TECHNICAL SPECIFICATIONS
ISSUE FOR BID

ORANGEGATE PARK –
PHASE 1 SITE IMPROVEMENTS
TACOMA, WASHINGTON

Pierce County
Department of Parks and Recreation
9850 64th Street West
University Place, Washington, 98467

DIVISION 01 GENERAL CONDITIONS – Provided by Pierce County Parks & Recreation

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SECTION 01 11 00
SUMMARY OF WORK

GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Project Information.
2. Work Phases
3. Use of premises.
4. Owner's occupancy requirements.
5. Project special requirements
6. Specification formats and conventions.

1.2 RELATED DOCUMENTS

A. Pierce County's General Provisions for Construction contracts apply to all sections of the specifications and contract documents.

B. Drawings and Pierce County General Provisions of Contract, including General and Special Conditions and Divisions 00 & 01 Specifications sections, apply to work of this section.

1.3 PROJECT INFORMATION

A. Project Name:

B. Project Location:

C. Owner: Pierce County Parks and Recreation
   1. Owner's Rep: Griffin Collins, griffin.collins@piercecountywa.gov, 253-677-0304

D. Prime Consultant: HBB Landscape Architecture
   1. Architect's Rep: Dean W. Koonts, dkoonts@hbbseattle.com, 206-682-3051

The Work consists of the following:

1. New park development consisting of parking lot, restrooms, covered shelters, playground, trails, and all other accompanying utilities, infrastructure, and elements as shown on the Contract Drawings and Specifications.

Project will be constructed under a single prime contract.

G. The work will be conducted in one phase.

1.4 USE OF PREMISES

Use of Site: Limit use of premises to areas within work areas and immediately adjacent to the work indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Owner Occupancy: Allow for safe Owner occupancy and use by the public of areas outside the project work areas.

Driveways and Entrances: Keep driveways, and entrances serving premises clear and available to Owner, Owner's employees, the public and emergency vehicles at all times.

a. Do not use these areas for parking or material storage.
b. Use areas immediately adjacent to project work for staging, employee parking and material storage. Coordinate location and size of areas with Owner’s Representative prior to beginning work.
c. Schedule deliveries to minimize use of driveways and entrances.
d. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

OWNER'S OCCUPANCY REQUIREMENTS

Full Owner Occupancy: Owner will occupy the site and existing buildings during construction, with the exception of areas under construction.

1. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner and general public usage. Perform the Work to minimize Owner's day-to-day operations. Maintain existing building exits not affected by construction, unless otherwise indicated.
2. 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 authorities having jurisdiction.

Maintain pedestrian and vehicular access to and around the site.

1. Provide access for Pierce County Parks and Recreation staff for standard operations throughout the site.

1.6 PROJECT SPECIAL REQUIREMENTS (Not Used)

SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-Division MasterFormat numbering system.
   1. Sections in Division 00 and 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be

interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

C. Order of Precedence
    1. Any conflict or inconsistency between the conditions of the Contract Documents shall be resolved as shown in 00 72 00 - 1.03 Contract Document Order of Precedence.

PRODUCTS (Not Used)

EXECUTION (Not Used)

END OF SECTION 01 11 00

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for inadvertent discovery of archaeological items.

1.2 RELATED DOCUMENTS

A. Pierce County's General Provisions for Construction contracts.

B. Section 00 72 00 Section 3.25.

1.3 PROCEDURES

Work on the project shall comply with all requirements in the Pierce County Public Works Inadvertent Discovery Plan. See Appendix H.

B. Additionally, Work shall comply with project-specific requirements for archaeological monitoring dictated in March 2, 2026 letter from Washington State Recreation and Conservation (RCO), see Appendix I. Work shall also comply with project-specific Archaeological Resources Monitoring and Inadvertent Discovery Plan (MIDP) dated August 2025, see Appendix I.

1. Within the project, there is an archaeological site 45PI1615 which requires archaeological monitoring of initial clearing, grading, and demolition within the site and within a 30-meter buffer around the site. Contractor shall coordinate to have Owner-provided archaeological monitoring representative present during all clearing, grading, and demolition work in this area. See Appendix I for full requirements and details.
2. In case of conflict between the project specific and general Pierce County PPW discovery plans, the more stringent requirement shall govern.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 14 00

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

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

1.3 PROCEDURES

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

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

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

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

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

1.4 SCHEDULE OF ALTERNATES

A. Substitutive Alternate 01: Picnic Shelter 1
1. Description of work:
a. Additive work includes the site preparation, TESC, grading, paving, stormwater, electrical, site furnishings, soil preparation, and planting

associated with installing Picnic Shelter 1 and the concrete paved connecting to the shelter in the limits shown in the Contract Documents.

b. Subtractive work includes soil preparation and seed limits shown in the Base Bid.

c. The Base Bid excludes Picnic Shelter 1, the concrete paved connection to the shelter, and adds seed and mulch within limits of work where shown in the Contract Drawings.

B. Additive Alternate 02: OLA (Off Leash Area) Loop Trail

1. Description of work:

a. Alternate includes site preparation, TESC, grading, paving, soil preparation, and planting for the trail as shown on the Contract Drawings.

b. Base Bid excludes all improvements within limits shown on the Contract Drawings.

C. Additive Alternate 03: OLA Clearing

1. Description of work:

a. Alternate includes Contractor to clear all Himalayan blackberry from the OLA and ensure the area is free of blackberry at project substantial completion (e.g. it will not be acceptable to clear blackberry at beginning of project and allow it to regrow by the time substantial completion arrives). Contractor shall retain all native plants and native vegetation within the OLA. Coordinate with Pierce County Parks Arborist before commencing this work.

b. Base Bid excludes all clearing in OLA shown on the Contract Drawings.

D. Additive Alternate 04: Split Rail Fence Along 84th St E

1. Description of work:

a. Alternate includes fencing and installation of Split Rail Fence installed along 84th ST E as shown in the Contract Documents.

b. Base Bid excludes split rail fencing along 84TH St E as shown on Contract Documents.

E. Additive Alternate 05: Contractor Furnish, Owner Install Trail Directional Signs

1. Description of work:

a. Alternate includes Contractor supply of Fifteen (15) 'Trail Directional' signs including signage, posts, mounting hardware, and delivery. Contractor need not include supplies for foundations. Installation is by Owner. See Appendix D PC Parks Sign Standards for sign template specifics. Anticipate that each sign would have different text.

b. Base bid excludes supply of this signage

F. Additive Alternate 06: Contractor Furnish, Owner Install Trail Entry-Large Signage in Greater Orangegate Park Land

1. Description of work:

a. Alternate includes Contractor supply of Four (4) 'Trail Entry – Large' signs. Contractor shall include full scope of supply work including but not limited to signage, posts, anchors and fasteners,delivery, etc. Contractor need not include supplies for foundations. Anticipate that

each sign would have different text. See appendix D PC Parks Sign Standards for sign template specifics.

b. Base bid excludes supply of this signage.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 23 00

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications

1.2 RELATED DOCUMENTS

A. Section 00 72 00 – Part 6 “Method to Calculate Adjustments to Contract Price”

B. Section 01 27 00 “Unit Prices” for administrative requirements for using Unit Prices.

C. Section 01 60 00 – Product Requirements for product substitution procedures.

1.3 MINOR CHANGES IN THE WORK

A. The Owner’s Consultant will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Request for Change Proposal: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the request will include supplemental or revised Drawings and Specifications.

1. Request for Change Proposal issued by Owner is for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 5 (five) days after receipt of Request for Change Proposal, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made.
    b. Indicate applicable delivery charges, equipment rental and trade discounts.

See 00 72 00 – Part 5 for allowable markup for allowable markups.

    d. Include costs of labor and supervision directly attributable to the change.
    e. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1. Use available total float before requesting Contract Time extension.

B. Contractor-Initiated Request for Change Order: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a Request for Change Order to the Owner.

1. Comply with requirements in 00 72 00
2. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
4. Indicate applicable taxes, delivery charges, equipment rental, trade discounts, profit, overhead and markup
5. Include costs of labor and supervision directly attributable to the change.
6. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship.
   a. Use available total float before requesting an extension of the Contract Time.
7. Comply with requirements in Section 01 60 00 "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use form approved by Owner’s Representative.

Do not include Contractor's or subcontractor's indirect expense in the Proposal Request cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Owner’s Representative may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data including receipts to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

A. A Change Order will be issued for one or more Owner or Contractor initiated Proposal Requests or Construction Change Directives grouped into a single Change Order.

1. Payment for changed work cannot be paid until the Change Order is finalized and signed by required parties.
2. Payment for a Change Order cannot be processed until all previous Change Orders are complete and paid.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 27 000
UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in Section 3.1.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials and execution described under each unit price.

E. Owner will issue a Change Order for additional work based on the actual quantities approved by the Owner at the Unit Price listed by the Contractor on the Bid Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

Unit Price No. 01 Unsuitable Soils

1. Description: Provide labor, materials, tools and equipment necessary to complete the work as specified, in accordance with the Contract Documents including all costs for excavating, removing, hauling and disposing of the unsuitable material off site. Import, place, grade and compact the suitable material. Work includes, but is not limited to:
   a. Removal of existing unsuitable soil.
      1) Measurement of material removed to be confirmed by the Engineer in the field prior to fill installation.
   b. Recompact existing soil to remain
   c. Haul unsuitable soil off-site and legally disposed of.
   d. Install Imported Structural Fill as referenced in the appropriate specific and as identified in the geotechnical report.
   e. Compact as specified for typical fill materials.
2. Unit of Measurement: Cubic Yard of excavated unsuitable soil.
3. Base Bid: Do not include removal and replacement of unsuitable soil.

END OF SECTION 01 27 00

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 RELATED SECTIONS

A. Drawings and the General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section.

B. 01 29 73 Schedule of Values for requirements for creating and submitting the Schedule of Values.

C. Section 00 72 00 – Part 7 for Payment and Completion Requirements.

1.3 PAYMENT APPLICATIONS

A. General Requirements

Each Payment Application shall be consistent with previous applications and payments as certified and paid for by Owner.

2. Submit completed application using Owner's project management software (Procore) as well as in Excel template provided by Owner.
3. Application Preparation:
   a. Complete every entry on form.
      1) Entries shall match data on the Schedule of Values and Contractor's Construction Schedule
   b. Use updated schedules if revisions were made.
   c. Include amounts of Change Orders issued before last day of construction period covered by application.
   d. Owner's Representative will return incomplete applications without action.
   e. Include items noted in 00 72 00 – Part 7 Payment and Completion.
4. Submit completed signed and notarized application to the Owner via email.
   a. Final submitted application shall be signed by person authorized to sign legal documents on behalf of contractor.

Initial Payment

1. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   a. List of subcontractors.
   b. Apprenticeship Utilization Requirements. See Section 00 73 44.
   c. Approved Schedule of Values.
   d. Approved Contractor's Construction Schedule
   e. Approved Submittals Schedule

f. List of Contractor's staff assignments
g. Approved Contractor and Subcontractor site specific Safety Program. See 00 72 00 3.23 – Safety Program.
h. List of Contractor's principal consultants.
i. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
j. Initial progress report.
k. Pre-Construction Conference Report.
l. Certificates of current insurance coverage.
m. Statement of Intent to Pay Prevailing Wages as required in Section 00 73 49.

C. Progress Payments

Application for Payment Times: The date for each progress payment is indicated in Section 00 72 00 – Part 7. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement

2. Application for Payment Times: Submit Progress payments to Owner's Representative by the 20th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
3. Submit Payment Application(s) using Owner's project management software (Procore) as well as in Excel template provided by Owner

D. Substantial Completion

After Owner issues the Certificate of Substantial Completion, submit an Application for Payment showing the Work claimed is substantially complete.

a. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

E. Final Payment

Submit Final Payment Application with releases and supporting documentation not previously submitted and accepted, including, but not limited to the following:
Requirements in 00 72 00 – Part 7

b. Evidence of completion of Project Closeout requirements.
c. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
d. Updated final statement, accounting for final changes to the Contract Sum.
e. Final, liquidated damages settlement statement.
f. Complete Final Acceptance form included in Section 00 65 00.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SUMMARY

1. This section specifies administrative and procedural requirements for preparing the Schedule of Values.

1.2 RELATED DOCUMENTS

A. Drawings and the General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section.

1.3 SCHEDULE OF VALUES REQUIREMENTS

Schedule of Values submittal requirements

1. Enter Schedule of Values in Owner's project management software as well as Excel Template provided by Owner.
   a. If agreed to by the Owner's Representative the Contractor may provide the Schedule of Values in an agreed-upon format other than the project management software. Owner's Representative will enter the Schedule of Values into the project management software.
2. Schedule: Enter Schedule of Values for review and approval as specified in 00 72 00 – Part 4.
3. Make sum of total scheduled costs equal to Contract Sum.
4. Line items should be broken down into area, phase, level, etc where reasonable, so that progress for each line item is easily determined.
   a. In general, no single line item should be over $50,000.
   b. Provide additional cost breakdown of the submitted line items until Owner accepts level of detail in the Schedule.
5. Provide pricing backup if requested.
6. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports.
7. Application for payment will not be processed without an approved Schedule of Values.
8. Provide a separate line item for each part of the Work where Applications for Payment may include materials or equipment.
9. This project includes areas of Grant-Reimbursable work and non-Grant reimbursable work (see project plans). The Schedule of Values shall be required to break out work activities in the grant-reimbursable and non-grant reimbursable areas.

10. Closeout & other costs: Include separate line items for these activities in the Schedule of Values. The maximum allowable percentage of the contract total is shown for each item.
    a. Closeout Activities and Documents (2%)
    b. Punch List activities (2%)
    c. Demonstration and Training (1.25%)
    d. Mobilization. Where the percentages indicated are a fraction of the entire contract value. (5.0%)
11. Round amounts to nearest whole dollar. Total shall equal the Contract Sum.

1.4 RELATED REQUIREMENTS

A. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
    1. Use the Schedule of Values as basis for developing the Application for Payment, for developing Project Construction Schedule and for developing estimated pay request amounts during the contract. Correlate line items in the Schedule of Values with other required administrative forms and schedules including Application for Payment, Submittals Schedule and Contractor's Construction Schedule.

Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
b. Schedule Updating: Update the Schedule of Values before the next Application for Payment when Change Orders result in a change in the Contract Sum.

B. Coordinate related requirements specified in other parts of the Project Manual including but not limited to the following:
    1. Pierce County General Provisions for Construction Contracts.
    2. Division 01 and Division 02-32 Specification Sections.

1.4 FORM AND CONTENT OF SUBMITTAL

A. Enter Schedule of Values into Owner’s project management software.
    1. Identify each line item with number and title of respective major Specification Section.
    2. In each item include a directly proportionate amount of Contractor’s overhead and profit.
    3. For each line item installed, show breakdown by major products or operation under each item.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 73

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. Project Management Software.
2. Coordination.
3. Submittals.
4. Project meetings.

1.2 RELATED DOCUMENTS

A. Section 01 70 00 - Execution Requirements for procedures for coordinating general installation and field engineering services including establishment of benchmarks and control points.

1.3 PROJECT MANAGEMENT SOFTWARE

A. The Owner’s instance of Procore project management software will be used for electronically coordinating and managing project communication and documentation throughout the construction period through and including project closeout.

1. The Owner will provide online access to the software for the Consultant team, Contractor and other team members as requested and agreed to by the Owner at no additional cost to these parties.
2. Items processed through the project management software include but are not limited to:
    a. Project Directory
    b. Meeting Minutes
    c. Applications for Payment
    d. Contract modifications
    e. Photo documentation
    f. Scheduling
    g. Submittals including documents, review process and logs.
    h. Documents including project drawings
    i. Requests for Information (RFI’s) including documents, review process and logs.
    j. Contractor Daily Reports

1.4 COORDINATION

Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.

1. Schedule construction operations in logical and efficient sequence 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 accessibility and avoid “trade stacking”.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare written communication to each party involved in coordinating a particular item or type of work, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Include Owner on all communication.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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. Preinstallation conferences.
7. Project closeout activities.

1.5 SUBMITTALS

Coordination Drawings: Prepare Coordination Drawings in the following circumstances:

1. Limited space availability necessitates maximum utilization of space for efficient installation of different components.
2. Coordination is required for installation of products and materials fabricated by separate entities.
3. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

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

b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

Maximum sheet size: 22 inches by x 34 inches.

5. Format: PDF format unless otherwise indicated.

6. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

7. See 01 33 00 Submittal Procedures" for submittal requirements.

1.6 PROJECT MEETINGS

A. General: 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's Representative of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned within three days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to attendees, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Contractor and its superintendent; major subcontractors; suppliers; any required inspectors, and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

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

a. Tentative construction schedule.

b. Phasing.

c. Critical work sequencing and long-lead items.

d. Designation of key personnel and their duties.

e. Procedures for processing field decisions and Change Orders.

f. Procedures for Requests for Interpretations (RFIs).

g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Preparation of Record Documents.
l. Use of the premises and existing buildings.
m. Work restrictions.
n. Owner's occupancy requirements.
o. Responsibility for temporary facilities and controls.
p. Construction waste management and recycling.
q. Parking availability.
r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security and security clearances.
v. Progress cleaning.
w. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Pre-installation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Consultant of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related Requests for Interpretations (RFIs).
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.

p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date. Submittals pertinent to the Work shall have been reviewed and approved prior to the meeting.

D. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Attendees: In addition to Owner Representatives, each 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.
   a. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting.
   a. Review other items of significance that could affect progress. Include topics for discussion as appropriate to Project status.
   b. Contractor's Construction Schedule:
      1) Review progress since the last meeting.
      2) Determine whether each activity is on time, ahead of schedule, or behind schedule~~,~~ in relation to Contractor's approved Construction Schedule.
      3) Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
      4) Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      5) Review 3-week look-ahead schedule.
   c. Review present and future needs of each entity present, including the following:
      1) Key Project Dates

2) Safety
3) Neighborhood or Staff Issues
4) Schedule
5) RFI's
6) Submittals
7) Contract Changes
8) Pay Applications
9) Permitting and Inspections
12) Deliveries.
13) Off-site fabrication.
14) Access.
15) Site utilization.
16) Temporary facilities and controls.
17) Work hours.
18) Hazards and risks.
19) Progress cleaning.
20) Quality and work standards.
21) Status of correction of deficient items.
22) Field observations.
23) Status of Proposal Requests.
24) Pending changes.
25) Change Order status
26) Pending claims and disputes.

3. Minutes: Meeting minutes will be recorded by the Contractor. Contractor will distribute through the Owner's project management software after Owner has reviewed and approved the minutes. Include RFI log, submittal log, and updated project schedule.
   a. Minutes will be distributed to meeting attendees. Attendees are responsible for forwarding to other interested parties.
4. 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.

Project Safety Meetings: Meet requirements in 00 72 00 – Part 3

1. Upload meeting minutes including sign-in sheets to Owner's Project management software within 3 days of meeting.

F. Other Meetings as may be necessary to effect successful installation of the Work and completion of the Project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

Contractor's Construction Schedule.

2. Submittals Schedule.
3. Daily construction reports.
4. Field condition reports.

1.2 RELATED DOCUMENTS

A. Division 00 sections for Conditions of the Contract.

B. Section 01 11 00 “Summary of Work” for project schedule items and dates.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Baseline Schedule: A schedule baseline is the approved, fixed version of a project timeline used to measure performance, track progress, and evaluate delays. It locks in planned start dates, end dates, task durations, dependencies, and milestones

C. CPM: Critical Path Method: A method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

Float: The measure of leeway in starting and completing an activity.

Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.4 SUBMITTALS

A. Submit as specified in Section 01 33 00 “Submittal Procedures”.

B. Format: Submit in Owner’s project management software unless otherwise indicated.

C. Submittal Process Schedule: The submittal schedule will be produced in Owner’s project management software based on the project specification requirements. Contractor to ensure that the submittal register therein is complete and accounts for all products, methods, requirements, etc.

Contractor's Construction Schedule: Indicate the entire schedule for entire construction period.

E. Daily Construction Reports: Submit reports in Owner's project management software.
   1. PDF attachments are acceptable but must be uploaded to a Daily Report entry in the software.

F. Field Condition Reports: Submit Report in Owner's project management software at time of discovery of differing conditions.
   1. Notify the Owner separately via email at the same time.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, List of Subcontracts, Submittals Schedule, Progress Reports, Payment Requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCESS SCHEDULE

A. Prepare Submittals Schedule arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows a revised completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

Activity Duration: Define activities so no activity is longer than 5 days, unless specifically allowed by Owner.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule.
   a. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 10 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Owner’s administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

Work Stages: Indicate important stages of construction for each major portion of the Work.

2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

Coordination with existing construction.

b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.

h. Environmental control.

3. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Mobilization, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type of Contractor's Construction Schedule within 10 days of the Notice to Proceed in PDF format. Base schedule on the Preliminary Construction Schedule as well as updating, and feedback received since the start of Project. Owner shall review and upon Owner acceptance this submittal shall act as the Baseline Schedule for the project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. No single activity that may be reasonably split into phases/areas/sections/etc. should have a duration longer than 10 working days.

2.4 COMPLETION TIMES

A. Schedule and phasing are critical for the timely completion of this Work. The following schedule and milestone dates align with the funding requirements and ongoing public usage of the site and are critical to achieve in order to allow timely occupancy of portions of the Work and ultimately complete the project in accordance with the funding requirements

1. It is the Contractors responsibility to plan the working hours to accommodate Pierce County Parks and Recreation activities and to minimize disruptive noise, odors, dust, or any other construction related disruptions or impediments. Costs related to phasing, scheduling, extra effort or special work schedules required to complete the Work by the indicated substantial completion dates shall be included in the Contractors Bid amount.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

List of subcontractors at Project site.

2. Equipment at Project site.

3. Material deliveries.

4. High and low temperatures and general weather conditions.

5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Orders and requests of authorities having jurisdiction.
9. Services connected and disconnected.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information using the Owner's Construction Management Software. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Construction Photographs: Photograph project progress and include on Daily Construction Reports and Field Condition Reports. Photographs shall be in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Digital Images: All digital images should be exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
2. Field Office Images: Maintain one set of images in the field office at Project site, available at all times for reference. Identify images same as those submitted to Owner/Consultant.
   a. Date and Time: Include date and time in filename for each image.

Flag construction limits before taking construction photographs.

4. Before starting work, take minimum eight photographs of each work area included in the project and areas immediately adjacent to the buildings to accurately record physical conditions at start of construction.
   a. Include photos of interior and exterior conditions.

D. Periodic Construction Photographs: Take minimum 25 digital photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Schedule Updating: Update schedule at weekly intervals to reflect actual construction progress and activities. Issue schedule 2 days prior to next regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Consultant and Owner's Representative, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Upload schedule to Owner's project management software copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 32 22
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Pre-construction photographs.
2. Construction progress photographs.
3. Digital video camera system including camera and related hardware, software and other components.

1.2 RELATED DOCUMENTS

A. Drawings and Pierce County General Provisions for Construction Contracts, including General and Special Conditions and Divisions 00 & 01 Specifications sections, apply to work of this section.

B. Section 01 31 00 "Project Management and Coordination" for photograph and video management, storage and access.

C. Section 01 77 00 "Closeout Procedures" for submitting equipment and systems demonstration and training videos to Owner's personnel.

1.3 SUBMITTALS

A. Webcam system.

B. Usage rights transfer.

C. At project completion – submit all construction photos and video.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights to Owner for unlimited reproduction of photographic and video documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images:

1. Provide images in JPEG format, produced by a digital camera with minimum sensor size of 8.0 megapixels, and at an image resolution of not less than 2400 by 3000 pixels.

Video System:

1. General: Video system shall meet or exceed the following requirements:
2. Camera:

a. Camera quantity and placement to ensure complete coverage of project area.
b. Resolution: Minimum HD resolution.
c. Minimum 70º horizontal field of view.
d. Remote pan, tilt, zoom controls.
e. Live video stream capability.
f. Weatherproof housing.

3. Data Connectivity and storage
   a. 4G LTE cellular service for data transmission.
   b. Image and Video Storage: Store all images and video in Camera System provider online storage and / or Project Management software. Provide Owner with full access to all images and videos.
4. Power Connection:
   a. Provide 120 VAC direct power, battery and/or solar power source.
   b. Power status display on online video system dashboard.
   c. Provide uninterrupted system operation during power outage for minimum 4 hours.
5. Mounting:
   a. Pole mount on existing poles to remain, or on existing buildings as directed by Owner's Representative.
6. Software:
   a. Web and mobile accessible software interface for use on computer and mobile devices.
   b. Browser-based dashboard shall include, but is not limited to the following features:
      1) Display all cameras on single screen.
      2) Real-time live video viewing.
      3) Dashboard feature to allow user-controllable pan, tilt & zoom of camera.
      4) Timeline navigation for selecting specific videos or images from specific dates.
      5) Display upcoming and historical weather data.
   c. In addition to online browser-based dashboard, include Apple and Android mobile software.
   d. Access Control:
      1) Restrict access and features to authorized project participants such as Owner's Representative and Design Team.
      2) Provide open access user accounts as directed by Owner's Representative.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General:

1. Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
2. Digital Images: Provide digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
3. Photo Naming:
    a. Date and Time: Include date and featured object in filename for each image. For example – "2023-10-12 – Play Area Subgrade".
4. Image access: Maintain one (1) set of images available at all times for reference.
    a. Name images as indicated for submittal to Owner's Representative.
    b. Provide digital copies of all photos to Owner's Representative at project completion.
5. Upload all project photos into Owner’s project management software.
    a. Upload the same day photos are taken.
    b. Organize as directed by Owner.

B. Preconstruction Photographs:

1. Photograph site before starting construction.
2. Flag construction limits prior to photographing site.
3. Photograph site and surrounding properties, existing pavement, structures and landscape areas to remain during construction and adjacent pavement, structures and landscape areas where new construction will join or connect.
4. Photograph items from different vantage points, as directed by Owner's Representative.
5. Quantity as needed to adequately document existing conditions.

C. Periodic Construction Photographs:

1. Take digital photographs weekly at a minimum, with timing each month adjusted to coincide with the cutoff date associated with Application for Payment.
2. Select vantage points to show status of construction and progress since previous photographs were taken.

D. Installation Photographs

1. Photograph all work that will be covered by later construction including, but not limited to concrete reinforcement, electrical work and underground utilities including irrigation and piping.

2. Failure to photograph items before covering may result in Owner's Representative requiring covering to be removed to confirm installation.
    a. Removal requirement shall be solely at the option of the Owner's Representative.
    b. Contractor is solely responsible for cost to remove covering and reinstall as specified.

E. Additional Photographs: Provide additional photographs as well as periodic, preconstruction or installation photographs specified above.

1. Circumstances that require additional photographs include, but are not limited to:
    a. Immediate follow-up when on-site events result in construction damage injury, or loss.
    b. Photographs at fabrication locations away from Project site.
    c. Substantial Completion of a major phase or component of the Work.
    d. Final Acceptance of a major phase or component of the Work.
    e. Other emergency situations.
2. All photographs noted above, or as requested by the Owner's Representative will be considered incidental to the Work.

3.2 VIDEO SYSTEM INSTALLATION

A. No Project work shall begin until video camera system including all cameras and online access are fully complete and operational.

B. Camera installation:

1. Orient camera to completely cover the project area.
2. Location to be submitted and reviewed by Owner.
3. Mount camera on existing site features such as building, light pole, etc.
4. Mount at 20-30-foot height as directed by Owner's Representative.
5. Provide power to operate camera.
6. Provide and connect to cellular service for data transmission.

C. Online system:

1. Configure online access
2. Provide multiple accounts for Owner's online and mobile access.
3. Configure project dashboard.

D. Test camera system after installation is complete or camera is relocated. Testing to include:

1. System power.
2. Data transmission.
3. Video / recording settings.
4. Field of view is approved by Owner's Representative.

5. Web-based dashboard is fully functional including, but not limited to ability to view video from all cameras, remotely control cameras, live-stream activity and weather data.
6. User access is working correctly.

3.3 VIDEO SYSTEM MAINTENANCE

A. Contractor to pay for all video system costs, power and utilities, cellular connection and data charges, as well as storage and related costs until project is complete, camera removed and data retrieved off the Camera System online storage.

B. Video and still images captured on the system to be maintained on the System Vendor's servers at all times throughout the life of the project and for no less than sixty (60) days after Final Completion.

C. Maintain camera including camera cleaning and making appropriate arrangements for the camera to remain in operation through project Final Completion.

D. Remove cameras only after all work is complete.

END OF SECTION 01 32 22

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Product Data, Shop Drawings, Samples, and other submittals.

1.2 RELATED SECTIONS

A. Section 00 72 00 – Part 4

B. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and project photos.

C. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports.

D. Section 01 77 00 "Closeout Procedures" for submitting warranties.

E. Section 01 78 23 "Operation and Maintenance Data" for submitting Operation and Maintenance manuals.

F. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

G. Individual sections for submittals specific to the work specified.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Owner’s responsive action.

B. Informational Submittals: Written information that does not require Owner’s responsive action.

1.4 SUBMITTAL PROCEDURES

Submittal processing will be managed through the Owner’s project management software.

B. Contractor to enter submittals into Owner’s project management software.

C. Format: Provide Submittal documents in PDF format unless otherwise indicated.
   1. Attach submittal documents to individual submittal items in Owner’s project management software.

D. Coordination: Coordinate submittal preparation and processing with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Coordinate submission of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Owner / Consultant reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

E. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

F. Processing Time:

1. Initial Review: Review time starts on receipt of submittal by Consultant.
a. Allow 10 working days for initial review of each submittal. Public holidays and weekends are not working days.

Allow additional time if coordination with subsequent submittals is required. Consultant will advise Contractor when a submittal being processed must be delayed for coordination.

2. Resubmittal Review: Allow 10 working days for review of each resubmittal.

3. Contract Time extension will not be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents.

Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals.

PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data is not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Manufacturer's catalog cuts.
    e. Wiring diagrams showing factory-installed wiring.
    f. Printed performance curves.
    g. Operational range diagrams.
    h. Compliance with specified referenced standards.
    i. Testing by recognized testing agency.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

Dimensions.

    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Notation of coordination requirements.
    j. Notation of dimensions established by field measurement.
    k. Relationship to adjoining construction clearly indicated.
    l. Seal and signature of professional engineer if specified.
    m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 22 by 34 inches (560 by 860 mm).

Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected.
   a. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   b. Number of Samples: Submit two sets of Samples. Engineer will retain one Sample set. Mark up and retain one returned Sample set as a Project Record Sample.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Schedule of Values."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Submit through Owner’s project management software.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

C. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

D. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Owner’s Representative, and other information specified.

F. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

G. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

H. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

I. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

J. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

K. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a

qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by

insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

V. Construction Photographs: Comply with requirements in Division 1 Section "Construction Progress Documentation."

W. Material Safety Data Sheets (MSDSs): Submit information directly to Owner/Architect.

1. Owner/Architect will review submittals that include MSDSs and will return them for resubmittal.

DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before uploading to Owner’s project management software for review.

B. Approval Stamp: Stamp each submittal with a uniform approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 CONSULTANTS’ ACTION

A. General: Consultant will not review submittals that do not bear Contractor's approval stamp and will return them without action.

Action Submittals: Consultant will review each submittal, make marks to indicate corrections or modifications required, and return it. The review is to verify general compliance with Contract Documents only. Corrections (or absence of corrections) or comments do not relieve the Contractor from the requirement to comply with the Contract Documents. The Contractor is responsible for all quantities, dimensions, gauges, materials, fabrication processes, sequences of installation and coordination with other trades.

B. Informational Submittals: Consultant will review each submittal and will return without action if it does not comply with requirements.

C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

2. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 RELATED DOCUMENTS

A. Divisions 01 through 32 Sections for specific test and inspection requirements.

Section 00 72 00 for Testing requirements

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Owner’s Representative.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

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

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

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

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

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

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

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

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that specified requirements apply exclusively to tradespeople of the corresponding generic name.

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

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Consultant for a written decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 SUBMITTALS

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

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

Date of issue.

2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1.6 QUALITY ASSURANCE

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

Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

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

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

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

1. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

QUALITY CONTROL

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

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

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

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

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

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.
   1. Report results in writing as specified in Division 01 Section "Submittal Procedures."

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

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

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.

Delivery of samples to testing agencies.

   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

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

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

1.8 SPECIAL TESTS AND INSPECTIONS

A. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

B. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

C. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 13
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Regulatory requirements applicable to the Work.

2. Federal grant requirements associated with Land and Water Conservation Fund (LWCF) funding.

3. Contractor responsibilities for compliance with applicable laws, regulations, permits, and grant conditions.

B. Related Requirements:

1. Section 01 33 00 – Submittal Procedures.

2. Section 01 61 13 – Build America, Buy America Requirements.

3. Other Sections of the Specifications as applicable.

1.02 FEDERAL FUNDING REQUIREMENTS

A. This Project is funded in whole or in part through a Land and Water Conservation Fund (LWCF) grant administered by the National Park Service.

B. Contractor shall comply with all applicable federal laws, regulations, grant conditions, and requirements associated with LWCF funding.

C. Federal requirements shall apply to the Contractor, subcontractors, suppliers, manufacturers, and all lower-tier entities performing Work or furnishing products under the Contract.

1.03 BUILD AMERICA, BUY AMERICA ACT

A. The Project is subject to the Build America, Buy America Act (BABA), enacted as part of the Infrastructure Investment and Jobs Act (Public Law 117-58), and applicable implementing regulations, guidance, and agency requirements.

B. Materials, products, and supplies incorporated into the Work shall comply with applicable domestic preference requirements unless specifically exempted by law or covered by an approved waiver issued by the responsible federal agency.

C. Contractor shall comply with all requirements specified in Section 01 61 13 – Build America, Buy America Requirements.

D. Failure to comply with BABA requirements may result in rejection of products, removal and replacement of noncompliant Work, withholding of payment, or other remedies available under the Contract.

1.04 PERMITS, LICENSES, AND REGULATIONS

A. Obtain and maintain permits, licenses, inspections, and approvals required for performance of the Work.

B. Comply with applicable federal, state, and local laws, ordinances, codes, regulations, and orders having jurisdiction over the Project.

C. Where requirements conflict, comply with the more stringent requirement unless otherwise directed by the Owner.

1.05 CONTRACTOR RESPONSIBILITY

A. Contractor is responsible for becoming familiar with and complying with all applicable regulatory requirements affecting the Work.

B. Contractor shall promptly notify Owner of any known or suspected noncompliance with applicable laws, regulations, permit conditions, grant requirements, or domestic preference requirements.

C. Contractor shall include applicable regulatory requirements in subcontracts and purchase agreements to ensure compliance throughout the supply chain.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 41 13

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

General: Basic Contract definitions are included in the Conditions of the Contract.

"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 Conditions of the Contract.

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

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

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

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

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

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

"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 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.

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

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 bound with the Contract Documents.

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

Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG Americans with Disabilities Act Accessibility Guidelines

1.3 ABBREVIATIONS AND ACRONYMS

Industry Organizations: 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.

AAADM	American Association of Automatic Door Manufacturers
AIA	American Institute of Architects (The)
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BHMA	Builders Hardware Manufacturers Association
CSI	Construction Specifications Institute (The)
DHI	Door and Hardware Institute
FMG	FM Global (Formerly: FM - Factory Mutual System)
NAAMM	National Association of Architectural Metal Manufacturers
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRTL	OSHA Nationally Recognized Testing Laboratories
NVLAP	NIST's National Voluntary Laboratory Accreditation Program.
UL	Underwriters Laboratories

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.

BOCA	BOCA International, Inc.
CABO	Council of American Building Officials (See ICC)
IAPMO	International Association of Plumbing and Mechanical Officials (The)
ICBO	International Conference of Building Officials
ICC	International Code Council, Inc.

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.

EPA	Environmental Protection Agency

PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 RELATED DOCUMENTS

A. See Division 01 Section "Execution Requirements" for progress cleaning requirements.

B. Divisions 2 through 32 Sections for temporary heat and ventilation and product requirements in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Consultant, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner, Consultant, testing agencies, and authorities having jurisdiction.

Water Service:

1. Contractor to provide water needed for construction operations. Use charges are contractor’s responsibility and are included in the bid.

C. Electric Power Service:

1. Electrical power from Owner’s existing system is not available for use on this project. Provide connections and extensions as required by electrical provider.

D. Any other utilities desired by the Contractor to support temporary facilities or effect the work are Contractor’s responsibility and are included in the bid

E. Provide drinking water from a proven safe source for all those connected with the Work. Store water in such a manner as to keep it clean and fresh.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, site enclosure fence, utility hookups, staging areas, and parking areas for construction personnel. Submit for review and approval prior to mobilization to site.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, UL, and Federal, State, and local utility standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

Portable Chain-Link Fencing: Thick, galvanized steel, chain-link fabric fencing with galvanized steel posts set in precast concrete footing blocks. Minimum 72” in height.

TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained heat source with individual space thermostatic control that conforms to requirements of authority having jurisdiction.

Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is strictly prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. Water Service: At Substantial Completion, restore these facilities to existing condition.

B. Sanitary Facilities: Contractor shall supply portable toilets and sanitary facilities during the entirety of the project for all work crews, vendors, delivery drivers, etc. Use of Owner's existing toilet facilities is reserved for the public patrons of the park. Construction crews shall not be permitted to use them while working on site.

Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

Electric Power Service: At Substantial Completion, restore these facilities to existing condition.

Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, and inspections.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

C. Telephone Service: Provide superintendent with cellular telephone or portable two-way radio for use when away from field office

D. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail in field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

Provide incombustible construction for offices, shops, and sheds located within construction area. Comply with NFPA 241.

2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion may be permitted to use permanent facilities, under conditions acceptable to Owner.

Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. The Contractor shall retain the responsibility for traffic operations. Whenever the Contractor's activity affects vehicular or pedestrian traffic, the Contractor shall install and maintain lighted barriers, signals, separators, or other measures as necessary to provide safety and continued flow for the Public. Provide flaggers for traffic control as required to comply with all local and AHJ requirements.
2. Protect existing site improvements to remain including curbs, pavement, and utilities.
3. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary areas for construction personnel, if applicable. Coordinate location and area required with Engineer.

Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities

having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. All expenses associated with these support facilities shall be borne by the Contractor and are included in the bid.

SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
   1. The Washington State Clean Air Act requires the use of all known, available, and reasonable means of controlling air pollution, including dust. Control dust generated during construction activities by wetting dust sources such as areas of exposed soil, washing truck wheels before they leave the site, and installing, and maintaining gravel construction entrances. Construction vehicle track-out is also a major dust source. Any evidence of track-out can trigger violations and fines from the Department of Ecology or the Puget Sound Air Pollution Control Agency (SFFP Natural Environment/Air Quality Policies).
   2. Mitigation of Damages: During the Construction protect all adjacent property and structures from damage due to and including, but not limited to, subsidence erosion and inundation. Mitigation of damages caused by the Contractor’s operations shall be the sole responsibility of the Contractor.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Security: Contractor shall be responsible for the determination of and maintenance of proper security measures for the job site temporary facilities and construction zones of the project for the duration of the Construction Project until Owner assumes the responsibility in writing. Contractor shall provide the following items (the following list does not guarantee adequate security measures):
   1. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence(s) in a manner that prevents people and animals from easily entering project work areas except by entrance gates.

a. Extent of Fence: As required to enclose work areas or portion determined sufficient to accommodate construction operations.

a. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

b. All exterior barriers shall be continuous chain link fence, a minimum height of 72” with supporting posts at a minimum of 8 feet on center and include gates as appropriate for access to Work areas.

c. Provide Owner’s Representative with two sets of keys.

d. The site enclosure fence shall remain and be paid for by the Contractor, through construction of the Project to be removed at the end of the Contract.

2. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
3. Locks on all construction equipment boxes, temporary storage and office facilities, and construction equipment (vehicles, cranes, dozers, forklifts, etc).
4. Temporary construction cores for all exterior and storage room doors, locksets or cylinders.
5. Maintain security site lighting systems.
6. Restrict entrance of unauthorized persons and vehicles into construction areas.

Contractor shall hold the Owner harmless from damage, vandalism, stolen equipment or supplies on the Project site for whatever reason, or from injury to or death of unauthorized person trespassing on Project Site because of inadequate security measures until the Owner releases the Contractor from security responsibilities in writing or at Final Completion, whichever comes first.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Insulate partitions to provide noise protection to occupied areas.
2. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.

3. Protect air-handling equipment.
4. Weather strip openings.
5. Provide walk-off mats at each entrance through temporary partition.

Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.
2. As required by FM Global, supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

J. All expenses associated with these security and protection facilities shall be borne by the Contractor and are included in the bid.

K. Contractor is responsible for security and protection

3.5 RESTORATION OF ROADS

A. Unless otherwise specified or shown, resurface and bring to original grade and section roads in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this Contract. Restore any curbs or gutters damaged during construction. Clean and repair roads used by the Contractor. Before resurfacing material is placed, trim edges of pavement back far enough to provide clean, solid, vertical faces, free of loose material. All expenses shall be borne by the Contractor and are included in the bid.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion and written owner approval.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 55 00
MAINTENANCE OF TRAFFIC

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Description of Work
   1. Submittals
   2. Traffic Maintenance Facilities

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Make particular reference to the following Division One sections:
   1. Section 01 10 00 - Summary of the Work
   2. Section 01 50 00 – Construction Facilities and Temporary Controls

B. Make particular reference to the Pierce County Manual on Uniform Traffic Control Devices

1.3 DESCRIPTION OF WORK

A. The Contractor shall retain the responsibility for the traffic operations. The Contractor shall cooperate with the Owner so that traffic flow is least impeded by the execution of the work under this Contract. In the event of conflict, the Owner shall be the sole judge of the adequacy of the Contractor's protective measures to assure the flow of traffic.

B. The Contractor understands the requirement of maintaining the surrounding roads, shoulders, and pathways in full operation concurrent with the construction activity and for obtaining approval from and coordinating with the proper AHJ as well as the Owner for any disruptions or modifications to traffic and pedestrian movement patterns.

C. Whenever the Contractor's activity affects vehicular or pedestrian traffic the Contractor shall install and maintain lighted barriers, signals, separators, etc for the safety of the public and movement of traffic. Provide flaggers for traffic control as required to comply with Pierce County and other agency requirements.

D. The Contractor shall comply with all AHJ requirements for control of vehicular and pedestrian traffic during Construction. This includes obtaining any required permits or approvals as well as performance of physical traffic control tasks to effect the requirements. The Contractor shall include all required traffic control work/costs in their bid, including but not limited to administration, permit/plan reviews and fees, plan(s) creation and submission, flagging, labor, equipment, materials, etc as may be necessary to meet AHJ requirements and ensure smooth maintenance of traffic operations. This shall apply throughout the entirety of the Contract.

1.4 SUBMITTALS

A. Prior to starting any work, the Contractor shall submit to Pierce County and the Owner a detailed plan of proposed method for controlling traffic. The Contractor is responsible for obtaining approvals from Pierce County for all Traffic Control in Public ROW. The proposed traffic control plan shall show and describe the proposed locations and time durations covering the following:

1. Vehicular traffic routing
2. Proposed use of traffic control manager, traffic control supervisor, flaggers, and/or other traffic control labor, and their certifications.
3. Traffic blockage anticipated to be caused by the work under this Contract.
4. Trucking plan for delivery of materials and haul-off of debris, soils, and any hazardous materials.
5. On-site parking plan meeting Pierce County requirements.
6. Compliance with Pierce County requirements.

1.5 TRAFFIC MAINTENANCE FACILITIES

A. Other than as shown on the approved traffic control plans, at no time shall the Contractor's operations interfere with the safe and orderly operation of Owner occupied-areas of the park or the neighborhood. Encroachment by the Contractor's operations will not be permitted

B. For the duration of the Contract, the Contractor shall immediately repair or replace any and all appurtenances damaged or destroyed in the performance of work included herein.

C. Upon completion of the work, temporary traffic maintenance items furnished by the Contractor shall remain their property and shall be removed from the site by the Contractor.

D. The Contractor shall utilize water applications to control dust on access streets and the project site to the satisfaction of the designer, Owner, and AHJ. Power sweepers shall be used to clean streets of dirt along haul routes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 55 00

SECTION 01 56 39
TEMPORARY TREE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work in this Section includes but is not limited to the preservation of trees as indicated in Contract Documents or as directed by the Owner's Representative. Work includes:

1. Site photographic documentation.
2. Protection of existing trees.
3. Pruning of existing trees.
4. Tree replacement.

B. Furnish all labor, materials, equipment, and supplies and perform all operations required to complete tree protection, and removal hereinafter specified.

C. Tree protection applies to trees to remain within the Limit of Work and those which are in the vicinity of the Limit of Work and which may be affected by construction activity.

1.3 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:

1. Section 00 72 00 “General Conditions for Public Works Construction Contracts “

   With specific reference to 00 72 00-3.15
2. Section 01 50 00 "Temporary Facilities and Controls”
3. Section 31 00 00 "Earthwork"
4. Section 31 10 00 "Site Clearing"

1.4 SUBMITTALS

A. Submit a tree protection plan for project work areas that are inside project limit of Work. Tree protection shall be correlated to the project schedule.

B. WARNING: Owner’s Representative may ORDER THE WORK STOPPED if unauthorized use of protected area(s) is occurring, or if tree protection fencing is not restored within twenty- four (24) hours of notice to do so.

PART 2 - PRODUCTS

2.1 TREE PROTECTION FENCING

A. Portable Chain Link Fencing: Thick, galvanized steel, six foot (6') high chain-link fabric fencing with galvanized steel posts set in precast concrete footing blocks to form a six foot (6') high enclosure in locations noted and/or as directed by Owner's Representative.

PART 3 - EXECUTION

3.1 SITE PHOTOGRAPHIC DOCUMENTATION

A. The Owner's Representative, together with a representative for the Contractor, shall photograph the site prior to construction to document original site conditions. This photo record shall include, but not limit itself to, existing trees to remain. Contractor shall be responsible to initiate the request for this meeting.

3.2 TREE PROTECTION

A. Trees to be protected are designated on the Plans. Protect this vegetation against unnecessary cutting, breaking of branches, skinning or bruising of bark, breaking or skinning of roots, compaction of root zones, smothering of trees by stockpiling construction materials or excavated materials within the critical root zone, excess foot or vehicular traffic, or parking of vehicles within the critical root zone.

1. Provide temporary Tree Protection Fencing as specified to protect trees and vegetation to be left standing.

B. All trees within project limit of Work shall be maintained in a healthy and flourishing condition until Physical Completion of the project. Protection and maintenance shall include but not be limited to: surrounding the identified trees with tree protection fencing; aerating compacted soils; controlling surface runoff; and watering of trees and other vegetation as required to maintain their health during course of construction operations.

C. Trees and plants to be removed shall be identified on the Site prior to commencing work under this Agreement. Any discrepancies between site conditions and Contract Drawings shall be brought to the immediate attention of the Owner's Representative. Mark trees and plants to be removed and obtain Owner's Representative's subsequent instruction for protection of adjacent plant materials.

D. Carefully plan and execute operations to avoid damage to existing trees and plants scheduled to remain. Perform any heavy equipment work from angles and directions that minimize compaction to tree roots in the site area.

1. Under the supervision of the Pierce County Parks' Arborist, tie back all flexible limbs and overhead branches which, in the opinion of the Parks Arborist may be damaged by the passage or activity of equipment.

2. Do not remove any tree limbs without the prior written approval of the Parks Arborist.

E. Root Protection and Pruning: All root pruning of vegetation to remain shall be performed by the Pierce County Parks Arborist.

1. Protect roots over one and one-half inch (1½") diameter that are cut during construction operations. During time of exposure, temporarily cover exposed roots and keep moist with wet mulch and burlap or equivalent to

prevent roots from drying out; cover with earth as soon as possible.

2. Use an air spade, vacuum truck, or hand methods to dig within the tree Critical Root Zone (CRZ). Where possible, leave intact and undamaged roots larger than two inches (2") in diameter. Place utility conduit either under roots by tunneling or over roots with adequate bedding.

3.3 LOCATIONS OF TREE AND SITE PROTECTION FENCING

A. Locate tree protection fence as shown on Contract Drawings. This is generally one foot (1') out for every one-inch (1") diameter of tree or trunk, but in no case closer than six feet (6') from the trunk of any tree. This area is considered the critical root zone (CRZ). The drip line is understood to be the line on the ground of points projected vertically from the ends of farthest branches of the tree. Contractor shall stake fencing location. No site work shall start until the Owner's Representative has approved final fencing location.

3.4 INSTALLATION OF TREE AND SITE PROTECTION FENCING

A. Provide sufficient concrete footing blocks to ensure fence remains rigid during subsequent excavation and grading. Take care not to compact soil inside the fence line during placement of posts and footing blocks. Do not use heavy equipment for this operation.

B. Provide diagonal bracing to vertical posts at corners of enclosures and wherever needed to ensure rigidity of the fencing.

C. Fence fabric shall be tight to grade at the bottom edge, and stretched uniformly between posts. Top of fabric shall be a minimum of six feet (6') above grade.

D. Install fabric to form closed area around trees as shown on Contract Drawings. Attach fabric to posts at twelve inches (12") on center.

3.5 MAINTENANCE

A. Maintain fence in specified location and good condition until completion of site operations and delivery of equipment and material, except where directed otherwise in writing by the Owner's Representative. Fencing shall be immediately repaired when damaged, regardless of cause of damage.

B. Tree protection fencing may be removed temporarily, for specific construction operations, only when explicitly approved IN WRITING by the Owner's Representative.

3.6 USE OF AREA WITHIN PROTECTION FENCING

A. Do not use area within protective fence for operation or storage. Use of the area within the fence area or CRZ shall be only as approved by the Owner's Representative.

B. Alter no grades within the required protective fence line except as directed during the fine grading operations at the conclusion of site development. Use only hand grubbing methods for clearing & grubbing required within the tree drip line.

C. Control soil moisture within the protected area. Prevent flooding of the soil, and protect root areas from leachate, cement, oil, fuel and lubricating oil, and all other

contaminants.

3.7 USE OF AREA ADJACENT TO PROTECTION FENCING

A. Do not store materials potentially harmful to tree roots adjacent to protected areas. Potentially harmful materials include, but are not limited to: petroleum products; cement and concrete additives; lime; paint coating; waterproofing agents; form coatings; detergents; acids; cleaning agents; etc.

3.8 TREE PROTECTION REMOVAL

A. Tree protection fencing shall be removed at the conclusion of construction operations, or if at a point before final acceptance of the work when fine grading, topsoil, or planting work is required within the protective fence. Remove and dispose of protective fencing and other temporary facilities erected for tree protection, including crushed stone and filter fabric.

3.9 DAMAGES FOR LOSS OR INJURY TO EXISTING TREES

A. Replace any and every tree lost or, in the opinion of the Owner's Representative, irreparably damaged as a result of failure of the Contractor to protect or to adequately maintain existing trees. Trees which fail to fully foliate in the first or second spring following completion of construction operations may be presumed to have been lost due to construction operations.

B. Replace trees with healthy specimens of the same species and size, except where agreed otherwise in writing by the Owner's Representative. Maintain and guarantee the health of replacement trees for one (1) full year from the date of installation.

C. Completely remove and dispose of any tree lost or irreparably damaged as a result of Contractor's failure to protect or maintain trees to remain.

D. In the event a damaged or lost tree cannot be replaced in kind, Contractor shall pay to the Owner as liquidated damages: 1) a sum equal to the value of each lost tree as determined by the most current *"Guide for Establishing Values of Trees and Other Plants"* by the Council of Tree and Landscape Appraisers, plus an amount of $1,500 per tree in compensation for the efforts of the Owner in administering and overseeing the replacement; OR 2) a sum of $8,000, whichever is greater.

E. Locate and install replacement trees in accordance with the instructions of the Owner's Representative. The Owner's Representative is not bound to replace lost trees in the same location at their discretion.

F. In the event of injuries to the crown, trunk or root system of any tree to remain resulting from the Contractor's failure to protect and/or maintain such tree, the Owner's Representative may elect to retain the tree and hold the Contractor liable for compensation, the just value of which is determined by the *"Guide for Establishing Values of Trees and Other Plants"*.

3.10 PRUNING OF EXISTING TREES

A. All pruning of existing trees to remain shall be performed by the Pierce County Parks Arborist.
   1. Notify Owner's Representative immediately when tree pruning needs are identified.

B. Ensure that existing trees remaining on the project site shall be in as good condition at completion of the work as at the commencement of the work. If such a condition does not exist at the completion of the work, Contractor shall provide corrective or replacement with new material as directed by the Owner's Representative.

C. All costs for the repair of any damage to trunks or major limbs three inches (3") in diameter or larger requiring, in the opinion of the Owner's Representative, the attention of a professional tree surgeon shall be borne entirely by the Contractor. All costs incurred in the protection of existing trees shall be considered incidental to the contract.

END OF SECTION 01 56 39

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 RELATED DOCUMENTS

A. Section 01 77 00 "Closeout Procedures" for submitting warranties for Contract closeout.

B. See separate Specification Sections for specific requirements for product warranties and installations specified to be warranted.

Section 00 72 00 for Substitution requirements

1.3 DEFINITIONS

Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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

number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Substitution Requests: Submit in PDF format unless otherwise indicated for each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided by Owner.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project name and address and name and address of Engineer and Owner.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Consultant's Action: If necessary, Consultant will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Consultant will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
   a. Form of Acceptance: Change Order.
   b. Use product specified if Consultant cannot make a decision on use of a proposed substitution within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle products using means and methods that prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Store cementitious products and materials on elevated platforms.

5. Store foam plastic to minimize exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

D. See 00 72 00 – Part 3 for requirements of materials and equipment furnished by the County.

PRODUCT WARRANTIES

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

Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to separate Specifications Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

Provide products complete with accessories, trim, finish, fasteners, and other items needed for complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Consultant and Owner's Representative will make selection.

5. Where products are accompanied by the term "match sample," sample to be matched is Owner's Representative's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

Products Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Owner's Representative's sample. Engineer and Owner's

Representative's decision will be final on whether the proposed product matches.

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

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

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

b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

Timing: Owner / Consultant will consider requests for substitution if received within 10 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Owner.

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

Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 61 13
BUILD AMERICA, BUY AMERICA REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for compliance with the Build America, Buy America Act (BABA).

2. Contractor responsibilities for procurement, documentation, certification, and compliance.

3. Submittal requirements demonstrating compliance with domestic preference requirements.

4. Procedures for requesting waivers when permitted by the funding agency.

B. Related Requirements:

1. Section 01 33 00 – Submittal Procedures.

2. Section 01 41 13 – Regulatory Requirements.

3. All Sections requiring furnishing and installation of products incorporated into the Work.

1.02 REFERENCES

A. Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58.

B. Build America, Buy America Act (BABA).

C. 2 CFR Part 184, Buy America Preferences for Infrastructure Projects.

D. Applicable Land and Water Conservation Fund (LWCF) Grant Agreement and Special Conditions.

E. Applicable guidance, memoranda, and waivers issued by the funding agency administering the grant.

1.03 DEFINITIONS

A. Construction Materials: As defined by applicable federal regulations and guidance implementing BABA.

B. Manufactured Product: As defined by applicable federal regulations and guidance implementing BABA.

C. Iron and Steel Products: Articles, materials, and supplies consisting wholly or predominantly of iron or steel.

D. Domestic Product: Product meeting applicable domestic content requirements established under BABA and implementing regulations.

E. Waiver: Written approval issued by the responsible federal agency authorizing use of noncompliant materials, products, or components.

1.04 APPLICABILITY

A. This Project is funded in whole or in part by a Land and Water Conservation Fund grant and is subject to Build America, Buy America requirements.

B. Unless specifically exempted by statute, regulation, agency guidance, or approved waiver, all iron, steel, manufactured products, and construction materials permanently incorporated into the Work shall comply with applicable BABA requirements.

C. Requirements of this Section apply to the Contractor, subcontractors, suppliers, manufacturers, fabricators, and all lower-tier entities furnishing products incorporated into the Work.

D. Compliance with this Section is a material requirement of the Contract.

1.05 CONTRACTOR RESPONSIBILITIES

A. Verify compliance of all applicable products prior to procurement and installation.

B. Incorporate BABA requirements into all purchase orders, supplier agreements, and subcontracts.

C. Obtain certifications and supporting documentation from manufacturers, suppliers, and subcontractors.

D. Maintain records demonstrating compliance for the duration required by the Contract Documents and grant requirements.

E. Immediately notify Owner upon discovery of any actual or potential noncompliance.

F. Do not procure, deliver, or install products known to be noncompliant unless an approved waiver has been obtained.

1.06 SUBMITTALS

A. BABA Compliance Plan:

1. Submit within 30 days after Notice to Proceed.

2. Identify procedures for tracking compliance throughout procurement and construction.

B. Product Compliance Certifications:

1. Submit certifications for products subject to BABA requirements.

2. Include:
   a. Product name and description.
   b. Manufacturer name and location.
   c. Country of manufacture.
   d. Basis for compliance.
   e. Supporting documentation as required.

C. Supporting Documentation:

1. Manufacturer certifications.
2. Mill certificates.
3. Bills of material.
4. Assembly and manufacturing information.
5. Other documentation requested by Owner or funding agency.

D. Waiver Requests:

1. Submit waiver requests sufficiently in advance to avoid project delays.

2. Include:
   a. Product description.
   b. Reason waiver is requested.
   c. Market availability documentation.
   d. Cost information if required.
   e. Proposed alternatives considered.

3. Contractor shall not assume waiver approval.

1.07 QUALITY ASSURANCE

A. Owner reserves the right to audit compliance documentation at any time.

B. Contractor shall cooperate with audits or investigations conducted by Owner, grant administrators, state agencies, or federal agencies.

C. Failure to provide satisfactory documentation shall constitute evidence of noncompliance.

1.08 NONCOMPLIANCE

A. Products installed in violation of BABA requirements may be rejected.

B. Owner may require removal and replacement of noncompliant products at no additional cost.

C. Costs associated with correction of noncompliant Work shall be borne by Contractor.

D. Acceptance of submittals does not relieve Contractor of responsibility for compliance.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products furnished under the Contract shall comply with applicable Build America, Buy America requirements.

B. Where Contract Documents specify products that do not meet applicable domestic preference requirements, notify Owner before procurement.

C. Do not substitute noncompliant products without written approval and, when required, an approved federal waiver.

2.02 IRON AND STEEL PRODUCTS

A. All manufacturing processes for iron and steel products shall occur in the United States except as specifically permitted by applicable regulations or approved waivers.

2.03 MANUFACTURED PRODUCTS

A. Manufactured products shall satisfy domestic content requirements established by applicable federal regulations and agency guidance in effect at the time of procurement.

2.04 CONSTRUCTION MATERIALS

A. Construction materials shall satisfy domestic content requirements established by applicable federal regulations and agency guidance in effect at the time of procurement.

PART 3 - EXECUTION

3.01 PROCUREMENT CONTROLS

A. Verify compliance prior to issuing purchase orders.

B. Maintain traceability between installed products and submitted compliance documentation.

C. Prevent commingling of compliant and noncompliant products.

3.02 FIELD VERIFICATION

A. Owner may request additional documentation for any product delivered to the site.

B. Contractor shall provide requested documentation within five business days unless otherwise directed.

3.03 CLOSEOUT SUBMITTALS

A. Prior to Final Payment, submit a signed certification stating that products incorporated into the Work comply with Build America, Buy America requirements except for products specifically covered by approved waivers.

B. Include copies of approved waivers with the closeout certification.

3.04 CERTIFICATION

A. Certification shall be executed by an authorized representative of the Contractor.

B. Certification shall state: "To the best of the Contractor's knowledge and belief, all products incorporated into the Project that are subject to Build America, Buy America requirements comply with applicable federal domestic preference requirements, except as specifically identified in approved waivers submitted with this certification."

END OF SECTION 01 61 13

SECTION 01 70 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

Construction layout.

2. Field engineering.
3. General product installation.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. See Section 01 77 00 "Closeout Procedures" for submitting Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence location and points of connection for utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Engineer when it is necessary to adjust, move, or relocate existing utility lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly.
1. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
2. Coordinate fabrication schedule with construction progress to avoid delaying the Work

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately, on discovery of the need for clarification of the Contract Documents, submit a Request for Interpretation. Include a detailed description of issue encountered, together with recommendations for changing the Contract Documents.

1. Submit request in Owner’s Project Management software.

3.3 CONSTRUCTION LAYOUT

A. Verification: Confirm existing conditions and measurements and layout all work prior to starting construction and receive approval of Engineer.

B. Contractor to confirm Datum point on survey is consistent with site prior to starting work. A signed and dated letter on the contractor’s letterhead must be submitted and approved by the architect or engineer of record.

C. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

D. Site Improvements: Locate and lay out site improvements, including, but not limited to pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties' involved templates for work specified to be factory prepared and field installed.

1. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Consultant.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 75 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally
4. Comply with requirements in 00 72 00 – 3.14 Maintenance and Site Cleanup.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site is not permitted.
1. Washing waste materials down sanitary or storm sewers or into waterways is not permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration until Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary throughout construction. Adjust and lubricate operable components to ensure operability without damaging effects.

3.7 STARTING AND ADJUSTING

A. Starting:

B. Adjusting:

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction.

C. Comply with manufacturers' written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Comply with requirements in Section 01 73 29 "Cutting and Patching."

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly to “as-new” condition and function.
1. Remove and replace operating components that cannot be repaired to the Owner’s satisfaction.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 70 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.2 RELATED DOCUMENTS

A. See separate Specifications Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.

Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

Structural Elements: Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Engineer’s Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Consultant's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials. Get Owner's written approval before proceeding with the work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

Floors and Walls: Where walls or partitions that are cut or removed patch and repair floor and wall surfaces in the new space.

a. Use materials for patching that match existing adjacent materials to remain.

b. Provide an even surface of uniform finish, color, texture, and appearance.

c. Remove in-place floor and wall coverings and replace with new materials to achieve uniform color and appearance.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition

a. Use comparable materials to match existing adjacent materials to remain.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

Requirements for achieving Substantial Completion

2. Requirements for achieving Final Completion
3. Warranties.
4. Final cleaning.

1.2 RELATED SECTIONS

A. Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

B. Section 01 32 00 "Construction Progress Documentation" for submitting Final Completion construction photographs.

C. Section 00 65 00 “Final Acceptance Form” for Final Acceptance Form

D. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

E. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

F. See separate Specifications Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 REQUIREMENTS FOR ACHIEVING SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection to determine the date of Substantial Completion, complete the following. List items below that are incomplete in request.

Prepare a list of items to be completed and corrected (Pre-Punchlist). Include the value of items on the list, and reasons why the Work is not complete.

a. Prepare the list in the Owner’s project management software.

2. Advise Owner’s Representative of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit all system commissioning documentation as specified in other sections.
6. Confirm that all permit Final Inspections have been performed and all permits are Approved. Permits issued by Pierce County should have “Final” status.
7. Prepare, submit and receive approval of Project Record Documents, Operation and Maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
8. Deliver tools, spare parts, extra materials, and similar items specified in other sections to location designated by Owner.
    a. Label with manufacturer's name and model number where applicable.

Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

10. Terminate and remove temporary facilities from Project site, including mockups, construction tools, and similar elements.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting. See Section 3.1
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for Substantial Completion inspection

1. On receipt of request, Owner’s Representative will either proceed with inspection or notify Contractor of unfulfilled requirements.
2. The Owner and Consultant will conduct a Punchlist inspection. The Pre-Punch list will be reviewed and items either added or closed. The Substantial Completion Punchlist will then be issued to the Contractor as items to complete before Final Completion.
3. Owner’s Representative will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner’s Representative, that must be completed or corrected before Certificate will be issued.
4. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed.
5. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 REQUIREMENTS FOR ACHIEVING FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection to determine the date of Final Completion, complete the following:

Submit a Final Application for Payment according to 01 29 00 "Payment Procedures."

2. Notify the Owner when all items on the Substantial Completion Punchlist have been completed.
3. Owner Provides the Final Acceptance Form to be signed and returned for Parks Director approval. See Section 00 65 00.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
5. Remove video camera equipment and mounting hardware. Restore electrical connections to pre-construction, weather-tight condition.

B. Inspection: Submit a written request for Final Inspection. On receipt of request, Owner and Consultant will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Owner’s Representative will prepare a final Certificate for Payment after successful inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. General:
1. Submit in Owner’s project management software.
2. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction. Include areas disturbed by Contractor that are outside the limits of construction.
3. Organize list of spaces in sequential order.
4. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Owner’s Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Provide one compiled document of all warranties in PDF format. Include “WARRANTIES", Project name, and Contractor name in file name.

2. Divide into sections for each separate warranty. Mark section to identify the product or installation. Provide a description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FINAL CLEANING

General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
   1) Avoid disturbing natural weathering of exterior surfaces.
   2) Restore reflective surfaces to original condition.

g. Sweep concrete floors broom clean in unoccupied spaces.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

i. Remove labels that are not permanent.

j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
   1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

Replace parts subject to unusual operating conditions.

l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

m. Leave Project clean and ready for occupancy.

Comply with safety standards for cleaning.

1. Do not burn waste materials.
2. Do not bury debris or excess materials on Owner's property.
3. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
4. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

Operation and Maintenance manuals for systems, subsystems, and equipment and the care and maintenance of products, materials and finishes for systems and equipment.

1.2 RELATED SECTIONS

A. 01 77 00 Closeout Procedures for requirements for submitting Operation and Maintenance data.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE MANUAL

A. Organization: Organize manual into separate sections for each Construction Specifications Institute (CSI) Division and Section.

B. Contents:

1. Title Page: Include the following information:

Subject matter included in manual.

b. Name and address of Project.
c. Name and address of Owner.
d. Submittal date.
e. Contractor name, address, and telephone number.
f. Names and addresses of sub-contractors

2. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

3. Insert PDF bookmark link from all Table of Contents Divisions and Sections to associated page in the manual.

4. Section Contents:

a. Product data. Include for each system, subsystem and piece of equipment not part of a system:
1) Product name and model number.
2) Manufacturer's name, local supplier and service agent.
3) Reordering information for specially manufactured products.
4) Product color, pattern and texture.
5) Equipment identification with serial number of each component.

6) Equipment function.
7) Operating characteristics.
8) Limiting conditions.
9) Performance curves.
10) Engineering data and tests.

b. Operation and Maintenance data and requirements:
1) Complete nomenclature and number of replacement parts.
2) Manufacturer's maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components and recommended spare parts for each component part or piece of equipment.
3) Maintenance procedures: test and inspection instructions, troubleshooting guide, disassembly instructions and adjusting instructions that detail essential maintenance procedures.: Operating and maintenance procedures including routine, normal, seasonal, and weekend operating instructions
a) Manufacturer's written recommendations and inspection procedures,
b) Types of cleaning agents,
c) Cleaning methods
d) Cleaning and maintenance schedule
e) Repair instructions
4) Maintenance and service schedules including service and lubrication requirements, list of required lubricants for equipment and separate schedules for preventive and routine maintenance and service with standard time allotment.
5) Spare parts and source information.
6) Maintenance Service contracts
7) Wiring and control diagrams.
8) License requirements

c. Warranty Information.
1) Include warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

5. Submit in PDF format, as noted in 01 77 00 Closeout Procedures

2.2 ELECTRONIC ASSET INFORMATION

A. In addition to requirements in this section, provide product information in an electronic spreadsheet for import by the Owner into the Owner's Asset management System.

B. Contractor to call meeting with the Owner to discuss this spreadsheet and make clear any project specific needs. If this meeting does not take place and recorded meeting minutes are not emailed out after, the Contractor may be required to redo the spreadsheet if it does not conform to the Owner's expectations.

C. Contractor will produce a list of assets for which information is needed.
1. An asset is any item installed by the contractor that (1) has a manufacturer's warranty (2) has a lifespan greater than **2** years (3) if the item is lost it compromises the function or service delivery of the park.

a. Examples include, but are not limited to, major electrical components, mechanical equipment, appliances, site furnishings, play equipment, onsite storm and sewer infrastructure, utility components, etc.

D. Include:

1. Asset Description
2. Manufacturer’s name
3. Model Number
4. Serial Number
5. Substantial Completion Date
6. Warranty Expiration Date
7. Value/cost
8. Maintenance Schedule and Frequency
   a. Text field describing required task and frequency
9. Required for Warranty (Y/N)

E. Electronic spreadsheet file will be provided by the Owner for input by the Contractor.
1. Contractor to identify assets on project.
2. Owner will review and approve

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data includes more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

Do not use original Project Record Documents as part of operation and maintenance manuals.

C. Comply with Section 01 77 00 "Closeout Procedures" for requirements for submitting operation and maintenance documentation. Submit as one compiled document.

END OF SECTION 01 78 23

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

Record Drawings.

2. Record Specifications.
3. Record Product Data.

1.2 RELATED DOCUMENTS

A. Section 01 78 23 "Operation and Maintenance Data" for Operation and Maintenance manual requirements.

B. See separate Specifications Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

Record Drawings: Comply with the following:

1. Format: Submit (1) one copy in PDF format

Procedure: Submit Record Drawings as follows:

a. Initial Submittal: Submit one set of marked-up Record Drawings. Consultant will initial and date each and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Consultant will return drawings for organizing correcting revisions and final submittal.

b. Final Submittal: Submit one copy of marked-up Record Drawing in PDF format.

B. Record Specifications: Submit in PDF format of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Contractor’s As-built Drawing Set: Maintain one set of Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Drawings.
    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately.
    a. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with red-colored marking. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings, or CAD 2018.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Consultant for resolution.
4. Consultant will furnish Contractor with one set of CAD Drawings of the Contract Drawings for use in recording information.
    a. Consultant makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    b. CAD Software Program: The Contract Drawings are available in AutoCAD 2024 version.

Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Drawings: Organize Record Drawings into individual sheets with ‘bound’ external references. Also provide fonts and other support files such that Owner can print the CAD file without errors. Include identification on cover sheets.
2. Identification:
    a. Project name.
    b. Date.
    c. Designation Sheet Number

2.2 MISCELLANEOUS RECORD SUBMITTALS

Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

B. Maintenance of Record Documents and Samples Maintain updated drawing sheets in Procore to ensure they represent current conditions throughout the project duration. Provide access to Project Record Documents for Consultant and Owner’s Representative's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 02 41 00
SITE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all materials, equipment, labor, and related items necessary to complete site demolition work. The items of work to be performed shall include but are not limited to all items shown in the Contract Drawings. In summary these include:
   1. Install and maintain temporary Site Enclosure Fencing per Specification 01 50 00.
   2. Selective site clearing & grubbing.
   3. Protect existing underground utilities, power poles, overhead lines, right-of-way signs, and all utility services and vaults.
   4. Protecting existing site elements that are to remain.
   5. Salvage removed trees for use as brush piles, snags, habitat logs, and barrier logs.
   6. Remove existing curbs, asphalt paving, concrete paving, pavement slabs, gravel surfacing, aggregate bases, and other materials associated with pavement.
   7. Remove existing vehicular guardrail and foundation.
   8. Salvage existing park signs within limit of work for Pierce County Parks removal and relocation; remove and dispose of posts and foundations.
   9. Salvage existing concrete ecology blocks within limit of work for Pierce County Parks removal and relocation.
   10. Remove all loose nails, barbed wire fencing, metal, and other debris from area within the limit of work and the forest area within the limits of the dog Off-leash Area.

1.02 QUALITY ASSURANCE

A. Perform all demolition work in accordance with the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction as published by the Washington Department of Transportation (WSDOT), latest edition, unless otherwise described herein and in Contract Drawings.
B. The WSDOT Standard Specifications apply only to performance and materials and how they are to be incorporated into the demolition work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.

1.03 SUBMITTALS

A. Submit disposal certifications.
B. Shop drawing for Temporary Project Sign.
C.

1.04 STORAGE AND HANDLING OF SALVAGED MATERIAL

A. Store and handle salvaged material with sufficient care to prevent scratches and other damage to finishes and materials.
B. Store salvaged material to prevent corrosion, deterioration, and damage.
C. Bent, dented, scratched, chipped, or otherwise damaged items are not acceptable for reinstallation and must be replaced by items and components in new condition.

1.05 OBJECTIONABLE NOISES

A. Limit use of air hammers and all other noise producing equipment as much as possible.

B. Conform to local governing noise restrictions and requirements.

1.06 JOB CONDITIONS

A. Visit site prior to bidding to determine nature of existing site conditions, materials, and other conditions that may affect work. Drawings of previously existing facilities are available for information only and do not necessarily reflect the actual conditions. The Contractor shall verify locations of existing utilities prior to proceeding with any work.
B. Carefully maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace at the Contractor's expense.
C. Underground utilities and elements: Locate all underground utilities and elements prior to digging and/or driving stakes. Do not disturb nor damage any existing above ground or underground utilities or elements noted to be protected. The Contractor shall call Utility Notification Center (811) or (800) 424-5555 or click www.callbeforeyoudig.org for utility location at or near the Public Rights-of-Way / Property Lines, and can also call Locating, Inc. (425) 392-6412, CNI (206) 255-8650 or Applied Professional Services (425) 313-1034 for location of utilities within the site, (note: these firms will charge for services rendered). The Contractor must pay for all fees and costs associated with utility disconnect, capping of lines, and meter removals required within the Public Rights-of-Way.
D. Do not disturb utilities within the utility easements. Known utilities include the gas line, Tacoma Public Utility water line, and Summit Water and Supply Company water line. If a conflict arises regarding the utilities, immediately notify Owner (Pierce County Parks), Owner's Representative, and the Inspector of the utility company as applicable.
E. Meet with Owner and the Owner's Representative on-site once Contractor has verified the location of utilities with the Contractor's location services.
F. Utility Shutoffs: Coordinate all work with other Division 01 requirements. Do not shut off or cap utilities without prior notice.
G. Keep streets, sidewalks and site clean and free from debris at all times. Keep both right-of-way and site drainage systems open for free passage of runoff at all times. See Specification 31 25 00 Erosion and Sedimentation Control.
H. Submit written verification that all appropriate services have been disconnected.

1.07 PERMITS, CODES, & REGULATIONS

A. Obtain and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.
B. Keep fully informed and shall comply with all existing laws, codes, ordinances, and regulations, which in any way affect the conduct of the work.
C. Comply with environmental agencies, building codes and other local requirements that are more stringent than included in Contract Specifications.

1.08 CONDUCT OF WORK

A. Confine operations to the working areas allotted limits of work as shown on Contract Drawings by the Owner for operations, including material and equipment storage.
B. Progressively clean the work site of debris and rubbish as the work proceeds.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. As required to complete the demolition work as shown on the Contract Drawings and/or as specified in the Contract Specifications.

B. Temporary Project Sign, see Appendix F.

PART 3 EXECUTION

3.01 PREPARATION

A. Review the topographical survey documents included in Appendix A, the geotechnical report in Appendix G, and visit the site in order to make determination of the site improvements to be demolished and removed including above and below-grade demolitions.
B. Install Temporary Project sign per Appendix F and locate per Project Representative.

3.02 PROTECTION

A. Provide protective cover and barriers as necessary to prevent damage and straining to all existing site improvements to remain during construction.
B. Install temporary erosion control facilities and tree protection prior to commencing demolition operations.
C. Protect all existing landscaping outside the limits of work, and all existing trees and native vegetation not identified to be removed at all times during construction.
D. Contact respective utility maintenance agencies to verify location of active utilities prior to excavation. Keep active utilities intact and in continuous operation. Protect active utility pipes and electrical systems encountered, as well as notify persons owning same.
E. Protect neighboring property, occupants of said property, customers, visitors, passers-by from injury and discomfort caused by dust or debris.
F. Maintain street and site drains, street catch basins, roadside ditches, and storm sewers open for free drainage.

3.03 CLEARING AND GRUBBING

A. Clear and grub the vegetation and root layers, obstructions, and debris to a soil depth noted in the Contract Drawings and disposed of off-site. This soil layer shall not be acceptable for reuse.
   1. Do not remove trees or other vegetation indicated to remain.
   2. Use only hand methods for grubbing within Tree and Plant Protection fencing for trees and vegetation to remain.
B. Fill depressions caused by clearing and grubbing operations with sandy loam, unless further excavation, earthwork, or other permanent surface treatment is indicated in the Contract Drawings.
C. Remove debris, rock, and extracted vegetation from the site and haul to an approved offsite disposal location. Do not burn or bury materials onsite.
D. Do not perform clearing activity beyond the limits of work.

3.04 REMOVAL OF TREES

A. Removal of trees includes digging out and grinding of stumps, digging out obstructions, and grubbing roots, and completely removing stumps, roots, obstructions, and debris to a minimum depth of 3 feet below top of exposed subgrade, unless otherwise noted on Contract Drawings. Notify Owner’s Representative in writing for site review prior to filling depressions left by removal activity.
B. Fill depressions with material per Specification 31 20 00 Earth Moving caused by tree removal operations with sandy loam, unless further excavation or earthwork is indicated in the Contract Drawings.
C. In Septic related areas:
   1. Preserve trees in septic reserve areas.

2. Do not remove or disturb soil in existing drainfield areas without written approval from sewage system designer / engineer.
3. Remove trees in primary drainfield areas under the direction and supervision of the certified drainfield installer. Installer shall use C-33 sand or equivalent approved by local health officer to fill any excess void spaces which will not be excavated or filled per approved drainfield design.
4. Remove trees in the septic tank cluster area, including the stumps and roots, in preparation for excavation for the tank installation.

3.05 REMOVAL OF CONCRETE PAVING, CONCRETE CURBS, AND ASPHALT PAVING

A. Identify the areas as shown on Contract Drawings of existing concrete paving, concrete curbs, and asphalt paving that are designated to be removed.
B. Provide a clean, sawn edge through the material to be removed to protect adjacent paving or curb to remain. Use care to protect paved edges to remain as the saw-cut edge will remain as the finished edge against new concrete work.
C. Completely remove concrete paving, concrete curb, and asphalt paving including base courses to the depth of the existing subgrade. Care must be taken not to undermine adjacent paving or other surfacing to remain.

3.06 REPAIR AND REPLACE

A. Repairs of minor damages to existing work that was to be protected will only be allowed as reviewed and approved by the Owner's Representative.
B. Provide repair work in first quality, workmanlike condition and per manufacturer's written instructions.
C. Remove all damaged components as determined by the Owner's Representative.
D. Replace existing items with irreparable damage in-kind in a workmanlike manner per original contract drawings for that work.
E. Replacement work of and repair work to existing built work that was to be protected is at no cost to the Owner.

3.07 REMOVAL OF EXISTING STRUCTURES AND SITE ELEMENTS

A. Remove existing above and below grade structures and site elements as indicated in Contract Drawings and as necessary to facilitate new construction improvements.
B. Include the removal of the item, the foundation, and any gravel and aggregate base material below the foundation. .
C. Use magnets or metal detectors that can detect metal debris to a depth of 12 inches and remove all loose nails, barbed wire fencing, metal mesh, or metal debris that is found in existing soils within the dog Off-Leash Area. Restore duff layer of forest and soils in areas that are disturbed.

3.08 CLEAN UP & DISPOSAL OF MATERIALS

A. Clean all work areas during progress of work and until completion.
B. Dispose of all surplus materials, refuse, waste materials, and rubbish from demolition activity off-site in accordance with all governmental laws, regulations, and ordinances. Recycle materials whenever possible.
C. Provide certification from disposal site operator stating the disposal site complies with all governmental regulations.
D. Do not leave refuse material on the project site, burn, or bury in embankments or trenches on the project site.
E. Maintain hauling routes clean and free of all debris resulting from work of this Section.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

A. Install concrete formwork using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of concrete formwork in a first quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ACI: American Concrete Institute:
      a. ACI 301: Structural Concrete for Buildings
      b. ACI 347: Concrete Formwork
   2. WSDOT: Washington State Department of Transportation – Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 03 20 00, CONCRETE REINFORCING.
   2. Specification 03 30 00, CAST-IN-PLACE CONCRETE.

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for concrete construction.

1.06 SUBMITTALS

A. Curing Compound
   1. Curing mix shall conform to WSDOT Standard Specification 6-02.3(11).
   2. Contractor shall submit a product for review by Owner’s Representative.

B. Commercial Concrete
   1. Commercial Concrete shall conform to WSDOT Standard Specification 6-02.3(2)B.
   2. Contractor shall submit a product for review by Owner’s Representative.

C. Ready Mix Concrete
   1. Commercial Concrete shall conform to WSDOT Standard Specification 6-02.3(4).
   2. Contractor shall submit a product for review by Owner’s Representative.

D. Grout
   1. Grout shall conform to WSDOT Standard Specification 9-20.3(2).
   2. Contractor shall submit a product for review by Owner’s Representative.

E. Mix Identification.
   1. Submit a job mix formula at least 15 days prior to delivery of concrete to the job site.
   2. Upon approval of the job mix formula, a mix identification number will be assigned to the mix. This number shall become the identifying designation of that mix and, as such, shall be used in all references to that mix.
   3. Concrete delivered to the job site shall be accompanied by a delivery slip bearing the assigned mix identification number.
   4. A new job mix may be required if unsatisfactory results occur.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 GENERAL

1. Perform formwork design, engineering, construction, and removal.

3.02 FORM CONSTRUCTION

1. Forms shall conform to the lines, dimensions, and shapes of concrete shown providing for openings, recesses, keys, slots, beam pockets, and projections as required.
2. Make forms clean and free of foreign material before placing concrete.
3. Form all concrete surfaces. Do not use earth cuts as forms for vertical surfaces, unless otherwise approved.
4. Provide forms so that no discernible imperfection is in evidence in finished concrete surfaces due to deformation, bulging, jointing, or leakage of forms.
5. Unless noted otherwise in these specifications all concrete formwork shall be in conformance with Section 6-02 of the WSDOT Standard Specifications.

3.03 TOLERANCES

1. Conform to ACI 301, Chapter 4, Paragraph 4.3, Specifications for Structural Concrete for Buildings.

3.04 PREPARATION OF FORM SURFACES

1. Conform to ACI 301, Chapter 4, Paragraph 4.4.

3.05 FORM REMOVAL

1. Conform to ACI 347, Chapter 3, Paragraph 3.6 for removal of forms and supports.

3.06 REUSE OF FORMS

1. Forms may be reused if they will produce the same surface quality as new formwork

PART 4 PAYMENT

1. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary to provide concrete formwork that meets all standards referenced as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

A. Install concrete reinforcement using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of concrete reinforcement in a first quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ACI: American Concrete Institute:
      a. ACI 315: Details and Detailing Concrete Reinforcement
      b. ACI 318: Building Code Requirements for Reinforced Concrete
   2. ASTM: American Society for Testing and Materials:
      a. ASTM A82: Cold-Drawn Steel Wire for Concrete Reinforcement
      b. ASTM A185: Welded Steel Wire Fabric for Concrete Reinforcement.
      c. ASTM A615: Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 03 11 00, CONCRETE FORMWORK.
   2. Specification 03 30 00, CAST-IN-PLACE CONCRETE.

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for concrete construction.

1.06 SUBMITTALS

1. Submit complete bar schedule, bar details, and erection drawings in accordance with ACI 315.
2. Show each type of bar marked with identification corresponding to identification tag on bar.
3. Erection drawings shall be clear and easily legible and to a minimum scale of:
   a. 1 inch – 1 foot.
4. Erection drawings shall show size and location of all openings.

1.07 REINFORCEMENT STEEL STORAGE

A. Store reinforcing steel blocked up off the ground and in orderly stacks.
B. Each stack shall only contain bars with the same identifying label.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforcement Bars:
   1. No. 4 or larger; bars shall conform to ASTM A615, Grade 60.
   2. No. 3 bars shall conform to ASTM A615, Grade 40.
B. Welded Wire Fabric: Conform to ASTM A185 using bright basic wire meeting ASTM A82.
C. Bolster, Chairs, and Accessories:
   1. Conform to ACI 315.
   2. Provide all spacers, bolsters, chairs, ties, and other devices necessary to properly space, place, support and fasten reinforcement in place.
   3. Metal accessories shall be galvanized or plastic-protected where legs will be exposed in finished concrete surfaces.
   4. Do not use rocks, broken bricks, wood blocks, or concrete fragments for reinforcing support.
D. Testing: Perform at the mill for each heat. Submit certified test results, if required.

2.02 FABRICATION OF BARS

A. Fabricate with cold bends conforming to the recommended dimensions shown in ACI 318, Chapter 7.
B. Field fabrication will be allowed only if the Contractor has equipment to properly fabricate steel.
C. Attach metal tags for identification.

PART 3 EXECUTION

3.01 PLACING METAL REINFORCEMENT

A. Place in accordance with ACI 318, Chapters 7 and 12.
B. Tie securely with 16-gauge or larger annealed iron wire.
C. Place steel with concrete cover in accordance with ACI 318, Chapter 7, Paragraph 7.7, unless otherwise indicated.
D. Splice steel not less than 30-bar diameter for ASTM A615, Grade 60, unless otherwise indicated. For plain bars, splice not less than twice that for deformed bars.
E. Lap welded wire fabric is not less than the length of one mesh.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the installation of concrete reinforcing materials as well as preparation, safety, and quality control measures.

END OF SECTION

SECTION 03 30 00
CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Install cast in place concrete using the materials and proportioning as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of cast in place concrete in a first quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ACI: American Concrete Institute:
      a. ACI 301: Structural Concrete for Buildings
      b. ACI 304: Guide for Measuring, Mixing, Transporting and Placing Concrete.
      c. ACI 305: Hot Weather Concreting.
      d. ACI 306: Cold Weather Concreting.
      e. ACI 308: Curing Concrete.
      f. ACI 309: Consolidation of Concrete.
   2. ASTM: American Society for Testing and Materials:
      a. ASTM C94: Ready-Mixed Concrete.
      b. ASTM C171: Sheet Materials for Curing Concrete
      c. ASTM C309: Liquid Membrane-Forming Compounds for Curing Concrete.
      d. ASTM C494: Chemical Admixtures for Concrete.
      e. ASTM C618: Fly Ash and Raw or Calcified Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
      f. ASTM D1751: Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
   3. NRMCA: National Ready Mixed Concrete Association.
   4. WSDOT: Washington State Department of Transportation – Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 03 20 00, CONCRETE REINFORCING.
   2. Specification 03 11 00, CONCRETE FORMWORK.

1.05 QUALITY ASSURANCE

A. CONTRACTOR QUALIFICATIONS
   1. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for concrete construction.

B. PLANT CERTIFICATION

1. The NRMCA certifies plants which can demonstrate that their facilities are capable of furnishing good concrete. The system permits a qualified plant to display a Certificate of Conformance which assures the purchaser that the physical capability of furnishing good concrete is available.
2. For plants which are certified by NRMCA, compliance will be assumed for production facilities within the limits set forth by ASTM C94. Applicable sections of ASTM C94 are as follows: 8. Measuring Materials, 9. Batching Plant, 10. Mixers and Agitators, 11. Mixing and Delivery, and 12. Use of Nonagitating Equipment. These sections provide assurance of facilities that are capable of furnishing good concrete.
3. All production facilities (scales, mixers, trucks, storage bins, conveyors, etc.) shall be continuously maintained in good working condition.
4. Use only concrete plants complying with ASTM C94 or NRMCA minimum standards.
5. Unless noted otherwise within this specification all workmanship shall be in conformation with Section 6-02 of the WSDOT Standard Specifications.

1.06 SUBMITTALS

A. Mix Identification.
   1. Submit a job mix formula at least 15 days prior to delivery of concrete to the job site.
   2. Upon approval of the job mix formula, a mix identification number will be assigned to the mix. This number shall become the identifying designation of that mix and, as such, shall be used in all references to that mix.
   3. Concrete delivered to the job stie shall be accompanied by a delivery slip bearing the assigned mix identification number, beginning batch time, revolutions counter with a non-zero reset, aggregate weight, mix ratio, and added water.
   4. A new job may mix be required if unsatisfactory results occur.

PART 2 PRODUCTS

2.01 CONCRETE IN A FRESHLY-MIXED AND UNHARDENED STATE

A. Concrete in a freshly-mixed and unhardened state shall comply with ASTM C94 except as expressly and specifically modified and designated herein. Modifications and designations shall be as follows:
   1. Cement (See ASTM C94 4.1.1) shall contain no more than 0.80 percent total alkalis (Na20+0.658 K20).
B. Pozzolan shall conform to ASTM C618 Class F or Class C. A Certificate of Compliance shall be provided on request. Total weight of Pozzolan shall not exceed 18 percent of the weight of cement.
C. Quality of concrete shall conform to ASTM C94 5.1.
D. Concrete of all classes shall be in conformance with requirements of section 6-02 of the WSDOT Standard Specifications.
E. All concrete sidewalk shall be Class 3000 air entrained unless otherwise shown on the drawings.
F. All concrete driveway shall be Class 4000 air entrained unless otherwise shown on the drawings.
G. All concrete curb and gutter shall be Class 3000 unless otherwise shown on the drawings.
H. All other concrete for the work shall be Class 4000 air entrained unless otherwise shown on the drawings.

2.02 JOINT FILLERS

A. Joint fillers shall comply with ASTM D1751.

2.03 GROUT

A. Metallic: One of the following, or equal, for general applications:
   1. “Embeco” (Master Builders Company)
   2. “Ferrolith G” (Sonneborn Building Products, Inc.)
   3. “Ferrotex” (National Pulverized Metals, Co., Chicago, Ill.)
B. Non-metallic: One of the following, or equal, for setting base plates:
   1. “Five Star Grout” (US Grout Corp.)
   2. “Sealtight 588” (W.R. Meadows, Inc.)
   3. “Upcon” (The Upcon Co.)
   4. “Masterflow 928” (Master Builders Co.)
C. Epoxy: One of the following, or equal, for setting equipment:
   1. “Sika-Dur Hi-Mod,” “Cement Epoxy” (Sika Chemical Corp.)
   2. “Five Star Epoxy Grout” (US Grout Corp.)
   3. “Ceilcote 648CP” (Ceilcote Co.)

2.04 CURING MATERIAL

A. Liquid Membrane Curing Compound: ASTM C309, Type 2, formulated to be removable after 28 days, and guaranteed not to affect the bond of applied finishes.
B. Polyethylene Sheeting: Of approved manufacture, 4 mils thick.
C. Reinforced Building Paper: ASTM C171.
D. A sample shall be made and provided to the Owner’s Representative 7 days prior to concrete work.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean existing concrete surfaces thoroughly before placing abutting fresh concrete.

3.02 CONCRETE PLACEMENT, CONSOLIDATION, CURING, AND PROTECTION

A. Concrete shall be placed, consolidated, cured, and protected in accordance with American Concrete Institute recommended practice. The following ACI standards and reports are guides to good practice and shall be used by the Contractor:
   1. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
   2. ACI 305: Hot Weather Concreting
   3. ACI 306: Cold Weather Concreting
   4. ACI 308: Recommended Practice for Curing Concrete
   5. ACI 309: Recommended Practice for Consolidation of Concrete

3.03 EMBEDDED ITEMS

A. Conform to ACI 301, Chapter 6
B. Accurately set anchorage devices and structural steel connections by line and transit and coordinate the locating of all anchorage devices to be set for the accommodation of the work of other trades.
C. Locate anchor bolts as shown on the drawings and on shop drawings. Obtain necessary templates for mechanical and electrical equipment as required for the proper setting of anchor bolts and other items.

3.04 PATCHING

A. Comply with ACI 301, Chapter 9 and Chapter 13, Paragraph 13.6.

3.05 FINISHING

A. Tilt-Up Panels: Cast panels with exterior face up. Give exterior face a light vertical broom finish. Cast a 2-foot by 2-foot test panel for approval. Exterior face shall match approved test panel.
B. Exposed Concrete Surfaces: Leave with a smooth finish, even textured, and free of blemishes. As soon as the face forms are removed, remove all fins and other projections carefully, level offsets and grind where necessary. Repair, replace and point and fill voids. Patch as specified above.

3.06 GROUTING

A. Remove loose concrete particles, dust, and any other material which would prevent bonding.
B. Perform surface preparation, mixing, placing, and finishing in accordance with the approved manufacturer’s printed instructions.

3.07 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete and proper installation of the cast in place concrete as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes roof-edge drainage systems, gutter and downspouts.

1.02 SUBMITTALS

A. Product Data: For each type of product.
   1. 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Manufacturers' standard chart of colors and finishes, Owner's Representative to select color and finish.
C. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.
D. Samples for Verification:
   1. Include samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard options available.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.04 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Provide base

calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.02 ROOF-EDGE DRAINAGE SYSTEMS

A. Gutters: Manufactured in uniform section lengths not exceeding 10 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
   1. Zinc-Coated Steel: Nominal 0.034-inch thickness.
   2. Gutter Profile: 6”, half-round single bead according to SMACNA's "Architectural Sheet Metal Manual."
   3. Corners: Factory mitered and continuously welded.
   4. Gutter Supports: Overhead Gutter Strap, with finish matching the gutters.
   5. Gutter Accessories: Continuous screened leaf guard with sheet metal frame, and Wire ball downspout strainer; flat ends for half-round gutter.

B. Downspouts: 4”, plain round, complete with smooth-curve elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Zinc-Coated Steel: Nominal 0.034-inch thickness.

C. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond can’t or tapered strip into field of roof.
   1. Zinc-Coated Steel: Nominal .028-inch thickness.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout.
   1. Zinc-Coated Steel: Nominal 0.028-inch thickness.

E. Zinc-Coated Steel Finish: Three-coat fluoropolymer.
   1. Color: Match Metal Roof Panels.

2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

B. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.04 FINISHES

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

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

3.02 INSTALLATION

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
   1. 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning
   2. and without warping, jogs in alignment, buckling, or tool marks.
   3. 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
   4. 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify
   5. shapes and dimensions of surfaces to be covered before manufacture.
   6. 4. Torch cutting of roof specialties is not permitted.
   7. 5. Do not use graphite pencils to mark metal surfaces.
B. B. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
   1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
C. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
D. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
E. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.03 ROOF-EDGE SPECIALTIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.04 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 18 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
   1. Install continuous leaf guards on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 2 inches away from walls; locate fasteners at top and bottom and at approximately 48 inches o.c.
   1. Connect downspouts to underground drainage system indicated.
D. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal or solder exterior wall scupper flanges into back of conductor head.
E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.05 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
B. Clean and neutralize flux materials. Clean off excess solder and sealants.
C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10 14 53
TRAFFIC SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install permanent traffic signage and sign support structures using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of all traffic signs, posts, and foundations in a first quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Manual on Uniform Traffic Control Devices for Streets and Highways, 11th Edition;
   2. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction;
   3. WSDOT Sign Fabrication Manual;
   4. Manual on Design Guidelines and Specifications for Road and Bridge Construction in Pierce County (Pierce County Manual);
   5. Custom signs shall be in cooperation with Pierce County.

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for permanent signage installation.

B. Perform work in accordance with Section 8-21 Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA Publication M41-10), and Project Plans.

1.05 SUBMITTALS

A. Product Data: The Contractor shall submit a Manufacturer's Certificate of Compliance for all permanent signs in accordance with WSDOT Standard Specifications Section 1-06.3; a copy of the Manufacturer's Certificate of Compliance shall be available at the fabricator's plant. Permanent signs will be inspected at the fabricator's plant prior to shipment to the project unless otherwise accepted by the Engineer. Signs without an approved decal will not be installed on the project. The only exceptions are double-faced signs which do not receive decals or fabricator's stickers.

PART 2 PRODUCTS

2.01 SIGNS

A. The County Engineer reserves the right to do all signing, with the exception of 'Stop' signs, on all County roadways. Contractor shall coordinate with the County Engineer's Office. See Pierce County Design Manual Section 8.1 for additional information.

1. The Contractor shall bid the project assuming Pierce County has declined the opportunity to supply and install signing.

B. Private Signs: Provide in accordance with Plan requirements and per Pierce County sign details, per WSDOT Standard Specifications Section 8-21.2 for signs and sign support structures. (Type III or Type IV Sheeting).

2.02 SIGN POSTS

A. Sign posts shall be 4 inch by 4 inch untreated western red cedar in accordance with Pierce County Standard Drawing PC.G2.1 and PC.G2.2 for roadside sign structures. See plans for detail.

2.03 SIGN SUPPORT

A. Sign supports shall be in accordance with Plan requirements, per Pierce County sign details, and WSDOT Standard Plan G-22.10 (Timber Sign Support).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Dimensions: The Contractor shall verify all dimensions, sizes and post lengths prior to ordering signs and sign posts with the Engineer.

