 - 3. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.
 - 4. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.

- C. 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.

3.5 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 for manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.7 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use pipe fittings in sewer pipes at branches for cleanouts, and use PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 - 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, per the Detail. 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.

3.8 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drain. Use transition fitting to join dissimilar piping materials.
- 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 core drilling into existing unit. Make connection into existing pipe using an "Inserta-Tee" fitting per the manufacturer's recommendations or approved equal. Make connection to existing manhole using round rubber gasket installed on the pipe per the manufacturer's instructions. Cut end of connection pipe passing through the manhole wall to conform to the shape of and be flush with the inside wall unless otherwise indicated. The opening around the gasket shall be grouted to a watertight seal. Existing manhole inverts, flow lines, channels, etc. shall be chipped out and re-grouted to accommodate the new pipe.

- 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.
- C. Connect to grease, oil, and sand interceptors.
- D. Make connections to existing piping and underground structures so finished Work complies with requirements specified for new Work.

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.
- 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. Allowable leakage is maximum of 50 gal. /inch of nominal pipe size per mile of pipe, during 24-hour period.
 - c. Close openings in system and fill with water.
 - d. Purge air and refill with water.
 - e. Disconnect water supply.
 - f. Test and inspect joints for leaks.
 - g. Option: Test concrete gravity sewer piping according to ASTM C 924.
 - 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.
 - 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. Flush with potable water.

END OF SECTION

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes gravity-flow nonpressure storm drainage outside the building, with the following components:
 - 1. Pipe and fittings.
 - 2. Trench Drains.
 - 3. Cleanouts.
 - 4. Nonpressure transition couplings.
 - 5. Backwater valves
 - 6. Stormwater inlets.
 - 7. Pipe outlets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Backwater valves.
 - 2. Cleanouts.
 - 3. Inlets.
 - 4. Pipe.
 - 5. Fittings.
 - 6. Drains.
 - 7. Trench Drains.
- B. **Shop Drawings:**
 - 1. Stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
 - 2. Pre-cast concrete structures, including frames and covers.
- C. Field quality-control reports.

1.3 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Architect's written permission.
- B. Site Information: Research public utility records, and verify existing utility locations prior to ordering any materials. Notify Architect immediately if any discrepancies are found in the project Survey.

PART 2 - PRODUCTS

2.1 Refer to Part 3 "Piping Applications" for applications of pipe, fitting, and joining materials.

2.2 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, 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.

2.3 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.

2.4 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.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C 443, 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. 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. Shielded, Flexible Couplings:
 - 1. 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.
- E. Ring-Type, Flexible Couplings:
 - 1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 CLEANOUTS

- A. Plastic Cleanouts:
 - 1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 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. 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.

2.7 PIPE OUTLETS

- A. Riprap Basins: as shown on Plans.

2.8 TRENCH DRAINS

- A. Trench drains to be KlassikDrain as manufactured by ACO, or approved equal.
 - 1. Load Class A pedestrian, in non-vehicular access areas.
 - 2. Load Class C commercial, in vehicular access areas and fire lane.
 - 3. 0.6 percent pre-slopes channel bottom.

PART 3 - EXECUTION**3.1 EARTHWORK**

1. Excavation, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving." Install tracer wire directly over piping and at outside edges of underground structures. See section 31 20 00 "Earth Moving" for tracer wire material requirements.

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 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.
- D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.
- E. Install gravity-flow, nonpressure drainage piping according to the following:
 1. Install piping pitched down in direction of flow at a minimum slope of 1 percent, unless otherwise indicated.
 2. Install piping with 36-inch minimum cover, unless otherwise indicated.
 3. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 4. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 5. Install piping below frost line.
- F. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 1. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 2. Join PVC corrugated sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints.
 3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, as indicated on plans. 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 OVERFLOW INLET INSTALLATION

- A. Set frames and grates to elevations indicated.

3.6 STORMWATER OUTLET INSTALLATION

- A. Construct riprap as indicated.

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 Section 22 14 13 "Facility Storm Drainage Piping."
- 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 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.
- C. Pipe couplings and expansion joints 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. Unshielded or 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.

3.9 IDENTIFICATION

- A. Install green tracer wire directly over piping and at outside edges of underground structure. See Section 31 20 00 "Earth Moving" for tracer wire material requirements.

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. Option: Test plastic piping according to ASTM F 1417.
- 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.

END OF SECTION

SUBDRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building Perimeter Foundation Drainage Systems.
- B. Filter aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

- A. Section 31 20 00 - Earth Moving: Excavation and fill.

1.03 REFERENCE STANDARDS

- A. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe drainage products, pipe accessories, and filter fabric.
- C. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

1.05 LEED REQUIREMENTS

- A. LEED Project Goals:
 - 1. See Section 01 81 13 - LEED Requirements.
- B. Requirements of the following LEED credits are mandatory for the work of this Section in order to achieve LEED certification:
 - 1. Indoor Environmental Quality Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.
- C. Requirements of the following LEED credits contribute cumulatively toward LEED certification:
 - 1. Materials and Resources Credit 4 - Recycled Content.
- D. Submittals: Submit required LEED documentation for Mandatory and Contributing credits:

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Polyvinyl Chloride Pipe: ASTM D2729; plain end, 6 inch inside diameter; with required fittings.
- B. Use perforated pipe at subdrainage system; unperforated through sleeved walls. Sub

2.02 AGGREGATE AND BEDDING

- A. Filter Aggregate and Bedding Material: Open graded Fine Granular fill as specified in Section 31 23 33.

2.03 ACCESSORIES

- A. Pipe Couplings: Solid plastic.
- B. Filter Fabric: Water pervious type, black polyester; non-biodegradable, woven .

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavated base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with crushed rock specified in Section 31 20 00 - Earth Moving.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- B. Place drainage pipe on clean cut subsoil.
- C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Place pipe with perforations facing down. Mechanically join pipe ends.
- E. Install pipe couplings.
- F. Install Open Graded Granular Fill at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.
- G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
- H. Place aggregate in maximum 4 inch lifts, consolidating each lift.
- I. Connect to storm sewer system with unperforated pipe .

3.04 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspection and testing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION