NORTH CAMPUS OREGON STATE HOSPITAL DEMOLITION PROJECT

SPECIFICATIONS

Oregon State Hospital
2600 Center Street NE
Salem, Oregon 97301

September 2016

DAS Project No. 2000.063

Prepared for:
Oregon Department of Administrative Services
Facilities Enterprise Asset Management
Salem, Oregon

Prepared by:
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Portland, Oregon

HHPR
Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

North Campus Oregon State Hospital Demolition Project

The plan drawings ("Drawings") and specifications ("Specifications") have been prepared by a multi-discipline team including subconsultants. The following is a general list of responsibilities and the Specifications that each firm prepared:

Capitalized terms used in these Specifications, if not defined herein, have the meanings provided in the ITB and exhibits to the ITB.

Owner – Project management and multi-disciplinary team coordination.

Contact: Larry Befus, Senior Project Manager
(503) 373-7110
larry.befus@state.or.us

Harper Houf Peterson Righellis, Inc., an Oregon corporation ("HHPR" or "Engineer"). HHPR was the prime consultant for the development of these Specifications and the Drawings. HHPR provided consulting civil engineering design including project management, utility coordination, survey, erosion control, and permit coordination. HHPR compiled the Specifications and provided related input or information. HHPR's subcontractors are listed below.

Contact: Beau Braman, P.E., Project Engineer
(503) 221-1131
beaub@hhpr.com

Interface Engineering, Inc., an Oregon corporation ("Interface Engineering"). Interface Engineering provided mechanical, electrical, and plumbing demolition design related to the Specifications.

Contact: Steven Dacus, MEP Engineer
(503) 382-2661
steved@interfaceeng.com

GeoEngineers, Incorporated, a Washington corporation ("GeoEngineers"). GeoEngineers provided geotechnical field exploration and laboratory testing to provide a general site characterization for potential future development. GeoEngineers also provided analysis and design recommendations in a geotechnical report related to the Specifications.

Contact: Julio Vela, Geotechnical Engineer
(503) 624-9274
jvela@geoengineers.com

Morgan Holen & Associates, LLC, an Oregon limited liability company ("Morgan Holen"). Morgan Holen provided tree inventory and coordination regarding tree removal and retention. Morgan Holen produced an arborist report summarizing the tree inventory and recommendations for tree protection related to the Specifications.

Contact: Morgan Holen, Arborist
(971) 409-9354
morgan.holen@comcast.net

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PART 1 - GENERAL

1.1 Summary

A. Section Includes:

1. Related Documents.
2. Project information.
3. Work covered by Contract Documents.
4. Phased construction.
5. Work by Owner.
6. Work under separate contracts.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and Drawing conventions.

1.2 Related Documents

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

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 Project Information

A. Project Identification: North Campus Oregon State Hospital Demolition Project, Project No. DAS 2000.063

1. Project Location: 2600 Center St. NE, Salem, Oregon 97301

B. Owner: State of Oregon, Department of Administrative Services
Facilities Enterprise Asset Management
1225 Ferry St. NE, U100, Salem, Oregon 97301
Contact: Larry Befus – (503) 373-7110

C. Civil Engineer: Harper Houf Peterson Righellis, Inc.
205 Spokane St. SE, Suite 200, Portland, Oregon 97202
Contact: Beau Braman – (503) 221-1131

D. Engineer's Consultants: Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. MEP Engineer: Interface Engineering
100 Main St. SW, Suite 1600, Portland, Oregon 97204
Contact: Steve Dacus – (503) 382-2661
2. Geotechnical Engineer: GeoEngineers
15055 Sequoia Pkwy SW, Suite 140, Portland, Oregon 97209
Contact: Julio Vela – (503) 624-9274
3. Arborist: Morgan Holen
3 Monroe Pkwy, Suite P 220, Lake Oswego, Oregon 97035

Contact: Morgan Holen – (971) 409-9354

E. Other Owner Consultants:

1. Environmental Engineer: PBS Engineering and Environmental Inc., an Oregon corporation

   4412 Corbett Ave SW, Portland, Oregon 97239

   Contact: Steven Dilling – (503) 417-7576

   a. PBS Engineering and Environmental ("PBS") is under a separate contract with Owner to perform a hazardous material abatement design for the existing buildings prior to demolition, and is not a subcontractor for this part of the overall project.

1.4 Work Covered By Contract Documents

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Demolition of 4 existing buildings and associated underground utility and pedestrian tunnels, removal of above ground surfacing, removal of all underground utilities within the demolition limits, and relocation of existing utilities.

B. Type of Contract:

1. Project will be demolished under a single prime contract under this ITB.

1.5 Phased Construction

A. The Work shall be conducted in 5 phases, following the completion of the separate abatement of hazardous materials project.

1. Phase 1: Install Erosion Control measures and tree protection fencing as shown in Drawings.
2. Phase 2: Perform all utility shutoffs and disconnects prior to demolition process.
3. Phase 3: Coordinate removal of salvage items as shown in salvage item log and Drawings. Individual building demolition can begin without all salvage items removed, but it is Contractor's responsibility to see that the specified items are protected and removed.
4. Phase 4: Remove four existing buildings and utility lines per Drawings, Specifications, and Geotechnical Report. Demolition sequence is as follows: Eola Hall, Underground Site Tunnels, Mckenzie Hall, Santiam Hall, Breitenbush Hall.
5. Phase 5: Remove any remaining surface sidewalks, asphalt pavement, concrete pavement, etc.

B. Before commencing Work of each phase, submit an updated copy of the demolition contractor's construction schedule showing the sequence, commencement and completion dates for all phases of the Work.

1.6 Work By Owner

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or other work by Owner. Coordinate the Work of this Contract with other work directed by Owner.

1.7 Work Under Separate Contracts

A. Concurrent Work: Owner has awarded a separate contract for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. PBS Engineering and Environmental: To test and coordinate all hazardous material removal, including the lead paint work under Specification section 02 83 19 (Lead Handling Procedures).

2. The Owner under a separate contract, will have the hazardous materials removed or abated for the project site.

1.8 Access To Site

A. Use of Site: Limit use of Project site to Work in areas indicated in Drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to boundaries shown in Drawings.

2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.9 Coordination With Owner

A. Full Owner Occupancy: Owner will occupy adjacent buildings (Dome Building and Yaquina Hall) during entire demolition period. Contractor must cooperate with Owner during demolition operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.10 Work Restrictions

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to business working hours of 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend and holiday Hour limitations: 8 a.m. to 5 p.m.

2. Early Morning Hours: Seek Owner’s written consent not less than 72 hours in advance of activities that Contractor desires to conduct prior to 7 a.m. on weekdays and 8 a.m. on weekends and holidays

3. Hours for Utility Shutdowns: Notify Owner not less than 72 hours in advance of activities that will affect Owner’s operations.

C. Existing Utility Interruptions: Contractor must not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to the requirements indicated in the Drawings and Specifications:

1. Notify Engineer not less than three days in advance of proposed utility interruptions.

2. Obtain Engineer’s prior written consent before proceeding with utility interruptions.

1.11 Specification And Drawing Conventions

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements must to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the Specifications sections.
2. Abbreviations: Materials and products are identified by abbreviations as shown in Drawings.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

A. Section includes a description of Contractor's administrative requirements for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for information (RFIs).
4. Digital project management procedures.
5. Project meetings.

1.2 Related Documents

A. The Drawings and provisions of the Agreement, including the General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section (and the Specifications generally).

1.3 Definitions

A. RFIs: Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 Informational Submittals

A. Subcontract List: Contractor must prepare a written summary identifying subcontractors proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification sections covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 General Coordination Procedures

A. Coordination: Coordinate construction operations included in different sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Contractor shall coordinate its construction operations with those of other contractors (on other parts of the overall project) to ensure efficient and orderly progress of each part of the Work. Contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and other vendors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 Coordination Drawings

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one vendor.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.

g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance

requirements. Provide alternative sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be amendments to the Agreement.

1.7 Request for Information (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Engineer will return without response those RFIs submitted to Engineer by Contractor's subcontractors.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the bid amount Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, product data, s[?] drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

1. RFI Attachments shall be electronic files in PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. on a business day will be considered as received the following business day.

1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the bid amount.

f. Requests for interpretation of Engineer's actions on submittals.

g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with each new RFI.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.
8. Engineer’s RFI response.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1.8 Digital Project Management Procedures

A. Use of engineer's digital data files: digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, shop drawings, and project record drawings.
2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
3. Digital drawing software program: Drawings in PDF and AutoCAD Civil 3D 2016 formats.

B. PDF Document Preparation: Where PDFs are required to be submitted to Engineer, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate.

1.9 Project Meetings

A. General: Engineer will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting demolition, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Engineer, and their agents; Contractor and its superintendent; subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to decide matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Responsibilities and personnel assignments.

   b. Tentative construction schedule.

   c. Phasing.

   d. Critical work sequencing and long lead items.

   e. Designation of key personnel and their duties.

   f. Lines of communications.

   g. Use of web-based Project software.

   h. Procedures for processing field decisions and Change Orders.

   i. Procedures for RFIs.

   j. Procedures for testing and inspecting.

   k. Procedures for processing applications for payment.

   l. Distribution of the Contract Documents.

   m. Submittal procedures.

   n. Sustainable design requirements.

   o. Preparation of Record Documents.

   p. Use of the premises and existing building.

   q. Work restrictions.

   r. Working hours.

   s. Owner's occupancy requirements.

   t. Responsibility for temporary facilities and controls.

   u. Procedures for moisture and mold control.

   v. Procedures for disruptions and shutdowns.

   w. Construction waste management and recycling.

   x. Parking availability.

   y. Office, work, and storage areas.

   z. Equipment deliveries and priorities.

   aa. First aid.

   bb. Security.

   cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Project Closeout Conference: Engineer will schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 30 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Engineer, and their agents; Contractor and its superintendent; subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of Record Documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Procedures for completing and archiving web-based Project software site data files.
   d. Submittal of written warranties.
   e. Requirements for completing sustainable design documentation.
   f. Requirements for preparing operations and maintenance data.
   g. Requirements for delivery of material samples, attic stock, and spare parts.
   h. Requirements for demonstration and training.
   i. Preparation of Contractor's punch list.
   j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   k. Submittal procedures.
   l. Coordination of separate contracts.
   m. Owner's partial occupancy requirements.
   n. Installation of Owner's furniture, fixtures, and equipment.
   o. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: Engineer will conduct progress meetings at biweekly intervals or as needed.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Engineer, Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to

ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM (building information modeling) component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.
4. Preconstruction video recordings.
5. Periodic construction video recordings.

B. Related Requirements:

1. Section 024116 "Structure Demolition" for photographic documentation before building demolition operations commence.
2. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 Related Documents

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

1.3 Informational Submittals

A. Key Plan: Submit plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos on CD-ROM, thumb-drive, and/or through email. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag:
   a. Date photograph was taken.
   b. Description of location, vantage point, and direction.
   c. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings on CD-ROM, thumb drive, and/or through email. Include copy of key plan indicating each video's location and direction.
2. Identification: With each submittal, provide the following information in file metadata tag:
   a. Date video recording was recorded.
   b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 Formats And Media

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format. Provide supplemental lighting in low light levels or backlit conditions.

C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time from camera.

E. File Names: Name media files with Project area and sequential numbering suffix.

1.5 Construction Photographs

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

D. Periodic Construction Photographs: Take photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

E. Additional Photographs: Engineer may request photographs in addition to periodic photographs specified.

1. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.

b. Immediate follow-up when on-site events result in construction damage or losses.

c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.

d. Substantial Completion of a major phase or component of the Work.

e. Extra record photographs at time of final acceptance.

f. Owner's request for special publicity photographs.

1.6 Construction Video Recordings

A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

B. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.

2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

C. Preconstruction Video Recording: Before starting demolition, record video recording of Project site and surrounding properties from different vantage points.

1. Show existing conditions adjacent to Project site before starting the Work.

2. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of demolition.

3. Show protection efforts by Contractor.

END OF SECTION

PART 1 - GENERAL

1.1 Definitions

A. General: Basic Contract definitions are included in the Agreement and in other Contract Documents.

B. When using terms such as those in "Approved" and "Directed" paragraphs below, do not extend Architect's responsibility into Contractor's area of means, methods, and techniques of construction. See Evaluations.

C. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Agreement.

D. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

H. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

I. "Provide": Furnish and install, complete and ready for the intended use.

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

1.2 Related Documents

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

1.3 Industry Standards

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not included with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 Abbreviations And Acronyms

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.

35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.

71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; http://www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.

107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.

142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.

179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.
191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tileroofing.org.
194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USAV - USA Volleyball; www.usavolleyball.org.
197. USGBC - U.S. Green Building Council; www.usgbc.org.
198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institute fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

END OF SECTION

PART 1 – GENERAL

1.1 Scope

A. Contractor shall arrange for and provide temporary connections of utilities such as water service, sanitary facilities, etc., as specified herein and shall inspect Owner's facilities to determine the capacity and operation of services provided by Owner are adequate for the execution of the work. Electrical power service will be provided by the Owner to a single power pole as shown on the drawings. The cost for connection to the owner supplied temporary power panel board located on the temporary power pole and electrical power distribution to the contractor's work areas are the responsibility of the contractor.

PART 2 - PRODUCTS

1.2 Material

A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

1.3 Temporary Electrical Power And Lighting

A. Temporary Electrical Service: Owner will provide, without charge, electrical power from existing outlets up to the rated capacities until the power is terminated by the demolition Contractor. The Owner will then provide, without charge, electrical power from temporary power poles identified in the Drawings. Contractor shall provide connections and all means of conveying same from existing outlets to required locations and shall pay for any damage to existing systems resulting from misuse thereof. Electrical safety measures, including ground fault protection, waterproofing of temporary lighting and cords, and deactivation of existing electrical wiring within work areas, is part of the work under this Agreement.

B. Contractor shall maintain temporary wiring in safe manner and utilize it so as not to constitute a hazard to persons or property.

C. When permanent power and lighting system outside of the isolated work area is in operating condition, it may be used provided Contractor obtains Owner's prior written approval, assumes full responsibility for entire power and lighting system, and pays costs for maintenance and restoration of system.

D. Temporary Lighting: Contractor shall provide temporary lighting in all isolated work areas. Lighting shall be durable, grounded, and provide safe illumination levels throughout the work area.

1.4 Temporary Water Service

A. Temporary Water Service: Owner will provide, without charge, water from existing hose bibs and sinks. Contractor shall make temporary connections to existing facilities until water is terminated by the demolition contractor. Once existing onsite water services are terminated, the Contractor shall arrange, pay for and provide temporary water service.

1.5 Temporary Sanitary Facilities

A. Contractor shall arrange, pay for, and provide portable sanitary facilities including toilets and wash stations.

B. Contractor shall provide locks on all portable facilities to avoid unauthorized use or vandalism.

C. Contractor shall coordinate portable facility locations with Owner.

D. No existing onsite washroom facilities shall be used by the Contractor.

E. No existing toilet facilities shall be allowed to be used by the Contractor.

1.6 Access To Site

A. Contractor shall instruct all vendors, Subcontractors, and employees to enter site from location as indicated by the Drawings. Use of other entrances shall not be permitted without Owner permission.

B. Contractor shall ensure only authorized personnel are allowed access to the site.

1.7 Security

A. Contractor shall take adequate precautions against fire, keep flammable material at the absolute minimum, and ensure that such material is properly handled and stored. Open flames, fires, or gas-fired space heaters are not permitted.

1.8 Noise And Vibration Control

A. Contractor shall use methods and equipment that will keep noise and vibration to a minimum.

B. If Owner determines in its sole discretion that the work interferes with normal functions or is a public nuisance, Owner may require that Contractor stop noisy or other work. Contractor may resume this work at a mutually agreed-upon time or switch to a less noisy method. If the work is stopped, it shall not be used as a claim for additional compensation or Contract Time.

C. Contractor shall cooperate with Owner by informing Owner in advance of particularly noisy operations, operations causing excessive building vibrations, or other potentially objectionable activities.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

A. The work covered by this section includes all equipment, material and labor necessary to furnish, install, operate and maintain a complete dewatering system for the construction site. Site dewatering shall be sufficient to allow construction work to conform to the Contract Documents and applicable regulatory requirements.

B. Contractor's shall be responsible for developing the method of site dewatering to the limits and extent required for performing all Work under the Agreement.

C. Related Sections:

1. Section 020000 – Earthwork
2. Section 024116 – Structure Demolition
3. Section 312717 – Trenching

D. Reference Standards and Documents:

1. American Society for Testing and Materials (ASTM), most recent edition.
2. Geotechnical Engineering Services Report; State of Oregon Department of Administrative Services, State Hospital Demolition, Salem, Oregon, dated April 8, 2016, prepared by GeoEngineers, Inc. GeoEngineers project: 11681-006-00.

1.2 REGULATORY REQUIREMENTS

A. 1200-C Construction Stormwater General Permit

1. Owner has obtained a 1200-C Construction Stormwater General Permit for the construction activities required for this Agreement.
2. Contractor shall comply with the requirements of the 1200-C Construction Stormwater General Permit.

B. Dewatering activities shall be carried out in compliance with Oregon Department of Environmental Quality's (DEQ's) provisions for maintenance of water quality standards in the Willamette Basin (OAR Chapter 340, Division 41).

C. Contractor shall obtain and comply with the requirements of any additional permits required for the off-site discharge of the removed water.

1.3 SUBMITTALS

A. Contractor shall submit a dewatering plan for the construction site to the Engineer for review no more than 7 calendar days after the Notice to Proceed.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide all materials necessary to remove water from the construction site that will be detrimental to the work. Contractor shall provide all temporary electrical connections for equipment used to dewater the site.

B. The dewatering system shall be designed and operated so as to prevent erosion and so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

C. Provide all components necessary to legally dispose of water resulting from the dewatering activities.

D. Establish and maintain measures for disposal of water resulting from dewatering activities complying with:

1. The requirements of the 1200-C Construction Stormwater General Permit.
2. Other applicable regulations.

E. Contractor shall have standby pumping equipment in good working condition available for emergencies.

PART 3 – EXECUTION

3.1 GENERAL

A. The dewatering system shall be in place and operating prior to proceeding with excavations for the work.

B. Contractor shall operate and maintain the dewatering system continuously until backfill has been placed, compacted, and approved. The contractor shall bear all costs for the power and fuel required to operate the dewatering system.

C. Contractor shall dispose of all water collected or pumped during the dewatering work in a suitable manner that does not cause damage to adjacent property or a violation of permit requirements and all other applicable ordinances and regulations.

D. Remove dewatering system components prior to completion and acceptance of the work unless otherwise directed by the Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work covered by this Section includes excavating, placing, stabilizing and compacting earth at the site; including rock excavation, addition of borrow, disposal of excavated material and all other earthwork on the site.

B. Classification of Excavation: There shall be no classification of excavation. The terms excavation, earthwork and grading shall include all materials excavated or removed regardless of the type, character, composition, or condition of the material so excavated.

C. Related Sections:

1. Section 021400 – Dewatering
2. Section 024116 – Structure Demolition
3. Section 311000 – Site Clearing
4. Section 312317 – Trenching

D. Reference Standards and Documents:

1. Standard Specification for Highway Construction, Oregon State Highway Division, most recent edition (OSSC).
2. American Society for Testing and Materials (ASTM), most recent edition.
3. Geotechnical Engineering Services Report; State of Oregon Department of Administrative Services, State Hospital Demolition, Salem, Oregon, dated April 8, 2016, prepared by GeoEngineers, Inc. GeoEngineers project: 11681-006-00.
4. Oregon Administrative Rules Chapter 340, Division 41.
5. ASTM D 1557, Test Methods of Laboratory Compaction Characteristics of Soil Using Modified Effort.
6. 2015 Oregon Standard Specifications for Construction (the "Oregon Standard Specifications")

1.2 QUALITY ASSURANCE

A. Compaction and Soil Moisture/Density Standards:

1. The degree of compaction is expressed as a percentage of maximum relative density. Maximum relative densities refer to dry soil densities obtainable at optimum moisture content following specified test procedures.
2. Where soil material is required to be compacted to a percentage of maximum relative density, the maximum density at optimum moisture content shall be determined by Contractor by ASTM Test Method D 1557. In-place tests of soil density shall be determined by Contractor by ASTM Test Methods D 1556, D 2167 or D 2922.

B. The Engineer will engage GeoEngineers as the Owner's on-site representative for quality control and observation of earthwork.

C. GeoEngineers will evaluate material proposed for use as fill and backfill, make and/or review appropriate tests, evaluate compaction of in-place fill and backfill, and designate for removal identified unsuitable material.

D. In-place field density tests will be made by GeoEngineers to determine the adequacy of compaction of fill and backfill material. Tests will be performed as deemed necessary to determine the adequacy of compaction. Other evaluation methods include proofrolling with heavy construction equipment as deemed necessary by GeoEngineers. Cooperate with such testing by GeoEngineers.

E. Do not cover site improvements with backfill material prior to required evaluations, tests, and approvals. Backfill material covering unevaluated, untested, and rejected site improvements shall be removed and replaced at Contractor's sole expense.

F. Unfavorable Weather Conditions: Do not place, spread, or roll fill material during unfavorable weather conditions. Do not resume operations until existing subgrade and fill meet the requirements of Parts 3.2 and 3.3 of this Section to the satisfaction of GeoEngineers.

1.3 SUBMITTALS

A. Gradation analyses for all imported materials shall be paid for by Contractor and results of the gradation analyses shall be submitted to GeoEngineers for review.

B. Results of all compaction and density tests performed by the Contractor (or the Contractor's subcontractor) shall be submitted to GeoEngineers for review.

C. Provide Level B certification for geotextile fabric in accordance with Section 02320.10 of the Oregon Standard Specifications.

D. Submittals shall be provided in conformance to the State of Oregon General Conditions.

1.4 EXISTING UTILITIES

A. Prior to starting any excavation, Contractor must call the electrical, telephone, underground cable, and water and sewer utilities location assistance service 48 hours in advance to locate cables and other underground utilities on the site and adjacent areas.

B. Maintain and protect existing utilities and other site features not specifically noted to be removed. If damage occurs, repair or replace as directed.

1.5 ARCHEOLOGICAL OBJECTS

A. If archeological objects are encountered during ground disturbing activate, no further work can be done until an archeologist can evaluate the discovery. The archeologist and any associated required remedial work and/or permits will be provided by the Owner.

PART 2 – PRODUCTS

2.1 CRUSHED ROCK BACKFILL

A. **C**rushed Rock Backfill shall be Open-Graded Base Aggregate material free of debris and organics and conforming to Section 02630 of the Oregon Standard Specifications.

2.2 BACKFILL MATERIAL

A. Select backfill, pipe bedding and pipe zone material shall be imported 3/4-inch - minus crushed aggregate free from debris, organic material, or mud, and conforming to the durability requirements set forth in Section 02630.10 of the Oregon Standard Specifications and the following gradations.

Sieve Size	Percentage Passing by Weight
1-inch	100
3/4-inch	90 - 100
3/8-inch	55-75
1/4-inch	40-60
No. 10	16-36
No. 40	8-24
No. 200	0-5

B. Native backfill material shall consist of select, excavated material free from manmade debris, organic material, mud, and rocks larger than 2 inches in diameter. The material must be reviewed and accepted by GeoEngineers prior to use.

2.3 CONTROLLED DENSITY FILL

A. Controlled density fill shall be controlled low-strength material conforming to Section 00442 of the Oregon Standard Specifications.. Uniformly-graded such as pea-gravel or coarse sand are not allowed as structural fill for the project.

2.4 TOPSOIL

A. Topsoil shall consist of the top 8 inches of cleared, grubbed and scalped soil from within the project site.

B. Topsoil shall be free of all roots and all rocks larger than 3/4-inch in diameter.

2.5 GEOTEXTILE FABRIC

A. Geotextile for subsurface stabilization under gravel shall be Subgrade Geotextile Fabric conforming to Section 02320 of the Oregon Standard Specifications.

B. Geotextile for subsurface drainage shall be Type 2 Drainage Fabric conforming to Section 02320 of the Oregon Standard Specifications.

2.6 SPOIL

A. All excess material not required or suitable for backfill shall be treated as spoil and properly disposed of by Contractor.

2.7 SUBSURFACE DRAINAGE MATERIAL

A. Subsurface drainage material shall be 3/4-inch to 1/2-inch Granular Drain Backfill Material conforming to Section 00430.11 of the Oregon Standard Specifications.

PART 3 – EXECUTION

3.1 GENERAL

A. Provide erosion, sediment and pollution control measures in accordance with Section 312500 of these Specifications during all earthwork activities.

B. All vegetation and debris shall be removed from excavation and fill areas. Perform clearing and grubbing prior to excavation operations.

C. Sheeting, Shoring, Bracing and Barricades:

1. Adequate sheeting, shoring and/or bracing shall be used as necessary to protect existing structures and basins, to protect adjacent work, and to prevent running, heaving or caving during excavation.

2. Contractor shall be solely responsible for the design, furnishing, placement, maintenance and removal of all sheeting, shoring and bracing.

3. Contractor shall design, furnish, place, maintain and remove barricading at all trenches and open excavations in accordance with the requirements of Oregon Occupational Safety and Health Administration and other applicable regulations.

3.2 STRIPPING

A. Topsoil shall be stripped to a minimum depth of 8 inches and stockpiled separate from the remainder of the excavated material.

B. Sufficient quantities of topsoil shall be stockpiled at the job site to cover to a depth of 8 inches on those surfaces that shall be reseeded in connection with this project.

1. Such surfaces shall include all cut or filled areas that will not receive gravel surfacing or that will not be built upon as shown on the plans.

2. Stockpiled topsoil shall be adequately covered and drained to prevent erosion by rain and to prevent blowing dust.

3.3 EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

A. Structural Excavation

1. Structural excavation shall be carried to the lines and elevations shown on the plans through whatever material is encountered. All bearing surfaces shall be level, clean,

and undisturbed. Leveling courses will be permitted and shall consist of Crushed Rock Backfill.

2. Perform structural excavation and other work in excavations in accordance with all safety rules of the state and local agencies having jurisdiction over such construction safety matters.
3. Contractor shall be responsible for design of excavation protection systems and for all costs of excavation protection systems.
   a. Provide all sheeting, shoring and bracing necessary to provide safe working conditions, protect existing structures and basins, protect adjacent work, and to prevent running, heaving or caving during excavation.
   b. Damages resulting from improper trench protection or improper removal of sheeting, shoring and bracing shall be the sole responsibility of Contractor.
   c. Excavation protection systems shall remain in place until the backfill around structures is complete.
4. Due to the silt and silty sand soils at the project site, Contractor must employ working procedures that prevent disturbance and softening of the subgrade soils during wet conditions.
5. Excavation within the final 3 to 4 feet of any subgrade should be accomplished with a trackhoe equipped with a smooth-edged bucket.
6. Excavations shall extend a sufficient distance from walls and footings to allow the placement and removal of forms, installation of piping and appurtenances, and observation of the Work, except where concrete is specified to be poured directly against undisturbed excavated surfaces.
7. Any excavation carried below the lines and grades specified on the drawing by Contractor without authorization from the Engineer shall be backfilled and compacted to the proper elevation by Contractor, at his own expense,
8. Bottoms of excavations disturbed because of Contractor's operations and that require overexcavation and backfill, shall be backfilled by Contractor, at his own expense, to the proper elevation in accordance with the procedure specified for Overexcavation in Article 3.3 B. of this Section.
9. For structures where the excavation extends vertically below the foundation or slab elevation shown on the plans, the excavation shall also extend horizontally beyond the outside edge of the structure an additional 6 inches for each foot of excavation below the footing or slab elevation.
10. Overexcavation
    a. Where the undisturbed condition of natural soils at the subgrade elevation shown on the plans is inadequate for support of the planned construction, the Engineer will direct Contractor to over-excavate to adequate supporting soils. The excavated space shall be filled to the required elevation with structural backfill and compacted to 95 percent maximum relative density.
    b. Overexcavation and replacement with Structural Backfill shall be included in the lump sum amount in the bid (along with all other requirements in the Agreement and these Specifications).
    c. Remove and properly dispose of native excavated materials.

B. Structural Dewatering

1. Remove sufficient surface and subsurface water at the project site to prevent the softening of subgrades and the formation of "quick" conditions. Provide dewatering system in accordance with Section 021400 of these Specifications.

2. Contractor shall keep excavations reasonably free from water during construction. Contractor shall control surface runoff to prevent entry or collection of water in excavations.
3. The static water level shall be drawn down a minimum of two feet below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified relative density.

C. Structural Backfill

1. After completion of structures that are below the elevation of the final grade and prior to backfilling, remove forms and clean excavated areas of all debris.
2. Subgrade
   a. Backfill shall not be placed until the subgrade portions of the structure have been checked by the Engineer's representative.
   b. After rough excavation, structural subgrades shall be graded to the proper elevation and the top 6 inches shall be proof-rolled to at least 95 percent of maximum relative density.
   c. After proof-roll and inspection place and compact Structural Backfill to required thickness and grade
3. Backfill shall not be deposited against concrete structures until the concrete has developed adequate strength as specified in Division 32 - Concrete Paving.
4. Unless otherwise specified, place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 9 inches in loose depth for material compacted by hand-operated compaction equipment. Prior to placing each lift, the backfill or fill material shall be properly moisture conditioned to achieve a moisture content that is +1% to +3% (wet) of optimum moisture content as determined by ASTM D1557.

D. Structural Compaction

1. Compaction shall be to the relative densities listed below. Percentages of maximum relative density shall be determined in accordance with ASTM D1557.
   a. Compaction of structural subgrades after rough excavation, shall be to 95 percent maximum relative density
   b. Compaction of backfill laterally adjacent to structure walls and sides of footings shall be to 92% of maximum relative density within 5 feet of the walls and footings and 95% of maximum relative density more than 5 feet from the walls and footings.
   c. Compaction of trench drainage materials for under drain trenches shall be to 90% of maximum relative density.
2. Contractor shall be responsible for using accepted construction methods to achieve the required compaction without damaging the subgrade or structures.

E. Testing

1. Notify GeoEngineers when excavation has reached required subgrade elevations or encounters bedrock in order to conduct in-place density testing to determine the adequacy of the compaction effort.
2. The field compaction tests shall consist of:
   a. One compaction test per lift on a 25-foot grid on footing, slab and foundation subgrades, and at specific locations of concern as may be indicated by the Engineer.
   b. A minimum of one compaction test per lift and for every 50 cubic yards of backfill placed around walls, or at a lesser interval as may be directed by the Engineer.

3. If any tests indicate that the specified compaction is not achieved, Contractor shall remove unacceptable backfill or fill material and shall determine and utilize new and/or revised methods of placement and compaction of the backfill or fill material until specified levels of compaction have been demonstrated.

3.4 EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

A. Trench Excavation

1. Perform all excavation of every description, and of whatever substances encountered, to the alignment and depth shown on the Plans, or otherwise specified. All excavated materials not required, or suitable for backfill, shall be removed from the site. Perform grading as may be necessary to prevent surface water from flowing into trenches or other excavations.
2. Trenches shall be excavated to the lines and grades as shown on the plans, or as established by the Engineer, with proper allowance for pipe wall thicknesses, pipe bedding and foundation stabilization.
3. Minimum trench width shall be as detailed on the plans or as required to provide adequate space for workers to properly install the pipe and place pipe zone backfill, whichever is greater. In no case shall the trench width from the trench foundation to the springline of the pipe be greater than the outside pipe diameter plus 12 inches on each side of the pipe. Trench walls shall be vertical to 12 inches above the top of pipe.
4. Perform trench excavation and other work in trenches in accordance with all safety rules of the state and local agencies having jurisdiction over such construction safety matters. Provide all sheeting, shoring and bracing necessary to protect existing structures and basins, to protect adjacent work, and to prevent running, heaving or caving during excavation.
   a. Contractor is responsible for design of trench protection systems and for all costs of trench protection systems. Damages resulting from improper trench protection or improper removal of sheeting, shoring and bracing shall be the sole responsibility of Contractor.
   b. Where sheeting and bracing are used, the trench width shall be increased as required to provide adequate space for workers to properly install the pipe and place pipe zone backfill.
   c. Trench protection systems shall remain in place until the pipe has been laid, tested for defects and repaired if necessary, and the backfill around it compacted to a depth of 2 feet over the top of the pipe.
5. Unsuitable Material
   a. Material encountered at the trench foundation that will not uniformly support the pipe under its full backfill load, or is otherwise unsuitable, shall be excavated to an additional depth as directed by the Engineer.
   b. The additional excavated area shall be backfilled with foundation stabilization material, placed in lifts not to exceed 9 inches and compacted to 95 percent of the maximum relative density, to restore the required trench foundation grade.
   c. Where especially poor foundation conditions are encountered, the Engineer may order Contractor to place controlled density fill.
6. If the trench is excavated below required trench foundation grade without Owner's prior written authorization, Contractor shall restore the grade with foundation stabilization material at no expense to Owner. The material shall be placed over the full width of the trench, in layers not exceeding 9 inches and compacted to 95 percent maximum relative density.
7. Non-uniform trench foundation produced by removal of boulders, or other interfering objects extending below the required grade, shall be filled with foundation stabilization material compacted to 95 percent maximum relative density.

8. Provide a minimum clearance of 12 inches between the outsides of the pipe walls at locations where pipes cross above and below one another, unless otherwise shown on the drawings.
9. Where pipes are buried beneath structural slabs and footings, provide a minimum clearance of 12 inches between the outside of the pipe wall and the underside of the structure, unless otherwise shown on the drawings.

B. Trench Dewatering

1. Provide dewatering system in accordance with Section 021400 of these Specifications.
2. Contractor shall remove and dispose of water entering the trench to as great an extent as is practical during installation of trench protection systems and piping systems, and during pipe bedding, pipe zone, trench backfill placement and compaction
   a. The trench at all times shall be kept free from water to facilitate fine grading, the proper laying and joining of pipe and prevention of damage to completed joints.
   b. Adequate pumping equipment shall be provided to handle and dispose of the water without damage to adjacent property.
   c. Water in the trench shall not be allowed to flow through the pipe while construction work is in progress unless special permission to do so has been given by the Engineer.
   d. An adequate screen shall be provided to prevent the entrance of objectionable material into the pipe.
3. Groundwater shall be controlled to prevent softening of the trench foundation or formation of "quick" conditions. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils and so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.
4. Contractor shall dispose of the water in a suitable manner without damage to adjacent property or violation of permit requirements and local regulations.

C. Trench Backfill and Compaction

1. Pipe Bedding
   a. The trench foundation upon which the bedding is placed shall be firm and true to grade. Contractor shall allow the Engineer to review the trench foundation prior to bedding placement.
   b. All buried pipe shall have a minimum 6-inch compacted thickness of bedding material below the barrel of the pipe. Bedding material shall be placed in the bottom of the trench, leveled and compacted to 95 percent of the maximum relative density. Bell holes shall be excavated at each pipe joint as necessary to provide uniform bearing of pipe on bedding.
   c. Bedding under the pipe shall provide a firm, unyielding support along the entire pipe length. The material under the pipe haunches shall be thoroughly compacted.
2. Pipe Zone
   a. After the pipe has been laid to alignment and grade, unless otherwise specified, pipe zone material shall be placed in 6-inch lifts the full width of the trench and compacted up to a minimum of 12 inches above the top of the pipe to 95 percent of maximum relative density.
   b. Pipe zone material shall be placed simultaneously on both sides of the pipe, keeping the level of backfill the same on each side. The material shall be carefully sliced along the underside of the pipe with a shovel or other approved

procedure and compacted around pipe so that the pipe barrel is completely supported, and no voids are left around the pipe.

c. Mechanical equipment with suitably shaped tamping feet shall be used to compact the material and obtain the specified relative density beneath the haunches of the pipe. At the time of placement, the materials shall have the optimum moisture content required for compaction, and the moisture content shall be uniform throughout each layer. Hydraulic methods shall not be used to compact pipe zone material.

d. Contractor shall use care to prevent pipe from either horizontal or vertical movement during placement and compaction of pipe zone material.

3. Pipe Identification

a. Install a single line of plastic tracer tape 1.5 feet above the centerline of all buried pipe.

b. For all non-metallic lines, place color coded trace wire along the full length of the pipe, tape it to the pipe at 15 foot intervals and bring to the surface at all junctions and terminations using methods approved by the Engineer. Splice wire ends with epoxy packs or other splicing system suitable for underground installations to maintain continuity.

4. Trench Backfill

a. Trench backfill shall be crushed aggregate pipe zone material, placed in 6-inch lifts and compacted to 95 percent maximum relative density where graveled surfacing and structures shall be constructed over trench.

b. Place native trench backfill material in maximum 9-inch lifts, compacted to 95 percent maximum relative density, in all other areas.

c. In areas that shall receive seeding, the top 8 inches of material shall be topsoil compacted to 90 percent.

d. Trench backfill shall not be placed until conformance of pipe zone backfill with specified compaction requirements has been confirmed with test results.

e. Backfill shall not be allowed to free-fall into the trench until at least three feet of cover is provided over the top of the pipe.

f. Mobile pavement breakers or pile-driving equipment or hydraulic methods shall not be used for compacting backfill at any stage of the operations.

g. Compacted backfill not less than 30 inches over the pipe shall be in-place before power-operated hauling or rolling equipment travels over the pipe in order to prevent excessive live loads on the pipe.

h. If the specified compaction is not obtained, Contractor may be required to use a modified compaction procedures and/or reduce the thickness of lifts. In no case shall excavation and pipe laying operations proceed until Contractor is able to compact the backfill to the satisfaction of the Engineer.

i. Trench backfill disturbed by weather or other construction shall be scarified, re-shaped and compacted to the required density.

D. Testing

1. Notify the Geotechnical Engineer in order to conduct in-place density testing to determine the adequacy of the compaction effort on each layer of the trench bedding, pipe zone, and backfill areas

2. The field compaction tests shall consist of one compaction test per lift, made for every 200 lineal feet of trenching and backfill, or at a lesser interval as directed by the Geotechnical Engineer.

3. If any tests indicate that the specified compaction is not achieved, Contractor shall remove unacceptable backfill or fill material and shall determine and utilize new and/or

revised methods of placement and compaction of the backfill or fill material until specified levels of compaction have been demonstrated.

3.5 EXCAVATING, BACKFILLING, AND COMPACTING FOR PAVEMENT

A. Pavement Excavation

1. Existing pavement shall be neatly saw-cut to produce an even joint. Cut pavement shall be removed and hauled away.
2. Excavate or fill with select Native Backfill or Crushed Rock Backfill to establish the new subgrade required for the base course within plus or minus 0.10 foot.

B. Pavement Backfill and Compaction

1. Fill shall be placed in maximum 9-inch lifts and compacted to 95% maximum relative density.
2. Control surface and subsurface water at the project site to prevent the softening of subgrades once subgrade elevations has been established until final base and pavement are installed.

C. Testing

1. Notify GeoEngineers in order to conduct in-place density testing shall be conducted to determine the adequacy of the compaction effort.
2. The field compaction tests shall consist of one compaction test per lift, made for every 200 lineal feet of roadway, or at a lesser interval as directed by the Engineer.
3. If any tests indicate that the specified compaction is not achieved, Contractor shall remove unacceptable backfill or fill material and shall determine and utilize new and/or revised methods of placement and compaction of the backfill or fill material until specified levels of compaction have been demonstrated.

3.6 PLACEMENT OF CONTROLLED DENSITY FILL

A. Place Controlled Density Fill where indicated on the drawings and as required by the Engineer.

B. Controlled Density Fill shall not be placed when the air temperature is 38 degrees F. or less. Place Controlled Density Fill in lifts such that excess pressure does not develop against adjacent structures.

C. Prevent traffic or construction equipment from coming in contact with controlled density fill for at least 24 hours after placement or until the controlled density fill has hardened sufficiently to prevent rutting.

3.7 FINISH GRADING

A. All areas disturbed during construction, excavated areas and filled areas that will not receive pavement, gravel surfacing or be under constructed improvements shall be brought to finish grades, compacted, and receive 8 inches of topsoil.

1. Finished grade shall be as established by the contours and spot elevations shown on the plans plus or minus 0.10 foot, except where a local change in elevation is required to match cleanouts and valve boxes, or to achieve proper drainage.
2. Where no contours or spot elevations are shown shall be graded to drain evenly without abrupt grade changes.
3. Grade and compact all areas to a minimum of 90% of maximum relative density providing allowance for placement of the topsoil layer over the compacted earth.

B. Topsoil Fill

1. Scarify prepared subgrade to a depth of 4” immediately prior to placing topsoil. Place topsoil fill to a minimum depth of 8”
2. Place loose; do not compact; do not place in wet or muddy conditions.

C. Seed and institute erosion and sediment control measures shall be instituted in conformance with Section 312500 on all areas as soon as possible once final grading is complete.

3.8 REMOVAL OF SPOIL

A. Contractor shall submit to the Engineer for review a plan and location(s) for stockpiling spoil at the site during construction. The plan shall include quantities and area required for storing of these materials. The plan shall also include methods for preventing loss of materials due to erosion.

B. All excavated spoil materials occurring or resulting from work under this section shall become the property of Contractor and shall be removed from the site.

C. Spoil materials shall be hauled to legal disposal sites by Contractor. Contractor shall pay for all hauling and disposal costs.

1. Contractor shall obtain any permits required from ODOT for hauling.
2. Haul loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. Haul loads shall be watered as necessary after trimming to eliminate dust.
3. Contractor shall be responsible for any damage or spillage caused by his operations or subcontractor's or agent's operations on all public roads from the job site to the disposal site. Spills shall be cleaned up immediately and damage to roadways shall be repaired promptly and more than 24 hours after the occurrence.
4. Prior to final payment, Contractor shall provide a release form from every property owner upon which any excess excavation is placed.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 011000 – "Summary" for use of the premises and phasing requirements.
2. Section 013200 – "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 – "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 – "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.2 Related Documents

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

B. Salvage Items Log, attached in the Appendix, applies to this Section.

1.3 Definitions

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver per Drawings and Salvage Items Log.

1.4 Materials Ownership

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 Preinstallation Meetings

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 Informational Submittals

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

C. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.

E. Statement of Refrigerant Recovery: Signed by Contractor’s refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 Closeout Submittals

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 Quality Assurance

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.9 Field Conditions

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
   a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified in the Contract Documents, including lead paint under Specifications section 02 83 19.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.

F. On-site storage or sale of removed items or materials is not permitted.

1.10 Coordination

A. Arrange demolition schedule per Project General Notes in Drawings.

PART 2 – PRODUCTS

2.1 Performance Requirements

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 Soil Materials

A. Satisfactory Soils: Comply with requirements in Sections 022000 "Earthwork" and 311000 "Site Clearing."

PART 3 – EXECUTION

3.1 Examination

B. Verify that utilities have been disconnected, capped, and marked before starting demolition operations.

C. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

D. Obtain written approval from PBS that hazardous materials have been remediated before proceeding with building demolition operations.

E. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 013233 "Photographic Documentation."

3.2 Preparation

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris. In cleaning bricks, chip off mortar and remove dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to locations identified in Drawings.
5. Protect items from damage during transport and storage.

3.3 Utility Services And Mechanical/Electrical Systems

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Owner will arrange to shut off utilities when requested by Contractor.

2. Arrange to shut off utilities with utility companies.
3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
4. Cut off pipe or conduit as shown in Drawings. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
6. Contractor to install Bernsten–CTLP6 72” Fiberglass Carsonite thin line post with Bernsten TL utility decal for the associated utility.

3.4 Protection

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
   a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 Demolition, General

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 Demolition By Mechanical Means

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated on Drawings.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

F. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 Site Restoration

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Sections 022000 “Earthwork” and 311000 “Site Clearing" and the Geotechnical Engineering Report for the site “Geotechnical Engineering Services Report; State of Oregon Department of Administrative Services, State Hospital Demolition, Salem, Oregon, dated April 8, 2016, prepared by GeoEngineers, Inc. GeoEngineers project: 11681-006-00.”

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 Repairs

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 Disposal Of Demolished Materials

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 Cleaning

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. This section covers Contractor performing any task under this Agreement including demolition, selective demolition, removal, sanding, patching, paint preparation, on-site chemical stripping, torch burning, welding, abrasive blasting, or any task performed on painted or varnished surfaces that may result in occupational exposures to lead. All contractors performing tasks as identified under OAR 437 Division 3 1926.62 (Lead for the Construction Industry Standard, Oregon) shall be required to perform work in accordance with the standard and these specifications.

B. Work requirements under this section include, but are not limited to, initial testing and evaluation of work practices, development of a written lead compliance program, lead awareness training, employee monitoring, respiratory protection, engineering controls, containment, wash facilities, and signage.

C. Lead paint exists throughout the buildings. Contractor shall presume that all painted or varnished surfaces contain lead.

D. Contractor personnel are subject to potential lead exposure. Contractor shall provide all labor, materials, equipment, and services necessary to comply with the OSHA standard and disposal requirements.

E. The Contractor must select work methods that minimize the creation or spreading of lead dust.

1.2 RELATED WORK

A. Owner has retained an Environmental Consultant (PBS) to perform the following:

1. Take and analyze air, surface wipe, and soil samples before, during, and after lead handling activities.
2. Observe work by the Contractor.
3. Monitor Contractor's compliance with regulatory and specification requirements.

1.3 DEFINITIONS

A. Action Level: Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an eight-hour period.

B. Air Monitoring: The process of measuring the airborne concentrations of a specific volume of air in a stated period of time.

C. Atomic Absorption: A method of measuring elements such as lead. The lead is vaporized at high temperature, usually several thousand degrees, and light of a very specific wavelength is shined through the vapor.

D. Biological Monitoring: The analysis of a person's blood and/or urine to determine the level of lead contamination in the body.

E. Containment: A process for protecting both workers and the environment by controlling exposures to lead dust and debris created during lead handling tasks.

F. Contractor: performing lead handling procedures herein.

G. Engineering Controls: Measures implemented at the work site to contain, control, and otherwise reduce exposure to lead dust and debris.

H. Exposure Monitoring: The personal air monitoring of an employee's breathing zone to determine the amount of contaminant (e.g., lead) to which he/she is exposed.

I. Fixed Object: Fixtures attached to a building or too heavy or bulky to remove from the work area.

J. Independent Testing Laboratory: A qualified American Industrial Hygiene Association Environmental Lead Proficiency Analytical Testing (AIHA ELPAT) laboratory financially independent from and hired by Owner or Contractor.

K. Industrial Hygienist: The representative assigned to monitor work progress, perform sampling, and visually inspect areas during and after lead handling procedures. The Industrial Hygienist must be certified by the American Board of Industrial Hygiene or an industrial hygienist in training, or an individual with similar education or experience.

L. Medical Removal: The temporary removal of workers due to elevated blood lead levels as defined in the OSHA Lead Standard.

M. Micrograms: One millionth of a gram: µg. The prefix "micro" means "1/1,000,000 of" (one millionth of). Since there are 453 grams in one pound and 16 ounces in one pound, one gram equals 0.035 ounces. A microgram is equal to about 35/1,000,000,000 (thirty-five billionths) of an ounce.

N. Movable Object: Furnishings that are not attached to the building structure and can be removed from the work area.

O. Off-Site Paint Removal: The removal of paint or varnish at a site away from the project, such as the stripping of lead paint from the surface of a component in a chemical tank. or at a commercial paint-stripping facility.

P. Paint Removal: Stripping or removal of lead paint from surfaces of components.

Q. ppm: Stands for "parts per million," meaning the weight of one part per weight of the total amount of material. For example, a lead concentration of 1 ppm expresses the ratio of one gram of lead dissolved into one million (1,000,000) grams of water.

R. Public Area: Any area outside the isolated work area. When work area isolation measures are removed, the work area becomes a public area.

S. Regulated Area: An area where the Permissible Exposure Limit has been, or is expected to be, exceeded and only trained personnel with appropriate personal protective equipment are allowed.

T. TCLP: Toxic Characteristic Leaching Procedure is one of the tests for determining whether a solid waste is classified as a hazardous substance via EPA Method 1311.

1.4 SUBMITTALS AND NOTICES

A. Contractor shall submit three copies of the following information to the, Owner, and Environmental Consultant prior to beginning work on the project:

1. WORKER TRAINING PROGRAM. Written proof shall be submitted indicating that all employees impacting lead-containing materials have received training per OAR 437-003-0001.

2. LEAD COMPLIANCE PLAN. A written "Compliance Plan" satisfactory to the Owner and Environmental Consultant describing the methods for lead handling procedures, and plans for location of decontamination enclosure systems, worker training and protection measures, engineering controls, dust control and collection techniques, etc., in compliance with OAR chapter 437 division 3, these Specifications, and applicable regulations shall be submitted. Contractor shall update the Lead Compliance Plan as necessary while work progresses.

3. PRODUCT INFORMATION AND MATERIAL SAFETY DATA SHEETS. Complete product information for chemical removal agents and for any materials, products, and procedures for which Contractor requests approval for use under this Agreement shall be submitted. Contractor shall identify any concerns with possible chemical reaction with new materials, coatings, etc., to be installed after chemical stripping.

B. Contractor shall not begin work until submittals are complete, reviewed, and accepted by the Owner and the Environmental Consultant. Allow a 10-day review period.

C. During the work, Contractor shall submit all sampling and exposure monitoring data.

1.5 LEAD EXPOSURE MONITORING AND TESTING REQUIREMENTS

A. Contractors shall perform employee exposure assessments as required under OAR chapter 437 Division 3 for any employees performing tasks that may result in exposures above the Action Level.

B. An Independent Testing Laboratory shall be retained by Contractor. All exposure monitoring analysis shall be performed in accordance with 29 CFR Part 1926.62 as adopted by OR-OSHA.

C. Owner and Environmental Consultant have the right to monitor Contractor's performance via air, dust wipe, and TCLP samples during removal work, in addition to Contractor's exposure monitoring and testing.

1.6 QUALITY ASSURANCE

A. Periodic monitoring of air and surface dust may be analyzed by Owner and Environmental Consultant in occupied spaces and containment areas. The following lead exposure limits shall apply to all areas where lead handling procedures are undertaken:

1. Air Samples:
   a. 30 µg/m3 – OSHA Action Level (8-hour Time-Weighted Average)
   b. 50 µg/m3 – OSHA Permissible Exposure Limit (8-hour Time-Weighted Average)
2. Dust Samples: (Expected levels at completion of work.
   a. 0 µg/ft2 – Clearance for stripped surfaces, components, etc.
   b. 40 µg/ft2 – Clearance level for floors
   c. 250 µg/ft2 – Clearance level for interior window sills
   d. 250 µg/ft2 – Clearance level for rough surfaces
   e. Note: The above-noted Dust Sample standards shall only apply to target housing. elementary, preschool and day-care facilities. Owner may modify these standards, if appropriate, in other facilities.
3. Blood Lead Levels:
   a. 40 µg/dL – (OSHA) permissible blood level for worker
   b. 50 µg/dL – (OSHA) blood level requiring medical removal of worker
4. Dispose of as Hazardous Waste:
   a. 5 ppm Pb (analyzed as "leachable" using Toxicity Characteristic Leaching Procedure – in TCLP EPA Method 1311)
5. Paint: Painted surfaces with lead concentrations greater than the limits of detection as determined by atomic absorption, EPA Method 7420-3050.
6. Soil:
   a. 400 ppm – High-traffic play areas
   b. 1,200 ppm – Non-play areas
7. Waste Water: 0.7 mg/L lead or less to dispose of in the sanitary sewer. Verify with the City of Salem on local requirements.

B. If, at any time during the work, analysis of occupied area air or wipe samples taken by Contractor, Owner, or Environmental Consultant indicate a concentration in excess of the allowable maximums specified, Contractor shall immediately notify:

1. Owner
2. The Environmental Consultant:

   PBS Engineering and Environmental Inc.

   (503) 248-1939

C. Immediately upon being notified of concentrations exceeding the specified maximum allowable levels, Contractor shall perform the following steps in the order presented, at no additional cost to Owner:

1. Stop lead-related work.
2. Environmental Consultant will determine the affected area and affected adjacent areas considered to be contaminated and will determine the actions to be taken.
3. Modify work procedures, if feasible, that may be the cause of high lead concentrations. Employ engineering controls to reduce lead exposure.
4. Carefully resume work under close supervision and monitoring.
5. Contractor shall be responsible for costs of any testing, cleanup, repair, downtime loss, etc., that is a result of Contractor's negligence, poor maintenance of containment areas, or improper procedures.

1.7 PERSONNEL PROTECTION

A. Training

1. When demolition or lead handling activities result or are expected to exceed the Action Level, Contractor shall follow personnel protection and work area isolation procedures outlined in this section.
2. Prior to commencement of work, Contractor shall ensure all workers have been adequately trained as specified in 29 CFR 1926.62.
3. Contractor shall provide and post at hand wash locations the decontamination, respirator, and work procedures to be followed by the workers as outlined in the written Lead Compliance Program.
4. Workers shall not eat, drink, chew gum, or apply cosmetics in the established work area. Smoking or using other tobacco products is prohibited.
5. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of lead-containing or -contaminated material and until final cleanup is completed.

B. Building Security and Protection

1. Contractor shall post adequate warning signs at all potential entrances to work areas as required by EPA and OSHA.
2. Contractor shall protect all existing fixed equipment, existing building finishes that are to remain, and existing systems and functions from damage. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, or equipment shall be remedied by Contractor at its expense.
3. Contractor shall maintain access and use of existing fire lanes.

1.8 SAFETY

A. With regard to the work under of this Agreement, the safety of Contractor’s employees, Owner’s employees, and the public is the sole responsibility of Contractor.

1.9 PROTECTION

A. Damaged or deteriorating materials shall not be used and shall be removed from the premises by Contractor. Materials that become contaminated with lead shall be disposed by the Contractor of in accordance with the applicable regulations.

1.10 SUBCONTRACTORS

A. Any Subcontractors employed by Contractor shall be bound to all the work and safety standards specified elsewhere in these Specifications. Subcontractor personnel shall be fully trained and supervised by Contractor during performance of this work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Plastic Sheet: Plastic sheet shall be fire-retardant polyethylene material sized in lengths and widths to minimize the frequency of joints. The minimum thickness shall be 6 mil.

B. Plastic Bags: Plastic bags shall be 6-mil polyethylene printed with warning labels per OSHA and EPA regulations.

C. Tape: Tape shall be capable of sealing joints of adjacent sheets of plastic and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under dry and wet conditions, including use of amended water.

D. Disposal Containers: Disposal containers for all listed hazardous waste, including lead, shall be ODOT-approved #1-A2 55-gallon steel drums.

E. Warning Labels and Signs: Warning labels and signs shall be posted as required by OR-OSHA, ODOT, and DEQ regulations.

F. Chemical Strippers: Use of chemical strippers shall require review and approval from the Owner, and Environmental Consultant.

2.2 TOOLS AND EQUIPMENT

A. Water Sprayer: The water sprayer shall be an airless or other low-pressure sprayer for high-phosphate wash water application.

B. Scaffolding: Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations. All special scaffolding shall have drawings and calculations stamped and signed by a civil or structural engineer registered in the state of Oregon.

C. Electrical: Electrical tools, equipment, and lighting shall meet all applicable codes and regulations. Ground fault protection as required by OSHA shall be in effect at all times. Contractor shall take all additional precautions and measures necessary to ensure a safe working environment during wet removal.

PART 3 - EXECUTION

3.1 WORK AREA CONTAINMENT PREPARATION

A. Contractor shall perform lead handling procedures under full or partial containment when work practices are expected to create exposures greater than the Permissible Exposure Limit (PEL) of 50 µg/m3. The following lead handling procedures shall always be performed under full containment: abrasive blasting, welding and torch cutting, grinding or dry sanding, heat gun removal, and chemical stripping of lead paints or varnishes with volatile and caustic chemicals. Partial containment will be acceptable for tasks such as selective demolition, spot chemical removal, and patching of surfaces.

B. Contractor shall perform the following containment procedures in the order in which they are presented: Alternative engineering control methods considered by Contractor must be proven by historical data and approved by the Environmental Consultant. The liberal use of water spray, ventilation, and HEPA air-filtration devices are most effective for reducing airborne lead concentrations.

3.2 PARTIAL CONTAINMENT WORK AREA PREPARATION

A. Tasks requiring partial containment include items such as: Selective demolition, exterior paint removal, patching and repair of painted components, and other tasks where incidental exposures to airborne lead concentrations are likely to occur. Historical monitoring of similar procedures may alleviate partial containment requirements.

B. Contractor shall perform the following procedures in the order in which they are presented and describe procedures for exterior paint removal and other work in non-isolated work areas:

1. Seal off airflow HVAC systems serving other building areas.
2. Restrict access to work area and post warning signs.

3. Install localized HEPA exhaust fan in work area if feasible. Locate fan intake to immediate area of work in such a manner that any lead dust released will be drawn away from the worker and into intake duct.
4. Cover floor and other surfaces below work area with 6-mil polyethylene sheeting.
5. Have emergency cleanup equipment and supplies (including HEPA vacuum, wash water, disposal bags, mop, buckets, towels, and sponges) on hand prior to start of abatement work.

C. When work is complete, Contractor shall remove all visible debris from the work area. Once area has been cleaned, Contractor shall notify Owner and Environmental Consultant to perform a visual inspection and dust wipe or soil sampling as specified in this section.

3.3 WASTE DISPOSAL

A. General: Disposal of building demolition waste coated with lead-based paint will generally not require a hazardous waste determinations (i.e., TCLP testing) if demolition debris is disposed of at a solid waste landfill that is permitted by DEQ and that meets the current design standards for municipal solid waste disposal facilities of 40 CFR Part 258.

B. Other Contractor-generated waste streams shall be tested and properly disposed of by Contractor. Concentrated lead-based paint waste will require a hazardous waste determinations (i.e., TCLP testing) by Contractor. Lead-based paint waste that is deemed hazardous must be properly disposed of by Contractor.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work included in 22 00 00, Plumbing Basic Requirements applies to Division 22 of the Standard Specifications, Plumbing work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, ITB Addenda, Owner/ Engineer agreement, and Owner/hazmat contractor agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.2 RELATED SECTIONS

A. Contents of Section applies to Division 22, Plumbing Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Engineer agreement
   e. Owner/hazmat contractor agreement
   f. Codes, Standards, Public Ordinances and Permits

1.3 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 22, Plumbing Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. OESC - Oregon Electrical Specialty Code

c. OFC - Oregon Fire Code
d. OMSC - Oregon Mechanical Specialty Code
e. OPSC - Oregon Plumbing Specialty Code
f. OSSC - Oregon Structural Specialty Code
g. OEESC - Oregon Energy Efficiency Specialty Code
h. Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. AHRI - Air-Conditioning Heating & Refrigeration Institute
4. ANSI - American National Standards Institute
5. ASCE - American Society of Civil Engineers
6. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
7. ASHRAE Guideline 0, the Commissioning Process
8. ASME - American Society of Mechanical Engineers
9. ASPE - American Society of Plumbing Engineers
10. ASSE - American Society of Sanitary Engineering
11. ASTM - ASTM International
12. AWWA - American Water Works Association
13. CFR - Code of Federal Regulations
14. CISPI - Cast Iron Soil Pipe Institute
15. ETL - Electrical Testing Laboratories
16. EPA - Environmental Protection Agency
17. FM - FM Global
18. IAPMO - International Association of Plumbing and Mechanical Officials
19. GAMA - Gas Appliance Manufacturers Association
20. HI - Hydraulic Institute Standards
21. ISO - International Organization for Standardization
22. MSS - Manufacturers Standardization Society
23. NEC - National Electric Code
24. NEMA - National Electrical Manufacturers Association
25. NFGC - National Fuel Gas Code
26. NFPA - National Fire Protection Association
27. NRCA - National Roofing Contractors Association
28. NSF - National Sanitation Foundation
29. OSHA - Occupational Safety and Health Administration
30. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
31. TEMA - Tubular Exchanger Manufacturers Association

32. TIMA - Thermal Insulation Manufacturers Association
33. UL - Underwriters Laboratories Inc.

D. See Division 22, Plumbing individual Sections for additional references.

E. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in this Agreement. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

F. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE (Polybrominated Diphenyl Ethers) in all insulating materials.

1.4 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 22, Plumbing Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that Engineer's review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any [Contractor?] action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings [Drawings?] in electronic format only. Electronic format must be submitted via posted to ftp site. For electronic format, provide one zip file per specification division containing a separate file for each Specification section. Individual submittals sent piecemeal in a per Specification section method will be returned without review or comment. All transmissions/submissions to be submitted to Engineer. Deviations will be returned without review.

3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 22, Plumbing Sections.

4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

   a. Label submittal to match numbering/references as shown in Contract Documents and schedules. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

   b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference Division 22, Plumbing Sections for specific items required in product data submittal outside of these requirements.

   c. See Division 22, Plumbing Sections for additional submittal requirements outside of these requirements.

5. Maximum of two reviews Engineer of complete submittal package. Arrange for additional reviews by Engineer and/or early review of long-lead items; bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to Contractor without review.
6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.
7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, and existing connections as required per Division 22, Plumbing Coordination Documents.
8. Make provisions for openings in building for removal of equipment prior to start of demolition.
9. Record Drawings:
   a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
   b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.
   c. Provide Invert elevations and dimensioned locations for water services, building waste, and storm drainage piping below grade.
   d. See Division 22, Plumbing individual Sections for additional items to include in record drawings.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform to all local, state, federal and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect site observations and discoveries. They are not intended to show every item in its exact dimensions, or details of equipment layout. Verify actual dimensions of systems (i.e., piping) and equipment.

C. Items shown on Drawings are not necessarily included in Specifications. Confirm requirements in all Contract Documents.

1.6 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide related items from one manufacturer for uniformity, including but not limited to fixtures, pumps, drains and equipment.

2.2 MATERIALS

A. furnish materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL or ETL approved or have adequate approval or be acceptable by state, county, and city authorities.

B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Engineer. Hazardous materials will be removed by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Earthwork:

1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:
   a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions of related earthwork Sections/divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
   b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
   c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils.

3.2 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system.

3.3 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with the following:

1. Cutting, patching and repairing for work specified in this Division will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.

3.4 INSTALLATION

A. Confirm installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

3.5 DEMOLITION

A. Confirm demolition requirements in Division 01, General Requirements and Division 0. In absence of specific requirements, comply with the following:

1. Scope:

a. The Contract Documents provide necessary information and adjustments to plumbing system required to cap existing utilities for future connection. The capped utilities will be located near the perimeter of the work area.

b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, or building access to the remaining buildings.

c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site.

3. Unless specifically indicated otherwise on Drawings, remove all piping. Cap piping below grade and repair surfaces to match surrounding finish.

4. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point near the work zone perimeter.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Tags
2. Plastic Pipe Markers
3. Detectable Underground Tape

1.2 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01. General Requirements.

B. In addition, submit Schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate piping system, system abbreviation (as shown on tag), location of valve. Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals.

1. Equipment Type:
   a. Identification:
   b. Background:
      1) Size:
      2) Color:
   c. Lettering:
      1) Size:
      2) Color:

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22, Plumbing Sections. Where more than a single type is specified for application, provide single selection for each product category.

B. Tags:

1. Brady Corporation
2. Brimer

3. Champion America Inc.
4. Craftmark
5. Seton Identification Products
6. Or approved equivalent.

C. Plastic Pipe Markers:

1. Brady Corporation
2. Brimer
3. Champion America Inc.
4. Craftmark
5. Seton Identification Products
6. Or approved equivalent.

D. Detectable Underground Tape:

1. Brady Corp.
2. Brimar
3. Champion American
4. Craftmark
5. Seton Identification Products
6. Or approved equivalent.

2.2 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch diameter.

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

C. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

D. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7-inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

2.3 PLASTIC PIPE MARKERS

A. Color: Conform to ASME A13.1 and ANSI Z535.1.

B. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.4 DETECTABLE UNDERGROUND TAPE

A. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape with aluminum backing, minimum 6-inches wide by 4 mil thick, manufactured for direct burial service. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 - EXECUTION

3.1 General Installation Requirements

A. Lettering and Graphics:

1. General: Coordinate names, abbreviations and other designations used in plumbing identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
2. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).

B. Preparation:

1. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 Tags

A. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.

B. Install tags with corrosion resistant chain.

C. Identify valves in main and branch piping with metal tags. Indicate valve function.

3.3 PLASTIC PIPE MARKERS

A. Install plastic pipe markers in accordance with manufacturer's instructions.

B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

C. For exterior underground piping installations, install underground plastic pipe markers with tracer wire 6 to 8-inches below finished grade directly above buried pipe.

D. Identify piping with plastic tape pipe markers. Use metal tags on piping 3/4-inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feeet.

3.4 DETECTABLE UNDERGROUND TAPE

A. For underground piping installations, install underground plastic pipe markers with tracer wire 6-inches to 8-inches below finished grade, directly above buried pipe.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Cold Domestic Water above Grade
2. Ductile Iron Pipe and Fittings
3. Steel Pipe and Fittings

1.2 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G
2. Steel pipe to conform to ASTM and ANSI Standards as specified in this Section.
3. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper Development Association (CDA), and American Welding Society, (AWS).
4. Cast Iron Piping to conform to standards of ASTM A-74, CISPI 301 and FM 1680.
5. Manufacturer's Standards Society (MSS) for valving and support reference standard.
6. American Waters Association (AWWA) for Valving Assembly Standards.
7. American Society of Sanitation Engineers (ASSE) for Valving Standards.
8. American National Standards Institute (ANSI) for Piping Standards.

1.4 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See component manufacturers listed in individual articles below.

B. Cerro

C. Dodge Phelps

D. Tyler

E. Charlotte

F. Elkhart

G. Gruvlok

H. Spears

I. Nibco

J. US Steel

K. or approved equivalent.

2.2 GENERAL

A. Provide pipe, tube and fittings of the same type, fitting requirements, grade, class and the size and weight indicated or required for each service, as indicated in other Division 22, Plumbing Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

B. Manufactured materials delivered, new to the project site and stored in their original containers.

C. Product Marking: Each item to be furnished with legible markings indicating: name brand and manufacturer, manufacturing process, and markings as required per ASTM and UL/FM Standards.

2.3 COLD DOMESTIC WATER ABOVE GRADE

A. Ductile Iron Pipe and Fittings

1. Pipe: Class 52 ductile iron, ANSI A21.51, AWWA C1510-70, 150 PSI cement lined; factory encased with 8 mil polyethylene tube or sheet.

2. Fittings: ANSI A21.10 mechanical joint, AWWA C110-1971, 250 PSI. Fittings to be double field wrapped with 2-inch, 20 mil vinyl tape, 50 percent overlap, Scotch Wrap No. 51.

3. Fittings restrained with 2000 PSI thrust blocks in accordance with NFPA-24.

B. Steel Pipe and Fittings

1. Materials:

a. Piping: Schedule 40 and 80 black or hot dipped zinc coated galvanized, welded and seamless steel pipe, ASTM A-53.

b. Joints: Threaded, flanged or bevel welded. Piping installed in plenums or shafts to have welded joints.

2. Fittings:

a. Malleable Iron: Class 150 and Class 300, ANSI B16.3, threaded or flanged joint.

b. Cast Iron: Class 125 and 250, ANSI B16.3, threaded or flanged joint.

c. Cast-Iron Drainage: Recessed threaded fittings manufactured to ASME/ANSI B16.12 (Durham).

d. Carbon Steel: Long radius, standard weight or extra strong, ANSI B16.9, bevel welded joint.

2.4 DUCTILE IRON PIPE AND FITTINGS

A. See 2.3 A. above.

2.5 STEEL PIPE AND FITTINGS

A. See 2.3 B. above.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Underground Piping Systems Examination:

1. Verify that excavations are to required grade, dry, and not over-excavated.

B. General:

1. Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.
2. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
3. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.
4. Excavation: Excavate trenches/sumps to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate size for proper installation of piping, pumps or conduit.

C. General Installation:

1. Work performed by experienced journeyman plumbers. No exceptions.
2. Install pipes and pipe fittings in accordance with recognized industry practices and manufacturers recommendations.

D. Testing:

1. General:
   a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) is installed and remove or disengage control devices before testing. Where necessary, test Sections of each piping system independently, but do not use piping valves to isolate Sections where test pressures exceed local valve operating pressure rating. Fill each Section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.
   b. Notify Architect and local Plumbing Inspector 2 days before tests.
   c. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.
   d. Send test results to Architect for review and approval and include in Operation and Maintenance Manual.

3.2 COLD DOMESTIC WATER ABOVE GRADE

A. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
2. Observe each test Section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

C. Test cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

3.3 DUCTILE IRON PIPE AND FITTINGS

A. Excavation and Backfill:

1. See 3.01 B. above.

B. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times

static pressure at connection to serving utility main for period of two hours with no loss in pressure.

3.4 STEEL PIPE AND FITTINGS

A. Excavation and Backfill:

1. See 3.01 B. above.

B. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in Sections if minimum head cannot be maintained in each Section. 5 PSI head to be minimum pressure at highest joint.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Duplex Sump Pump

1.2 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Seismic anchor details and calculations signed and stamped by licensed Oregon structural engineer with equipment data.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G compliant.
2. ISO 9001 Certified.
3. IAPMO Low Lead Certification

C. Products approved for installation by state authorizing agency, no exceptions.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Duplex Sump Pump - Air Filled:

1. Acceptable Pump Manufacturers:

a. Grundfos
b. Goulds
c. Hydromatic
d. Liberty
e. Weil
f. Or approved equivalent.

2.2 GENERAL

A. Reference drawings for capacities and specific model numbers.

2.3 DUPLEX SUMP PUMP

A. System: Storm Drain

B. Entire unit is to be delivered complete with operating controls and require only plumbing and electrical service connections.

C. Furnish and install where shown on Drawings, one duplex dewatering pump system to prevent groundwater/stormwater from accumulating in the utility tunnels.

D. Pump casing be one piece cast iron constructed with tripod support legs that provide an even distribution of weight.

E. Mating surfaces between motor end bell, motor shell and seal chamber sealed by means of sectional quad rings. Designs using conventional circulate 'O' rings or rectangular cross sectional gaskets are not considered equal.

F. Pump motor vertical, NEMA-6 and of an air filled, hermetically sealed design for premium efficiency. Oil filled shell not considered equal.

G. Motor end bell cast iron, design as terminal box and separated from motor shell by combination bearings support and inspection plate.

H. Motor housed within water tight, heavy duty cast iron with integral extended cooling fins. Motor have Class 'F' insulation and permanently lubricated, double sealed ball bearings having minimum life of 17,500 hours. Motors using sleeve type bearings not considered equal.

I. Motor shaft be 300 series stainless steel with keyway for positive positioning of impeller. Motors using carbon steel shafts or stainless stub shafts not be considered equal.

J. Impeller be multi-vane design, constructed of bronze, accurately machined and dynamically balanced to job site conditions. Impeller will not require use of wearing rings to ensure proper operation and be capable of passing 4-inch minimum solids.

K. Double mechanical seal system be furnished and housed in machined cast iron seal chamber filled with clean dielectric oil, providing constant lubrication. Lower seal surfaces be of solid silicon carbide to provide longer life. Carbon ceramic, tungsten carbide or systems that allow lower seal surfaces to come in contact with pumped media, not be considered equal.

L. Each pump be tested and computer generated report will be kept in file and made available upon request. Reported test data consists of six duty points of various heads and capacities, one of which will be design point and includes actual efficiencies and horsepower requirements.

M. Furnish remote packaged factory pre-wired duplex pump controller with following:

1. NEMA 1 double door dead front steel lockable enclosure.
2. Magnetic starter with overload reset through cover, each pump.
3. Fused disconnect switch with handle through cover, each pump.
4. Automatic alternator, separately fused with lead/lag/alternating capacity.
5. Overload reset buttons, each pump.
6. Running lights, each pump.
7. H-O-A switches, each pump.
8. Control circuit transformer for 120V operation for each pump.
9. Output connections for hi-water annunciation.
10. Alarm silencing switch.
11. Alarm light with flasher.
12. Numbered and wired terminal strip.
13. Single point electrical connection.

14. Wiring between control panel and pump provided under Division 22, Plumbing.

N. Sump Basin:

1. FRP Fiberglass and access covers provided under Division 22, Plumbing.

O. Basin Cover:

1. Fabricate a heavy-duty bar grate. Openings with openings with gaskets, seals, and bushings, for discharge piping, vent connections, and power cables will be routed below ground.
2. Material: 1/4-inch steel plate.

P. Control Switches:

1. Furnish and install mercury float switches complete with galvanized rod and wall support bracket. Each pump control switch will consist of 2 c normally open mercury switches, encapsulated in epoxy resin. Float casing will be polypropylene. Switch cable will be type STO PVC jacket 4 #18 conductor. 41 strand, 600 volt insulation. Cable will be secured to support rod with polypropylene composition clamp with stainless steel bolts. Switches used for high water alarm service will be of same construction as pump switches, except that 2 conductor cables will be furnished. Switch housing will be color coded to distinguish between pump and alarm switches.

Q. Operation of Pumps:

1. See Drawings for switch elevation settings.
2. Switch 1 turns lead pump off at minimum submergence depth for the installed pumps.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Rigging: Heavy duty rigging eye bolts for Crosby Group swivel hoist rings installed over pump access covers for removal or maintenance.

G. Equipment Start-Up:

1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Engineer and Owner's Representative for approval.
3. Remove and replace filters when start-up testing is executed.
4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.
5. Engineer and Owner will be notified 10 days prior to start-up and will be present at start-ups.
6. Provide written report from manufacturer's representative on results of start-up within 48 hours.

7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.
8. Seismic Verification:
   a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.
   b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

3.2 DUPLEX SUMP PUMP

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Rigging: Heavy duty rigging eye bolts for Crosby Group swivel hoist rings (or approved equivalent) installed over pump access covers for removal or maintenance.

G. Equipment Start-Up:
   1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.
   2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Engineer and Owner's Representative for approval.
   3. Engineer and Owner's Representative will be notified 10 days prior to start-up and will be present at start-ups.
   4. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work included in 26 00 00, Electrical Basic Requirements applies to Division 26, Electrical work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electrical systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.2 RELATED SECTIONS

A. Contents of Section applies to Division 26, Electrical Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:
   a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
   b. Drawings
   c. Addenda
   d. Owner/Engineer Agreement
   e. Owner/Contractor Agreement
   f. Codes, Standards, Public Ordinances and Permits

1.3 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 26, Electrical Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:
   a. OAR - Oregon Administrative Rules
   b. OESC - Oregon Electrical Specialty Code

c. OFC - Oregon Fire Code
d. OMSC - Oregon Mechanical Specialty Code
e. OPSC - Oregon Plumbing Specialty Code
f. OSSC - Oregon Structural Specialty Code
g. OEESC - Oregon Energy Efficiency Specialty Code
h. Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. ANSI - American National Standards Institute
4. APWA - American Public Works Association
5. ASCE - American Society of Civil Engineers
6. ASHRAE Guideline 0, the Commissioning Process
7. ASTM - ASTM International
8. CFR - Code of Federal Regulations
9. EPA - Environmental Protection Agency
10. ETL - Electrical Testing Laboratories
11. FCC - Federal Communications Commission
12. FM - FM Global
13. IBC - International Building Code
14. IEC - International Electrotechnical Commission
15. IEEE - Institute of Electrical and Electronics Engineers
16. IES - Illuminating Engineering Society
17. ISO - International Organization for Standardization
18. MSS - Manufacturers Standardization Society
19. NEC - National Electric Code
20. NECA - National Electrical Contractors Association
21. NEMA - National Electrical Manufacturers Association
22. NETA - National Electrical Testing Association
23. NFPA - National Fire Protection Association
24. OSHA - Occupational Safety and Health Administration
25. UL - Underwriters Laboratories Inc.

D. See Division 26, Electrical individual Sections for additional references.

E. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

F. Whenever this Specification requires material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

1.4 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as individual Division 26, Electrical Sections.

B. Provide drawings in format equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via posted to ftp site. For electronic format, provide one zip file per specification division containing a separate file for each Specification Section. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Engineer. Deviations will be returned without review.

3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 26, Electrical Sections.

4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and drawings.

   a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

   b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 26, Electrical specification Sections for specific items required in product data submittal outside of these requirements.

   c. See Division 26, Electrical individual Sections for additional submittal requirements outside of these requirements.

5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.

7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements

for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 26, Electrical Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
10. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Engineer.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
11. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 26, Electrical specification Sections for additional requirements for shop drawings outside of these requirements.
    a. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
12. Samples: Provide samples when requested by individual Sections.
13. Resubmission Requirements:
    a. Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
    b. Resubmit for review until review indicates no exception taken or "make corrections as noted".
14. Operation and Maintenance Manuals, Owners Instructions:
    a. Submit, at one time, electronic files (PDF format) on CD/DVD of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
        1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, and quantities, relevant to each piece of equipment.

3) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

4) Include product certificates of warranties and guarantees.

5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

7) Include copy of startup and test reports specific to each piece of equipment.

8) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

15. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed electrical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

d. See Division 26, Electrical individual Sections for additional items to include in Record Drawings.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform to all local, state and federal codes, and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e. distribution equipment, duct banks, light fixtures, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

C. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer, in writing, before starting work.

D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

E. Provide products that are UL listed.

1.6 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide like items from one manufacturer.

2.2 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturers printed catalog data and are to be UL or ETL approved or have adequate approval or be acceptable by state, county, and city authorities. Equipment/fixture supplier is responsible for obtaining State, County, and City acceptance on equipment/fixtures that are not UL approved or are not listed for installation.

B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials, including lead paint.

2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. [Other than lead paint,] If hazardous materials are encountered, do not disturb; immediately notify Owner and Engineer. [Other than lead paint,] Hazardous materials will be removed by Owner or its agent.

PART 3 - EXECUTION

3.1 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment requiring access (i.e., junction boxes, light fixtures, power supplies, motors, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in passageways, doorways, scuttles or crawlspaces which would impede or block the intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Engineer prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:

1. Confirm Earthwork requirements in Contract Documents. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.

b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.

c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:

1. Confirm requirements in Division 07, Thermal and Moisture Protection. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Start-up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

G. Provide miscellaneous supports/metals required for installation of equipment and conduit.

3.2 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 26 Electrical Sections.

B. General:

1. Earthquake resistant designs for Electrical (Division 26) equipment and distribution, i.e. power distribution equipment, generators, UPS, etc. to conform to regulations of jurisdiction having authority.

2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide means to prohibit excessive motion of electrical equipment during earthquake.

3.3 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Notify Engineer, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground conduit installation prior to backfilling.

2. Prior to covering walls.

3. Prior to ceiling cover/installation.

4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:

1. Request a final punch visit from the Engineer when the mechanical systems are ready for final punch.

2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of Contractor.

3.4 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:

1. During remodeling or addition to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring, and wiring to point of connection.
3. Coordinate transfer time to new service with Owner. If required, perform transfer during off-peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
   a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
4. No interruption of services to any part of existing facilities will be permitted without express permission in each instance from Owner. Requests for outages must state specific dates, hours and maximum durations, with outages kept to these specific dates, hours and maximum durations. Obtain written permission from Owner for any interruption of power, lighting or signal circuits and systems.
   a. Organize work to minimize duration of power interruption.
   b. Coordinate utility service outages with utility company.

3.5 CUTTING AND PATCHING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:

1. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
2. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
3. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and/or walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
4. Additional work required by lack of proper coordination caused by Contractor will be provided at no additional cost to Owner.

3.6 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.7 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Products

and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage and handling to be replaced before installation.

2. Protect equipment to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3. Protect bus duct and similar items until in service.

3.8 DEMONSTRATION

A. Confirm demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 08 00, Commissioning of Electrical and individual Division 26, Electrical Sections.

B. Upon completion of work and adjustment of equipment, test systems and demonstrate to Owner's Representative, and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.9 CLEANING

A. Confirm Cleaning requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Upon completion of installation, thoroughly clean electrical equipment, removing dirt, debris, dust, temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start-up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. Provide miscellaneous supports/metals required for installation of equipment.

3.11 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces (i.e., hangers, hanger rods, equipment stands, etc.) with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.

2. In Electrical Room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Owner.

3. See individual equipment Specifications for other painting.
4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
5. Conduit: Clean, primer coat and paint interior/exterior conduit exposed in public areas with two coats paint suitable for metallic surfaces. Color selected by Owner.
6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Engineer that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

   a. Cleaning

   b. Operation and Maintenance Manuals

   c. Training of Operating Personnel

   d. Record Drawings

   e. Warranty and Guaranty Certificates

   f. Start-up/Test Document and Commissioning Reports

3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
2. During site evaluations by Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.14 RECYCLED MATERIAL

A. Electrical equipment that cannot be salvaged for reuse sell/give to recycling company. Recycle following excess, removed, or demolished electrical material:

1. Copper or aluminum conductors, buses, and motor/transformer windings.
2. Steel and aluminum from raceways, boxes, enclosures, and housings.
3. Acrylic and glass from luminaire lenses/refractors.

B. Provide separate on-site storage space for recycled material. Clearly label space.

C. Confirm additional salvaged equipment and recycled materials in the Contract Documents.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Materials and Equipment

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements and circuiting arrangements are as shown on Drawings.

B. Determine the exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by the failure to locate and preserve utilities. Replace damaged items with new material to match existing.

C. Verify that abandoned wiring and equipment serve only abandoned facilities.

D. Demolition drawings are based on field observation.

1. Verify the accuracy of the information shown prior to bidding and provide such labor and material as is necessary to accomplish the work.
2. Verify location and number of electrical outlets in the field.

E. Report discrepancies to Owner before disturbing existing installation.

F. Beginning of demolition means installer accepts existing conditions without exception.

3.2 PREPARATION

A. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access, and access to different areas. Owner will cooperate to the best of their ability to assist in a coordinated schedule, but will remain the final authority as to time of work permitted.

B. Disconnect electrical systems in walls, floors, and ceilings to be removed.

C. Coordinate utility service outages with utility company.

D. Interruption of services (power, telephone, fire alarm, communication systems) to existing facilities: not permitted without express permission in each instance from Owner.

1. Requests for service outages: State specific dates, hours and the maximum duration.
2. Written permission: Obtain from Owner for interruption of power, lighting or signal circuits and systems.
3. Organize the work to minimize duration of service interruptions.
4. Provide temporary wiring and connections to maintain existing systems in service during construction.

E. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

F. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections.

1. Obtain permission from Owner at least 5 working days before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.

G. Overtime and shift work: Provide as required to maintain continuity of services during normal working hours of the occupied building.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.5 SALVAGED EQUIPMENT AND RECYCLED MATERIAL

A. Salvage the following equipment not being reused and return to Owner:

1. Items shown on drawings

B. Salvage the following equipment not being reused and sell/give to electrical salvage company:

1. Luminaires
2. Panelboards
3. Breakers
4. Transformers

C. Electrical equipment that cannot be salvaged for reuse sell/give to recycling company. Recycle the following excess, removed, or demolished electrical material:

1. Copper or aluminum conductors, buses, motor/transformer windings, and the like.
2. Steel and aluminum from raceways, boxes, enclosures, housings and the like.
3. Acrylic and glass from luminaire lenses/refractors.

D. Provide separate on-site storage space for recycled and salvaged material. Clearly label space.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.
2. Equipment grounding.

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition:

1. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

2.2 GENERAL

A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:

1. 3/4 HP and Under: 120 volt, 1 phase.
2. 1 HP and Over: 208 volt, 3 phase.

B. Safety Switches: Provide as required by NEC and as specified in Section 26 28 16, Enclosed Switches and Circuit Breakers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:

1. Division 22, Plumbing

3.2 INSTALLATION

A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Engineer.

B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.

C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.

D. Install motor starters and controllers for equipment furnished by others.

E. Appliance/Utilization Equipment:

1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.
2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Division 01, General Requirements.

3.4 SYSTEMS STARTUP

A. Provide field representative to prepare and start equipment.

1. Test and correct for proper rotation of polyphase motors.

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Lugs and Pads
2. Wires and Cables
3. Splices
4. Connectors

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Cable insulation test reports in project closeout documentation.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Lugs and Pads:

1. Anderson
2. Ilsco
3. Panduit
4. Thomas & Betts
5. 3M
6. Or approved equivalent.

B. Wires and Cables:

1. General

a. Carol
b. General Cable
c. Okonite
d. Southwire
e. Or approved equivalent.

2. Metal Clad Cable - Type MC:
   a. Alflex
   b. AFC
   c. Carol
   d. Southwire
   e. Or approved equivalent.

C. Splices:
1. Branch Circuit Splices:
   a. Ideal
   b. Scotch-Lock
   c. 3M
   d. Or approved equivalent.
2. Feeder Splices:
   a. Not allowed.

D. Connectors:
1. Stranded conductors by Anderson.
2. Burndy
3. Ilsco
4. 3M
5. Thomas & Betts
6. Or approved equivalent.

2.2 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

B. Copper Pads: Drilled and tapped for multiple conductor terminals.

C. Lugs: Compression type for use with stranded branch circuit or control conductors; mechanical lugs for use with solid branch and feeder circuit conductors.

2.3 WIRES AND CABLES

A. Copper, 600 volt rated throughout. Conductors 12 AWG and 10 AWG, solid or stranded. Conductors 8 AWG and larger, stranded. 12 AWG minimum conductor size. Minimum insulation rating of 90 degrees C. Insulation Type: THWN-2, XHHW-2 or THHN-2.

B. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.

C. Color Code Conductors as Follows:

PHASE	208 VOLT WYE	240 VOLT DELTA	480 VOLT
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray or White w/colored strip
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	N/A	N/A

D. MC Cable: Not allowed.

E. AC Cable (Armored Cable): Not allowed.

F. NMB Cable: Not allowed.

G. SO Cord: Annealed copper conductors, 600 volt rated. Minimum size No. 12 AWG with ground wire. Maximum of six conductors and ground per cable. 90 degrees C rated thermoset jacket.

H. Service Entrance Cable: Copper conductor, 600 volt insulation, XHHW, Type SE.

2.4 SPLICES

A. Feeders: Compression barrel splice with two layers Scotch 23 and four layers Scotch 33+ as vapor barrier.

2.5 CONNECTORS

A. Split bolt connectors not allowed.

B. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 12 AWG through 8 AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer instructions and NEC.

B. Field Quality Control:

1. Test conductor insulation on feeders of 100 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below. Notify Engineer if insulation resistance is less than 1 megohm.

2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit test reports with project closeout documents.

3. Inspect and test in accordance with NETA Standard ATS, except Section 4.

4. Perform inspections and tests listed in NETA Standard ATS, Section 7.3.2.

3.2 LUGS AND PADS

A. Thoroughly clean surfaces to remove all dirt, oil, great or paint.

B. Use torque wrench to tighten per manufacturer's directions.

3.3 WIRES AND CABLES

A. General:

1. Do not install or handle thermoplastic insulated wire and cable in temperatures below +14 degrees F (-10 C).

2. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.

3. Install conductors with care to avoid damage to insulation.

4. Do not apply greater tension on conductors than recommended by manufacturer during installation.

5. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.

6. Conductor Size and Quantity:

a. Install no conductors smaller than 12 AWG unless otherwise shown.

b. Provide required conductors for a fully operable system.

7. Provide dedicated neutrals (one neutral conductor for each phase conductor) in all 120V circuits

8. Conductors in Cabinets:

   a. Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets.

   b. Tie and bundle feeder conductors in wireways of panelboards.

   c. Hold conductors away from sharp metal edges.

9. Homeruns:

   a. Do not change intent of branch circuit homeruns without approval. Homeruns for 20A branch circuits may be combined to a maximum of six current carrying conductors including neutral conductors in homeruns. Apply derating factors as required per NEC. Increase conductor size as needed.

10. Identify wire and cable under the provisions of Section 26 05 53, Identification for Electrical Systems. Identify each conductor with its panel and circuit number as indicated.

11. Exposed cable is not allowed.

3.4 SPLICES

A. Make up slices complete and promptly after wire installation. Provide single wire pigtails for luminaire and device connections. Wire nuts may be used for luminaire wire connections to single wire circuit conductor pigtails.

B. Make splices for No. 8 and larger wires with mechanically applied pressure type connectors. Make all taped joints with Scotch 33+ or equal, applied in half-lap layers without stretching to deform.

C. Remove insulation with a stripping tool designed specifically for that purpose. A pocket knife is not an acceptable tool. Leave all conductors nick-free.

3.5 CONNECTORS

A. Install to assure a solid and safe connection.

B. Do not connect copper and aluminum wiring without UL listed connectors that are listed for the purposes.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Grounding Electrodes
2. Connectors and Accessories
3. Grounding Conductor

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Test reports of ground resistance for service and separately derived system grounds.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Comply with the requirements of ANSI/NFPA 70.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Grounding Electrodes:

1. Erico
2. Thomas & Betts
3. Talley
4. Or approved equivalent.

B. Connectors and Accessories:

1. Burndy Hyground Compression System
2. Erico/Cadweld
3. Amp Ampact Grounding System
4. Pipe Grounding Clamp:
   a. Burndy GAR Series
   b. O Z Gedney
   c. Thomas & Betts

d. Or approved equivalent.

C. Grounding Conductor

1. Carol
2. General Cable
3. Okonite
4. Southwire
5. Or approved equivalent

2.2 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, minimum 3/4-inch diameter, 10-feet long, tapered point, chamfered top.

2.3 CONNECTORS AND ACCESSORIES

A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors.

B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.

2.4 GROUNDING CONDUCTOR

A. Grounding Electrode Conductor: Soft-draw bare stranded copper for wire sizes larger than #10 AWG Bare. Solid copper for wire sizes #10 AWG and smaller.

B. Equipment Grounding Conductor: Green insulated, insulation type to match that of associated feeder or branch circuit wiring, size as indicated on drawings.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Verify site conditions prior to beginning work.

B. Bond Sections of service equipment enclosure to service ground bus.

C. Separately Derived Systems: Ground each separately derived system per NEC Article 250.

D. Corrosion inhibitors: Apply a corrosion inhibitor to contact surfaces when making grounding and bonding connections. Use corrosion inhibitor appropriate for protecting a connection between metals used.

E. Grounding system resistance to ground not to exceed 5 ohms. Make necessary modifications or additions to grounding electrode system for compliance. Submit final tests to assure that this requirement is met.

F. Resistance of grounding electrode system: measure using a four-terminal fall-of-potential method as defined in IEEE 81. Take ground resistance measurements before electrical distribution system is energized and in normally dry conditions, not less than 48 hours after last rainfall. Take resistance measurements of separate grounding electrode systems before systems are bonded together below grade. Combined resistance of separate systems may be used to meet required resistance, but specified number of electrodes must still be provided.

G. Inspect and test in accordance with NETA Standard ATS, Except Section 4.

H. Perform inspections and tests listed in NETA Standard AB, Section 7.13.

3.2 GROUNDING ELECTRODES INSTALLATION

A. Reuse existing building service ground.

B. Metal Underground Water Service: Bond water service pipe to service equipment ground bus or to the grounding electrode system. Connect to water pipe on utility side of isolating fittings or meters, bond across water meters.

C. Other Metal Piping Systems: Bond gas piping system, fire sprinkler piping system and other metal piping systems to service equipment ground bus or to the grounding electrode system.

D. Bond together metal siding not attached to grounded structure; bond to grounding electrode system.

3.3 CONNECTORS AND ACCESSORIES INSTALLATION

A. Install per manufacturer's instructions.

3.4 GROUNDING CONDUCTOR INSTALLATION

A. Raceways:

1. Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger equipment grounding conductor is included with circuit, use grounding bushing with lay-in lug.
2. Connect metal raceways, which terminate within an enclosure but without mechanical connection to enclosure, by grounding bushings and ground conductor to grounding bus.
3. Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.
4. Install equipment grounding conductor, code size minimum unless noted on drawings, in metallic and nonmetallic raceway systems.

B. Feeders and Branch Circuits:

1. Provide continuous green insulated copper equipment grounding conductors for feeders and branch circuits.
2. Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment grounding conductors for feeders and branch circuits sized in accordance with the latest adopted edition of NEC Article 250, Table 250-122.

C. Bond boxes, cabinets, enclosures and panelboard equipment grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Rigid Metal Conduit (RMC)
2. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Metal Conduit
3. Electrical Metallic Tubing (EMT)
4. Flexible Metal Conduit (FMC)
5. Liquidtight Flexible Metal Conduit (LFMC)
6. Electrical Polyvinyl Chloride (PVC) Conduit
7. Conduit Fittings

B. Provide a complete system of conduit and fittings, with associated couplings, connectors, and fittings, as shown on drawings and described in these specifications.

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 05 34, Boxes

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.7 DEFINITIONS

A. Raceway system is defined as consisting of conduit, tubing, duct, and fittings including but not limited to connectors, couplings, offsets, elbows, bushings, expansion/deflection fittings, and other components and accessories. Complete electrical raceway installation before starting the installation of conductors and cables.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Rigid Metal Conduit (RMC):

1. Allied Tube & Conduit
2. Beck Manufacturing Inc.
3. Picoma
4. Wheatland Tube Company
5. Or approved equivalent.

B. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit:
   1. Allied Tube & Conduit
   2. Thomas & Betts Corporation
   3. Robroy Industries
   4. Or approved equivalent.

C. Electrical Metallic Tubing (EMT):
   1. Allied Tube & Conduit
   2. Beck Manufacturing WL
   3. Picoma
   4. Wheatland Tube Company
   5. Or approved equivalent.

D. Flexible Metal Conduit (FMC):
   1. AFC Cable Systems Inc.
   2. Electri-Flex Company
   3. International Metal Hose
   4. Or approved equivalent.

E. Liquidtight Flexible Metal Conduit (LFMC):
   1. AFC Cable Systems Inc.
   2. Electri-Flex Company
   3. International Metal Hose
   4. Or approved equivalent.

F. Electrical Polyvinyl Chloride (PVC) Conduit:
   1. AFC Cable Systems Inc.
   2. Electri-Flex Company
   3. International Metal Hose
   4. JM Eagle
   5. Or approved equivalent.

G. Conduit Fittings:
   1. Bushings:
      a. Insulated type for Threaded Rigid, IMC, or EMT without Factory Installed Plastic Throat Conductor Protection:
         1) Thomas & Betts 1222 Series
         2) O-Z Gedney B Series
         3) Or approved Equivalent.
   2. Raceway Connectors and EMT Couplings:
      a. Thomas & Betts Series
      b. O-Z Gedney Series
      c. Or approved Equivalent.
   3. Expansion/Deflection Fittings:

a. EMT, O-Z Gedney Type TX

b. RMC, O-Z Gedney Type AX, DX and AXDX, Crouse & Hinds XD

c. Or approved equivalent.

2.2 RIGID METAL CONDUIT (RMC)

A. UL 6, ANSI C80.1. Hot dipped galvanized steel conduit after thread cutting.

1. Fittings: NEMA FB2.10.

2.3 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT

A. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. Description: UL 797, ANSI C80.3; steel galvanized tubing.

B. Fittings: NEMA FB 1; steel, compression type.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Description: UL 1, Interlocked steel construction.

B. Fittings: NEMA FB 2.20.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: UL 360, inner core made from spiral wound strip of heavy gauge, hot dipped galvanized low carbon steel. 3/4-inch through 1-1/4-inch trade sizes have a square lock core and contain an integral bonding strip of copper. 1-1/2-inch and larger have fully interlocked core. Jacket material is moisture, oil and sunlight resistant flexible PVC.

B. Fittings: NEMA FB 2.20.

2.7 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: UL 651, NEMA TC 2; Schedule 40 PVC.

B. Fittings: NEMA TC 3.

2.8 CONDUIT FITTINGS

A. Bushings:

1. Insulated type for Threaded Rigid, IMC Conduit or Raceway Connectors without factory-installed plastic throat conductor protection.

2. Insulated grounding type for Threaded Rigid, IMC Conduit and Conduit Connectors.

B. Raceway Connectors and EMT Couplings:

1. Steel connectors, couplings, and conduit bodies, with hot-dip galvanized.

2. Connector locknuts are steel, with threads meeting ASTM tolerances. Locknuts are hot-dip galvanized.

3. Connector throats (EMT, flexible conduit, metal clad cable and cordset connectors) have factory installed plastic inserts permanently installed. For normal cable or conductor exiting angles from raceway, the cable jacket or conductor insulation bears only on plastic throat insert.

4. Steel gland, Tomic or Breagle connectors and couplings are recognized for this Contract as having acceptable raceway to fitting electrical conductance.

5. Set screw connectors and couplings, without integral compression glands, are recognized for this contract as not having acceptable raceway to fitting electrical

conductance. A ground conductor sized per this Specification must be included and bonded within raceway assembly utilizing this type connector or coupling.

C. Provide expansion/deflection fittings for EMT.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Finished Surfaces: Schedule raceway installation to avoid conflict with installed wall and ceiling surfaces. If unavoidable, coordinate work and repairs with Architect.

B. Conduit Size:

1. Minimum Size: 3/4-inch for power and control, unless otherwise noted. 3/4-inch for communication/data, unless otherwise noted. 3/4-inch for signal systems, unless otherwise noted.

C. Underground Installations:

1. More than 5-feet from Foundation Wall: Use PVC.
2. Within 5-feet from Foundation Wall: Use PVC coated RMC.
3. In or Under Slab on Grade: Use PVC.
4. Minimum Size: 1-inch.

D. Provide two pull strings/tapes in empty conduits. Types:

1. Utility Company Conduit: Polyester measure/pulling tape, Greenlee 4436 or approved equivalent. Coordinate exact requirements with utility company.
2. Feeders: Polyester measure/pulling tape, Greenlee 4436 or approved.
3. Branch circuits and low voltage: Greenlee Poly Line 431 or approved.
4. If fish tape is used for pulling line or low voltage wiring, fiberglass type to be used. Metal fish tapes will not be allowed.
5. Secure pull string/tape at each end.
6. Provide caps on ends of empty conduit to be used in future.
7. Label both ends of empty conduits with location of opposite end.

E. Elbows: Fiberglass or PVC coated RMC acceptable for underground installations.

F. Verify that field measurements are as shown on drawings.

G. Plan locations of conduit runs in advance of the installation and coordinate with ductwork, plumbing, ceiling and wall construction in the same areas.

H. Verify routing and termination locations of conduit prior to rough-in.

I. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

J. Install raceways securely, in neat and workmanlike manner, as specified in NECA 1, Standard Practices for Good Workmanship in Electrical Construction.

K. Install steel conduit as specified in NECA 101, Standard for Installing Steel Conduits.

L. Install nonmetallic conduit in accordance with manufacturer's instructions.

M. Inserts, anchors and sleeves.

1. Coordinate location of inserts and anchor bolts for electrical systems prior to concrete pour.
2. Coordinate location of sleeves with consideration for other building systems prior to concrete pour.

N. Conduit Supports:

1. Arrange supports to prevent misalignment during wiring installation.
2. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Group related conduits; support using conduit rack. Construct rack using steel channel. Provide space on each for 25 percent additional conduits.
4. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
5. Do not attach conduit to ceiling support wires.

O. Flexible steel conduit length not-to-exceed 6-feet, 3-feet in concealed walls. Provide sufficient slack to reduce the effect of vibration.

P. Install conduit seals at boundaries where ambient temperatures differ by 10 degrees F or more as shown on the drawings. Install seals on warm side of partition.

Q. Seal raceways stubbing up into electrical equipment. Plug raceways with conductors with duct-seal. Cap spare raceways and plug PVC raceway products with plastic plugs as made by Underground Products, or equal, shaped to fit snugly into the stubup.

R. Seal raceways penetrating an exterior building wall to prevent moisture and vermin from entering into the electrical equipment.

S. Use suitable caps on spare and empty conduits to protect installed conduit against entrance of dirt and moisture.

T. Installation of conduit in structural concrete that is less than 3-inches thick is prohibited without the approval of the Structural Engineer. Maintenance pads, and curbs are exempted.

U. Arrange conduit to maintain headroom and present neat appearance.

V. Do not install conduits on surface of building exterior, along vapor barrier, across roof, on top of parapet walls, or across floors, unless otherwise noted on drawings.

W. Exposed conduits are permitted only in following areas:

1. Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished material.
2. Existing walls that are concrete or block construction.
3. Where specifically noted on Drawings.
4. Route exposed conduit parallel and perpendicular to walls, tight to finished surfaces and neatly offset into boxes.

X. Do not install conduits or other electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block area passage's intended usage.

Y. Install continuous conduit and raceways for electrical power wiring and signal systems wiring.

Z. Below Grade Conduit:

1. Place minimum 3-inch cover of sand or clean earth fill around conduit. Lay conduit on smooth level trench bottom, so that contact is made for its entire length.
2. Remove water from trench before conduit is installed.
3. When three or more conduits are in a single trench, use conduit spacers that will maintain 3-inch spacing between conduits. Provide spacers on 5-foot centers.
4. Provide PVC coated galvanized rigid conduit for elbows larger than 30 degrees or 1-inch diameter.
5. Provide trenching, backfilling, compaction, repaving or other site restoration as required by work done in this division.

6. Slope underground conduits which enter building to drain away from building and to be water sealed to prevent moisture from passing through conduit into building. Joints threaded and taped or glued to prevent entry of water into conduits.
7. Provide watertight conduit sleeves and rubber seals for conduit entering building below grade, Link-Seal system by Thunderline Corporation or approved equivalent.

AA. Maintain adequate clearance between conduit and piping.

AB. Keep conduits a minimum of 12-inches away from steam or hot water radiant heating lines (at or above 104 degrees F) or 3-inches away from waste or water lines.

AC. Cut conduit square using saw or pipecutter; deburr cut ends.

AD. Bring conduit to shoulder of fittings; fasten securely.

AE. Use conduit hubs to fasten conduit to cast boxes in damp and wet locations.

AF. Install no more than the equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate factory elbows for bends in metal conduit larger than 2-inch size.

AG. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

AH. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.

AI. Feeders: Do not combine or change feeder runs.

AJ. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.

3.2 RIGID METAL CONDUIT (RMC) INSTALLATION

A. Outdoor Locations above Grade: Use RMC.

B. Damp Locations: RMC up to 2-inches in diameter.

C. Dry Locations:

1. Concealed: RMC.
2. Exposed: RMC.

D. Dry, Protected: RMC.

E. In areas exposed to severe mechanical damage: RMC.

F. For security conduits installed exposed and subject to tampering: RMC.

G. In hazardous areas per NEC 501: RMC.

3.3 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT INSTALLATION

A. Use PVC coated RMC 36-inch radius ells for power service conduits and 48-inch radius ells for telephone service conduits.

3.4 ELECTRICAL METALLIC TUBING (EMT) INSTALLATION

A. Damp Locations: EMT up to 2-inches in diameter.

B. Dry Locations:

1. Concealed: EMT.
2. Exposed: EMT.

C. Dry, Protected: EMT.

3.5 FLEXIBLE METAL CONDUIT (FMC) INSTALLATION

A. For Dry Areas: Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.

B. Flexible Conduit: Install 12-inch minimum slack loop on flexible metallic conduit.

3.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) INSTALLATION

A. Use PVC coated liquidtight flexible metallic conduit for motors and equipment connections subject to movement or vibration and subjected to any of following conditions: Exterior location, moist or humid atmosphere, corrosive environments, water spray, oil, or grease.

B. Flexible Conduit: Install 12-inch minimum slack loop on liquidtight flexible metallic conduit.

3.7 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT INSTALLATION

A. Underground Installation: Emergency System (Life Safety and Critical) per NEC 517.30(c)(1): Schedule 80 PVC.

3.8 CONDUIT FITTINGS INSTALLATION

A. Conduit Joints: Assemble conduits continuous and secure to boxes, panels and equipment with fittings to maintain continuity. Provide watertight joints where embedded in concrete, below grade or in damp locations. Seal PVC conduit joints with solvent cement and metal conduit with metal thread primer. Rigid conduit connections to be threaded, clean and tight (metal to metal). Threadless connections are not permitted for RMC and IMC. Seal conduits where penetrating below raised floor area.

B. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Use set screw type fittings only in dry locations. When set screw fittings are utilized provide insulated continuous equipment ground conductor in conduit, from overcurrent protection device to outlet.

D. Use compression fittings in dry locations, damp and rain-exposed locations. Maximum size permitted in damp locations and locations exposed to rain is 2-inches in diameter.

E. Use threaded type fittings in wet locations, hazardous locations, and damp or rain-exposed locations where conduit size is greater than 2-inches.

F. Use PVC coated, threaded type fittings in corrosive environments.

G. Use PVC coated RMC 36-inch radius ells for power service conduits.

H. Use insulated type bushings with ground provision at switchboards, panelboards, safety disconnect switches, junction boxes that have feeders 60 amperes and greater.

I. Condulets and Conduit Bodies:

1. Do not use condulets and conduit bodies in conduits for signal wiring, in feeders 100 amp and larger, or for conductor splicing.

J. Sleeves and Chases - Floor, Ceiling and Wall Penetrations: Provide necessary rigid conduit sleeves, openings and chases where conduits or cables are required to pass through floors, ceilings or walls.

K. Expansion Joints:

1. Provide conduits crossing expansion joints where cast in concrete with expansion-deflection fittings, equivalent to OZ/Gedney AXDX, installed per manufacturer’s recommendations.

2. Secure conduits 3-inches and larger to building structure on opposite sides of a building expansion joint with an expansion-deflection fitting across joint installed per manufacturer's recommendations.

3. Provide conduits less than 3-inches where not cast in concrete with junction boxes securely fastened on both sides of expansion joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits 3-inch and larger may be installed.
4. Verify expansion/deflection requirements with Structural Engineer prior to installation.

L. Seismic Joints:

1. No conduits cast in concrete allowed to cross seismic joint.
2. Provide conduits with junction boxes securely fastened on both sides of seismic joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. Prior to installation, verify with Architect that 15-inches is adequate for designed movement, and if not, increase this length as required.
3. Provide conduits less than 3-inches where not cast in concrete with junction boxes securely fastened on both sides of expansion joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits 3-inch and larger may be installed.

M. Provide rigid conduit coupling flush with surface of slab or wall for conduit stubbed in concrete slab or wall to serve electrical equipment or an outlet under table or to supply shop tool, etc. Provide plug where conduit is to be used in future.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Pull and Junction Boxes
2. Box Extension Adapter
3. Conduit Fittings

B. Provide electrical boxes and fittings for a complete installation. Include but not limited to junction boxes, pull boxes, bushings, locknuts and other necessary components.

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 05 33, Raceways
2. Section 26 05 53, Identification for Electrical Systems

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Pull and Junction Boxes:

1. B-Line
2. Hoffman
3. Or approved equivalent.

B. Box Extension Adapter:

1. Hubbell
2. Thomas & Betts
3. Cooper/Crouse-Hinds
4. Or approved equivalent.

C. Conduit Fittings:

1. O-Z Gedney
2. Hubbell
3. Thomas & Betts

4. Cooper/Crouse-Hinds
5. Or approved equivalent.

2.2 PULL AND JUNCTION BOXES

A. Construction: Provide ANSI 49 gray enamel painted sheet steel junction and pull boxes, with screw-on covers; of type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

B. Location:

1. Provide junction boxes and pull boxes to facilitate installation of conductors and limiting accumulated angular sum of bends between boxes, cabinets and appliances to 270 degrees.

C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:

1. Construction: Galvanized cast iron.
2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: ELECTRIC.

D. Fiberglass Handholes: Die molded glass fiber hand holes:

1. Cable Entrance: Pre-cut 6- x 6-inch cable entrance at center bottom of each side.
2. Cover: Fiberglass weatherproof cover with nonskid finish.
3. Cover Legend: ELECTRIC.

2.3 BOX EXTENSION ADAPTER

A. Construction: Diecast aluminum.

B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

2.4 CONDUIT FITTINGS

A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1, Standard Practice of Good Workmanship in Electrical Construction.

B. Secure boxes rigidly to substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

C. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

D. Set wall mounted boxes at elevations to accommodate mounting heights specified in this Section.

E. Electrical boxes are shown on drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10-feet if required to accommodate intended purpose.

F. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.

G. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

H. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

I. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12-inches of box.

J. Box Color Coding and Marking: Reference Section 26 05 53, Identification for Electrical Systems.

K. Adjust boxes to be parallel with building lines. Boxes not plumb to building lines are not acceptable.

L. Install knockout closures in unused box openings.

M. Clean interior of boxes to remove dust, debris, and other material.

N. Clean exposed surfaces and restore finish.

3.2 PULL AND JUNCTION BOXES INSTALLATION

A. Install pull boxes and junction boxes in unfinished areas only.

B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.

C. Do not fasten boxes to ceiling support wires.

D. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 BOX EXTENSION ADAPTER INSTALLATION

A. Match material to box.

B. Install gaskets at exterior and wet locations.

3.4 CONDUIT FITTINGS INSTALLATION

A. Install set-screw fittings so the screws can be seen from below.

B. Tighten compression fittings per manufacturer instructions.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Equipment Nameplates

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals not required for this Section.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
2. Manufacturer's standard products of categories and types required for each application as referenced in other Division 26, Electrical Sections. Where more than a single type is specified for application, provide single selection for each product category.
3. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Equipment Nameplates:

1. B & I Nameplates
2. Intellicum
3. JBR Associates
4. Or approved equivalent.

2.2 EQUIPMENT NAMEPLATES

A. Engraved phenolic plastic, laminate, minimum 1/8-inch thick in the size indicated, with beveled edge border matching letter color. Federal specification L-P-387. All upper case letters in engraver standard letter style of the size and wording indicated. Punched for mechanical fastening, except where adhesive mounting is necessary due to substrate. Embossed tape style labels are not acceptable.

B. Color:

1. Normal (Utility): White letters on black background.
2. Life Safety/Critical (Emergency Systems): Black letters on orange background per WAC 296-46B-700.9.

3. Equipment Branch (Legally Required Standby Systems): Black letters on yellow background.
4. X-Ray Branch (Optional Standby Systems): Black letters on white background.

C. Letter Size:

1. Use 1/2-inch letters minimum for identifying major equipment and loads, including switchgear, switchboards, etc.
2. Use 1/4-inch or 1/2-inch letters minimum for identifying panels, breakers, etc.
3. Use 3/16-inch minimum for identifying source, voltage, current, phase, and wire configurations.

D. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

E. The, Engineer, and Owner have the right to make modifications to the nameplates as necessary.

F. Locations:

1. Switchgear, switchboards, sub-distribution switchboards, distribution panels, and branch panels.
2. Main breakers and distribution breakers in switchgear, switchboards, and distribution panels.
3. Equipment including, but not limited to, motor controllers, disconnects, and VFDs.
4. Low-voltage equipment enclosures including, but not limited to, fire alarm panels, access control panels, and lighting control panels.
5. Distribution transformers.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate designations used on Drawings with equipment nameplates and device labels.

B. Install nameplates and labels parallel to equipment lines.

C. Identify empty conduit and boxes with intended use.

D. Provide typewritten branch panel schedules with protective clear transparent covers accounting for every breaker installed. Use actual room designations assigned by name or number near completion of the work, and not the designations shown on drawings.

E. Provide color coded boxes as follows:

1. Fire Alarm: Red.

3.2 Equipment Nameplates

A. Degrease and clean surfaces to receive nameplates.

B. Secure equipment nameplates to equipment front using self-tapping stainless steel screws.

C. Secure equipment nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Verify emergency system distribution equipment nameplate colors with Owner.

E. Switchgear, switchboards, and panels to include name source, voltage, current phase, wire configuration and fault current rating. Transformers to include source KVA, and secondary voltage, phase, and wire configuration.

F. Provide nameplates for flush mounted branch panelboards identifying name on front door. On inside of door provide nameplate as noted above. Verify with Owner if nameplate on outside of door is required.

G. Provide a second label at branch panelboards listing the means of identification of branch circuit conductors. This identification legend to consist of the color code used for each voltage system (208Y/120V and 480Y/277V). See Specification Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables, for required conductor color code for this project. Include identification of both voltage systems on each label, regardless of the voltage of the panelboard to which the label is affixed. Comply with requirements of NEC 210.5.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Switchboards

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 05 73, Electrical Distribution System Studies.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. UL 891, Standards for Switchboards.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Operation and Maintenance Manuals:

a. After completion of work and start-up of the equipment at the project site, deliver to Owner's Representative operation instructions, maintenance manuals and drawings presenting full details for care and maintenance of each time of equipment provided under this Contract. Number of copies in accordance with Division 01.

b. Each copy to contain the operating and maintenance information and parts lists for equipment provided under this Contract. When necessary, provide supplemental drawings to show system operation and servicing maintenance points. For electrical components, provide wiring and connection diagrams. Include instructions required to accomplish specified operation and functions. Data to be neat, clean and legible.

c. Switchboard drawings and wiring diagrams to be included and up to date at the completion of start-up and system acceptance by Owner. Drawings and wiring diagrams to include any field modifications or changes to reflect actual as-installed conditions.

d. In general, the manual to include, but not necessarily be limited to, the following:

1) Switchboard Elevation and One line.

2) AC and DC Schematic and Physical Component Layout Drawings.

3) Remote Interface Drawing.

4) Bill of Material.

5) Description of Operation.

e. Provide manuals in accordance with Division 01 adequately labeled with the project name and location and the contents indexed.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Switchboards

1. Eaton Electric
2. GE Industries
3. Schneider Electric/Square D
4. Or approved equivalent.
5. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances and selective coordination per Section 26 05 73 can be met. Prior to submitting bid, Contractor to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to Owner that does not meet these conditions.
6. Basis of Design: Eaton. Manufacturers listed are allowed on condition of meeting specified conditions including available space for the equipment and Code required working clearances and selective coordination per Section 26 05 73, Electrical Distribution System Studies. Remove and replace electrical equipment installed that does not meet these conditions at no cost to Owner.

B. Source Quality Control

1. Eaton Electric
2. GE Industries
3. Schneider Electric/Square D
4. Or approved equivalent.
5. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances and selective coordination per Section 26 05 73 can be met. Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to Owner that does not meet these conditions.
6. Basis of Design: Eaton. Manufacturers listed are allowed on condition of meeting specified conditions including available space for the equipment and Code required working clearances and selective coordination per Section 26 05 73, Electrical Distribution System Studies. Remove and replace electrical equipment installed that does not meet these conditions at no cost to Owner.

2.2 SWITCHBOARDS

A. Description: NEMA PB 2 freestanding switchboard with electrical ratings and configurations as indicated and specified.

B. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated switchboards are not acceptable. Reference Drawings for available fault current.

C. Bus Material: Extruded aluminum plated by Altan 70 or 80 process, standard size.

D. Ground Bus: Extend length of switchboard, 50 percent of phase bus capacity.

E. Neutral Bus: 100 percent rated, full length of switchboard.

F. Lugs: Mechanical type for copper conductors.

G. Main Section Devices: Individually mounted.

H. Distribution Section Devices: Panel mounted.

I. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole.

1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

2. Include shunt trip where indicated.

J. Circuit breakers 1200 Amp and Greater: Provide breaker with energy-reducing maintenance switching with local status indicator per NEC Article 240.87(B).

K. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

L. Metering Transformer Compartment: For utility company's use; compartment size, bus spacing and drilling, door, and locking and sealing requirements in accordance with utility company's requirements.

M. Utility Pull Section:

1. Width as shown on drawings. Depth and height to match switchboard.

2. Arrange as shown on drawings.

N. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

O. Pull Box: Removable top and sides, same construction as switchboard.

1. Size as shown on drawings.

2. Provide insulating, fire-resistive bottom with separate openings for each circuit to pass into switchboard.

P. Enclosure: See drawings for NEMA enclosure rating.

1. Align Sections as shown on drawings.

2. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

3. Removable front covers: Screw attached.

4. Provide removable hinge pins on hinged doors.

5. Provide full height barriers between Sections.

6. Mimic Bus: Showing bussing, connections and devices in single line form on the front panels of the switchboard.

a. Use blue factory painting.

b. Use plastic strips

c. Fasten strips flat against the panel face with screws or rivets.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Provide concrete housekeeping pad. Extend 6-inches beyond switchboard width and depth dimensions. Minimum 3-inches above finished floor. Install plumb and level.

B. Verify that field measurements are as indicated on Shop Drawings.

C. Install in a neat and workmanlike manner and in location shown on Drawings, according to NEMA PB 2.1.

D. Adjust all operating mechanisms for free mechanical movement.

E. Tighten bolted bus connections in accordance with manufacturer's instructions.

F. Reference Section 26 08 05, Electrical Acceptance Testing for testing requirements.

3.2 SWITCHBOARDS INSTALLATION

A. Shop inspect and test switchboard according to NEMA PB 2.

B. Make completed switchboard available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.

D. Install switchboard in accordance with manufacturer's installation instructions.

E. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

F. Provide arc flash labels per Section 26 05 73, Electrical Distribution System Studies.

G. Provide engraved nameplates per Section 26 05 53, Identification of Electrical Systems.

H. Perform field inspection and testing.

I. Perform inspections and tests listed in NETA STD ATS, Section 7.1.

J. Measure, using a Megger, insulation resistance of each bus Section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 Vdc; minimum acceptable value for insulation resistance is 1 megohms.

K. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturers recommended torque values.

L. Physically test key interlock systems to check for proper functionality.

M. Test ground fault systems by operating push-to-test button.

N. Adjust circuit breaker trip and time delay settings to values indicated.

O. Adjust circuit breaker trip and time delay settings to values as instructed by Engineer.

P. Clean exterior and interior of switchboard in accordance with manufacturers installation instructions.

Q. Vacuum construction dust, dirt, and debris out of switchboard interior.

R. Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Utility Metering Equipment

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Utility Metering Equipment
   a. Meter Base:
      1) Circle AW.
      2) Or approved equivalent.
   b. Metering Equipment Enclosure:
      1) General Electric
      2) Schneider Electric/Square D
      3) Eaton Electrical
      4) Or approved equivalent.

2.2 UTILITY METERING EQUIPMENT

A. Meter Base: Surface or Flush mounted meter socket enclosure. Provide meter base(s) for energy/demand and reactive energy/demand bases as required by serving electric utility.

B. Terminal Cabinet: Provide terminal cabinet that meets serving utility company's requirements. Construct as an integral part of main distribution switchboard.

C. Provide fault withstand rating greater than utility determined available fault current.

D. C.T. Enclosure: Provide enclosure that meets serving utility company's requirements. Construct as an integral part of main distribution switchboard.

PART 3 - EXECUTION

3.1 UTILITY METERING INSTALLATION

A. Installation:

1. Meter Bases: Locate to provide acceptable access for meter reading and maintenance. Locate to minimize risk of physical damage.
2. Metering Equipment: Install current transformers supplied by serving electric utility.
3. Verify utility requirements prior to bidding and provide associated work required by local utility including but not limited to:
   a. Service underground primary including conduit, pull cord, excavation and backfill.
   b. Underground pull vaults.
   c. Pole risers.
   d. Transformer pads, and vaults.
   e. Secondary service lateral raceways.
   f. Grounding of transformers.
   g. Service metering equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Molded Case Circuit Breakers

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Product data and instantaneous let-through current curves and average melting time current curves for fuses supplied to project.
2. Product data and time/current trip curves for circuit breakers supplied to project.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Molded Case Circuit Breakers:

1. Eaton Electrical
2. General Electric
3. Schneider Electric/Square D
4. Or approved equivalent.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. 1-, 2- or 3-pole bolt-on, single handle common trip, 600VAC or 250VAC as indicated on Drawings.

B. Overcenter toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position.

C. Calibrate for operation in 40 degrees C ambient temperature.

D. 15 to 150 Amp Breakers: Permanent trip unit containing individual thermal and magnetic trip elements in each pole.

E. 151 to 400 Amp Breakers: Adjustable magnetic trip elements. Provide push-to-trip button on cover of breaker for mechanical tripping.

F. Greater than 401 Amp: Electronic trip type with adjustments for long-time, instantaneous, and short-time functions.

G. Circuit breakers 1200 Amp and Greater: Provide breaker with energy-reducing maintenance switching with local status indicator per NEC Article 240.87(B).

H. Provide ground fault function for breakers greater than 800 amps where applied at 480 volts line-to-line; and where indicated on drawings.

I. Combination AFCI Breaker: UL 1699 compliant. Integral 30mA GFCI trip. Manual test button for AFCI mechanism.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Coordination:

1. Obtain and review the submitted product data for equipment furnished by Owner, and furnished under other Divisions of this contract, particularly under Divisions 22 and 23.
2. Confirm the equipment nameplate maximum overcurrent protection (MOCP) and make accommodations and adjustments to overcurrent protective devices as necessary to coordinate with the nameplate rating.

B. Install all items in accordance with manufacturers written instructions.

3.2 MOLDED CASE CIRCUIT BREAKERS

A. Provide testing of ground fault interrupting breakers.

B. Provide circuit breakers, as specified and on Drawings, for installation in panelboards, individual enclosures or combination motor starters.

C. Provide ground fault interrupter circuit breakers for equipment in damp or wet locations.

D. Provide device on handle to lock breaker in "ON" position for breakers feeding time switches, night lights and similar circuits required to be continuously energized.

E. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.

F. Provide multi-pole branch circuit breakers for multiwire branch circuits for simultaneous disconnection of circuits.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 – "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 022000 – "Earthwork" for earthwork, fill, and testing requirements.
3. Section 024116 – "Structure Demolition" for removal of existing site improvements.

1.2 Related Documents

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

1.3 Definitions

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 Preinstallation Meetings

A. Preinstallation Conference: Conduct conference at Project site.

1.5 Material Ownership

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 Informational Submittals

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 Quality Assurance

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 Field Conditions

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged per drawings.

C. Utility Locator Service: Notify One Call for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree-protection measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements in the Drawings.

F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 Materials

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 022000 "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 Preparation

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Drawings.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 Temporary Erosion And Sedimentation Control

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 Tree And Plant Protection

A. Protect trees and plants remaining on-site according to requirements in Project Drawings General Notes and Details.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Project Drawings General Notes and Details.

3.4 Existing Utilities

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than three days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

B. Excavate for and remove underground utilities indicated to be removed.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition."

3.5 Clearing And Grubbing

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Grind down stumps and remove roots larger than 3 inches (75 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.

3. Use only hand methods or air spade for grubbing within protection zones.

4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 Topsoil Stripping

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 8 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 Stockpiling Rock

A. Remove from construction area naturally formed rocks that measure more than 1 foot (300 mm) across in least dimension. Do not include excavated or crushed rock.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 36 inches (900 mm).
2. Do not stockpile rock within protection zones.
3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus rock to allow later use by Owner.

3.8 Site Improvements

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.9 Disposal Of Surplus And Waste Materials

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

A. Trench excavation consists of excavation, bedding, backfill and removal or disposal of material as necessary in demolition and backfill of existing on-site utility tunnels and the installation of water lines and, sanitary and storm sewer lines and appurtenances, conduits, conductors, culverts and any other installation requiring trenching.

1. This work includes, but is not limited to, sheeting, bracing, dewatering, disposal of unsuitable materials, and importing approved bedding or backfill material.
2. All work shall be done in accordance with these Specifications and shown on the Drawings in conformity with the lines, grades, and dimensions.
3. Public Right-of-Way or Easements: All public work construction in the public right-of-way or easements shall be in accordance with the applicable requirements of the latest edition of the City of Salem Standards and Specifications.

B. Unless otherwise provided in the Contract, other work required under this item shall include the removal of structures or portions thereof, grubbing of structure sites which otherwise would not be grubbed, the construction of subsequent removal of shoring or cofferdams, the dewatering of excavated areas, the protection of excavated materials from weather and the placement and compaction of excavated or imported material. Work done under this item shall conform to all federal, state and local safety regulations.

1.2 Related Documents

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

B. RELATED SECTIONS

1. Section 021400 - Dewatering
2. Section 022000 – Earthwork
3. Section 024116 – Structure Demolition
4. Section 311000 – Site Clearing
5. Section 312500 - Erosion & Sediment Control
6. Section 331100 – Water Distribution Piping
7. Section 333100 – Sanitary Sewerage Piping
8. Section 334100 – Storm Drainage Piping

1.3 Site Conditions

A. Existing Utility Systems: The existing utility systems shown are based on record drawings supplied by Owner, and "surface" field survey. Prior to constructing any of the utility systems, Contractor shall "pot-hole" all connection points and utility crossings to verify inverts, sizes, locations, and potential conflicts. Any discrepancies shall be reported to the Engineer for resolution or redesign.

PART 2 - PRODUCTS

2.1 Materials

A. Bedding: The bedding of pipes, conduits, cables and structures shall be as shown on the Plans or as directed by the Engineer. The bedding material shall be placed and thoroughly compacted over the full width of the trench. Samples of the proposed materials shall be submitted to the Engineer for approval.

B. Backfill: The backfill for pipes, conduits, cables and structures shall be as shown on the Drawings or as directed by the Engineer. The backfill material shall be placed in maximum eight-inch lifts and thoroughly compacted over the full width of the trench. Samples of the proposed materials shall be submitted to the Engineer for approval.

1. Granular backfill shall be used in all other locations where native backfill is not designated. Unclassified excavated material used as native backfill shall be earth, sand, gravel, rock or combinations thereof, free of humus, organic matter, vegetable matter, frozen material, clods, sticks, and debris and containing no stones having a dimension greater than three inches. The materials shall predominate in the finer sizes and, in place, shall present no voids and no isolated points or areas of larger stones which would cause fracture or denting of the utility or structure or subject it to undue stress. Use of the native backfill shall be approved by the Engineer.
2. Granular backfill shall be used under paved areas, in trenches in streets, in trenches in public right-of-ways and easements, and other areas subject to wheel traffic, and at structures or as designated on the plans. Granular backfill material shall be 3/4 inch minus crushed aggregate. Top of rock elevation shall be held down at the specified depth in areas designated to receive asphalt paving. All granular backfill shall be placed in maximum eight-inch lifts and compacted to 95% (top 2 feet) and 90% (below 2 feet) maximum dry density per ASTM D 1557

PART 3 - EXECUTION

3.1 Contractor's Responsibility For Utility Properties And Services

A. Contractor shall comply with ORS 757.541 through 757.571 and shall notify all utility companies for line locations 72 hours (minimum) prior to start of work.

B. At points where Contractor's operation could cause damage or interference to railway, telegraph, telephone, television, power, oil, gas, water, irrigation, or other private, public or municipal utilities, Contractor shall suspend work until all arrangements necessary for the protection thereof have been made by Contractor.

C. Contractor shall notify all utility offices which are affected by the construction operation at least 72 hours in advance of excavation. Under no circumstances shall Contractor expose or interrupt any utility without first requesting permission and being granted to do so from the affected agency.

1. It shall be Contractor's responsibility, once permission from the utility has been granted, to locate, if necessary, and expose all of the existing underground utilities in advance of the trenching operation.

D. Contractor shall be solely and directly responsible to Owner and utility companies for any damage, expense, or claims of any kind brought because of injuries, damages or delay which may result from the carrying out of the work to be done under the Agreement.

E. In the event of interruption to domestic water or to other utility services as a result of accidental breakage, or as a result of being exposed, unsupported, or a lack of coordination, Contractor shall promptly notify the Engineer and the agency involved. Contractor shall cooperate with Engineer and the said authority in restoration of service as promptly as possible and shall bear any and all costs of repair.

1. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval of the Engineer or agency involved is granted.

F. Neither Owner nor its officers or agents shall be responsible to Contractor for damages as a result of the location of the underground utilities being other than that shown on the Plans and Drawings or for the existence of underground utilities not shown on the Plans.

3.2 Field Relocation

A. During construction, minor relocations of the utility lines may be necessary. Such relocations shall be made only with approval from the Engineer. Unforeseen obstructions encountered as a result of such relocations will not become subject to claims for additional compensation by Contractor.

3.3 Opening Trenches

A. Contractor shall not begin the trench excavation until the necessary material is on hand to complete the work involved.

1. The trenches shall be opened in accordance with the lines and grades given for the work, at such times and as far in advance of the work as may be required by the Engineer.
2. Not more than a total of 100 feet of trench shall be opened in advance of the completed utility unless authorized by the Engineer. Related structures must be completed and backfilled at the time of line installation.

3.4 Barricades, Guards And Safety Provisions

A. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights, and guards as required shall be placed and maintained during the progress of the work and until it is safe for public use.

1. Watchmen or flag personnel shall be provided as necessary.
2. Rules and regulations of all local and Federal authorities regarding safety provisions shall be observed. Contractor will be solely responsible for accidents caused by inadequate or insufficient safety provisions

3.5 Pavement Removal

A. All bituminous and concrete pavements, regardless of the thickness shall be sawcut prior to excavation. Width of the pavement cut shall be equal to the prescribed width of the trench at the ground surface or as shown on the plans.

1. Pavement removed during excavation shall be piled separately from other excavation materials and removed from the site. Pavement shall not be used as backfill material. Uneven pavement edges shall be sawcut before patching the pavement.

3.6 Obstructions

A. This item refers to obstructions which may be encountered and do not require replacement.

1. Obstructions to the construction of the trench such as tree roots, stumps, abandoned piling, buildings and concrete structures, logs, rubbish, and debris of all types shall be removed without additional compensation from Owner.
2. The Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the perpetual easement and right-of-way and without adversely affecting the intended function of the facility or increase costs to Owner. Sewer and water trenches must be maintained at a minimum specified separation, however.

3.7 Interfering Structures Or Roadways

A. Contractor shall remove, replace and/or repair any damage done by Contractor during construction to fences, buildings, cultivated fields, drainage crossings, and any other properties at his own expense without additional compensation from Owner.

1. Contractor shall replace or repair these structures to a condition as good as or better than their original condition prior to commencing work in the area.

B. Where paved roadways are cut, granular backfill shall be used as defined above. New pavement shall as specified on the plans and shall not deviate by more than one-quarter inch from the existing finish elevation.

C. If Contractor encounters existing structures which will prevent construction and are not adequately shown on the Drawings, they shall notify the Engineer before continuing with the work in order that the Engineer may make such revisions as necessary to avoid conflict with the existing conditions.

1. The cost of waiting or "downtime" during such field revisions shall be borne by Contractor without additional cost to Owner or liability to the Engineer.
2. If Contractor fails to so notify the Engineer when a conflict of this nature is encountered, but proceed with construction despite this interference, they shall do so at their own risk with no additional payment.

3.8 Easements

A. Any damage to private property, either inside or outside the limits of Owner's property, shall be the responsibility of Contractor.

1. Before final payment will be authorized by the Engineer, Contractor will be required to furnish Owner with written releases from property owners where special agreements or easements have been obtained by Contractor or where Contractor's operations for any reason, have not been kept within the construction right-of-way obtained by Owner.

2. Any such special agreements must be in written form and shall not involve Owner or Engineer as to liabilities in any way.

3.9 Grades

A. The bottom of the trench shall be excavated to the lines and grades shown on the plans or established by the Engineer with proper allowance for pipe thickness and required bedding. Any trench excavated below grade shall be returned to grade at Contractor's expense, with fine bedding material.

1. The bedding shall be placed over the full width of the trench in thoroughly compacted layers as previously specified herein. Grades shall be smooth without humps or sags.

B. The Engineer shall be notified by Contractor with reasonable notice in advance when a section has been excavated and is ready for installation of the utility line or structure. The Engineer will make a determination as to the suitability of the excavation foundation and will give notice to Contractor to proceed or remove unstable material.

3.10 Width of Trench

A. Trenches shall be excavated to a sufficient width to permit proper installation of piping, conduits or related improvements as shown on the plans or required by local standards and specifications.

1. For the installation of utilities or conduits, the minimum width of trenches shall be 18 inches plus the inside diameter of the pipe.

B. In cases where excessive width of excavation would cause damage to adjacent structure, the trench shall not be excavated in excess of the minimum width as specified herein or detailed on the drawings.

3.11 Boring

A. Boring may be used as an approved method in lieu of open trench excavation if approved by the Engineer. Contractor shall furnish the Engineer with a detailed construction schedule outlining methods, time schedule and proposed safety measures to be incorporated in construction.

1. Upon receiving approval, Contractor will not deviate from his proposed schedule without first obtaining approval of the Engineer and other respective agencies involved in that portion of the work.

3.12 De-watering

A. Whenever water is encountered in the trench or excavation area, Contractor shall pump or otherwise dry the bottom of the trench or excavated area before the pipe or conduit installation is commenced. Complete de-watering per section 021400.

1. Contractor shall not allow water encountered in the trench or excavated area to escape down any pipe or conduit in place unless he first obtains written approval from the Engineer for this method of de-watering.

2. Contractor will be responsible for cleaning and/or flushing as required, the complete pipe, conduit, or structure. Any soil, aggregate or other foreign matter in the utility prior to acceptance must be removed at Contractor's expense prior to final acceptance of the work.

3.13 Shoring and Sheathing

A. Contractor shall use whatever means necessary to maintain safe working conditions and protect adjacent property and structures from damage due to excavation. Contractor shall conform to all federal, state and local regulations governing shoring, sheathing and excavation.

1. When shoring or sheathing is installed, the trench width shall be increased accordingly. The shoring or sheathing shall remain in place until the utility or structure is backfilled to a point where caving could not damage the installation.

2. No additional payment will be made for shoring or sheathing. All costs involved in placement and removal of shoring and sheathing shall be considered part of the bid for the work.

3.14 Location of Excavated Materials

A. During excavation Contractor shall locate excavated material so as not to block any public right-of-way, traveled roadways, public or private; and unless otherwise approved by the Engineer, roadways shall be kept open to at least one lane of traffic.

1. Contractor shall store or waste excavated materials only in designated areas unless otherwise approved by the Engineer. Utmost care shall be taken to prevent spillage or damage to property adjacent to the project.

B. Excavated materials unsuitable for backfill as described herein or not required to meet original or specified grades shall be removed as soon as possible or at least by completion of backfill.

1. No additional payment (beyond the bid amount) will be made to the Contractor for disposal of excess materials.

3.15 Foundation Stabilization

A. When in the opinion of the Geotechnical Engineer, the existing material in the bottom of the trench or excavated area is unsuitable for supporting the pipe, conduit or structure or related appurtenances, excavation below the flowline of the pipe or base of other structure shall be executed to a suitable depth as directed by the Engineer.

3.16 Maintenance of Backfill

A. Notwithstanding the type of backfill placement, the backfilled trench or excavation surface shall be maintained until all construction has been completed and accepted by Owner and Engineer. This maintenance shall include but not be limited to the addition of backfill in settled areas and surface rock or pavement in roadways to keep the trench reasonably smooth and free from excessive ruts and potholes.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. Erosion/Sedimentation Control (ESC) is required on this project. Construction of all erosion control measures shall be in accordance with the City of Salem and per DEQ 1200-C permit requirements. Compost based BMP's shall be constructed in accordance with Oregon Department of Transportation Section 00280 – Erosion and Sediment Control specifications and details. All work shall comply with US Army Corps of Engineers and Oregon Department of State Lands Joint Permit and Sections 404 and 401 permit conditions and requirements.

B. The implementation of the ESC and the construction, maintenance, replacement, and upgrading of these ESC facilities is the responsibility of Contractor until all construction is completed and approved and the final vegetation/landscaping is established.

C. This section describes temporary measures and monitoring to control water pollution, soil erosion, and siltation. Erosion, sediment, and pollutant control (EPSC) devices or methods include the use of construction entrances, tree protection fences, diversion dikes, check dams, sediment basins and traps, compost filter sock sediment barriers, compost blanket mulch, gravel, mulches, sediment barriers, grasses, slope drains, and other techniques.

D. The boundaries of the clearing limits and limits of grading shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing area shall be permitted. The flagging shall be maintained by Contractor for the duration of the project.

E. The ESC facilities shown on the Drawings must be constructed in conjunction with all mass grading and site utility construction, in such a manner as to ensure that sediment and sediment laden water does not enter the drainage system, roadways, or violate applicable water standards.

F. The ESC facilities shown on the plan and/or details are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded as needed for unexpected storm events or site conditions to ensure that sediment and sediment-laden water do not leave the site.

1.2 Related Documents

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

B. Related Sections

1. Section 311000 - Site Clearing
2. Section 022000 – Earthwork
3. Section 312317 – Trenching

1.3 Submittals

A. At the pre-construction meeting, submit the following supplemental EPSC information:

1. Construction start and completion dates.
2. Dates when EPSC measures will be in place.
3. Projected date of removal of erosion control structures (after soil is stabilized by vegetation or pavement).
4. Description of control procedures to prevent the discharge of all wash water from concrete trucks into the storm sewer system.
5. Description of procedures for prompt maintenance or repair of EPSC measures utilized on-site.

6. Description of best management practices that will be used to prevent or minimize storm water from being exposed to pollutants from spills, cleaning and maintenance activities, and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery as well as debris, leftover paints, solvents, and glues from construction operations.

1.4 Quality Assurance

A. Contractor is to comply with all applicable local, State, and Federal ordinances, rules, and regulations concerning erosion and sedimentation control and stormwater runoff.

B. In case of conflict between the above codes, regulations, references, and standards and these specifications, the more stringent requirements shall govern.

C. Conduct a Preconstruction Meeting onsite as directed by Owner or Owner's Representative prior to the start of construction.

1.5 Project Site Conditions

A. Contractor to visit the site and verify all existing conditions affecting the work of this section prior to submitting bids or proposals. Additional compensation will not be allowed for revisions or modification of work resulting from failure to verify existing conditions.

PART 2 – PRODUCTS

2.1 General

A. All products shall conform to the applicable requirements of City of Salem and per DEQ 1200-C permit requirements and Oregon Department of Transportation specifications Section 00280 – Erosion and Sediment Control.

1. Construction Entrance
2. Tree Protection Fence
3. Inlet Protection
4. Compost Filter Sock Sediment Barriers
5. Compost Filter Blanker
6. Tire Washes
7. Concrete Washouts
8. Outlet Protection
9. Plastic Sheeting
10. Diversion Dikes
11. Temporary Seeding
12. Soil Tackifier
13. Erosion Control Blankets
14. Dust Control
15. Temporary Pipe Slope Drains

PART 3 – EXECUTION

3.1 General

A. The implementation of the EPSC measures and the construction, performance monitoring, maintenance, replacement, and upgrading of the EPSC measures are the responsibility of Contractor until all construction is completed and accepted and vegetation/landscaping and paving is established.

B. The EPSC measures shown on the drawings shall be constructed in conjunction with all clearing, grading, trenching, and earthwork activities and in a manner that ensures that sediment and sediment-laden water do not enter the drainage system, roadways, or violate applicable water quality standards.

C. The EPSC measures shown on the drawings are the minimum requirements for anticipated site conditions and Contractor methods and sequences. During the construction period, the EPSC measures shall be upgraded as needed for unexpected conditions, storm events, or Contractor methods or sequences and to ensure that sediment and sediment-laden water do not leave the site.

D. Contractor shall be responsible for implementing temporary erosion control measures during construction to correct unforeseen conditions. Contractor shall be responsible for additional erosion control due to Contractor's negligence, carelessness, or failure to install planned controls as a part of the work.

E. Implementation, construction, and maintenance of EPSC measures shall be in accordance with the City of Salem requirements.

F. Do not begin soil disturbance activities until perimeter EPSC measures are in place.

G. The erosion control sheets within the Drawings, together with the specifications and 1200-C documents constitute the EPSC plan. A copy of the EPSC plan shall be retained on site and made available to the City of Salem staff upon request.

3.2 Construction Details

A. Install and maintain all site public notification signs as shown on the drawings and keep signs easily readable from the public right-of-way throughout the duration of the ground-disturbing activities. Remove and dispose of signs upon completion of work.

B. No visible or measurable erosion material or pollutant shall exit the construction site. Visible or measurable is defined as:

1. Deposits of mud, dirt, sediment or similar material exceeding 1/2 cubic foot in volume in any area of 100 square feet or less on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dripping, discharge, or as a result of the action of erosion.

2. Evidence of concentrated flows of water over bare soils; turbid or sediment laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site.

3. Earth slides, mud flows, earth sloughing, or other earth movement which leaves the property.

C. Employ all reasonable means and methods to control or divert upslope stormwater runoff away from cleared and grubbed areas, stockpiled materials, and other disturbed areas that will be open or stockpiled for periods longer than two-weeks.

D. Construction entrances, exits, and parking areas shall be graveled or paved to reduce the tracking of sediment onto public or private roads. Maintain for the duration of the project.

E. Unpaved roads on the site shall be graveled or under other effective erosion and sediment control measures, either on the road or down gradient, to prevent sediment and sediment-laden water from leaving the site.

F. Preserve existing vegetation where practicable and revegetate open areas after grading or construction.

G. Continuously secure or protect soil stockpiles from runoff and erosion throughout the project with temporary soil stabilization measures or protective cover.

H. Provide ongoing maintenance, repair, and restoration of EPSC measures to keep them continually functional.

1. The following maintenance activities shall be included:

a. Visual or measurable amounts of sediment and pollutants that leave the site shall be cleaned up immediately and placed back on the site or properly disposed. Under no conditions shall sediment be intentionally washed into storm sewers or drainage ways.

b. Clean catch basin protection when design capacity has been reduced by 50 percent.

c. Remove sediment trapped by sediment barriers before it reaches one third of the above-ground barrier height.

d. Remove trapped sediments from sediment basins and traps when design capacity has been reduced by 50 percent.

I. If fertilizers are used to establish vegetation, the application rates shall follow manufacturer's guidelines and the application shall be done in a way that minimizes nutrient-laden runoff to receiving waters.

J. If construction activities cease for 30 days or more, the entire site shall be stabilized using vegetation or a heavy mulch layer, temporary seeding, or another method that does not require germination to control erosion.

K. Any use of toxic or other hazardous materials shall include proper storage, application, and disposal.

L. When trucking saturated soils from the site, either watertight trucks shall be used or loads shall be drained on-site until dripping has been reduced to minimize spillage on roads and streets.

M. Clean all catch basins and inlets protected from sediment prior to paving and final acceptance. The cleaning operation shall not flush sediment laden water into the downstream system.

N. EPSC measures installed during construction shall be removed when construction and site disturbance activity are complete and permanent soil stabilization is in place.

O. Remove and dispose of waste and unused building material.

3.3 Wet Weather Construction

A. Contractor is responsible for all additional erosion control measures required during wet weather construction between October 1st and May 30th.

3.4 Protection Of Adjacent Property

A. Protect adjacent properties from land disturbance, erosion, and sedimentation.

3.5 Protection Of Jurisdictional Wetlands

A. No work or land disturbance shall occur in jurisdictional wetlands and vegetated corridors prior to issuance of US Army Corps of Engineers and Oregon Department of State Lands Joint Permit.

B. Work shall be completed in compliance with US Army Corps of Engineers and Oregon Department of State Lands Joint Permit and conditions.

3.6 Disposition Of Temporary Measures

A. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization and the establishment of paving and final landscaping.

B. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. This section specifies requirements for furnishing and placing base course material composed of crushed aggregate.

1.2 Related Documents

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

B. Related Sections

1. Section 022000 Earthwork
2. Section 311000 Site Clearing
3. Section 312500 Erosion and Sediment Control

C. Geotechnical Engineering Services Report; State of Oregon Department of Administrative Services, State Hospital Demolition, Salem, Oregon, dated April 8, 2016, prepared by GeoEngineers, Inc. GeoEngineers project: 11681-006-00.

D. "Oregon Standard Specification" means the "2015 Oregon Standard Specifications for Construction" as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.

E. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the City of Salem standards and specifications.

1.3 Submittals

A. See section 013300 – Submittals, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Aggregate Composition Test Reports: Results of laboratory test on proposed and actual materials used.

D. Compaction Density Test Reports.

PART 2 – PRODUCTS

2.1 Materials

A. Aggregate Base Rock:

1. Aggregate base rock below asphalt concrete pavements should be clean, crushed rock or crushed gravel. The base aggregate should contain no deleterious materials, meet specifications provided in ODOT SS 02630.10 – Dense-Graded Aggregate, and have less than 5 percent by weight passing the U.S. Standard No. 200 Sieve.
2. Base aggregate material shall conform to the requirements of the Standard Specification in areas outside of the public right of way, and City of Salem standards for work in the public right-of-way. Refer to the Structural Contract Drawings for additional requirements for aggregate bases under the building.

B. Certification of Aggregate: Prior to the placing of the aggregate base course material, Contractor shall produce test results from a certified testing laboratory indicating the suitability of the material.

PART 3 – EXECUTION

3.1 Construction Requirements

A. Aggregate bases shall be placed per the requirements of the Standard Specification and the City of Salem and Marion County Standards.

B. Compact aggregate base course thoroughly and uniformly to at least 95% of the maximum density as determined by ASTM D1557.

3.2 Equipment

A. All equipment necessary for the proper construction of this work shall be in first-class working condition before construction is permitted to start, and all other equipment must be able to produce a product meeting the specifications.

3.3 Maintenance

A. Following the completion of the base course, Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for paving.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. Section Includes:

1. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.

B. Related Requirements:

1. Section 024116 "Structure Demolition" for demolition and removal of existing asphalt pavement.
2. Section 022000 "Earthwork" for earthwork, fill, and testing requirements.

1.2 Related Documents

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

1.3 Preinstallation Meetings

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

   a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

   b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 Action Submittals

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
3. Job-Mix Designs: For each job mix proposed for the Work.

1.5 Field Conditions

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 – PRODUCTS

2.1 Aggregates

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 Asphalt Materials

A. Asphalt Binder: AASHTO M 320, PG 64-22.

B. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

C. Water: Potable.

D. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

PART 3 – EXECUTION

3.1 Examination

A. Verify that subgrade is dry and in suitable condition to begin 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. 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 (300 mm) 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 reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.

2. 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: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

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. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 Repairs

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 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. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

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.

3.5 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. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. 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 (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

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.

3.6 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 (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
5. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 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 (85 deg C).

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: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent or greater than 100 percent.

2. 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. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 Installation Tolerances

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).

2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).

2. Surface Course: 1/8 inch (3 mm).

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 Field Quality Control

A. Testing Agency: Contractor to provide a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.10 Waste Handling

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. Section Includes Concrete Paving:

1. Driveways.
2. Curbs and gutters.
3. Walks.

1.2 Related Documents

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

1.3 Definitions

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 Preinstallation Meetings

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

   a. Concrete mixture design.

   b. Quality control of concrete materials and concrete paving construction practices.

1.5 Action Submittals

A. Product Data: For each type of product.

1.6 Field Conditions

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 – PRODUCTS

2.1 Concrete, General

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 Forms

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

2.3 Concrete Materials

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, gray portland cement Type I.
2. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: Potable and complying with ASTM C 94/C 94M.

2.4 Curing Materials

A. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.5 Concrete Mixtures

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials:

1. Fly Ash or Pozzolan: 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1-1/2 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 3000 psi (20.7 MPa).
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

2.6 Concrete Mixing

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 – EXECUTION

3.8 Examination

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 Edge Forms And Screed Construction

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 Joints

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

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 (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
   a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) either way from centers of dowels.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.
3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 Concrete Placement

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface 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 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) 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 joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

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 bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.

2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

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 (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

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

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas 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 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).

2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).

4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.

5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).

6. Vertical Alignment of Dowels: 1/4 inch (6 mm).

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.

8. Joint Spacing: 3 inches (75 mm).

9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.

10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.9 Field Quality Control

A. Testing Agency: Contractor to provide a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m), 5000 sq. ft. (465 sq. m), or fraction thereof of each concrete mixture placed each day.

   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Engineer, 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 Engineer 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 Engineer.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.10 Repair 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 Engineer.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. This section specifies requirements for water line distribution piping.

1. Pipe and fittings for potable water line and fire water line.
2. Valves and Valve Boxes.

1.2 Related Documents

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

B. Related Sections

1. Section 312317 Trenching
2. Section 331200 Water Appurtenances

C. City of Salem Specifications and Standard Details.

D. AWWA – American Water Works Association.

1.3 Submittals

A. Section 013300 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Project Record Documents: Record as-constructed locations of piping mains, valves, connections, thrust restraints, and invert elevations.

E. Identify and describe unexpected variations to subsoil conditions or discovers of uncharted utilities.

1.4 Quality Assurance

A. Perform Work in accordance with City of Salem Specifications and Standard Details.

1.5 Delivery, Storage, And Handling

A. Deliver and store valves in shipping containers with manufacturer's name and pressure rating labeling in place.

B. Store pipe and pipe materials in designated areas on-site.

C. Store polyethylene materials out of sunlight.

PART 2 - PRODUCTS

2.1 Water Piping

A. Public Water mains 6" and larger.

1. Push-on joint Ductile Iron Pipe, Class 52, cement-mortar lined conforming to ANSI/AWWA C151/A 21.51 and ANSI A21.11. Rubber ring gaskets shall conform to ANSI A21.11, suitable for the specified pipe sizes and pressures. Fitting joints shall be mechanical joint ends.

B. Private water lines 4" and larger

1. Push-on joint Ductile Iron Pipe, Class 52, cement-mortar lined conforming to ANSI/AWWA C151/A 21.51 and ANSI A21.11. Rubber ring gaskets shall conform to ANSI A21.11, suitable for the specified pipe sizes and pressures. Fitting joints shall be mechanical joint ends.
2. PVC AWWA C-900 and AWWA C905, designated for potable water use. Class DR 18, 150 psi, and DR 14, 200 psi.

C. Private water lines 2" and smaller

1. PVC Schedule 40 designated for potable water use.
2. Copper pipe type K

2.2 Fittings

A. Ductile Iron Fittings shall conform to ANSI / AWWA C110 / A21.10 and/or ANSI / AWWA C153/ A 21.53. Fitting joints shall have mechanical joint (MJ) ends.

B. Mechanical Joint Fittings and Restraints

1. Mechanical joint fittings shall be ductile iron short pattern.
2. Fittings shall conform to ANSI / AWWA C110 / A21.10 and shall be of a class at least equal to that of the adjacent pipe.
3. Bolts shall be domestic Cor-Ten or ductile iron tee-head bolts.
4. Mechanical Joint Restraints.
   a. The restraint shall be MEGALUG Series 1100 restraint device as manufactured by EBAA Iron, Inc. or equal.

C. Flanged Fittings

1. Flanged fittings shall conform to ANSI / AWWA C110/A21.10 and shall be faces and drilled Class 124 flanges that match ANSI B16.1 fittings.
2. Flanged fittings shall be ductile iron
3. Flange bolts and nuts shall be Grade 304 or 316 stainless steel with standard course threads. Threads on bolts and nuts shall be coated with a food grade anti-seize material to prevent thread galling.

D. Gaskets

1. Gasket material for flanged joints in ductile iron pipe shall consist of 1/8-inch thick, full-face one-piece, cloth inserted, rubber gaskets conforming to section 4 of ANSI/ AWWA C207 and ANSI B16.21.

E. Joints

1. Joints shall be restrained where called for in City of Salem Specifications and Standard Details using either mechanical joint restraints, Field Lok™ (Tyton), or approved equal
2. Where restrained joints are not required by the City of Salem Specifications and Standard Details Fastite™ (American) gaskets, or approved equal.

F. Thrust Blocks and Straddle Blocks

1. Use thrust block and straddle block materials shall be 3,500 psi minimum compressive strength concrete where called for in City of Salem Specifications and Standard Details.

PART 3 - EXECUTION

3.1 Preparation

A. Verify existing utility water main size, location and inverts are as indicated on the Drawings.

3.2 Excavation

A. Excavate pipe trench in accordance with Section 312317 Trenching. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

3.3 Installation

A. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufactures' instructions.

B. Install PVC pipe in accordance with AWWA C605 and manufactures' instructions.

C. Install water pipe in conformance with City of Salem Specifications and Standard Details.

3.4 Disinfection And Testing

A. Disinfection and testing shall be in conformance with City of Salem Specifications and Standard Details.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. This sections specifies requirements for water appurtenances.

1. Appurtenances commonly used for potable water line and fire water line.
2. Valves and Valve Boxes, Fire Hydrants

1.2 Related Documents

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

B. Related Sections

1. Section 312317 Trenching
2. Section 331100 Water Distribution Piping

C. City of Salem Specifications and Standard Details.

D. AWWA – American Water Works Association.

1.3 Submittals

A. Section 013300 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Project Record Documents: Record as-constructed locations of piping mains, valves, connections, thrust restraints, and invert elevations.

E. Identify and describe unexpected variations to subsoil conditions or discovers of uncharted utilities.

1.4 Quality Assurance

A. Perform Work in accordance with City of Salem Specifications and Standard Details.

1.5 Delivery, Storage And Handling

A. Deliver and store valves in shipping containers with manufacturer's name and pressure rating labeling in place.

B. Store pipe and pipe materials in designated areas on-site.

C. Store polyethylene materials out of sunlight.

PART 2 - PRODUCTS

2.1 Fire Hydrants

A. Fire Hydrants shall conform to the City of Salem Specifications and Standard Details.

2.2 Gate Valves, Box And Cover

A. Gate valves, boxes and covers shall conform to the City of Salem Specifications and Standard Details.

B. Valves twelve (12) inches and smaller shall be gate valves. Only resilient wedge gate valves shall be installed.

C. Valves must meet AWWA C509 Standard for Resilient Seated Gate Valves.

D. Valve body and bonnet shall be epoxy coated inside and out with fusion bonded epoxy. Coating shall conform to AWWA C550 Standard Protective Coatings for Valves and Hydrants.

E. Unless otherwise shown, valves shall have 2-inch square operating nut.

F. Tapping Valves

1. Tapping gate valves shall be flange by mechanical joint, shall conform to the above specifications unless stated otherwise, and as recommended by the manufacturer for use with the tapping sleeve supplied.
2. Valves shall be cast ductile iron body, resilient seated NRS tapping valves with 2-inch square operating nut, fusion epoxy coated inside and outside, meeting the requirements of AWWA C509.
3. Valves for O.D. Steel weld-on taps will be installed with insulation kits for flanged (or other) connections between dissimilar metals. Install tracer wire to either side of transition, and bring up both ends of tracer wire in a valve box for continuity purposes. (Follow basic valve box installation.)

G. Valve box and cover conforming to City of Salem Specifications and Standard Details.

2.3 Butterfly Valves, Box And Cover

A. Butterfly valves, boxes and covers shall conform to the City of Salem Specifications and Standard Details.

B. Valves greater than twelve (12) inches shall be butterfly valves.

C. All butterfly valves installed shall conform to AWWA C504 Standard for Rubber Seated Butterfly Valves.

2.4 Blowoff Assembly

A. Blowoff size must be in accordance with AWWA flushing flow rates, but not less than 2 inches for 8 inch lines and smaller, and 4 inches for lines larger than 8inches. Blowoffs shall conform to the City of Salem Specifications and Standard Details.

2.5 Combination And Vacuum Release Valve

A. Combination Air and Vacuum Release Valve shall be installed at dead ends where there is a risk of a vacuum being created due to water shut down.

B. Combination Air and Vacuum Release Valve shall be installed at high points in the water system.

2.6 Water Meter, Boxes, And Vaults

A. Water meter and Water meter boxes/vaults shall conform to the City of Salem Specifications and Standard Details.

2.7 Backflow Devices And Vaults

A. Backflow prevention assemblies shall conform to City of Salem Specifications and Standard Details.

B. Backflow prevention assemblies shall be installed on the Domestic water service, Fire water service and the irrigation service.

C. Fire service backflow prevention assemblies shall be installed at the edge of the public water line easement.

D. Only approved Double Detector Check Valve Assemblies are to be used for system containment on fire line services.

2.8 Tapping Valves And Sleeves

A. All tapping sleeve and valve assemblies shall meet the requirements of AWWA Standard C500, latest revision. Cast iron tapping sleeves or stainless steel wrap-around sleeves, and cast iron valves shall be used to make live taps into the existing water mains where shown on the drawings. Sleeve bodies must be of stainless steel. The flanges must conform to AWWA C207 Class D ANSI 150# drilling. All bolts and nuts shall be as specified.

B. Contractor shall verify type of existing main prior to ordering. The tapping valve shall have an inlet flange to match the sleeve and a mechanical joint outlet for connection to water main pipe. Tapping valve shall meet the requirements for gate valves specified herein. The sleeve shall have provisions for a tap and shall be pressure tested at 150 psi for a minimum of 60 minutes prior to tapping.

2.9 Restrained Joint Systems

A. Restrained joints shall be EBBA Iron, Inc. MegaLug Series 1100, or approved equal.

PART 3 - EXECUTION

3.1 Installation

A. General:

1. Install water appurtenances as shown, specified, as recommended by the manufacturer, and as required by City of Salem Specifications and Standard Details.
2. In the event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Engineer before proceeding.
3. Install service connections and valves where indicated on the plans.

3.2 Disinfection And Testing

A. Disinfection and testing shall be in conformance with City of Salem Specifications and Standard Details.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. This section specifies requirements for storm drainage pipe for a gravity flow storm drainage system.

1.2 Related Documents

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

B. Applicable sections of the current Oregon Plumbing Specialty Code and the "City of Salem Department of Public Works Administrative Rules Design Standards".

C. All work shall be done in accordance with these Specifications and in conformity with the Plans.

D. Related Section

1. Section 312317 Trenching

1.3 Submittals

A. Product Data: Provide data indicating pipe, pipe accessories, and Manufacturer.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents:

1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 Delivery, Storage and Handling

A. Do not store plastic pipe and fittings in direct sunlight

B. Protect pipe, pipe fittings and seals from dirt and damage.

1.5 Quality Assurance

A. Piping materials shall bear label, stamp, or other marking or specified testing agency.

B. Comply with NSF/ANSI 14, "Plastic Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer for plastic sewer piping.

1.6 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 Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service Owner's written permission.

PART 2 – PRODUCTS

2.1 Storm Drainage Piping 4 Inch And Larger With Greater Than 3 Feet Of Cover, Beyond 5 Feet Of The Building

A. PVC Pipe and Fittings

1. Pipe: Shall conform to the requirements of ASTM D3034, SDR 35

2. Fittings: All fitting shall be of the same materials as the pipe unless otherwise approved. Conform to the requirements of ASTM D3034, PVC
3. Gaskets: Shall conform to the requirements of ASTM F 477, elastomeric seals and ASTM 3212

B. PE Pipe and Fittings

1. Corrugated PE Pipe and Fittings Pipe: Shall conform to the requirements of ASTM D3350

C. HDPE Pipe and Fittings

1. All HDPE Pipe and Fittings shall conform to the requirements of ASTM F714, DR 26

2.2 Storm Drainage Piping 4 Inch And Larger With 3 Feet Or Less Of Cover, Beyond 5 Feet Of The Building

A. Ductile Iron, Gravity Sewer Pipe and Fittings

1. Pipe: AWWA C150-1, cement lined push-on joint. Class 50.
2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, ductile iron, for push-on joints.
4. Gaskets: AWWA C111, rubber

B. HDPE Pipe and Fittings

1. All HDPE Pipe and Fittings shall conform to the requirements of ASTM F714, DR 26

C. C900 Pipe and Fittings

1. All C900 Pipe and Fittings shall conform to the requirements of ASTM C-900 D-1784

2.3 Storm Drainage Piping within 5 feet of the building

A. PVC Pipe and Fittings

1. PVC DWV, Solid-Wall PVC Pipe shall conform to the requirements of ASTM D 2665, and plumbing code requirements

2.4 Perforated Pipe

A. Rigid round perforated PVC pipe shall conform to the requirements of ASTM D3034, SDR 35.

2.5 Grout

A. Grout shall be of the non-shrinking type. Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C-827 and CRD-C-621.

PART 3 – EXECUTION

3.1 Earthwork

A. Excavation, trenching, and backfilling are specified in section 312317 Trenching.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.2 Piping Installation

A. General location and arrangements: Drawing plans and details indicate general location and arrangement of underground storm sewer piping. Location and arrangement of piping layout tack into account design considerations. Install pipe 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 instruction for using lubricants, cements, and other installation requirements.

C. 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 complete. Place plug in end of incomplete piping at end of day and when work stops.

3.3 Connections

A. Pothole prior to construction to verify location, size and depth of existing piping. Notify Engineer if location, size or depth of existing pipe is different than shown on the plans.

3.4 Field Quality Control

A. Inspection and testing shall be per City of Salem Standards.

3.5 Cleaning

A. Clean dirt and superfluous material from interior of piping prior to testing.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

A. This section specifies requirements for storm drainage structures for a gravity flow drainage system.

1.2 Related Documents

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

B. Applicable sections of the current Oregon Plumbing Specialty Code, City of Salem Design Manual and Standard Drawings.

C. All work shall be done in accordance with these specifications and in conformity with the plans.

D. Section 334100 Storm Drainage Piping.

1.3 Submittals

A. Product Data.

B. Shop Drawings for Manholes

1.4 Delivery, Storage and Handling

A. Do not store plastic pipe and fittings in direct sunlight

B. Protect pipe, pipe fittings and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.5 Quality Assurance

A. Piping materials shall bear label, stamp, or other marking or specified testing agency.

B. Comply with NSF/ANSI 14, "Plastic Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer for plastic sewer piping.

1.6 Project Conditions

A. Interruption of Utility 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 Owner no fewer than two days in advance of proposed interruption of sanitary sewer service.

PART 2 – PRODUCTS

2.1 Manholes

A. Manhole components shall conform to City of Salem standards.

B. All steps within structures must comply with OSHA standards for fixed metal, individual rung ladders (OAR 437), and there shall be no more than 24 inches between the top of the casting and the rung of the top step.

C. All precast manhole riser sections shall conform to the requirements of ASTM C478.

D. All poured in place concrete shall have a 28 day strength of 3000 psi, and a slump of 2 inches to 2 inches.

E. All joints shall be sealed with preformed gaskets such as Kent-Deal #2, Ram-Neck, or an approved equal conforming to federal specifications SS-S00210.

F. All pipe connections to manhole shall be water tight.

G. Watertight / tamper proof manhole frame and cover shall be used in all easement and off street areas.

2.2 Cleanouts

A. Cleanout components shall conform to City of Salem standards.

B. Cleanout stand pipe shall be the same material and size as the mainline up to and including 8 inch pipe. Mainline greater than 8 inches shall have an 8 inch standpipe.

C. Cleanout frame and cover shall have a concrete collar.

PART 3 – EXECUTION

3.1 Earthwork

A. Excavation, trenching, and backfilling are specified in section 312317 Trenching.

3.2 Manhole Installation

A. General: install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C891 and City of Salem Standards.

3.3 Cleanout Installation

A. General: install cleanout complete with appurtenances and accessories indicated, and in conformance with City of Salem.

B. Install cleanouts where indicated on the drawings and per Oregon Plumbing Specialty Code.

3.4 Connections

A. Pothole prior to construction to verify location, size and depth of existing piping. Notify Engineer if location, size or depth of existing pipe is different than shown on the plans.

3.5 Field Quality Control

A. Inspection shall be per City of Salem Standards.

3.6 Cleaning

A. Clean dirt and superfluous material from interior of piping prior to testing.

3.7 Testing and Acceptance

A. Testing shall be in conformance with City of Salem requirements and Oregon Plumbing Specialty Code.

END OF SECTION

Appendix

North Campus Oregon State Hospital Demolition Project
Salvage Items Log
Contract # R03189
HHPR Project # DAS-01
August 2016

Delivery Addresses:

Oregon State Surplus: 1655 Industrial Dr. NE., Salem, Oregon 97301
Contact: Sven Anderson, 503-378-6057
Contact: Bob LaDuke, 503-378-4077

Oregon State Hospital - Junction City: 29398 Recovery Way, Junction City, Oregon 97448
Contact: Howard Davis, Director of Operations 541-465-2783

Oregon State Hospital - Salem Oregon: 2600 Center St, NE., Salem, Oregon, 97301
Contact: Michael Larimer, Director of Operations 503-945-2924

Oregon School for the Deaf: 999 Locust St, NE., Salem, Oregon, 97301
Contact: Bill Selnes, Facilities Manager 503-378-3993

Plan Set ID #	Surplus Tag ID #	Salvage Item	Salavage Item Location	Delivery Location	Action Date	Status	Make and Model	Serial Number	Capacity
1	25	Boiler	Mckenzie Hall - Building #40 - Basement Mechanical Room	Oregon State Surplus			Boiler: Weil McLain 1688, Burner: Webster JB3G-30	Burner: U94423E-01	5155 Mbtu/hr
2	26	Water Heater	Mckenzie Hall - Building #40 - Basement Mechanical Room	Oregon State Surplus					
3	No Tag	Feed water tank and pump	Mckenzie Hall - Building #40 - Basement Mechanical Room	Oregon State Surplus			Bryan Steam model HFS	Bryan No. 090547	130 Gallons
4	24	Compressor	Mckenzie Hall - Building #40 - Basement Mechanical Room	Oregon School for the Deaf			Quincy		
5	28	1 Cart of items	Mckenzie Hall - Building #40 - Basement Storage Room B004	Oregon State Surplus					
6	No Tag	1 Tote of Items	Mckenzie Hall - Building #40 - Basement Storage Room B004	Oregon State Surplus					
7	No Tag	Anitque Light Pole	Mckenzie Hall - Building #40 - Exterior South	Oregon State Surplus					
9	29	Generator	Mckenzie Hall - Building #40 - Exterior Northwest	Oregon State Surplus					
10	No Tag	Building Plaque	Mckenzie Hall - Building #40 - Exterior Front Entrance West	Oregon State Hospital - Salem					
11	No Tag	Pallet of Exterior Brick (500 Bricks Total)	Mckenzie Hall - Building #40 - Exterior	Oregon State Surplus					
12	1	Cooler	Breitenbush Hall - Building #35 - First Floor Dining Area West	Oregon School for the Deaf					
13	2	Cooler	Breitenbush Hall - Building #35 - First Floor Dining Area West	Oregon School for the Deaf					
14	4	Compressor	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon School for the Deaf			Quincy		
15	3	Generator	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon State Surplus					
16	5	Boiler	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon State Surplus			Boiler: Weil McLain 1388, Burner: Webster JB2G/LP-20	Burner: U94423C-01	4119 Mbtu/hr
17	6	Boiler	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon State Surplus			Boiler: Weil McLain 1388, Burner: Webster JB2G/LP-20	Burner: U94423C-02	4119 Mbtu/hr
18	8	Feed water tank and pumps	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon State Surplus			Bryan Steam model HFS	Bryan No. 090551	175 Gallons
19	7	Water Heater	Breitenbush Hall - Building #35 - Basement Boiler Room	Oregon State Surplus					
20	9	Boxes of Tile	Breitenbush Hall - Building #35 - Basement Equipment Room	Oregon State Surplus					
21	No Tag	Building Plaque	Breitenbush Hall - Building #35 - Exterior Entrance North	Oregon State Hospital - Salem					
22	No Tag	Building Plaque	Breitenbush Hall - Building #35 - Exterior Entrance South	Oregon State Hospital - Salem					
23	No Tag	2 Pallet of Exterior Brick (1000 Bricks Total)	Breitenbush Hall - Building #35 - Exterior	Oregon State Surplus					
24	No Tag	Heat Pump	Breitenbush Hall - Building #35 - Basement Mechanical Room Hall	Oregon State Surplus			Fujitsu model AOU9RLS	HRN004040	
25	16	Water Heater (WH-1)	Eola Hall - Building #50 - Exterior East	Oregon State Surplus					
26	17	Water Heater (WH-2)	Eola Hall - Building #50 - Exterior East	Oregon State Surplus					
27	18	Boiler 1	Eola Hall - Building #50 - Exterior East	Oregon State Surplus			Boiler: Weil McLain 1188, Burner: Webster JB2C-15	Burner: U95501A-01	3428 Mbtu/hr
28	19	Boiler 3	Eola Hall - Building #50 - Exterior East	Oregon State Surplus			Boiler: Weil McLain 1188, Burner: Webster JB2C-15	Burner: U95501A-03	3428 Mbtu/hr
29	20	Boiler 2	Eola Hall - Building #50 - Exterior East	Oregon State Surplus			Boiler: Weil McLain 1188, Burner: Webster JB2C-15	Burner: U95501A-02	3428 Mbtu/hr
30	12	Feed water tank and pump	Eola Hall - Building #50 - Exterior East	Oregon State Surplus			Bryan Steam model HFS	Bryan No. 5100059	275 Gallons
31	22	Generator	Eola Hall - Building #50 - Exterior East	Oregon State Surplus					
32	No Tag	Compactor	Eola Hall - Building #50 - Exterior Southeast	Oregon State Surplus					
33	No Tag	Reflection Pond Sculptures (11 each)	Eola Hall - Building #50 - Exterior Northwest	Oregon State Hospital - Junction City					
34	No Tag	Building Plaques	Eola Hall - Building #50 - Exterior Entrance South	Oregon State Hospital - Salem					
35	No Tag	Compressor	Eola Hall - Building #50 - Basement Mechanical Room	Oregon School for the Deaf			Quincy		
36	15	Generator	Santiam Hall - Building #34 - Exterior East	Oregon State Surplus					
37	10	Water Heater	Santiam Hall - Building #34 - Basement Mechanical Room	Oregon State Surplus					
38	11	Boiler	Santiam Hall - Building #34 - Basement Mechanical Room	Oregon State Surplus			Boiler-Weil McLain 1888; Burner-Webster JB2G/LP	Burner: U94423B-01	5485 Mbtu/hr
39	12	Feed water tank and pump	Santiam Hall - Building #34 - Basement Mechanical Room	Oregon State Surplus			Bryan Steam model HFS		
40	13	Compressor	Santiam Hall - Building #34 - Basement Mechanical Room	Oregon School for the Deaf			Dayton SpeedAire		
41	14	Ice Machine	Santiam Hall - Building #34 - Basement Hallway South End	Oregon State Surplus					
42	No Tag	Building Plaque	Santiam Hall - Building #35 - Exterior Entrance West	Oregon State Hospital - Junction City					
43	No Tag	Pallet of Exterior Brick (500 Bricks Total)	Sanitiam Hall - Building #35 - Exterior	Oregon State Surplus					
44	No Tag	Anitque Light Pole	Sanitiam Hall - Building #35 - Exterior West	Oregon State Surplus					

Building Time Capsule Note: Ceremonial Time Capsules were installed during the original building construction; Typically metal boxes located near entrances within the walls. If time capsules are discovered during demolition, the contractor is to salvage and return to the Department of Administrative Services (DAS)

D ST NE
25TH ST NE (PRIVATE)
PARK AVENUE
SEE DETAIL "B"
SEE DETAIL "A"
23RD ST NE
B ST NE (PRIVATE)
BITTERN ST NE (PRIVATE)
27TH ST NE (PRIVATE)
CENTER ST NE
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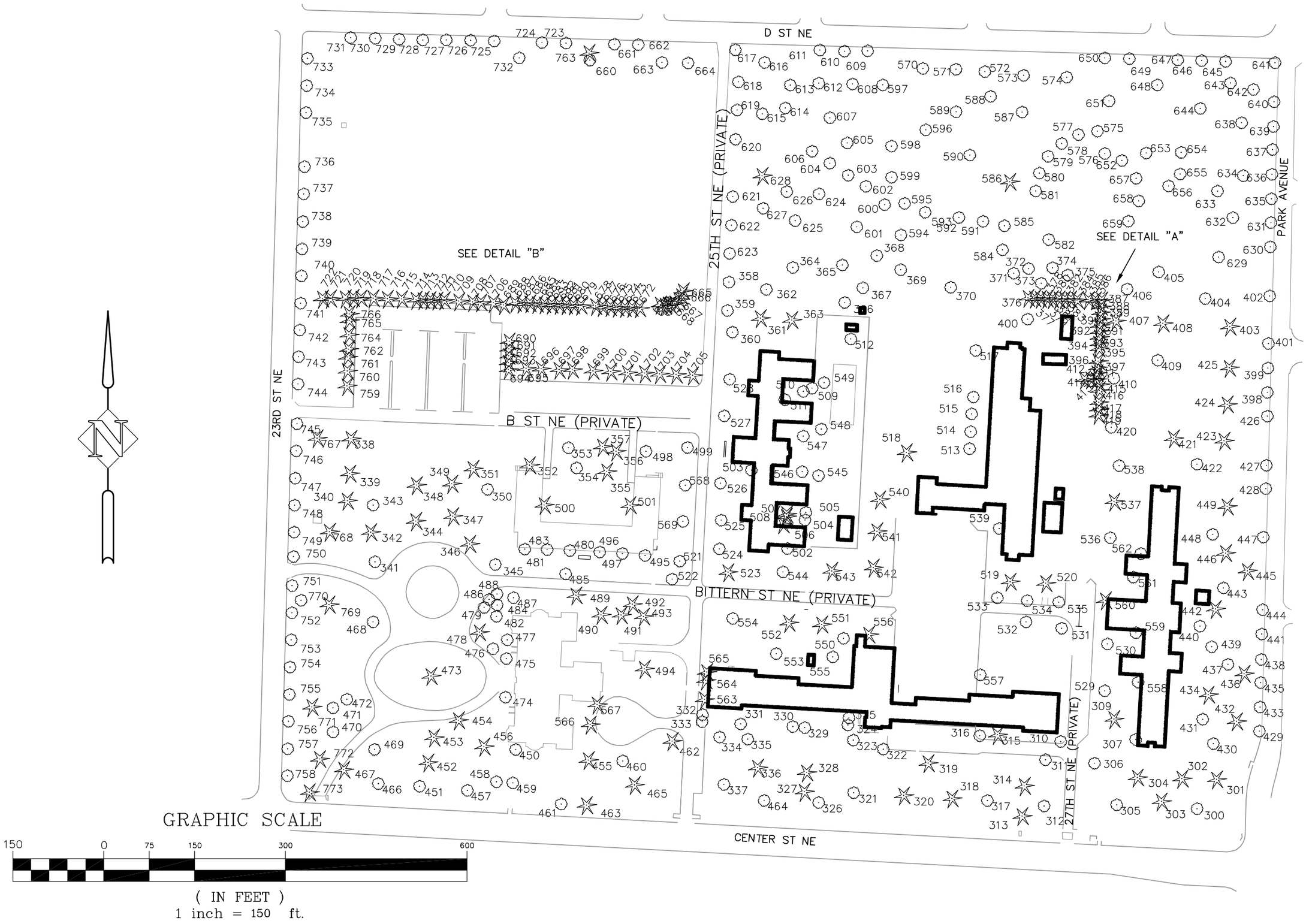
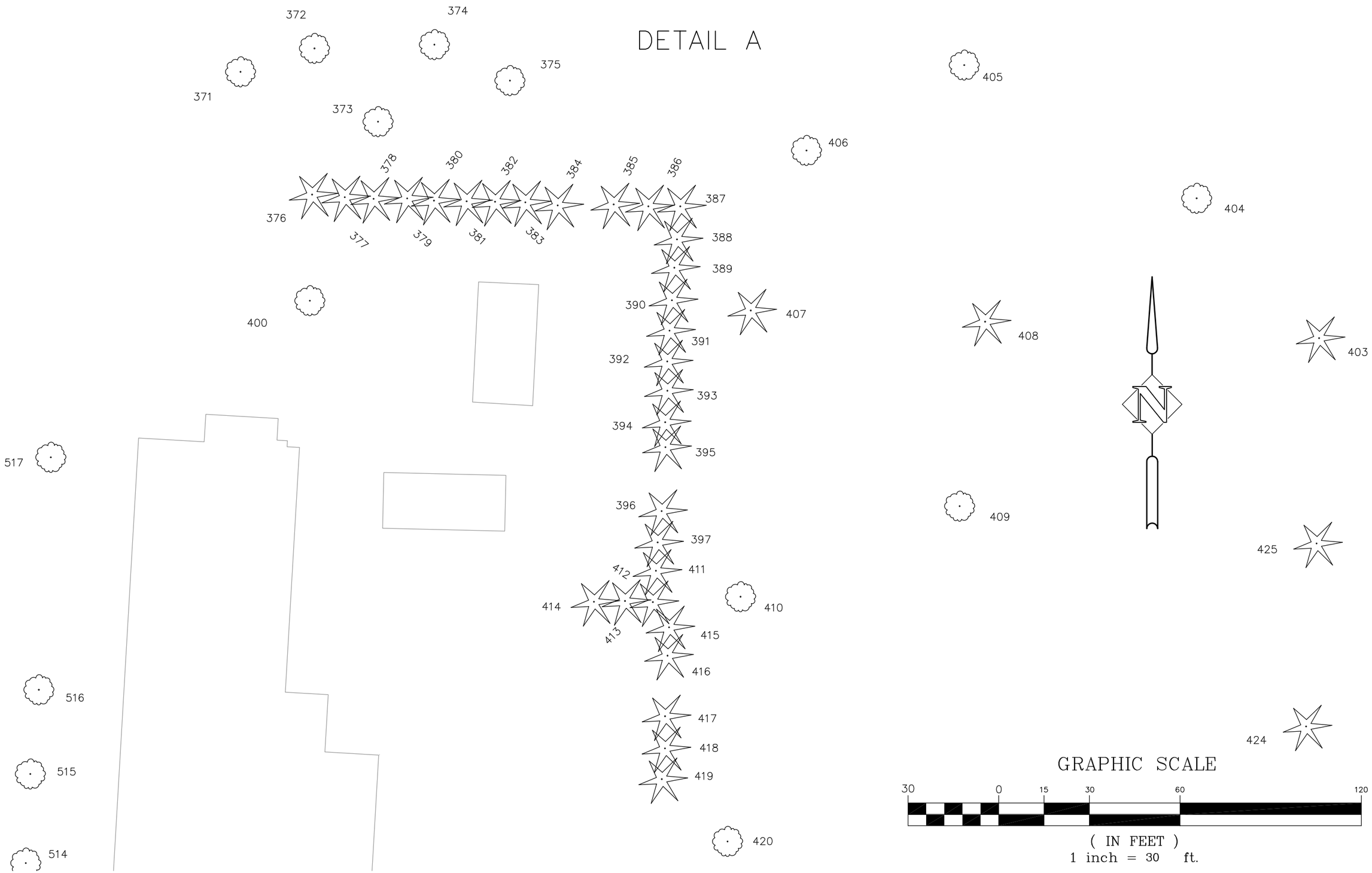
(IN FEET)
1 inch = 150 ft.


D ST NE
25TH ST NE (PRIVATE)
PARK AVENUE
23RD ST NE
B ST NE (PRIVATE)
BITTERN ST NE (PRIVATE)
27TH ST NE (PRIVATE)
CENTER ST NE
SEE DETAIL "B"
SEE DETAIL "A"
GRAPHIC SCALE
150 0 75 150 300 600
(IN FEET)
1 inch = 150 ft.

DETAIL A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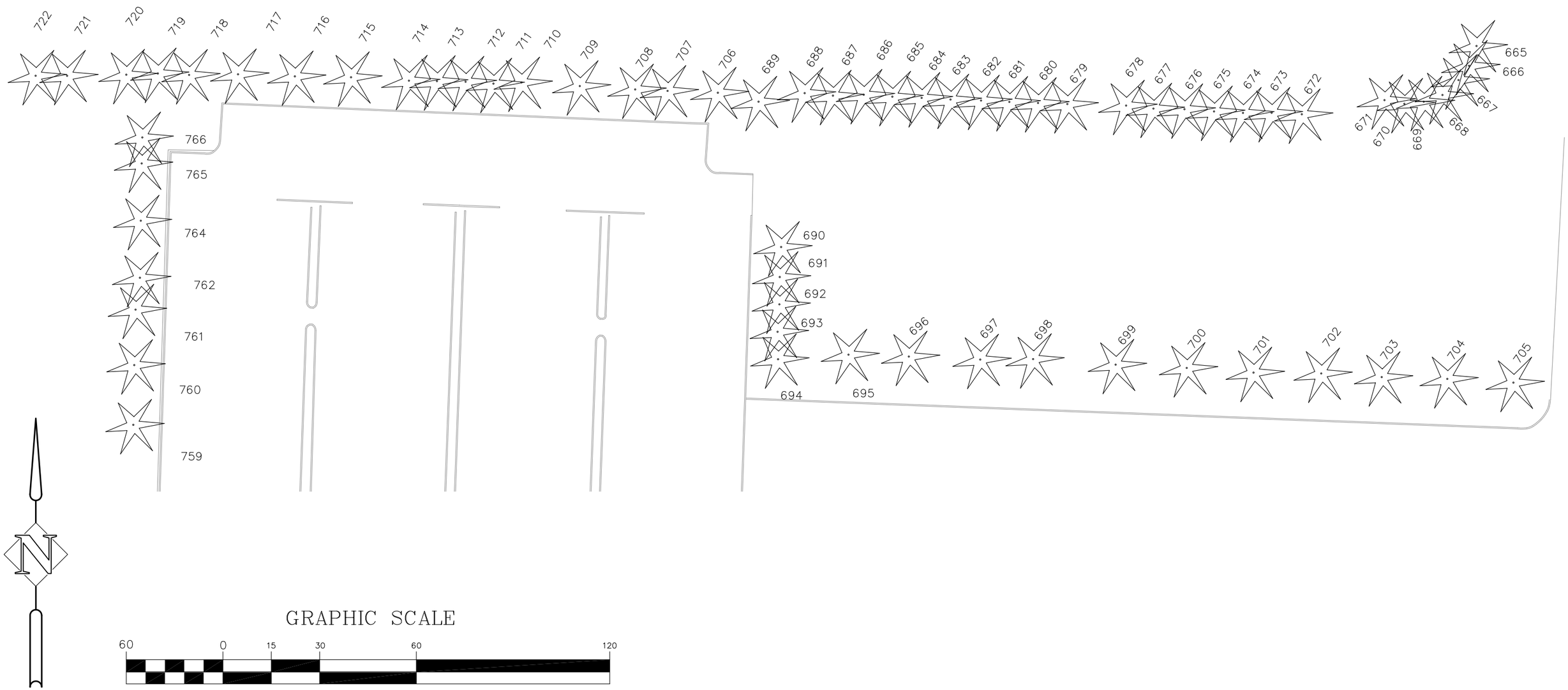
(IN FEET)
1 inch = 30 ft.

DETAIL B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GRAPHIC SCALE
60
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15
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60
120
(IN FEET)
1 inch = 30 ft.

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
300	red oak	*Quercus rubra*	29	38	G	No	moderate structure	retain
301	Douglas-fir	*Pseudotsuga menziesii*	16	18	G	No	minor lower trunk sweep	retain
302	Douglas-fir	*Pseudotsuga menziesii*	22	22	F	No	relatively thin crown	retain
303	arborvitae	*Thuja* spp.	3x6	5	G	No	moderate structure	retain
304	Douglas-fir	*Pseudotsuga menziesii*	48	34	E	No	codominant leaders	retain
305	Norway maple	*Acer platanoides*	25	28	G	No	invasive species, codominant leaders	retain
306	red oak	*Quercus rubra*	37	40	E	No	could use some minor pruning	retain
307	camellia	*Camellia* spp.	10	6	G	No	multi-stem, one-sided to building	remove
309	deodar cedar	*Cedrus deodara*	8	10	G	No	no major defects	retain
310	flowering pear	*Pyrus* spp.	10,14	16	P	No	heavily pruned, extensive crown decay	remove
311	red oak	*Quercus rubra*	40	44	G	No	history of scaffold branch failure, moderate structure, prune	retain
312	Norway maple	*Acer platanoides*	20	24	G	No	invasive species, codominant leaders	retain
313	western redcedar	*Thuja plicata*	28	18	G	No	pruned for power line clearance	retain
314	Port-Orford-cedar	*Chamaecyparis lawsoniana*	15	10	E	No	no major defects	retain
315	Port-Orford-cedar	*Chamaecyparis lawsoniana*	11	8	E	No	no major defects	retain
316	European white birch	*Betula pendula*	14	20	F	No	invasive species, poor structure, broken branches, branch decay	remove
317	linden	*Tilia* spp.	9	14	G	No	multiple leaders	retain
318	ponderosa pine	*Pinus ponderosa*	26	22	F	No	codominant leaders, thin crown, severe Sequoia pitch moth infestation, monitor	retain
319	ponderosa pine	*Pinus ponderosa*	29	22	G	No	multiple leaders, severe Sequoia pitch moth infestation, monitor	retain
320	ponderosa pine	*Pinus ponderosa*	40	28	F	No	codominant leaders, severe Sequoia pitch moth infestation, monitor	retain
321	black walnut	*Juglans nigra*	45	44	F	No	moderate crown structure, history of branch failure, possibly diseased, monitor	retain
322	tuliptree	*Liriodendron tulipifera*	30	20	F	No	codominant leaders	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
323	tuliptree	*Liriodendron tulipifera*	38	22	G	No	some history of branch failure, some decay	retain
324	flowering pear	*Pyrus* spp.	11	18	F	No	moderate structure, decay	remove
325	flowering pear	*Pyrus* spp.	13	16	F	No	moderate structure, advanced decay	remove
326	English holly	*Ilex aquifolium*	8	6	G	No	variegated leaves, forked leaders	retain
327	incense cedar	*Calocedrus decurrens*	59	28	G	No	candelabra structure	retain
328	Douglas-fir	*Pseudotsuga menziesii*	44	26	E	No	surface root damage, few dead twigs	retain
329	flowering pear	*Pyrus* spp.	20	22	F	No	moderate structure, broken branches, some decay	retain
330	flowering pear	*Pyrus* spp.	8,10,12	22	F	No	moderate structure, advanced basal decay, high risk	remove
331	flowering cherry	*Prunus* spp.	23	22	F	No	moderate structure, multiple attachments, surface root damage	retain
332	flowering pear	*Pyrus* spp.	12	9	F	No	some decay, heavily pruned but fairly well maintained	retain
333	flowering pear	*Pyrus* spp.	2x16	8	P	No	poor structure, very heavily pruned	remove
334	English holly	*Ilex aquifolium*	4x8	12	F	No	some twig dieback	retain
335	English holly	*Ilex aquifolium*	6x8	10	F	No	some dieback	retain
336	Douglas-fir	*Pseudotsuga menziesii*	56	30	E	No	few dead and broken branches, resin flow east face at ~50'	retain
337	red oak	*Quercus rubra*	44	45	E	No	few dead and broken branches, prune	retain
338	ponderosa pine	*Pinus ponderosa*	30	18	G	No	moderate structure, Sequoia pitch moth	retain
339	spruce	*Picea* spp.	15	15	G	No	forked leaders	retain
340	cryptomeria	*Cryptomeria* spp.	7	9	F	No	dead branch	retain
341	Norway maple	*Acer platanoides*	23	24	G	No	invasive species, surface root damage	retain
342	spruce	*Picea* spp.	16	15	G	No	no major defects	retain
343	bigleaf maple	*Acer macrophyllum*	10,15, 2x16,20x22	32	G	No	moderate structure, six codominant stems at ground level	retain
344	spruce	*Picea* spp.	17	18	G	No	self-correcting lean, surface root damage	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
345	English holly	*Ilex aquifolium*	16	8	G	No	invasive species, moderate structure, some trunk decay	retain
346	juniper	*Juniperus* spp.	16	10	G	No	moderate structure, multiple leaders	retain
347	Douglas-fir	*Pseudotsuga menziesii*	24	22	G	No	surface root damage	retain
348	deodar cedar	*Cedrus deodara*	31	25	G	No	codominant stems with tight "V" shaped union, some included bark	retain
349	ponderosa pine	*Pinus ponderosa*	19	15	F	No	multiple leaders, Sequoia pitch moth	retain
350	English holly	*Ilex aquifolium*	3x10	10	G	No	invasive species, moderate structure	retain
351	Port-Orford-cedar	*Chamaecyparis lawsoniana*	21	16	E	No	no major defects	retain
352	juniper	*Juniperus* spp.	8	8	F	No	crown raised	retain
353	European white birch	*Betula pendula*	16,18	24	F	No	invasive species, moderate structure, a little dieback, some decay	retain
354	deciduous	unknown	13	20	F	No	some trunk and crown decay	retain
355	paper birch	*Betula papyrifera*	9	14	G	No	multiple attachments	retain
356	spruce	*Picea* spp.	13	10	F	No	poor structure, surface roots	retain
357	Oregon white oak	*Quercus garryana*	38	24	F	**Yes**	basal decay west face, trunk decay north face	retain
358	black walnut	*Juglans nigra*	32	36	F	No	moderate structure, multiple attachments, some dead and broken branches, some decay	retain
359	black walnut	*Juglans nigra*	24	32	F	No	moderate structure, some dead and broken branches, decay, ponding water northwest quadrant	retain
360	Norway maple	*Acer platanoides*	31	28	G	No	invasive species, some history of branch failure, branch decay	retain
361	ponderosa pine	*Pinus ponderosa*	19	16	E	No	no major defects	retain
362	silver maple	*Acer saccharinum*	24	32	F	No	moderate structure, difficult to assess vigor	retain
363	spruce	*Picea* spp.	14	11	G	No	multiple leaders	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
364	silver maple	*Acer saccharinum*	13	12	F	No	advanced decay in codominant stem juncture on west face	remove
365	red maple	*Acer rubrum*	12	16	F	No	trunk decay 0-5' south side, codominant leaders	retain
366	English hawthorn	*Crataegus monogyna*	13	0	P	No	invasive species, topped, mostly dead, advanced decay	remove
367	English hawthorn	*Crataegus monogyna*	7	0	P	No	invasive species, topped, mostly dead, advanced decay	remove
368	Norway maple	*Acer platanoides*	18	18	G	No	invasive species, no major defects	retain
369	Norway maple	*Acer platanoides*	20	22	G	No	invasive species, multiple attachments	retain
370	honeylocust	*Gleditsia triacanthos*	22	22	G	No	moderate structure	retain
371	Norway maple	*Acer platanoides*	15	14	G	No	multiple attachments	retain
372	silver maple	*Acer saccharinum*	9	12	F	No	forked leaders, self-correcting lean	retain
373	Norway maple	*Acer platanoides*	21	20	G	No	self-correcting lean	retain
374	Norway maple	*Acer platanoides*	10	10	G	No	self-correcting lean, old trunk wound 0-3' on south side	retain
375	Norway maple	*Acer platanoides*	11	12	G	No	no major defects	retain
376	incense cedar	*Calocedrus decurrens*	19,23	12	G	No	dense row, most suitable for preservation as intact group	retain
377	incense cedar	*Calocedrus decurrens*	19	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
378	incense cedar	*Calocedrus decurrens*	17	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
379	incense cedar	*Calocedrus decurrens*	14,16	12	G	No	dense row, most suitable for preservation as intact group	retain
380	incense cedar	*Calocedrus decurrens*	2x16	12	G	No	dense row, most suitable for preservation as intact group	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
381	incense cedar	*Calocedrus decurrens*	16,18	12	G	No	dense row, most suitable for preservation as intact group	retain
382	incense cedar	*Calocedrus decurrens*	5,16	12	G	No	dense row, most suitable for preservation as intact group	retain
383	incense cedar	*Calocedrus decurrens*	14,16	12	G	No	dense row, most suitable for preservation as intact group	retain
384	incense cedar	*Calocedrus decurrens*	16,18	12	G	No	dense row, most suitable for preservation as intact group	retain
385	incense cedar	*Calocedrus decurrens*	2x14,18	12	G	No	dense row, most suitable for preservation as intact group	retain
386	incense cedar	*Calocedrus decurrens*	2x14,18	12	G	No	dense row, most suitable for preservation as intact group	retain
387	incense cedar	*Calocedrus decurrens*	2x11	12	G	No	dense row, most suitable for preservation as intact group	retain
388	incense cedar	*Calocedrus decurrens*	14	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
389	incense cedar	*Calocedrus decurrens*	16	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
390	incense cedar	*Calocedrus decurrens*	15	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
391	incense cedar	*Calocedrus decurrens*	2x12	12	G	No	dense row, most suitable for preservation as intact group	retain
392	incense cedar	*Calocedrus decurrens*	5,8	12	G	No	dense row, most suitable for preservation as intact group	retain
393	incense cedar	*Calocedrus decurrens*	12,15	12	G	No	dense row, most suitable for preservation as intact group	retain
394	incense cedar	*Calocedrus decurrens*	22	12	G	No	dense row, most suitable for preservation as intact group	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
395	incense cedar	*Calocedrus decurrens*	14,19	12	G	No	dense row, most suitable for preservation as intact group	retain
396	incense cedar	*Calocedrus decurrens*	21	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
397	incense cedar	*Calocedrus decurrens*	23	12	G	No	dense row, most suitable for preservation as intact group	retain
398	black walnut	*Juglans nigra*	38	46	F	No	scaffold branch decay, codominant leaders, monitor for disease	retain
399	black walnut	*Juglans nigra*	36	46	F	No	scaffold branch decay, relatively good structure, monitor for disease	retain
400	ponderosa pine	*Pinus ponderosa*	35	20	E	No	no access	retain
401	black walnut	*Juglans nigra*	52	55	G	No	relatively good, monitor for disease	retain
402	black walnut	*Juglans nigra*	36	40	G	No	relatively good, surface root decay, monitor for disease	retain
403	ponderosa pine	*Pinus ponderosa*	23	25	F	No	thin crown, forked leaders	retain
404	red maple	*Acer rubrum*	3x16	20	P	No	reduced vigor, trunk decay	remove
405	honeylocust	*Gleditsia triacanthos*	8	2	P	No	mostly dead	retain
406	honeylocust	*Gleditsia triacanthos*	14	10	F	No	moderate structure	retain
407	ponderosa pine	*Pinus ponderosa*	28	18	F	No	some branch dieback, moderate structure, Sequoia pitch moth	retain
408	ponderosa pine	*Pinus ponderosa*	29	18	F	No	multiple leaders, Sequoia pitch moth infestation, lots of resin flow	retain
409	red maple	*Acer rubrum*	31	36	F	No	moderate structure, reduced vigor, saturated soil, surface root damage	retain
410	red oak	*Quercus rubra*	39	49	F	No	history of scaffold branch failure, moderate structure	retain
411	incense cedar	*Calocedrus decurrens*	8,16	14	G	No	dense row, most suitable for preservation as intact group	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
412	incense cedar	*Calocedrus decurrens*	14	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
413	incense cedar	*Calocedrus decurrens*	21	14	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
414	incense cedar	*Calocedrus decurrens*	19	14	G	No	dense row, most suitable for preservation as intact group, codominant stems, forked	retain
415	incense cedar	*Calocedrus decurrens*	13	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
416	incense cedar	*Calocedrus decurrens*	17	12	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
417	incense cedar	*Calocedrus decurrens*	28	14	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
418	incense cedar	*Calocedrus decurrens*	22	14	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
419	incense cedar	*Calocedrus decurrens*	22	14	G	No	dense row, most suitable for preservation as intact group, codominant stems	retain
420	red oak	*Quercus rubra*	40	46	G	No	prune to improve crown structure	retain
421	Douglas-fir	*Pseudotsuga menziesii*	29	22	G	No	some previous lateral branch failure	retain
422	ginkgo	*Ginkgo biloba*	21	14	E	No	no major defects	retain
423	ponderosa pine	*Pinus ponderosa*	37	24	E	No	some Sequoia pitch moth	retain
424	spruce	*Picea* spp.	9	10	G	No	forked leaders	retain
425	spruce	*Picea* spp.	8	10	G	No	multiple leaders	retain
426	black walnut	*Juglans nigra*	17	28	F	No	advanced lower trunk decay, monitor for disease	retain
427	black walnut	*Juglans nigra*	28	32	F	No	advanced lower trunk decay, monitor for disease	retain
428	black walnut	*Juglans nigra*	26	36	F	No	advanced lower trunk decay, monitor for disease	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
429	black walnut	*Juglans nigra*	46	38	F	No	moderate structure, history of branch failure, decay, braced, monitor for disease	retain
430	elm	*Ulmus* spp.	32	30	F	No	history of large branch failure, moderate structure, self-correcting lean	retain
431	flowering pear	*Pyrus* spp.	9	10	P	No	moderate lean to west, moderate crown structure, reduced vigor	remove
432	Douglas-fir	*Pseudotsuga menziesii*	30	30	G	No	self-correcting lean	retain
433	black walnut	*Juglans nigra*	37	26	F	No	moderate structure, history of branch failure, small hollows with decay, monitor for disease	retain
434	Douglas-fir	*Pseudotsuga menziesii*	29	24	E	No	no major defects	retain
435	black walnut	*Juglans nigra*	38	28	F	No	moderate structure, history of branch failure, trunk decay, monitor for disease	retain
436	ponderosa pine	*Pinus ponderosa*	28	18	G	No	relatively high live crown	retain
437	elm	*Ulmus* spp.	29	40	G	No	moderate structure, self-correcting lean	retain
438	black walnut	*Juglans nigra*	36	28	F	No	moderate structure, history of branch failure, decay, leans to east, monitor for disease	retain
439	ponderosa pine	*Pinus ponderosa*	37	24	E	No	no major defects	retain
440	flowering pear	*Pyrus* spp.	16	12	F	No	heavily pruned, poor structure	retain
441	black walnut	*Juglans nigra*	38	26	F	No	moderate structure, history of scaffold branch failure, trunk decay, monitor for disease	retain
442	ponderosa pine	*Pinus ponderosa*	41	32	E	No	no major defects	retain
443	elm	*Ulmus* spp.	29	30	F	No	history of branch failure, crown decay	retain
444	black walnut	*Juglans nigra*	34	26	F	No	moderate structure, history of branch failure, decay, monitor for disease	retain
445	Douglas-fir	*Pseudotsuga menziesii*	32	26	E	No	no major defects	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
446	Douglas-fir	*Pseudotsuga menziesii*	28	24	E	No	no major defects	retain
447	black walnut	*Juglans nigra*	43	44	G	No	relatively good, minor lean to east, monitor for decay	retain
448	English hawthorn	*Crataegus monogyna*	16	16	P	No	invasive species, history of branch failure, poor structure	remove
449	ponderosa pine	*Pinus ponderosa*	42	32	E	No	no major defects	retain
450	European white birch	*Betula pendula*	16	22	F	No	minor dieback, branches with included bark	retain
451	European white birch	*Betula pendula*	29	24	F	No	invasive species, topped for power line clearance, one-sided to north, twig dieback	retain
452	cryptomeria	*Cryptomeria* spp.	16	12	F	No	multiple leaders, moderate structure	retain
453						No	gone - no tree	omit
454	ponderosa pine	*Pinus ponderosa*	50	36	G	No	excellent vigor, multiple tops, western gall rust, some Sequoia pitch moth	retain
455	cryptomeria	*Cryptomeria* spp.	19,3x25, 2x30	26	F	No	poor structure, extensive twig dieback	retain
456	cryptomeria	*Cryptomeria* spp.	39	24	F	No	forked top, dieback, history of branch failure, some crown decay	retain
457	European white birch	*Betula pendula*	30	26	F	No	invasive species, topped for power line clearance, one-sided to north, twig dieback	retain
458	English holly	*Ilex aquifolium*	23	12	F	No	invasive species, multi-stem	retain
459	English holly	*Ilex aquifolium*	24	12	F	No	invasive species, multi-stem	retain
460	European white birch	*Betula pendula*	29	30	F	No	invasive species, dieback, decline, hollows with decay	retain
461	deciduous	unknown	6	8	G	No	no major defects	retain
462	European white birch	*Betula pendula*	30	32	F	No	invasive species, top dieback, dead and broken branches	retain
463	spruce	*Picea* spp.	15	14	G	No	multiple leaders, pruned for power line clearance	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
464	camellia	*Camellia* spp.	16	14	F	No	multi-stem, moderate vigor	retain
465	ponderosa pine	*Pinus ponderosa*	28	20	G	No	forked leaders, Sequoia pitch moth	retain
466	English hawthorn	*Crataegus monogyna*	14	10	P	No	invasive species, very poor structure, decay	remove
467	cryptomeria	*Cryptomeria* spp.	27,28	26	F	No	some twig dieback, codominant stems, one with a forked top	retain
468	Norway maple	*Acer platanoides*	28	40	F	No	invasive species, one-sided to northeast, dieback, some decay	retain
469	Norway maple	*Acer platanoides*	24	22	G	No	invasive species, codominant leaders	retain
470	red oak	*Quercus rubra*	35	36	F	No	one-sided to northeast, large codominant stem failure with large wound on west face, branch decay	retain
471	English holly	*Ilex aquifolium*	22	9	G	No	invasive species, multi-stem	retain
472	English holly	*Ilex aquifolium*	21	10	F	No	invasive species, multi-stem, dieback	retain
473	deodar cedar	*Cedrus deodara*	53	32	G	No	moderate structure, codominant leaders	retain
474	flowering plum	*Prunus* spp.	22	0	P	No	topped, mostly dead	remove
475	flowering plum	*Prunus* spp.	22	0	P	No	topped, mostly dead, decay	remove
476	sweetgum	*Liquidambar styraciflua*	18	28	F	No	some history of branch failure, some crown decay, small dead branches	retain
477	flowering plum	*Prunus* spp.	25	4	P	No	topped, mostly dead, *Ganoderma* conk at base	remove
478	juniper	*Juniperus* spp.	16	16	G	No	no major defects	retain
479	English holly	*Ilex aquifolium*	20	10	G	No	invasive species, multi-stem	retain
480	camellia	*Camellia* spp.	16	9	G	No	multi-stem	retain
481	camellia	*Camellia* spp.	14	9	G	No	multi-stem	retain
482	English holly	*Ilex aquifolium*	25	10	G	No	invasive species, multi-stem	retain
483	camellia	*Camellia* spp.	12	9	F	No	multi-stem	retain
484	English holly	*Ilex aquifolium*	20	10	G	No	invasive species, multi-stem	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
485	crabapple	*Malus* spp.	25	16	F	No	moderate structure, history of branch failure, poor compartmentalization, crown decay	retain
486	English holly	*Ilex aquifolium*	25	10	G	No	invasive species, multi-stem	retain
487	European white birch	*Betula pendula*	18	18	F	No	invasive species, some dieback	retain
488	English holly	*Ilex aquifolium*	20	10	G	No	invasive species, multi-stem	retain
489	black walnut	*Juglans nigra*	40	24	P	No	poor structure, heavily pruned, history of branch failure, basal decay, monitor for disease and risk potential	retain
490	western redcedar	*Thuja plicata*	31	20	G	No	minor twig dieback	retain
491	western redcedar	*Thuja plicata*	16	13	P	No	twig dieback, thin crown	retain
492	cryptomeria	*Cryptomeria* spp.	31	10	F	No	broken top, remaining top with increased risk potential, branch and twig dieback	remove
493	western redcedar	*Thuja plicata*	36	18	G	No	small dead branches	retain
494	western redcedar	*Thuja plicata*	22	14	P	No	poor structure, broken top, dead and broken branches	retain
495	camellia	*Camellia* spp.	15	9	G	No	multi-stem	retain
496	camellia	*Camellia* spp.	14	9	G	No	multi-stem	retain
497	camellia	*Camellia* spp.	14	9	G	No	multi-stem	retain
498	English hawthorn	*Crataegus monogyna*	15	15	F	No	invasive species, crown decay, 20-degree lean to sidewalk	remove
499	European white birch	*Betula pendula*	21,24	10	P	No	invasive species, severe decline, not sustainable	remove
500	juniper	*Juniperus* spp.	9	11	G	No	crown raised	retain
501	juniper	*Juniperus* spp.	9	8	F	No	heavily pruned	retain
502	English laurel	*Prunus laurocerasus*	6,3x10	10	F	No	very poor structure, decay	remove
503	camellia	*Camellia* spp.	12	10	G	No	moderate structure	remove
504	camellia	*Camellia* spp.	12	10	F	No	no access	remove

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
505	camellia	*Camellia* spp.	12	10	F	No	no access	remove
506						No	gone - no tree	omit
507	juniper	*Juniperus* spp.	9	10	G	No	no access	remove
508	juniper	*Juniperus* spp.	8	10	G	No	no access	remove
509	camellia	*Camellia* spp.	12	10	G	No	no access	remove
510	mimosa	*Albizia julibrissin*	13	16	F	No	no access, moderate structure	remove
511	camellia	*Camellia* spp.	12	10	G	No	no access	remove
512	ash	*Fraxinus* spp.	39	30	G	No	no access, multiple attachments	retain
513	raywood ash	*Fraxinus oxycarpa* 'Raywood'	14	16	F	No	no access	remove
514	flowering pear	*Pyrus* spp.	12	14	F	No	no access	remove
515	raywood ash	*Fraxinus oxycarpa* 'Raywood'	13	18	F	No	no access	remove
516	flowering pear	*Pyrus* spp.	10	12	F	No	no access	remove
517	red oak	*Quercus rubra*	38	22	G	No	no access, codominant leaders, moderate crown structure	retain
518	ponderosa pine	*Pinus ponderosa*	19	16	G	No	codominant stems, some included bark, Sequoia pitch moth	retain
519	spruce	*Picea* spp.	13	14	G	No	no access	retain
520	spruce	*Picea* spp.	14	14	G	No	no access	retain
521	Norway maple	*Acer platanoides*	28	26	G	No	invasive species, surface root damage	retain
522	Norway maple	*Acer platanoides*	19	18	F	No	invasive species, codominant leaders, small dead branches	retain
523	Douglas-fir	*Pseudotsuga menziesii*	27	24	G	No	substantial crook at ~25', few dead branches	retain
524	European white birch	*Betula pendula*	41	24	F	No	broken branches, branch decay, multiple attachments	remove
525	European white birch	*Betula pendula*	3x16	16	P	No	dieback, decline	remove
526	red maple	*Acer rubrum*	28	28	G	No	moderate crown structure, squeaks in wind, prune if retained	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
527	red maple	*Acer rubrum*	36	38	G	No	moderate crown structure, history of scaffold branch failure, multiple attachments, included bark and splitting seams, wetwood, tremendous weight above defect	retain
528	European white birch	*Betula pendula*	22,30	32	G	No	invasive species, moderate structure	retain
529	Norway maple	*Acer platanoides*	21	24	G	No	invasive species, circling roots, surface root damage	retain
530	flowering pear	*Pyrus* spp.	18	10	G	No	codominant stems, some trunk decay	retain
531	katsura	*Cercidiphyllum* spp.	13	14	E	No	multiple attachments, no major defects	retain
532	European white birch	*Betula pendula*	18	20	F	No	invasive species, dead branches, hollows with decay	remove
533	European white birch	*Betula pendula*	17	16	F	No	invasive species, dieback, hollows with decay	remove
534	European white birch	*Betula pendula*	16	14	P	No	invasive species, dieback, hollows with decay	remove
535	European white birch	*Betula pendula*	17	16	F	No	invasive species, dead branches, hollows with decay	remove
536	Norway maple	*Acer platanoides*	32	26	G	No	invasive species, codominant stems	retain
537	Douglas-fir	*Pseudotsuga menziesii*	36	25	G	No	codominant stems with tight "V" shaped union, some included bark	retain
538	Norway maple	*Acer platanoides*	37	34	G	No	invasive species, few dead branches, multipole attachments	retain
539	Japanese maple	*Acer japonicum*	22	24	E	No	one-sided against building, few dead branches	remove
540	ponderosa pine	*Pinus ponderosa*	24	16	F	No	multiple leaders, heavy Sequoia pitch moth infestation	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
541	ponderosa pine	*Pinus ponderosa*	24	16	F	No	forked leaders, heavy Sequoia pitch moth infestation	retain
542	ponderosa pine	*Pinus ponderosa*	31	24	E	No	some Sequoia pitch moth, no major defects	retain
543	ponderosa pine	*Pinus ponderosa*	31	28	G	No	multiple leaders, some Sequoia pitch moth	retain
544	red oak	*Quercus rubra*	32	42	G	No	multiple attachments, few dead branches	retain
545	flowering plum	*Prunus* spp.	8	12	F	No	no access, moderate structure	remove
546	flowering plum	*Prunus* spp.	2x7	12	F	No	no access, few dead branches, sprouts	remove
547	flowering plum	*Prunus* spp.	16	12	P	No	no access, very poor structure, dead branches	remove
548	flowering plum	*Prunus* spp.	26	12	G	No	no access, moderate structure, dead branches	remove
549	flowering plum	*Prunus* spp.	11	16	P	No	no access, poor structure, dead branches	remove
550	flowering cherry	*Prunus* spp.	2x10	20	F	No	moderate structure, dead branches	retain
551	Atlas cedar	*Cedrus atlantica*	24,45	34	G	No	moderate structure	retain
552	Atlas cedar	*Cedrus atlantica*	46	28	E	No	few broken branches	retain
553	European white birch	*Betula pendula*	37	28	F	No	invasive species, some dieback	remove
554	Norway maple	*Acer platanoides*	32	30	G	No	invasive species, multiple attachments, few broken branches	retain
555	European white birch	*Betula pendula*	12,2x20	22	F	No	invasive species, moderate structure, history of branch failure	remove
556	Port-Orford-cedar	*Chamaecyparis lawsoniana*	3x10,11	14	G	No	moderate structure, one-sided against building	remove
557	beech	*Fagus* spp.	7	14	G	No	no access	retain
558	camellia	*Camellia* spp.	12	6	G	No	multi-stem	remove
559	rhododendron	*Rhododendron* spp.	10	6	F	No	trunk decay	remove
560	hinoki cypress	*Chamaecyparis obtusa*	8	9	F	No	no major defects	remove
561	camellia	*Camellia* spp.	12	8	G	No	multi-stem	remove
562	camellia	*Camellia* spp.	12	8	F	No	multi-stem	remove

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
563	juniper	*Juniperus* spp.	12	10	F	No	no access	remove
564	juniper	*Juniperus* spp.	7	10	F	No	no access	remove
565	juniper	*Juniperus* spp.	5,6	10	F	No	no access	remove
566	cryptomeria	*Cryptomeria* spp.	39	16	F	No	twig dieback	retain
567	cryptomeria	*Cryptomeria* spp.	9,11	16	F	No	codominant stems, some twig dieback, against building	retain
568	Norway maple	*Acer platanoides*	23	20	G	No	invasive species, surface root damage	retain
569	European white birch	*Betula pendula*	35	22	F	No	invasive species, moderate structure, some dieback, poor compartmentalization	retain
570	Oregon white oak	*Quercus garryana*	3	3	G	No	young tree	retain
571	Oregon white oak	*Quercus garryana*	3	3	G	No	young tree	retain
572	Oregon white oak	*Quercus garryana*	3	3	G	No	young tree	retain
573	silver maple	*Acer saccharinum*	24	30	G	No	codominant leaders, surface root damage	retain
574	silver maple	*Acer saccharinum*	18	30	G	No	codominant leaders, surface root damage, circling roots	retain
575	European white birch	*Betula pendula*	16,25	28	G	No	invasive species, moderate structure	retain
576	cherry	*Prunus* spp.	13	6	P	No	very poor structure, basal decay, poorly pruned	remove
577	European white birch	*Betula pendula*	2x16	20	G	No	invasive species	retain
578	European white birch	*Betula pendula*	2x20	30	G	No	invasive species	retain
579	European white birch	*Betula pendula*	23	28	G	No	invasive species	retain
580	European white birch	*Betula pendula*	11,18,21	32	G	No	invasive species, surface root damage	retain
581	European white birch	*Betula pendula*	12,14	26	G	No	invasive species	retain
582	Norway maple	*Acer platanoides*	19	22	G	No	invasive species, surface root damage	retain
584	black locust	*Robinia pseudoacacia*	7	14	G	No	invasive species	retain
585	black locust	*Robinia pseudoacacia*	5	10	F	No	invasive species, some trunk decay west face, lower trunk wounds	retain
586	elm	*Ulmus* spp.	24	20	P	No	poor structure, dieback, crown decay	remove

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
587	silver maple	*Acer saccharinum*	23	20	F	No	multiple attachments at ~6' with included bark, surface root damage	retain
588	English hawthorn	*Crataegus monogyna*	12	12	P	No	invasive species, advanced trunk decay, active split at codominant stems	remove
589	Norway maple	*Acer platanoides*	16	16	G	No	invasive species, codominant leaders, surface root damage	retain
590	silver maple	*Acer saccharinum*	16	16	F	No	moderate crown structure, advanced trunk decay 0-6' at juncture of codominant leaders	remove
591	black locust	*Robinia pseudoacacia*	7	14	F	No	invasive species, lower trunk wounds north and south sides	retain
592	black locust	*Robinia pseudoacacia*	4	6	F	No	invasive species, dead branches, topped	retain
593	honeylocust	*Robinia pseudoacacia*	13	12	G	No	few dead branches	retain
594	silver maple	*Acer saccharinum*	15	22	F	No	moderate structure, history of branch failure, crown decay	retain
595	black locust	*Robinia pseudoacacia*	6	14	G	No	invasive species, few small dead branches	retain
596	Norway maple	*Acer platanoides*	15	15	P	No	invasive species, advanced trunk decay 0-5'	remove
597	Norway maple	*Acer platanoides*	16	20	G	No	invasive species	retain
598	silver maple	*Acer saccharinum*	13	22	F	No	surface root damage, circling roots	retain
599	silver maple	*Acer saccharinum*	12	16	F	No	moderate structure, surface root damage	retain
600	elm	*Ulmus* spp.	24	20	F	No	moderate structure	retain
601	Norway maple	*Acer platanoides*	19	16	P	No	invasive species, crown dieback, trunk decay 0-6' with slime flux, crown decay	remove
602	deciduous	unknown	5	0	D	No	dead	remove
603	black locust	*Robinia pseudoacacia*	4	5	P	No	invasive species, mostly dead, trunk decay	remove
604	black locust	*Robinia pseudoacacia*	4	14	G	No	invasive species, codominant leaders	retain
605	Norway maple	*Acer platanoides*	15	18	G	No	invasive species, few dead branches, some crown decay, surface root damage	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
606	n/a	n/a	6	n/a	n/a	n/a	gone	omit
607	English hawthorn	*Crataegus monogyna*	7	7	P	No	invasive species, poor structure, crown and trunk decay, crown dieback	remove
608	Norway maple	*Acer platanoides*	14	18	G	No	invasive species, codominant leaders	retain
609	black walnut	*Juglans nigra*	31	38	F	No	crown dieback, dead branches with decay, history of branch failure, small hollows with decay, monitor for disease	retain
610	black walnut	*Juglans nigra*	35	46	F	No	crown dieback, dead branches with decay, history of branch failure, small hollows with decay, monitor for disease	retain
611	black walnut	*Juglans nigra*	52	50	G	No	crown dieback, dead branches with decay, history of branch failure, small hollows with decay, monitor for disease	retain
612	Norway maple	*Acer platanoides*	15	18	G	No	invasive species	retain
613	European white birch	*Betula pendula*	16	18	G	No	invasive species, minor crown dieback	retain
614	European white birch	*Betula pendula*	16	16	G	No	invasive species, surface root damage	retain
615	European white birch	*Betula pendula*	11	16	G	No	invasive species, surface root damage, moderate structure, dead branch with decay	retain
616	European white birch	*Betula pendula*	18	18	G	No	invasive species, minor crown dieback	retain
617	Oregon white oak	*Quercus garryana*	44	34	F	**Yes**	history of large scaffold branch and leader failure, large wounds with decay, moderate crown structure, vigorous foliage, crown and trunk decay; advanced assessment recommended	retain
618	black walnut	*Juglans nigra*	20	18	P	No	severe crown dieback, dead branches, trunk decay, monitor for disease	remove

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
619	black walnut	*Juglans nigra*	26	18	P	No	severe crown dieback, dead branches, crown and trunk decay, monitor for disease	remove
620	black walnut	*Juglans nigra*	27	30	F	No	dead central leader, dead and dying branches, large pruning wounds, monitor for disease	retain
621	black walnut	*Juglans nigra*	26	28	F	No	crown dieback, trunk decay on north face ~0-4', large pruning wounds with decay	retain
622	black walnut	*Juglans nigra*	30	24	P	No	severe crown dieback, large pruning wounds with decay, removal is recommended but prune and monitor if retained	remove
623	black walnut	*Juglans nigra*	24,25	32	F	No	crown dieback, moderate structure, codominant leaders, large pruning wounds, monitor for disease	retain
624	red maple	*Acer rubrum*	18	20	F	No	advanced decay 0-10' on south side in plane of lean, poor crown structure, increased risk to gravel drive	remove
625	redbud	*Cercis canadensis*	2	4	G	No	young tree	retain
626	honeylocust	*Gleditsia triacanthos*	8	10	F	No	basal wound, moderate structure, epicormic sprouts along trunk	retain
627	black walnut	*Juglans nigra*	9	10	F	No	basal wound, moderate structure, some crown decay	retain
628	ponderosa pine	*Pinus ponderosa*	11	10	G	No	some Sequoia pitch moth infestation	retain
629	silver maple	*Acer saccharinum*	17	18	F	No	hollow with trunk decay at ~4'	retain
630	black walnut	*Juglans nigra*	41	42	F	No	crown in relatively good condition, but advanced trunk decay, codominant leaders--one with advanced decay; advanced assessment recommended	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
631	black walnut	*Juglans nigra*	47	46	F	No	crown in relatively good condition, but trunk and basal decay and some crown decay; advanced assessment recommended	retain
632	Norway maple	*Acer platanoides*	21	22	G	No	invasive species, surface root damage	retain
633	Norway maple	*Acer platanoides*	16	20	G	No	invasive species, surface root damage	retain
634	Norway maple	*Acer platanoides*	18	24	G	No	invasive species, surface root damage	retain
635	black walnut	*Juglans nigra*	27	34	F	No	somewhat suppressed by adjacent trees, pruning wounds with some decay	retain
636	black walnut	*Juglans nigra*	40	38	G	No	relatively good condition, a few dead branches and some crown decay	retain
637	black walnut	*Juglans nigra*	33	38	F	No	large lower trunk wound on east face, moderate structure, some crown decay	retain
638	European white birch	*Betula pendula*	19	26	G	No	invasive species	retain
639	black walnut	*Juglans nigra*	38	46	G	No	relatively good condition, large pruning wounds	retain
640	black walnut	*Juglans nigra*	46	44	F	No	crown dieback, dead branches, hollows with decay	retain
641	black walnut	*Juglans nigra*	35	38	F	No	some crown dieback, crown decay	retain
642	European white birch	*Betula pendula*	10	15	P	No	invasive species, poor structure, trunk decay in plane of lean 0-5', twig dieback	remove
643	European mountain ash	*Sorbus aucuparia*	11	14	F	No	invasive species, lower trunk decay on north face	retain
644	silver maple	*Acer saccharinum*	18	18	F	No	codominant leaders	retain
645	black walnut	*Juglans nigra*	32	36	F	No	history of branch failure, crown decay, wound on lower trunk at north face, moderate structure, large pruning wounds	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
646	black walnut	*Juglans nigra*	40	44	G	No	moderate structure, large pruning wounds with some hollows, some basal decay on north face	retain
647	black walnut	*Juglans nigra*	38	38	F	No	crown dieback, dead branches, basal and trunk decay on north face	retain
648	Norway maple	*Acer platanoides*	16	20	G	No	invasive species, codominant leaders	retain
649	black walnut	*Juglans nigra*	40	55	G	No	relatively good condition, limited visual assessment due to active bee hive in hollow at ~8' on south side	retain
650	black walnut	*Juglans nigra*	39	32	P	No	severe dieback, crown decay, diseased	remove
651	silver maple	*Acer saccharinum*	15	12	P	No	dead branches, poor crown structure	remove
652	English hawthorn	*Crataegus monogyna*	11	6	F	No	invasive species, topped, very poor structure, some trunk decay	retain
653	cherry	*Prunus* spp.	9	10	F	No	some trunk decay 0-4' on south face	retain
654	cherry	*Prunus* spp.	7	5	P	No	advanced trunk decay 0-3' on southwest and east faces	remove
655	cherry	*Prunus* spp.	6	4	P	No	trunk and basal decay	remove
656	elm	*Ulmus* spp.	16	12	F	No	dead and broken branches, poor crown structure, progressive decline likely	retain
657	English hawthorn	*Crataegus monogyna*	9	4	F	No	invasive species, topped, poor structure, some decay	retain
658	English hawthorn	*Crataegus monogyna*	9	5	F	No	invasive species, topped, poor structure, some decay	retain
659	English hawthorn	*Crataegus monogyna*	12	5	F	No	invasive species, topped, poor structure, some decay	retain
660	Oregon white oak	*Quercus garryana*	3	4	G	No	young tree	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
661	black walnut	*Juglans nigra*	39	48	F	No	crown dieback, dead branches, large pruning wounds with some decay, monitor for disease	retain
662	black walnut	*Juglans nigra*	29	46	F	No	crown dieback, dead branches, large pruning wounds with some decay, monitor for disease	retain
663	Oregon white oak	*Quercus garryana*	3	3	F	No	young tree, dead branches	retain
664	Oregon white oak	*Quercus garryana*	2	4	F	No	young tree, poor lateral branch distribution	retain
665	incense cedar	*Calocedrus decurrens*	27	14	G	No	dense row	retain
666	incense cedar	*Calocedrus decurrens*	24	18	G	No	dense row	retain
667	incense cedar	*Calocedrus decurrens*	28	20	G	No	dense row	retain
668	incense cedar	*Calocedrus decurrens*	16	16		No	dense row	retain
669	incense cedar	*Calocedrus decurrens*	26	16	G	No	dense row	retain
670	incense cedar	*Calocedrus decurrens*	25	16	G	No	dense row	retain
671	incense cedar	*Calocedrus decurrens*	24	16	G	No	dense row, codominant leaders, some included bark	retain
672	spruce	*Picea* spp.	12	12	G	No	dense row of relatively young trees, forked leaders	retain
673	spruce	*Picea* spp.	11	9	G	No	dense row of relatively young trees, codominant leaders	retain
674	spruce	*Picea* spp.	13	11	G	No	dense row of relatively young trees, codominant leaders	retain
675	spruce	*Picea* spp.	11	10	F	No	dense row of relatively young trees, codominant leaders, twig dieback	retain
676	spruce	*Picea* spp.	14	12	G	No	dense row of relatively young trees, codominant leaders, surface root damage	retain
677	spruce	*Picea* spp.	10	12	F	No	dense row of relatively young trees, codominant leaders, lean, trunk wounds	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
678	spruce	*Picea* spp.	12	10	G	No	dense row of relatively young trees	retain
679	spruce	*Picea* spp.	12	12	G	No	dense row of relatively young trees, codominant leaders	retain
680	spruce	*Picea* spp.	12	10	G	No	dense row of relatively young trees, codominant leaders	retain
681	spruce	*Picea* spp.	11	10	G	No	dense row of relatively young trees, codominant leaders	retain
682	spruce	*Picea* spp.	10	10	G	No	dense row of relatively young trees, codominant leaders	retain
683	spruce	*Picea* spp.	10	10	G	No	dense row of relatively young trees, codominant leaders, lean	retain
684	spruce	*Picea* spp.	2x8	10	G	No	dense row of relatively young trees, codominant stems	retain
685	spruce	*Picea* spp.	8	10	G	No	dense row of relatively young trees, forked leaders, lean	retain
686	spruce	*Picea* spp.	8	10	G	No	dense row of relatively young trees	retain
687	spruce	*Picea* spp.	9	8	G	No	dense row of relatively young trees	retain
688	spruce	*Picea* spp.	12	8	G	No	dense row of relatively young trees, surface root damage, lean	retain
689	hinoki cypress	*Chamaecyparis obtusa*	8	10	F	No	lean, surface root damage	retain
690	Douglas-fir	*Pseudotsuga menziesii*	11	8	F	No	dense row, thin crown, reduced vigor	retain
691	Douglas-fir	*Pseudotsuga menziesii*	15	14	G	No	dense row, reduced vigor	retain
692	Douglas-fir	*Pseudotsuga menziesii*	15	14	G	No	dense row, reduced vigor	retain
693	Douglas-fir	*Pseudotsuga menziesii*	18	14	G	No	dense row	retain
694	Douglas-fir	*Pseudotsuga menziesii*	14	18	G	No	dense row	retain
695	ponderosa pine	*Pinus ponderosa*	29	14	G	No	dense row, good foliage density, severe Sequoia pitch moth infestation	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
696	ponderosa pine	*Pinus ponderosa*	41	26	E	No	dense row, codominant leaders with included bark, Sequoia pitch moth infestation in junctures, dense crown	retain
697	ponderosa pine	*Pinus ponderosa*	40	28	E	No	dense row, multiple leaders, dense crown, some Sequoia pitch moth	retain
698	Douglas-fir	*Pseudotsuga menziesii*	21	30	G	No	dense row, crowded by pines but good vigor, bark buckling at base on east face	retain
699	ponderosa pine	*Pinus ponderosa*	40	14	G	No	dense row, foliage not as dense relative to 700, some Sequoia pitch moth infestation	retain
700	ponderosa pine	*Pinus ponderosa*	37	32	E	No	dense row, good crown density, some Sequoia pitch moth	retain
701	ponderosa pine	*Pinus ponderosa*	34	28	G	No	dense row, poor trunk structure, some Sequoia pitch moth	retain
702	Douglas-fir	*Pseudotsuga menziesii*	27	24	G	No	dense row, crowded by pines but good vigor	retain
703	ponderosa pine	*Pinus ponderosa*	43	34	E	No	dense row, multiple leaders, some Sequoia pitch moth	retain
704	ponderosa pine	*Pinus ponderosa*	43	32	E	No	dense row, multiple leaders, some Sequoia pitch moth	retain
705	ponderosa pine	*Pinus ponderosa*	32	22	E	No	dense row, remove chain around base of trunk	retain
706	Douglas-fir	*Pseudotsuga menziesii*	21	20	G	No	dense row, surface root damage	retain
707	Douglas-fir	*Pseudotsuga menziesii*	26	20	G	No	dense row, surface root damage, possible old broken top	retain
708	Douglas-fir	*Pseudotsuga menziesii*	23	20	G	No	dense row, surface root damage	retain
709	Douglas-fir	*Pseudotsuga menziesii*	27	20	G	No	dense row, surface root damage, some history of lateral branch failure	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
710	Douglas-fir	*Pseudotsuga menziesii*	22	20	G	No	dense row, surface root damage, large surface roots	retain
711	Douglas-fir	*Pseudotsuga menziesii*	15	20	F	No	dense row, surface root damage, circling roots	retain
712	Douglas-fir	*Pseudotsuga menziesii*	18	20	F	No	dense row, surface root damage	retain
713	Douglas-fir	*Pseudotsuga menziesii*	18	20	G	No	dense row, surface root damage	retain
714	Douglas-fir	*Pseudotsuga menziesii*	21	20	G	No	dense row, surface root damage, circling roots	retain
715	Douglas-fir	*Pseudotsuga menziesii*	19	20	G	No	dense row, surface root damage, circling roots	retain
716	Douglas-fir	*Pseudotsuga menziesii*	23	20	G	No	dense row, surface root damage	retain
717	Douglas-fir	*Pseudotsuga menziesii*	29	20	G	No	dense row, surface root damage	retain
718	Douglas-fir	*Pseudotsuga menziesii*	14	20	G	No	dense row, surface root damage	retain
719	spruce	*Picea* spp.	9	12	F	No	dense row, surface root damage, relatively young trees	retain
720	spruce	*Picea* spp.	12	12	F	No	dense row, surface root damage, relatively young trees	retain
721	spruce	*Picea* spp.	11	12	F	No	dense row, surface root damage, relatively young trees	retain
722	spruce	*Picea* spp.	13	12	F	No	dense row, surface root damage, relatively young trees	retain
723	black walnut	*Juglans nigra*	38	44	F	No	some crown dieback, large pruning wounds with decay, basal decay, monitor for disease	retain
724	black walnut	*Juglans nigra*	34	48	F	No	some crown dieback, large pruning wounds with decay, dead branches, branch decay, monitor for disease	retain
725	black walnut	*Juglans nigra*	36	42	F	No	some crown dieback, large pruning wounds with some decay	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
726	black walnut	*Juglans nigra*	39	46	F	No	some crown dieback, large pruning wounds with some decay, lower trunk decay	retain
727	black walnut	*Juglans nigra*	39	44	F	No	crown dieback, some history of branch failure, large pruning wounds with some decay, monitor for disease	retain
728	black walnut	*Juglans nigra*	34	40	F	No	extensive crown dieback, dead branches, crown decay, lower trunk decay, monitor for disease	retain
729	black walnut	*Juglans nigra*	36	40	F	No	crown dieback, history of branch failure, crown and branch decay, monitor for disease	retain
730	black walnut	*Juglans nigra*	33	36	F	No	history of branch failure, crown and trunk decay	retain
731	black walnut	*Juglans nigra*	41	50	F	No	crown dieback, dead branches, large pruning wounds with decay, monitor for disease	retain
732	Oregon white oak	*Quercus garryana*	2	3	G	No	young tree	retain
733	Norway maple	*Acer platanoides*	11	11	G	No	invasive species, surface root damage, trunk wound with possible decay 2-5' on south face	retain
734	Norway maple	*Acer platanoides*	13	15	G	No	invasive species, surface root damage	retain
735	Norway maple	*Acer platanoides*	13	14	F	No	invasive species, surface root damage, basal decay	retain
736	Norway maple	*Acer platanoides*	13	14	G	No	invasive species, surface root damage	retain
737	Norway maple	*Acer platanoides*	11	14	F	No	invasive species, surface root damage, trunk decay on south face 0-4'	retain
738	Norway maple	*Acer platanoides*	12	14	G	No	invasive species, surface root damage	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
739	Norway maple	*Acer platanoides*	11	14	F	No	invasive species, surface root damage, minor branch dieback, some branch decay	retain
740	Norway maple	*Acer platanoides*	10	11	G	No	invasive species, surface root damage	retain
741	Norway maple	*Acer platanoides*	11	13	G	No	invasive species, surface root damage	retain
742	Norway maple	*Acer platanoides*	15	14	G	No	invasive species, surface root damage	retain
743	Norway maple	*Acer platanoides*	13	14	G	No	invasive species, surface root damage	retain
744	Norway maple	*Acer platanoides*	13	16	G	No	invasive species, surface root damage	retain
745	Norway maple	*Acer platanoides*	14	12	F	No	invasive species, surface root damage, crown dieback, trunk wound near base on west face	retain
746	Norway maple	*Acer platanoides*	15	14	G	No	invasive species, surface root damage	retain
747	Norway maple	*Acer platanoides*	16	14	G	No	invasive species, surface root damage, some branch dieback	retain
748	Norway maple	*Acer platanoides*	17	18	G	No	invasive species, surface root damage, wound on west face near base	retain
749	Norway maple	*Acer platanoides*	17	22	G	No	invasive species, surface root damage, adjacent sidewalk heave	retain
750	Norway maple	*Acer platanoides*	16	20	G	No	invasive species	retain
751	Norway maple	*Acer platanoides*	15	16	F	No	invasive species, codominant leaders, ~18-degree lean west	retain
752	Norway maple	*Acer platanoides*	16	22	G	No	invasive species, surface root damage	retain
753	Norway maple	*Acer platanoides*	18	20	G	No	invasive species, surface root damage, few dead branches	retain
754	Norway maple	*Acer platanoides*	17	20	G	No	invasive species, surface root damage	retain
755	Norway maple	*Acer platanoides*	14	18	G	No	invasive species, surface root damage	retain
756	Norway maple	*Acer platanoides*	16	16	F	No	invasive species, branch dieback relatively thin crown, lower trunk with wound on east and west faces	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
757	Norway maple	*Acer platanoides*	21	22	G	No	invasive species, surface root damage, codominant leaders leans ~14-degrees west	retain
758	Norway maple	*Acer platanoides*	20	20	G	No	invasive species, surface root damage, some branch dieback	retain
759	Douglas-fir	*Pseudotsuga menziesii*	22	18	G	No	dense row	retain
760	Douglas-fir	*Pseudotsuga menziesii*	24	18	G	No	dense row, possible old broken top, resin flower on lower trunk north face	retain
761	Douglas-fir	*Pseudotsuga menziesii*	19	18	G	No	dense row	retain
762	Douglas-fir	*Pseudotsuga menziesii*	21	18	G	No	dense row	retain
763	Douglas-fir	*Pseudotsuga menziesii*	15	18	G	No	dense row	retain
764	Douglas-fir	*Pseudotsuga menziesii*	19	18	G	No	dense row	retain
765	Douglas-fir	*Pseudotsuga menziesii*	23	18	G	No	dense row, codominant leaders, spur leaders with included bark and tight "V" shaped attachment	retain
766	Douglas-fir	*Pseudotsuga menziesii*	19	18	G	No	dense row	retain
767	ponderosa pine	*Pinus ponderosa*	32	26	G	No	numerous upright leaders, Sequoia pitch moth infestation	retain
768	ponderosa pine	*Pinus ponderosa*	34	28	G	No	numerous upright leaders, Sequoia pitch moth infestation	retain
769	Douglas-fir	*Pseudotsuga menziesii*	35	26	G	No	no major defects	retain
770	Oregon white oak	*Quercus garryana*	36	32	F	**Yes**	moderate crown structure, dead branches, branch decay, wound on south face at base with decay, basal decay with hollows on north, south, and east sides	retain
771	ponderosa pine	*Pinus ponderosa*	33	18	G	No	numerous upright leaders, Sequoia pitch moth infestation	retain
772	Austrian pine	*Pinus nigra*	15	16	F	No	codominant leaders, some included bark, Sequoia pitch moth	retain

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment
773	cryptomeria	*Cryptomeria* spp.	31	14	F	No	poor structure, codominant leaders at juncture of old broken top or topping cut, pruned for power line clearance, dieback, decline	retain

[1]**DBH** is tree diameter measured at 4.5-feet above the ground level in inches; multiple trunks splitting below DBH are measured separately and individual trunk measurements are separated by a comma, except multiple trunks of the same size are indicated as quantity x size. Camellia and holly were measured at the base.

[2]**C-Rad** is crown radius measured in feet.

[3]**Cond** is an arborist assigned rating to generally describe the condition of individual trees as follows-
Dead, **P**oor Condition, **F**air Condition, **G**ood Condition, or **E**xcellent.

[4]**Sig** notes whether or not trees are "significant" per SRC Section 808.005.k.

74 trees are recommended for removal either because of construction or poor condition. Based on the inventory data that was collected, treatments for removal have been assigned an order of priority from 1 (highest priority) to 3 (lesser priority) at the Client's request. Please note that the tree inventory was based on Level 2 Visual Tree Assessment and did not include Tree Risk Assessment.

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment	Priority
602	deciduous	unknown	5	0	D	No	dead	remove	1
588	English hawthorn	Crataegus monogyna	12	12	P	No	invasive species, advanced trunk decay, activ	remove	1
596	Norway maple	Acer platanoides	15	15	P	No	invasive species, advanced trunk decay 0-5' o	remove	1
601	Norway maple	Acer platanoides	19	16	P	No	invasive species, crown dieback, trunk decay	remove	1
642	European white birch	Betula pendula	10	15	P	No	invasive species, poor structure, trunk decay	remove	1
650	black walnut	Juglans nigra	39	32	P	No	severe dieback, crown decay, diseased	remove	1
330	flowering pear	Pyrus spp.	8,10,12	22	F	No	moderate structure, advanced basal decay, h	remove	1
364	silver maple	Acer saccharinum	13	12	F	No	advanced decay in codominant stem juncture	remove	1
492	cryptomeria	Cryptomeria spp.	31	10	F	No	broken top, remaining top with increased risk	remove	1
498	English hawthorn	Crataegus monogyna	15	15	F	No	invasive species, crown decay, 20-degree lea	remove	1
590	silver maple	Acer saccharinum	16	16	F	No	moderate crown structure, advanced trunk d	remove	1
624	red maple	Acer rubrum	18	20	F	No	advanced decay 0-10' on south side in plane	remove	1
310	flowering pear	Pyrus spp.	10,14	16	P	No	heavily pruned, extensive crown decay	remove	2
366	English hawthorn	Crataegus monogyna	13	0	P	No	invasive species, topped, mostly dead, advan	remove	2
367	English hawthorn	Crataegus monogyna	7	0	P	No	invasive species, topped, mostly dead, advan	remove	2
448	English hawthorn	Crataegus monogyna	16	16	P	No	invasive species, history of branch failure, po	remove	2
466	English hawthorn	Crataegus monogyna	14	10	P	No	invasive species, very poor structure, decay	remove	2
474	flowering plum	Prunus spp.	22	0	P	No	topped, mostly dead	remove	2
475	flowering plum	Prunus spp.	22	0	P	No	topped, mostly dead, decay	remove	2
477	flowering plum	Prunus spp.	25	4	P	No	topped, mostly dead, Ganoderma conk at bas	remove	2
499	European white birch	Betula pendula	21,24	10	P	No	invasive species, severe decline, not sustainal	remove	2
525	European white birch	Betula pendula	3x16	16	P	No	dieback, decline	remove	2
534	European white birch	Betula pendula	16	14	P	No	invasive species, dieback, hollows with decay	remove	2
576	cherry	Prunus spp.	13	6	P	No	very poor structure, basal decay, poorly prun	remove	2
586	elm	Ulmus spp.	24	20	P	No	poor structure, dieback, crown decay	remove	2
603	black locust	Robinia pseudoacacia	4	5	P	No	invasive species, mostly dead, trunk decay	remove	2
607	English hawthorn	Crataegus monogyna	7	7	P	No	invasive species, poor structure, crown and tr	remove	2
618	black walnut	Juglans nigra	20	18	P	No	severe crown dieback, dead branches, trunk	remove	2
619	black walnut	Juglans nigra	26	18	P	No	severe crown dieback, dead branches, crown	remove	2
622	black walnut	Juglans nigra	30	24	P	No	severe crown dieback, large pruning wounds	remove	2
654	cherry	Prunus spp.	7	5	P	No	advanced trunk decay 0-3' on southwest and	remove	2
655	cherry	Prunus spp.	6	4	P	No	trunk and basal decay	remove	2
316	European white birch	Betula pendula	14	20	F	No	invasive species, poor structure, broken bran	remove	2
325	flowering pear	Pyrus spp.	13	16	F	No	moderate structure, advanced decay	remove	2
502	English laurel	Prunus laurocerasus	6,3x10	10	F	No	very poor structure, decay	remove	2
524	European white birch	Betula pendula	41	24	F	No	broken branches, branch decay, multiple atta	remove	2

No.	Common Name	Species Name	DBH[1]	C-Rad[2]	Cond[3]	Sig[4]	Comments	Treatment	Priority
532	European white birch	Betula pendula	18	20	F	No	invasive species, dead branches, hollows with	remove	2
533	European white birch	Betula pendula	17	16	F	No	invasive species, dieback, hollows with decay	remove	2
535	European white birch	Betula pendula	17	16	F	No	invasive species, dead branches, hollows with	remove	2
333	flowering pear	Pyrus spp.	2x16	8	P	No	poor structure, very heavily pruned	remove	3
404	red maple	Acer rubrum	3x16	20	P	No	reduced vigor, trunk decay	remove	3
431	flowering pear	Pyrus spp.	9	10	P	No	moderate lean to west, moderate crown stru	remove	3
547	flowering plum	Prunus spp.	16	12	P	No	no access, very poor structure, dead branche	remove	3
549	flowering plum	Prunus spp.	11	16	P	No	no access, poor structure, dead branches	remove	3
651	silver maple	Acer saccharinum	15	12	P	No	dead branches, poor crown structure	remove	3
324	flowering pear	Pyrus spp.	11	18	F	No	moderate structure, decay	remove	3
504	camellia	Camellia spp.	12	10	F	No	no access	remove	3
505	camellia	Camellia spp.	12	10	F	No	no access	remove	3
510	mimosa	Albizia julibrissin	13	16	F	No	no access, moderate structure	remove	3
513	raywood ash	Fraxinus oxycarpa 'Raywood'	14	16	F	No	no access	remove	3
514	flowering pear	Pyrus spp.	12	14	F	No	no access	remove	3
515	raywood ash	Fraxinus oxycarpa 'Raywood'	13	18	F	No	no access	remove	3
516	flowering pear	Pyrus spp.	10	12	F	No	no access	remove	3
545	flowering plum	Prunus spp.	8	12	F	No	no access, moderate structure	remove	3
546	flowering plum	Prunus spp.	2x7	12	F	No	no access, few dead branches, sprouts	remove	3
553	European white birch	Betula pendula	37	28	F	No	invasive species, some dieback	remove	3
555	European white birch	Betula pendula	12,2x20	22	F	No	invasive species, moderate structure, history	remove	3
559	rhododendron	Rhododendron spp.	10	6	F	No	trunk decay	remove	3
560	hinoki cypress	Chamaecyparis obtusa	8	9	F	No	no major defects	remove	3
562	camellia	Camellia spp.	12	8	F	No	multi-stem	remove	3
563	juniper	Juniperus spp.	12	10	F	No	no access	remove	3
564	juniper	Juniperus spp.	7	10	F	No	no access	remove	3
565	juniper	Juniperus spp.	5,6	10	F	No	no access	remove	3
307	camellia	Camellia spp.	10	6	G	No	multi-stem, one-sided to building	remove	3
503	camellia	Camellia spp.	12	10	G	No	moderate structure	remove	3
507	juniper	Juniperus spp.	9	10	G	No	no access	remove	3
508	juniper	Juniperus spp.	8	10	G	No	no access	remove	3
509	camellia	Camellia spp.	12	10	G	No	no access	remove	3
511	camellia	Camellia spp.	12	10	G	No	no access	remove	3
548	flowering plum	Prunus spp.	26	12	G	No	no access, moderate structure, dead branche	remove	3
556	Port-Orford-cedar	Chamaecyparis lawsoniana	3x10,11	14	G	No	moderate structure, one-sided against buildi	remove	3
558	camellia	Camellia spp.	12	6	G	No	multi-stem	remove	3
561	camellia	Camellia spp.	12	8	G	No	multi-stem	remove	3
539	Japanese maple	Acer japonicum	22	24	E	No	one-sided against building, few dead branche	remove	3