B. Verification of Locations: The Contractor shall verify all final locations of signs with the Engineer prior to constructing sign supports.

3.02 LOCATION OF SIGNS

A. Signs are located in the plans by station numbers. These are tentative locations subject to change by the Engineer. The post lengths specified in the Plans are estimated for Bid purposes only. Final lengths of posts shall be verified with the Engineer at the request of the Contractor prior to fabrication.

3.03 PLACEMENT OF SIGNS

A. All reflectorized signs located less than 30 feet from the edge of the lane should be turned out approximately 3 degrees from the pavement edge of oncoming traffic lanes, and those located 30 feet or more from the edge of the lane should be turned in approximately 3 degrees from the pavement edge of oncoming traffic lanes. All sign posts shall be plumb and signs level. The signs shall be inspected at night by the Engineer and, if specular glare occurs from failure to install at 3 degrees as stipulated, the Contractor shall reinstall the signs at no expense to Owner.

3.04 STEEL SIGN POSTS

3.05 SIGN ATTACHMENT

A. Sign panels consisting of sheet aluminum shall be attached or mounted to signposts or sign structures as shown in the Plans. Signs not conforming to the above shall be attached or mounted to signposts or sign structures by means of positive connections—defined as through-bolted connections. The use of clips or clamps to accomplish the attachment or mounting of such signs and assemblies is prohibited.

3.06 FIELD QUALITY CONTROL

A. Inspect for incorrect location or direction, incorrect sign, incorrect height, plumbness, uncured or unstable foundation, and inadequate attachment to post.
B. Contractor shall remove incorrectly placed signs and sign supports that are in the incorrect location and install in the correct location as per contract plans at no additional cost.
C. Incorrect or unstable sign support foundations shall be removed and reinstalled by the Contractor to provide a stable sign structure foundation at no additional cost.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of the permanent traffic sign structures as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 11 68 13
PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Provide and install all playground equipment items hereinafter identified.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. Contractor is responsible for furnishing and installing footings, fasteners, anchors, touch-up, repair, and all other accessory items. The work included in this section shall include but is not limited to:
   1. Play Bridge
   2. We-Go-Round
   3. OmniSpin
   4. Rollerslide
   5. Forma Alpine Slide
   6. Mushroom Stepper 10”
   7. Mushroom Stepper 16”
   8. Mushroom Stepper 20”
   9. Mushroom Stepper 24”
   10. Mushroom Stepper 24”
   11. Mushroom Stepper 30”
   12. Rope Pull Climber
   13. Log Crawl Tunnel
   14. Symbol Communication Sign
   15. We-saw
   16. Swing set
   17. Oodle Swing
   18. All other related items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ASTM F1487-11 – Standard Consumer Safety Commission Handbook for Public Playground Equipment for Public Use.
   2. The Consumer Product Safety Commission Handbook for Public Playground Safety.
   3. “ADA Accessibility Guidelines for Play Areas” as published by the US Access Board.
   4. All standards shall include the latest additions and amendments as of the date of advertisement for bids.
   5. Comply with environmental agencies, building codes and other local requirements that are more stringent than the above.

1.04 QUALITY ASSURANCE

A. Before proceeding with any work, inspect the site, carefully check all grades, and verify all dimensions and conditions affecting the work. Immediately notify the Owner's Representative of any discrepancy on line and level.
B. Playground equipment work shall be performed by a company with at least 5 recent installations (in the last 5 years) in work of similar scope and quality.
C. Adhere to manufacturer's instructions for product storage and handling, assembly, installation, and maintenance.
D. Site Inspections.
    1. Request Owner's Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following is required:
        a. Inspection of temporarily marked/staked locations and alignments of playground equipment and/or footings prior to installation.
        b. Substantial Completion of all work (development of physical punch list items).
        c. Physical Completion of all work (physical punch list items satisfactorily completed).
    2. Playground Audit
        a. Upon Physical Completion, the playground is to be audited by a third-party Certified Playground Safety Inspector. Cost for the playground audit will be borne by the Owner. Any resulting corrections that need to be made in order to bring the playground into compliance due to contractor activity or improper installation shall be completed immediately by the Contractor and at no additional cost to the Owner.

1.05 SUBMITTALS

A. For each product specified, submit the following for approval prior to delivery:
    1. Manufacturer's product data including:
        a. Preparation instructions and recommendations.
        b. Storage and handling requirements and recommendations.
        c. Manufacturer's written assembly and installation instructions.
        d. Maintenance instructions.
        e. Manufacturer's warranty.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store playground equipment items in accordance with manufacturer's written recommendations. Handle all playground equipment with sufficient care to prevent scratches to the finish and other damage.

1.07 ENVIRONMENTAL CONDITIONS

A. Do not install playground equipment items during heavy rain, freezing temperature, or snowfall.

1.08 PROTECTION

A. Protect new work and work-in-progress from vandalism and damage that might be incurred by construction traffic, equipment, property, and persons.

1.09 PERMITS, CODES, AND REGULATIONS

A. Obtain and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.

B. Keep fully informed and comply with all existing laws, codes, ordinances, and regulations, which in any way affect the conduct of the work.

1.10 CONDUCT OF WORK

A. Continuously maintain a competent superintendent or foreman during the progress of the work, with the authority to act for the Contractor in all matters pertaining to the work. Give personal attention to the fulfillment of the Contract and keep the work under control. Subcontractors shall not be recognized, and all persons engaged in the work will be considered employees of the Contractor. Their work shall be subject to the provisions of the Contract, Contract Drawings, and Contract Specifications.
B. Confine operations to the working areas allotted by the Owner for operations, including material and equipment storage.
C. Progressively clean the work site of debris and rubbish as the work proceeds.

1.11 GUARANTEE PERIOD

A. Guarantee work of this Contract Specification section for one (1) year against all defects of materials and workmanship. The guarantee period begins after the date of Substantial Completion.
B. Repair any damage caused by the settlement and defects at no cost to the Owner.

PART 2 PRODUCTS

2.01 HARDWARE

A. All metal hardware not supplied by the manufacturer including bolts, nuts, washers, and anchor bolts shall be Stainless Steel Type 304 unless otherwise noted. All stainless steel bolts shall have stainless steel nuts and standard cut stainless steel washers at each end; size respectively unless otherwise noted in Contract Drawings. Hardware not noted by size shall be sufficient to draw and hold members securely.

2.02 PLAY BRIDGE

A. Play Bridge as shown on contract drawings must be manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.Play Bridge shall consist of the following components:
    a. Two (2) Bridge/Ramp Transition Bracket. Product number: 111345A
        1) Color per Appendix E
    b. Ramp Deck Extension DB 12” Dk. Product number: 171539A
        1) Color per Appendix E
    c. 149" OC BRIDGE W GUARDRAILS, CURBS, & Recycle Plastic Lumber (RPL) Above Deck Mink and cedar boards; stationary permalene leaves and permalene ant spinners bolted on each side of RPL. Product Number: CP036911
    d. Four (4) 76"Alum Post DB. Product Number: 111404J
        1) Color per Appendix E
    2. Installation: direct bury posts per manufacturer’s written instructions; see Appendix E.
B. Or approved equal.

2.03 WE-GO-ROUND:

A. We-Go-Round as shown on contract drawings must be We-Go-Round w/Nature DigiFuse Panels with 2 Seats DB Only, product number 249558A, manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
B. Installation: direct bury posts per manufacturer's written instructions; see Appendix E.
C. Color per Appendix E
D. Or approved equal.

2.04 OMNISPIN

A. OmniSpin as shown on contract drawings must be OmniSpin Spinner Surface Mount, product number 173591A, manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
   1. Installation: surface mount per manufacturer's written instructions. See Appendix E.
   2. Color per Appendix E
   3. Or approved equal.

2.05 ROLLERSLIDE

A. Rollerslide as shown on contract drawings must be manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com. Rollerslide shall consist of the following components:
      a. Rollerslide 56"Dk DB. Product number: 123333B
         1) Color per Appendix E
      b. DTR PB LH Transition Bench for Rollerslide Exit. Product number: CP022364A
         1) Color per Appendix E
      c. Two (2) 76"Alum Post DB. Product Number: 111404J
         1) Color per Appendix E
   2. Installation: direct bury per manufacturer's written instructions. See Appendix E.
B. Or approved equal.

2.06 FORMA ALPINE SLIDE

A. Forma Alpine Slide as shown on contract drawings must be Forma Alpine Slide DB, product number 307427A manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
   1. Installation: direct bury per manufacturer's written instructions. See Appendix E.
   2. Color per Appendix E
B. Or approved equal.

2.07 MUSHROOM STEPPER 10"

A. Mushroom Stepper 10" as shown on contract drawings must be Mushroom Stepper 10"Height DB Only, product number 171569A manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com. Mushroom Stepper 10" shall include the following products:
   1. Mushroom Stepper 10"Height DB Only. Product number: 171569A
   2. GFRC 10" Painted Mushroom Stepper DB; Product number: CP002858
      a. Colors as indicated on the drawings:
         1) Red with white polka dots

2) Blue with white polka dots
3) Tangerine with white polka dots

3. Installation: direct bury per manufacturer's written instructions. See Appendix E.

B. Or approved equal.

2.08 MUSHROOM STEPPER 16"

A. Mushroom Stepper 16" as shown on contract drawings must be Mushroom Stepper 15"Height DB Only, product number 171570A manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
1. Installation: direct bury per manufacturer's written instructions. See Appendix E.

B. Or approved equal.

2.09 MUSHROOM STEPPER 20"

A. Mushroom Stepper 20" as shown on contract drawings must be GRFC 20" Mushroom Stepper DB, product number CP002859 manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
1. Installation: direct bury per manufacturer's written instructions. See Appendix E.
2. Color:
a. Red with white polka dots
b. Blue with white polka dots
c. Tangerine with white polka dots

B. Or approved equal.

2.10 MUSHROOM STEPPER 24"

A. Mushroom Stepper 24" as shown on contract drawings must be Mushroom Stepper 24"Height DB Only, product number 171569A manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
1. Installation: direct bury per manufacturer's written instructions. See Appendix E.

B. Or approved equal.

2.11 MUSHROOM STEPPER 30"

A. Mushroom Stepper 10" as shown on contract drawings must be GFRC 30" Painted Mushroom Stepper DB, product number CP008260 manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
1. Installation: direct bury per manufacturer's written instructions. See Appendix E.
2. Color:
a. Red with white polka dots
b. Blue with white polka dots
c. Tangerine with white polka dots

B. Or approved equal.

2.12 ROPE PULL CLIMBER

A. Rope Pull Climbers as shown on contract drawings must be Rope pull Climber for 56’ Hill DB Approximately 14-6” long, product number CP025879, manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
   1. Includes clamps, 1 PB Post and 5 Roto knots.
   2. Installation: direct bury per manufacturer’s written instructions; see Appendix E.
   3. Color per Appendix E
B. Or approved equal.

2.13 LOG CRAWL TUNNEL

   1. Log Crawl Tunnel as shown on contract drawings must be Log Crawl Tunnel DB Only, product number 173594A manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
   2. Installation: in-ground mount per manufacturer’s written instructions, see Appendix E.

B. Or approved equal.

2.14 SYMBOL COMMUNICATION SIGN

A. Rope Pull Climbers as shown on contract drawings must be Symbol Communication Sign with two (2) Posts DB, product number 298208A, manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
   1. Installation: direct bury per manufacturer’s written instructions; see Appendix E.
B. Or approved equal.

2.15 SWING SET

A. Swing set as shown on contract drawings must be manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com. Rollerslide shall consist of the following components:
   1. 5" Arch Swing Frame 8' Beam Height Only. Product number: 221292A
   2. 5" Arch Swing Frame Additional Bay 8' Beam Height Only. Product number 221293A
   3. Belt Seat with ProGuard Chains for 8’ Beam Height. Product number 221293A.
      a. Color per Appendix E
   4. Full Bucket Seat with ProGuard Chains for 8' Beam Height. Product number 176038A
      a. Color per Appendix E
   5. Molded Bucket Seat (2-5 yrs) w/Harness with ProGuard Chains for 8' Beam Height. Product number 177351A
      a. Color per Appendix E
   6. Molded Bucket Seat (5-12 yrs) w/Harness ProGuard Chains for 8' Beam Height. Product number 177351A.
   7. Installation: direct bury per manufacturer’s written instructions; see Appendix E.
B. Or approved equal.

2.16 OODLE SWING

A. Swing set as shown on contract drawings must be Oodle Swing DB Only, product number 173592A, manufactured by Landscape Structures and supplied by PlayCreation, Inc; 2104 SW

152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com. Rollerslide shall consist of the following components:

1. Color per Appendix E

B. Or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 SUBGRADE PREPARATION

A. Verify that subgrade has been properly compacted and compaction tests, if required, have been accomplished.

3.03 CAST-IN-PLACE CONCRETE

A. Cast-In-Place Concrete for playground equipment footings and foundations shall be per Section 03 31 00.10 of these Contract Specifications. Layout and size per manufacturer's written instructions.

3.04 INSTALLATION OF MANUFACTURED ITEMS

A. Temporarily mark alignment and locations of all playground equipment items as shown in the Contract Drawings for Owner's Representative on-site review and approval prior to installation. Ensure fall zone requirements are met prior to installation. Incorrectly located work shall be removed and/or replaced by the Contractor at no additional cost to the Owner.
B. Assemble playground equipment per manufacturer's written instructions.
C. Playground equipment shall be installed plumb and level, and in accordance with manufacturer's written instructions.

3.05 CLEAN-UP

A. Clean playground equipment promptly after installation. Remove all residues, stains, scuffs, abrasions, and marks from the finished product in accordance with the manufacturer's instructions. Do not use harsh or abrasive cleaning materials or methods that could damage the finishes.
B. Touch-up and repair minor damages to the finish in accordance with manufacturer's instructions and as approved by the Owner's Representative.
C. Remove and replace damaged components that cannot be successfully repaired as determined by the Owner's Representative.
D. Remove all metal, wood, and concrete slurry and debris, protective wrappings and coverings, and shipping materials from the project site.
E. Fully restore all areas of the site that were impacted by the installation activities.

3.06 SUBSTANTIAL AND PHYSICAL COMPLETION

A. Inspection to determine Substantial and Physical Completion of playground equipment will be made by the Owner's Representative upon the Contractor's request.

B. Upon Physical Completion, Owner will request third-party Audit by a Certified Playground Safety Inspector. Do not allow public access to the playground equipment without Owner's approval.

END OF SECTION

SECTION 13 34 00
FABRICATED ENGINEERED STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

A. Provide and install all fabricated structures hereinafter identified.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor, and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section includes:
   1. Picnic Shelters
   2. Restroom and Maintenance Building
   3. All other related items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
   2. ASTM B30 – Standard Specification for Copper Alloys in Ingot and Other Remelt Forms.
   3. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   4. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. IBC – International Building Code, current version.
   6. All standards must include the latest additions and amendments as of the date of advertisement for bids.
   7. Comply with environmental agencies, building codes and other local requirements that are more stringent than the above.

1.04 QUALITY ASSURANCE

A. Before proceeding with any work, inspect the site, carefully check all grades, and verify all dimensions and conditions affecting the work. Notify the Owner's Representative of any discrepancy on line and level.

B. Fabricated structures work must be performed by a company with experience in work of similar scope and quality.

C. Adhere to building supplier's instructions for product storage and handling, assembly, installation, and maintenance.

D. Site reviews will be made by the Owner's Representative.
   1. Request Owner's Representative site review at least 48 hours in advance of the time review is required. Reviews for the following are required:
      a. Review of temporarily marked/staked locations and alignments of fabricated structures and/or foundations prior to installation.
      b. Substantial Completion of all work (development of physical punch list items).
      c. Physical Completion of all work (physical punch list items satisfactorily completed).

1.05 SUBMITTALS

A. For each product specified, submit the following for approval prior to delivery:
   1. Building supplier's product data including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Building supplier's written fabrication and installation instructions.
      d. Maintenance instructions.
      e. Building supplier warranties.
      f. Materials color and finish samples.
      g. Required certification letters.
   2. Submit shop drawings for review and submittal for Pierce County Commercial Building Permit by Owner's Representative. Approval of permit is required prior to delivery for the following:
      a. Picnic Shelters. Shop drawings, signed and stamped by the building supplier's engineer, for each picnic shelter must include the following:
         1) Concrete shelter footings.
         2) Structural component locations/positions, material types and dimensions, custom post details, structural calculations, and details of construction and assembly.
         3) Roofing details.
         4) Manufacturers' standard color chart of roofing colors to be selected by the owner representative.
         5) Construction/floor plans signed and stamped by the building supplier.
         6) Structural Plans and calculations signed and stamped by the building supplier.
         7) WA state energy code worksheets signed and stamped by the building supplier.
      b. Restroom and Maintenance Building. Shop drawings, signed and stamped by the building supplier's engineer, must include the following:
         1) Foundation, walls, opens, and all penetrations including doors, windows, and grating.
         2) All fixtures.
         3) All internal utilities including piping, conduit, electrical panels, receptacles, and ventilation.
         4) Roofing details.
         5) Manufacturers' standard color chart of roofing colors to be selected by the owner representative.
         6) Manufacturers' standard color chart of bathroom partition colors to be selected by the owner representative.
         7) Construction/floor plans signed and stamped by the building supplier.
         8) Structural Plans and calculations signed and stamped by the building supplier.
         9) WA state energy code worksheets signed and stamped by the building supplier.
         10) Gutter and downspout per Specification 07 71 00 Roof Specialties.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store fabricated structure items in accordance with building supplier's written recommendations. Handle all materials with sufficient care to prevent scratches to the finish and other damage.

1.07 ENVIRONMENTAL CONDITIONS

A. Do not install the fabricated structures or foundations during heavy rain, freezing temperature, or snowfall.

1.08 PROTECTION

A. Protect new work and work-in-progress from vandalism and damage that might be incurred by construction traffic, equipment, property, and persons.

1.09 PERMITS, CODES, AND REGULATIONS

A. The Contractor must obtain and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.
B. The Contractor must keep fully informed and must comply with all existing laws, codes, ordinances, and regulations, which in any way affect the conduct of the work.

1.10 CONDUCT OF WORK

A. The Contractor must continuously maintain a competent superintendent or foreman during the progress of the work, with the authority to act for the Contractor in all matters pertaining to the work.
B. The Contractor must confine operations to the working areas allotted by the Owner for operations, including material and equipment storage.
C. The Contractor must progressively clean the work site of debris and rubbish as the work proceeds.

1.11 GUARANTEE PERIOD

A. Guarantee work of this Contract Specification section for one (1) year against all defects of materials and workmanship. The guarantee period begins after the date of Substantial Completion.
B. Repair any damage caused by settlement and defects at no cost to the Owner.

PART 2 PRODUCTS

2.01 HARDWARE

A. All hardware is per the building supplier.

2.02 PICNIC SHELTERS

A. Picnic Shelters must be 32’ x 40’ pre-engineered single slope steel post structure with Fabral metal roofing, Glulam rafters, Glulam beams, and Doulas Fir tongue and grove decking. As designed and supplied by Romtec, Inc.; 18240 North Bank Road, Roseburg, Oregon 97470. Contact Cody Dooley; cdooley@romtec.com; phone: (541) 496-3541; website: www.romtec.com. Refer to Appendix C.
    1. All building materials and hardware are as supplied by the building supplier.
    2. Color and finishes per Appendix C.
    3. Wood Sealant for all ceiling decking, glulam beams, posts, and extensions: Provide Waterproof, UV resistant, mildew resistant clear stain/sealer for exterior condition.
        a. Provide a minimum 2” by 2” sample swatch on specified wood deck material for Owner’s Representative review and approval prior to application.
B. Or approved equal.

2.03 RESTROOM AND MAINTENANCE BUILDING

A. Restroom and Maintenance building must be a CMU structure with Fabral metal roofing and include a single occupant unisex restroom, double occupant women’s and men’s restrooms, sinks, toilets, urinal, restroom partitions, a mechanical storage room with a roll-up door, a

drinking fountain, and interior & exterior LED lighting. As designed and supplied by Romtec, Inc.; 18240 North Bank Road, Roseburg, Oregon 97470. Contact Cody Dooley; cdooley@romtec.com; phone: (541) 496-3541; website: www.romtec.com. Refer to Appendix B.

1. All building materials, fixtures, and mounting hardware are as supplied by the building supplier as specified in Appendix B.
2. Bathroom partition color to be reviewed and confirmed by Owner's Representative based on submitted manufacturer samples.
3. Interior block wall finish shall be White Latex Epoxy Paint
   a. Rust-oleum - White Latex Epoxy Interior/Exterior Paint – Semi-Gloss
4. Concrete Slab Sealer:
   a. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water-based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors, Petrotex, as manufactured by L & M Construction Chemicals, Inc., or approved.
   b. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI), FGS Concrete Conditioner, as manufactured by L & M Construction Chemicals, Inc., or approved. \
   c. Stain Guard Sealer: Ready to use, is a low odor, VOC compliant, topical sealer consisting of low molecular emulsified cross-linking, coupling polymers that effectively protect concrete and other natural stone floor surfaces from the damaging effects of staining, defacing and deterioration due to contaminant penetration, Permaguard SPS, as manufactured by L& M Construction Chemicals, Inc., or approved.
5. Wood Sealant for all decking, glulam beams, posts, and extensions: Provide Waterproof, UV resistant, mildew resistant clear stain and sealer for exterior condition.
   a. Provide a minimum 2" by 2" sample swatch on specified wood deck material for Owner's Representative review and approval prior to application.
6. Sealant for exterior CMU block: Use clear-drying, penetrating, water-based silicone emulsion for weatherproofing masonry materials and protecting them from graffiti attacks without altering their natural appearance.
   a. Physical and Performance Properties:
      1) Total Solids per ASTM D 2369: Fifteen (15) percent.
      2) Cleanability Level 2 per ASTM D7089.
      3) Comply with national, state, and district AIM VOC regulations.
      4) Build America, Buy America Act Compliant.
   b. Provide a sample swatch on one side of a CMU block for Owner's Representative review and approval prior to application on the building.
7. Lenel Security Access Hardware: Product, Hardware, and wire by Pierce County. Contractor to provide conduit sized for wiring and hardware requirements based on Pierce County provide information. Contractor to request information from Pierce County and locate per field directive.

B. Roof-edge drainage systems, gutter and downspouts per Specification 07 71 00 Roof Specialties
C. Or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.
B. Temporarily mark alignment and locations of structures for review by Owner's Representative prior to installation. Incorrectly located work must be removed and/or replaced by the Contractor at no additional cost to the Owner.
C. Install structures rigid, plumb and true to lines and levels shown in contract drawings or per building supplier's written instructions.
D. All ends of bolts to be tamperproof.

3.02 SUBGRADE PREPARATION

A. Verify that subgrade has been properly compacted and compaction tests, if required, have been accomplished.

3.03 CAST-IN-PLACE CONCRETE

A. Cast-In-Place Concrete for fabricated structures footings and foundations must be per the sealed structural plan sets furnished by the supplier. Unless otherwise indicated, exposed concrete must have a medium broom finish.

3.04 SEALANT FOR EXTERIOR CMU BLOCK: ANTI-GRAFFITI COATING APPLICATION

A. Provide a test of each surface substrate that will receive treatment prior to full application.
B. Apply Anti-Graffiti Coating according to manufacturer's written instructions including cleaning and drying of substrate prior to application and protection of all surrounding items and areas prior to application.
C. Do not dilute the product.
D. Apply only in well-ventilated areas.
E. Observe safety and protection precautions per manufacturer's written labels and instructions during application and drying.
F. Preferred method of application is with low pressure, spray equipment. Use roller or brush for small scall applications or when spray applications are not appropriate or difficult.
G. Apply in coverage rate and coatings as recommended by manufacturer.
H. Protect treated surfaces from rain for minimum of 6 hours after application.
I. For work found defective because of improper preparation of surfaces or improper application of treatment or damage to unprotect adjacent surfaces or materials, make good the defect to the satisfaction of the Owner's Representative at Contractor's expense before final acceptance.

3.05 CLEAN-UP

A. Clean structures promptly after installation. Remove all residues, stains, scuffs, abrasions, and marks from the finished products in accordance with the building supplier's instructions. Do not use harsh or abrasive cleaning materials or methods that could damage finishes.
B. Touch-up and repair minor damages to the finish in accordance with building supplier's instructions and as approved by the Owner's Representative.
C. Remove and replace damaged components that cannot be successfully repaired as determined by the Owner's Representative.
D. Remove all metal, wood, and concrete slurry and debris, protective wrappings and coverings, and shipping materials from the project site.

E. Fully restore all areas of the site that were impacted by the installation activities.

END OF SECTION

SECTION 26 05 00
COMMON WORK FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, Division 26 and Division 31.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 GENERAL REQUIREMENTS

A. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Section.

B. Provisions within the Specifications and Drawings describe minimum guidelines for electrical installations.

C. All electrical installations shall comply with the code requirements of NFPA 70 (NEC), NFPA 72, NFPA 90, WAC/RCW, Americans with Disabilities Act (ADA) and all local codes and ordinances.

D. Where industry standard design practices are published for use by design professionals, such guidelines shall be used as a minimum basis of design; e.g., IESNA Recommended Practices, BICSI Communication Distribution Standards, ANSI/TIA/EIA Standards and IEEE Publications.

E. Electrical efficiency, life-cycle cost and maintainability of proposed systems shall be considered prior to product selection.

F. Availability (lead times) and potential obsolescence shall be considered during product selection. Potential long-lead items shall be reviewed with the Owner’s Representative.

G. Specified items that are essential to a facility’s functional use shall have locally available spare parts and service and not be at risk to be discontinued by the manufacturer for a minimum of 5 years.

H. All low-voltage cables shall be labeled with computer printed, sleeve type, wire markers. The designation on the wire markers shall match those on the shop drawings.

I. The Owner shall be instructed on the operation of all systems at substantial completion and again three months after the initial instruction period.

1.03 SUMMARY

A. Provide supervision, labor, materials, tools, equipment/machinery, temporary power and lighting, and other services necessary to complete the work for complete operations described herein and as shown on the Drawings.

B. The provisions and intent of the General Conditions, Special Conditions, and General Requirements apply to the work as if specified in this Section and other Sections of the Specifications. Provide the electrical work as indicated or specified in other Sections of the Specifications and Drawings of the Contract Documents.

C. Execute electrical work in strict accordance with the latest edition of the National Electrical Code and governing local ordinances, codes, and regulations. Assure the strict conformity of electrical equipment, materials, construction methods, tests, and definitions with the established standards of the following in their latest adopted revision: Underwriter's Laboratories, Inc. (UL), and National Electrical Manufacturers Association (NEMA).

D. Furnish and install all equipment in the Contract in harmony with other trades to provide completed systems with neat, finished appearance, using approved methods of the trade. Only good workmanship will be accepted. If, in the judgment of the Owner's Representative, any portion of work not installed in a workmanlike manner or left in a rough, unfinished condition, remove the equipment, reinstall same, patch and paint surrounding surfaces satisfactory to the Owner's Representative, with no increase in cost.

E. Mounting details of equipment, devices, light fixtures, raceways, junction boxes and the like are not usually shown or specified. Provide per industry standard practice and code requirements as necessary for proper installation and operation the same as if herein specified or shown.

F. Provide supervision, labor, materials, tools, equipment/machinery, temporary power and lighting and other services necessary to complete the work for complete operations described herein and shown on the Drawings.

G. Provide installation means and methods of all equipment, devices, light fixtures, raceways, junction boxes and the like per industry standard practice and code requirements as necessary for proper configuration and operation as if herein specified or shown.

H. Execute electrical work in strict conformance with the latest edition of the National Electrical Code, NFPA, IBC, IFC, WSEC-2018, and governing local ordinances, codes, and regulations. Assure the strict conformity of Electrical equipment, materials, construction methods, tests, and definitions with the established standards of the following in their latest adopted revision: UL and NEMA.

I. All installations shall comply with ADA requirements.

J. Purchase permits, licenses, and approvals required for execution of the Work.

K. Test the entire electrical installation to assure compliance with Codes and proper system operation.

1.04 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electrical Code.

2. NFPA 70E – Standard for Electrical Safety in the Workplace.

3. NFPA 5000, 2018 Ed.

4. NFPA 1, 2018 Ed.

5. National Electrical Manufacturers Association (NEMA).

B. Underwriters Laboratories (UL).

1.05 DEFINITIONS

A. The terms “or other reviewed and approved Manufacturers”, “or approved equal” and “or equal” means final approval by the Architect or Engineer of a material or piece of equipment substituted for that which is shown in the Contract Documents.

B. The word “provide” as used in these Specifications or on the Drawings shall mean “furnish, install, and complete connection per factory instructions”.

C. The term Mechanical Contractor (M.C.) and Electrical Contractor (E.C.) as used in these Specifications or on the Contract Drawings, refer to those subcontractors working under the direction of the General Contractor (G.C.).

D. The term “Engineer” shall refer to the licensed professional electrical engineer who is responsible for the preparation of the electrical documents.

1.06 EQUIPMENT

A. All materials shall be UL listed and labeled.

B. The interior of all electrical equipment shall be thoroughly cleaned prior to final acceptance.

C. All equipment and receptacles shall have permanent panel name and circuit number on equipment, disconnects, cover plates, etc.

1.07 SUBMITTALS

A. Approval Submittals:

1. Statement of Manufacturer’s Qualifications.

2. Statement of Installer’s Qualifications.

3. Product Data: Submit and clearly identify product data, selection, and options.

4. Shop Drawings: Submit all required shop drawings. Where product data and shop drawings are required for the work, submit both at the same time.

B. Shop Drawings:

1. Shop drawings produced in AutoCAD shall be provided for low-voltage system specialty systems (lighting controls, etc.). Shop drawings shall show all device-to-device wiring. All as-builts shall be delivered in electronic format.

2. Provide as-built shop drawings for all systems. As-builts shall show the locations of all components, conduit runs and cables utilized.

C. Quality Assurance Submittals:

1. Test and Inspection Results.

D. Closeout Submittals:

1. Operations and Maintenance Manual Content.

2. Spare Parts and Materials.

E. Substitutions:

1. Conform to Division 01.

2. The naming of a certain brand or make or manufacturer in the Specifications is to establish a quality standard for the article desired. The Contractor is not restricted to the use of the specific name brand or manufacturer unless so specified as “no substitution”. However, substitution request is required and permitted only as specified in Division 01.

3. The Contractor shall assume full financial responsibility for any and all additional expenses arising from the use of a substitute product.

1.08 QUALITY ASSURANCE

A. General: These Specifications and Drawings are intended to cover a completed installation of systems. The omission of expressed reference to any items of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such labor and materials. Refer to the Drawings and Shop Drawings or other trades for additional details, which affect the proper installation of this work.

B. Conform to requirements of NFPA 70.

C. Conform to the latest edition of the NECA Standards for good workmanship in the electrical construction manual.

D. Provide all equipment included and as necessary and in harmony with other trades to provide completed systems with neat, finished appearance, using approved methods of the trade. Only good workmanship will be accepted. If, in the judgment of the Owner’s Representative, any portion of the work has not been installed in a workmanlike manner or left in a rough, unfinished condition, remove the equipment, reinstall same, patch and paint surrounding surfaces satisfactory to the Owner’s Representative, with no increase in cost to the Owner.

E. Before submitting bid, Contractor is strongly encouraged to visit the site and examine existing conditions by which to provide a complete and accurate bid.

F. A Certified Testing Company shall perform the work of this Section and shall be qualified to test electrical equipment and is a NETA (National Electrical Testing Association) certified

testing agency. The Certified Testing Company shall not be associated with the manufacturer(s) of the equipment or systems under test.

G. The Contractor shall provide all test equipment necessary to fulfill the checks and testing requirements. Test equipment shall have been calibrated within one (1) year of its use on this Project.

H. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer.

1.09 COORDINATION

A. Coordinate features of distribution equipment and power monitoring and control components to form an integrated interconnection of compatible components.

1. Match components and interconnections for optimum performance of specified functions.

B. Coordinate Work of this Section with those in Section specifying distribution components that are monitored or controlled by power monitoring and control equipment.

1.10 WARRANTY

A. Warranty workmanship and components of the work excluding incandescent and fluorescent lamps for a period of one-year from the date of Substantial Completion. Remedy any defects in workmanship and repair or replace any faulty equipment that fails within the warranty period without additional cost to the Owner. Assure cleanliness of lamps and fluorescent tubes and replacement of defective units at the time of Substantial Completion.

B. Refer to other Sections for additional warranty requirements.

1.11 CLOSEOUT DOCUMENTS

A. Conform to Division 01.

B. As-Built Drawings: Maintain a set of full-size Contract Plans at the site on which all changes and “as-built” modifications are recorded. All marks shall be in red pencil in a legible, neat manner. These drawings shall be reviewed monthly prior to final approval of pay request. Upon completion of the Project, the Contractor shall submit these drawings for final approvals.

C. Operation and Maintenance Manuals: Conform to Division 01.

D. Warranties:

1. Conform to Division 01.

2. Submit one-year warranty on all materials under the Contract work (excluding lamps). Refer to other Sections for additional warranty requirements.

3. Submit all subcontractor warranties.

4. Submit all manufacturer warranties.

1.12 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals in accordance with Division 01.

1. Provide one preliminary PDF set of Operation and Maintenance Manuals including maintenance information and parts list furnished by the manufacturer with the equipment, together with supplementary drawings where necessary to itemize serving and maintenance points. Include periodic maintenance, methods of operation, seasonal requirements, manufacturer's data and warranty forms. Provide address and 24-hour phone number of firm responsible under warranty. Items requiring service or correction during the warranty period shall be serviced within 24-hours of notification by the Owner. Data in manuals shall be neat, clean copies. An index shall be provided with all contents listed in an orderly presentation according to Specification Section.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Schedule materials, equipment, and light fixture deliveries and make all arrangements as necessary to complete all work in accordance with the project construction schedules. Provide schedules of work to the Owner's Representative as directed during construction.

B. Schedule deliveries and unloading to prevent traffic congestion, blocking of access, and interference with work. Arrange deliveries to avoid larger accumulations than can be suitably stored at site. Provide for continuity of supply to avoid change of supplier or change in brand of materials during any phase of work.

C. Deliver packaged materials to site in manufacturer's original, unopened, labeled containers. Do not open containers until approximate time for use. Store materials at locations that will not interfere with progress of work. Arrange locations of storage areas in approximately order of intended use.

D. Store materials in a manner that will prevent damage to materials or structure, and that will prevent injury to persons. Store cementitious materials in dry, weathertight, ventilated spaces. Store ferrous materials to prevent contact with ground and to avoid rusting and damage from weather.

E. Provide documentation to the Owner's Representative for any claim of material, equipment and light fixture deliveries not able to meet construction schedules.

1.14 PROJECT CONDITIONS

A. Field verify and examine existing conditions.

B. Verify requirements for temporary electrical power and construction power. Temporary electrical power must be provided to keep existing facilities fully operational during construction. Contractor shall be responsible to insure compliance with this requirement.

C. Verify requirements for permanent power and telecommunication service requirements.

D. Identify existing conditions and requirements for cutting, patching, excavation, core drilling, etc.

E. Include all costs to provide the electrical installation associated with the existing conditions for the best workmanship and operation according to the intent of the Specifications and Drawings.

F. Report to the Owner's Representative any condition that might prevent the installation of the equipment in the manner intended.

PART 2 – PRODUCTS

2.01 GENERAL

A. Naming of manufacturers indicates the manufacturer's brand name is acceptable only if their product is in compliance with each and every provision of this Specification. Failure to comply will result in disapproval.

B. Supplier and/or Electrical Contractor shall be responsible to ensure that material or equipment is of the same size, quality, capacity, weight, and electrical characteristics as that specified. The Contractor/Supplier shall pay any changes and costs required during construction due to Contractors/Suppliers neglect to properly select equipment.

C. Notify Owner's Representative for an on-site visit to inspect material and equipment prior to installation.

D. Materials and equipment shall be new, undamaged, and shall be UL listed for its use.

E. Defects and damages of material shall be replaced, furnish any new material as necessary and install the system at the Contractor's expense.

F. Furnish material and equipment samples when requested by the Owner's Representative, within 21-days of request.

G. Non-approved material and equipment must be removed from the jobsite.

PART 3 – EXECUTION

3.01 EXAMINITION

A. Examine pathway elements intended for cables. Check raceways, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting the performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 GENERAL

A. Conform to Division 01.

B. Provide conduit, wiring, and all components indicated on schedules and diagrams.

C. Before any installation, devices or equipment can be directed or located by the Owner's Representative within 20-feet of the designed contract location without extra cost.

D. Device or equipment mounting height given herein the Specifications, Contract Drawings, and/or documents are intended to provide general guidelines pursuant to industry standards. Such guidelines may not be exact or accurate and may or may not conflict with other trades installation without verification.

E. Provide field coordination and verification with other contractors, trades, or any shop drawings, and ensure that such mounting heights if indeed are practical and feasible as not to conflict with other installation and construction. If conflicts are discovered at any time during the construction, report to the Owner's Representative immediately for resolution.

F. If the Contractor fails to provide such coordination and field verification and results of erroneous installation, the Contractor shall remedy such installation per Owner's Representative direction, at Contractor's cost.

3.03 MANUFACTURER'S DIRECTIONS

A. Apply, install, connect, and erect manufactured items or materials according to the recommendations, wiring diagrams, instructions of the manufacturer when such recommendations are not illustrated or in conflict with the Contract Documents.

B. Furnish to the Owner's Representative on request, copies of manufacturer's recommendations. Secure approval of recommendations before proceeding with work.

C. Keep at the site not less than one copy, in good condition, of manufacturer's recommendations, wiring diagrams, instructions, or directions, pertaining to work at the site. Inform involved personnel of requirements and availability of manufacturer's recommendations.

3.04 UTILITY STANDARDS

A. All work associated with electrical power utilities shall be installed in accordance with the standards and specifications established by the serving utility.

B. Contact electrical power utilities. Verify and coordinate work scope prior to commencement of installation.

3.05 CONTINUITY OF BUILDING AND UTILITY SERVICES AND SHUTDOWNS

A. Continuity of utilities services in the building shall be maintained at all times as required to provide heat, water, lighting, and power to all portions of all buildings. Utility systems shutdowns required for extensions, alterations or connections of new services shall be accomplished in accordance with the following requirements.

B. Shutdowns: Utilities shutdowns shall be scheduled for weekends, holidays, or at night if the shutdown affects the use of the Owner's buildings. The actual time and date will be coordinated with, and approved by the Owner at least 72-hours in advance. Contractor shall be required to provide temporary power as required by the Owner to keep facilities operational during utility shutdowns. Coordinate with Owner.

C. Costs: Pay all costs associated with utilities shutdowns. No extra payment will be made for overtime work, schedule changes, or failure to complete utilities connections within authorized shutdown periods.

3.06 COORDINATION

A. The drawings are diagrammatic and indicate generally the locations of materials and equipment. These drawings shall be followed as closely as possible. Coordinate the work under this section with the landscape, civil, and the drawings of other trades for exact dimensions, clearances, and roughing-in locations. Cooperate with other trades in order to make minor field adjustments to accommodate the work of others.

B. Refer to project Construction Schedules. Schedule each specific area so that the delivery of materials and equipment are such as to cause no delay in Construction Schedules. Include the premium cost of delivery of equipment and overtime work in order to comply with the Construction Schedule if necessary.

C. Coordinate and verify exact locations of wiring devices, light fixtures and equipment prior to beginning of rough-in.

D. If directed by the Owner's Representative, the Contractor shall, without extra charge, verify with local inspectors or authorities having jurisdiction, and make reasonable modifications in the layout as needed to prevent conflict with work of other trades of for proper execution of the work.

E. If directed by the Owner's Representative, the Contractor shall, without extra charge, provide layouts of equipment and details of mounting method for review, prior to installation to ensure proper execution of the work.

3.07 RACEWAYS

A. One-line diagrams, risers, and conduit routing are schematic and are not showing exact physical arrangement of equipment or exact routing of conduit. Coordinate conduit routing with all other trades.

B. Where indicated on Drawings, junction boxes and pull boxes are minimum requirements. Provide other fittings and pull boxes of adequate size in the raceway system wherever necessary or required by the National Electrical Code. Allow a maximum of four-quarter bends between pull boxes in each run of conduits.

C. Coordinate conduit routing, pull box and equipment locations with other trades to avoid conflicts of equipment installations.

D. All empty conduits shall have pull wires.

E. Provide unistrut mounting channels, hanger rods, anchor bolts and fittings to support conduits and pull boxes.

F. Work shall comply with National Electrical Code requirements.

3.08 MISCELLANEOUS

A. Support all conduits and equipment in accordance with the National Electrical Code and the International Building Code.

B. Cutting and Patching: Perform cutting and patching as may be necessary for the proper installation of the electrical work. Grout around raceway penetrations and fill anchor bolt holes or spalled areas. Core drill new penetrations through existing structural walls, ceilings, and floor slabs.

C. Cleanup: The premises must be kept free of accumulated materials, rubbish, and debris at all times. Surplus materials, tools, and equipment must not be stored at the building. At the completion of the job, equipment and fixtures shall be left clean and in proper condition for their intended use.

D. Trenching: Perform excavation and backfill as may be necessary for the proper installation of the Electrical work, unless noted otherwise on the Drawings.

E. Demolition: Electrical demolition shall be performed by the Electrical Contractor as indicated on Plans and other sections of the Contract Documents.

F. Installation Details: Prepare and submit to the Owner's Representative detail sketches indicating equipment installation information with locations and dimensions.

G. Tests: Test wiring and electrical equipment to verify absence of grounds and short circuits and verify proper operation, rotation, and phase relationship. Demonstrate operation of all equipment in accordance with the requirements of this Specification and the manufacturer's recommendations. Perform tests in the presence of the Owner's Representative. Provide instruments and personnel required to conduct these tests.

3.09 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

A. Scope: Following installation of work, have representatives of installation tradesmen conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance to Owner's Representatives.

B. General Description of Instruction Periods: Each period shall include preliminary discussion, and presentation of information from maintenance manuals with appropriate references to Drawings; followed by tours of building areas explaining maintenance requirements, access methods, servicing and maintenance procedures, and equipment cleaning procedures, control settings and available adjustments.

C. Scheduling of Instruction Periods: Notice of Contractor's readiness to conduct such instruction and demonstration shall be given to Owner's Representative at least two (2) weeks prior to the instruction periods, and agreement reached as to the date at which the instruction periods are to be performed. Obtain approvals of proposed date prior to making final arrangements.

3.10 GENERAL ELECTRICAL CHECKS AND TESTING

A. Test wiring and electrical equipment to verify absence of grounds and short circuits and verify proper operation, rotation, and phase relationship. Upon request, demonstrate operation of all equipment in accordance with the requirements of this Specification and the manufacturer's recommendations. Provide instruments and personnel required to conduct these tests.

B. Checks are intended to begin upon completion of a component or equipment installation. Testing generally occurs later when systems are energized or nearing that point. Beginning

system testing before full completion, does not relieve the Contractor from fully completing the system as soon as possible, including all construction checklists and may require retesting portions of the system once all components are fully functioning.

C. The check and test procedures and record forms shall contain the following:

1. The Subcontractor(s) executing checks or tests.

2. A list of the integral components being inspected and tested, equipment tag numbers, manufacturer, model number, pertinent performance information / rating data.

3. Test equipment used.

4. Construction checklists associated with the components, if any.

5. Any special required conditions of the check or test for each procedure.

6. Items, conditions or functions to be inspected, verified or tested, the checks and testing method given and a place provided with results recorded.

7. Acceptance criteria (or reference by specific table where the acceptance criteria is found).

8. For each procedure, list the technician performing check or test and company, witnesses of the tests and dates of tests.

9. Sampling strategies used.

D. The test procedures for dynamic equipment like lighting controls shall contain more step-by-step procedures. For each piece of equipment, checks and test procedures and their documentation record forms may be different documents or combined in the same document, but checks and tests should be grouped.

E. Common Testing Requirements:

1. The following requirements apply to all electrical systems and features that are to be commissioned when referenced below. Tests shall:
   a. Verify functionality and compliance with the design intent for each individual sequence module in the sequences of operation. Verify proper operation of all control strategies, energy efficiency and self-diagnostics features by stepping through each sequence and documenting equipment and system performance. Test every step in every written sequence and other significant modes, sequences and operational features not mentioned in written sequences; including startup, normal operation, shutdown, scheduled on and off, unoccupied and manual modes, safeties, alarms, overrides, lockouts, and power failures.
   b. Verify all alarm and high and low limit functions and messages generated on all points with alarm settings.
   c. Verify integrated performance of all components and control system components, including all interlocks and interactions with other equipment and systems.
   d. Verify shutdown and restart capabilities both for scheduled and unscheduled events (e.g. power failure recovery and normal scheduled start/stop).

e. When applicable, demonstrate a full cycle from off to on and no load to full load and then to no load and off.
f. Verify time of day schedules and setpoints.
g. Verify all energy saving control strategies.
h. Verify that monitoring system graphics are representative of the systems and that all points and control elements are in the same location on the graphic as they are in the field.
i. Verify operator control of all commandable control system points including proper security level access.
j. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems the NETA test procedures shall be part of the testing requirements of this specification. Additional testing procedures may be listed in this Specification.

F. Common Acceptance Criteria:

1. The following common acceptance criteria apply to all equipment, assemblies, and features:
   a. For the conditions, sequences and modes tested, the equipment, integral components and related equipment shall respond to varying loads and changing conditions and parameters appropriately as expected, according to the sequences of operation, as specified, according to acceptable operating practice and the manufacturer's performance specifications. Verify that equipment operates within tolerances specified in: governing codes, acceptance criteria contained in the construction documents, manufacturer's literature and according to good operating practice.
   b. Systems shall accomplish their intended function and performance.
   c. All safety trips shall require a manual reset to allow a system restart.
   d. Resetting a manual safety shall result in a stable, safe, and predictable return to normal operation by the system.
   e. Safety circuits and permissive control circuits shall function in all possible combinations of selector switch positions (hand, auto, inverter, bypass, etc.).
   f. Other acceptance criteria is given in the equipment testing requirements articles or referenced standards.
   g. Additional acceptance criteria will be developed by the Commissioning Authority when detailed test procedures are developed.
   h. When testing procedures for commissioned equipment are listed in NETA Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems the NETA performance criteria shall apply.

G. Load Balancing:

1. Checks shall be made for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.

2. Record all circuit changes on as-built drawings.

3. Do not fabricate nameplates, or cover plate device labeling prior to load balance test and adjustments.

END OF SECTION

SECTION 26 05 01
BASIC MATERIALS AND METHODS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, Division 26 and Division 31

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Devices, material, equipment, enclosures, and assemblies shall be new, UL listed, approved, and suitable for its environment where used.

B. Unless noted otherwise, wiring systems shall be installed in a complete raceway system.

C. Determine the exact electrical requirements of equipment from the equipment suppliers prior to rough-in.

D. All installations shall comply with ADA requirements.

1.03 REFERENCES

A. National Fire Protection Association (NFPA) – www.nfpa.org:

1. NFPA 70 – National Electrical Code.

2. NFPA 70E – Standard for Electrical Safety in the Workplace.

B. International Code Council – www.iccsafe.org:

1. IBC – International Building Code.

2. IFC – International Fire Code.

C. National Electrical Manufacturers Association (NEMA).

D. Underwriters Laboratories (UL).

1.04 EQUIPMENT FINISH

A. Electrical equipment, control panels, and cabinets, shall be furnished factory painted in the manufacturer’s standard colors unless otherwise specified.

B. Unfinished materials and equipment except conduit, shall be cleaned, primed and painted by the Electrical Contractor as directed by the Owner’s Representative in accordance with the painting requirements noted in 32 33 00 (Site Furnishings).

C. The colors of exposed electrical materials and apparatus shall be as selected by the Owner's Representative.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications stating that materials comply with requirements.

1.06 QUALITY ASSURANCE

A. Source: For each type of material required for the Work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Make all necessary provisions for storing materials and equipment at the site to insure the quality and condition of the material to be installed. Utilize only new materials which are free of defects and which arrive at the jobsite unopened in the original container.

1.08 COORDINATION

A. Coordinate location of raceways, supports and electrical equipment with other trades.

B. Determine the exact electrical requirements of all equipment from the equipment suppliers prior to rough in wiring. Refer any discrepancy between the Drawings and equipment requirements to the Architect for resolution prior to installation.

C. Construction Observation: Advise the Architect at least two (2) full working days prior to the covering of concealed electrical work.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish all items of the materials, design, sizes, and ratings specified herein.

B. All devices, equipment, enclosures, and material shall be UL listed, Engineer approved, and suitable for its environment where used.

2.02 RACEWAYS AND FITTINGS

A. All raceways shall be 1/2" minimum and 3/4" minimum for homeruns.

B. 3/4" raceways shall have no more than six (6) #12 AWG conductors.

C. Minimize the use of flexible metallic conduit. Flexible conduit shall only be used for light fixture connections, interior equipment connections, expansion and seismic joints, and sound control. Flexible metallic conduit shall not be used in concealed locations.

D. Electrical Metallic Tubing (EMT): Hot dipped galvanized or sherardized steel. Utilize compression type with insulated throat in interior locations and steel rain tight type in exterior locations. Cast metal shall not be used.

E. Rigid Galvanized Steel (RGS): Rigid metal conduit shall be galvanized steel type. Conduit fittings and accessories shall be listed for use with RGS.

F. Polyvinyl-Chloride (PVC): Rigid PVC conduit shall be used in ductbanks and encased in concrete where noted on Drawings.

G. Flexible Steel Conduit: Interlocking single strip, hot-dipped galvanized or sherardized, liquid-tight when used in wet or damp locations. Fittings shall be screw wedge type or liquid-tight type depending on conduit type used. Provide grounding fittings for ground wire installation outside conduit.

H. Concealed raceways shall be secured with heavy-duty, single-hole, steel straps. Nail-in style straps shall not be used.

I. Exposed raceways shall be secured with heavy-duty, two-hole, steel straps.

J. Exposed raceway running on roofs, surface mounted on building exterior within 10-feet of ground, walkways or stairs, exposed to weather or under covered walkways shall be galvanized rigid steel on rubber support pads with strut straps (not wood).

K. Raceways shall be supported independently from the ceiling suspension system, cable trays, ducts, and piping.

L. Pendant mounted groups of raceways shall be supported by 1-5/8” square preformed channel (Unistrut).

M. Cap or plug the ends of below grade conduits to prevent concrete and other materials from obstructing conduits.

N. Wherever buried, non-metallic, conduit passes through an expansion or contraction joint, or where required to compensate for thermal expansion and contraction, provide a conduit expansion joint. Install the conduit to cross the joint at right angles.

O. Pull Wires: Provide a pull wire in all empty raceways:

1. Use nylon pull-wires of tensile strength not less than 240-pounds in each conduit and duct, leave pull-wires in ducts and conduit after cleaning.

2. No splices in pull-wire will be allowed.

3. Leave ample slack length at each end of pull-wire.

2.03 WIRE AND CABLE

A. Branch circuit wiring shall be #12 AWG copper minimum unless indicated otherwise. Conductors #10 AWG and smaller shall be solid copper with Code grade insulation and a minimum temperature rating of 75 deg C.

B. Branch circuit ground wire, isolated ground wire, equipment grounding conductor and grounding electrode conductors shall be insulated the same as the circuit or feeder conductors.

C. Conductors #8 AWG and larger shall be stranded copper, with Code grade insulation and a minimum insulation temperature rating of 75 deg C, and connected to equipment by means of compression type terminal lugs. Compression lugs shall be hydraulic compression only. Mechanical compression methods are not acceptable. Provide two-hole lugs of AL/Cu type only. Single hold lugs are not acceptable.

D. Marking: Wire must be marked at 2’ intervals with gauge, insulation type, and manufacturer. Label feeders at each end of phase designation.

E. Low voltage wiring and cables specified herein by Divisions 26 shall be installed either in complete raceway system or shall be plenum rated.

2.04 JUNCTION AND PULLBOXES

A. Manufacturers: Bower, Raco or Steel City. Boxes exposed to weather shall be Crouse Hinds or approved equal cast aluminum type.

B. Electrical boxes shall conform to UL-50, “Standard for Electrical Enclosures” and UL-514, “Standard for Electrical Outlet Boxes and Fittings”.

C. Provide electrical boxes of the material, finish, type, and size indicated and required for the location, kind of service, number of wires, and function.

D. Electrical boxes that are shown on the Drawings with no indication of size shall be provided in accordance with the NEC.

E. Junction boxes, pull boxes, and outlet boxes shall be pressed steel with knockouts and matching cover as required with size, depth, and shape best suited to the location and intended service. Cover on finish area shall be provided with specification grade quantity type to match finish surface. Include plaster or tile rings as required.

F. Provide neoprene gaskets 1/8” thick with all boxes subjected to weather.

G. Grounding: Provide each box with a grounding terminal.

1. Grounding Terminal: Either a green-colored washer-in-head machine screw not smaller than 10-32 in a drilled and tapped hole in the back of the box or a grounding bushing with green-colored machine screw terminal attached to one of the conduits.

2. Install grounding jumpers as specified in 26 05 26 “Grounding and Bonding”.

2.05 SUPPORTING DEVICES

A. Provide dedicated blocking and support method to ensure secure installation of all device boxes such that the installation is capable of withstanding a minimum 50-pound pulling force without moving.

B. Support raceway by straps, suitable clamps or hangers to provide a rigid installation. Perforated strap hangers and twisted wire attachments will not be acceptable. Do not support or fasten raceways to other pipe or in a manner to prevent the ready removal of other pipe.

2.06 GROUNDING

A. Conform to NEC Article 250.

B. Ground Wire: Color coded green, copper conductor, with insulation same as circuit or feeder conductors.

C. Grounding Conductor: Provide green insulated equipment grounding conductor or circuit grounding conductor per NEC 250 in raceway system. Insulation and conductor type shall be the same as circuit conductors.

PART 3 – EXECUTION

3.01 RACEWAY

A. IMC and EMT: Interior areas.

B. RGS: Exterior area with approved weatherproof fittings.

C. PVC: Exterior underground with RGS factory-radius elbows transitioning above ground.

D. Flexible Conduit: Flexible metal conduit located in wet locations, mechanical room, kitchen areas, shall be liquid-tight type. A maximum of 72” of flexible metal conduit shall be used for the connection to motors and vibrating equipment, final connection to lay-in light fixtures. Flexible metal conduit shall be continuous grounding type and provide with grounding lug per spec. No flexible conduit allowed for any concealed installation.

E. Minimum Sizes: Conduit sizes are not necessarily specified on Drawings. Provide a minimum 1/2" conduit branch circuits and minimum 3/4" conduit homeruns and multi-pole circuits. Refer to other specification sections for other minimum sizes. Contractor shall provide sizing of conduits as required to meet code where the above specified minimum sizes are too small to afford 40% fill. Conduit sizes shall be sized for conductor types and sizes per NEC.

F. Conduit termination shall have code-sized junction box for flush or surface installation. Conduit stubs shall have nylon insulated type bushing.

G. Pull Wires: Provide pull wires in all empty raceways. Pull wires shall be continuous in each raceway run and extend a minimum distance of 12” from the junction box or terminal at the end of the raceway.

3.02 INSTALLATION

A. One-line diagrams, risers, and conduit routing are schematic and do not show exact arrangement of equipment.

B. Where indicated on Drawings, junction boxes and pull boxes are minimum requirements. Provide other fittings and pull boxes of adequate size in the raceway system wherever necessary or required by the NEC. Allow a maximum of four 90-degree bends between pull boxes in each run of conduit.

C. Coordinate conduit routing, pull box and equipment locations with other trades to avoid conflicts of equipment installations. Empty conduits shall have pull wires.

D. Conceal all raceways except as permitted by owner/engineer.

E. Where permitted, exposed raceway shall be run parallel or perpendicular to the building. Run raceways as high as possible, unless noted otherwise.

F. Carefully form bends to avoid injuring or flattening raceway. Raceways 1-inch trade size and larger shall utilize factory formed fittings where bends are 45-degrees or larger. Minor offsets are permitted to be filed bent. All bends in conduits serving low-voltage systems shall not have bend radii less than 10-times the nominal conduit size.

G. Support raceways with heavy-duty, one-hole, pressed steel straps on interior surfaces. Support pendant mounted raceways on 1/4" rod with pear-shaped hanger (up to 2” pipe size) or trapeze type hanger with 3/8” rod, 1-5/8” square preformed channel. Conduit support system shall be dedicated and isolated from other systems and ceiling supports or tees. Conduit installations shall not use ceiling type wire and clips as support system.

H. Anchor all electrical work securely to structure using fasteners approved by a Washington State Licensed Structural Engineer for the types of structure encountered.

I. Anchor to frame structure by means of sheet metal screws. Fasten to structural walls with lead anchors or steel expansion shells and threaded bolts or screws with slotted heads. Fasten to architectural or masonry walls with toggle bolts or molley screws. Deviation from these methods must be approved prior to installation.

J. Furnish anchor bolts and anchorage items as required, and field check to insure proper alignment and location. Provide templates, layout drawings, and supervision at the job site to ensure correct placing of anchorage items in concrete. Check embedded items for correctness of location and detail before concrete is placed.

K. Control erection tolerance requirements to not impair the strength, safety, serviceability, or appearance of installations, as approved by the Engineer. Determine exact location of conduit. Route all conduit parallel to building lines.

L. Hot-dip galvanize all exterior support hardware after fabrication.

M. Install individual conductors in conduits, raceways, ducts, and trenches to complete the wiring systems.

N. Install switches and cover plates complete in a neat manner in accordance with the NEC and local codes.

3.03 WIRE AND CABLE

A. Branch circuits shall be #12 AWG minimum.

B. Branch circuit wiring size #10 AWG and smaller shall have continuous color code identification per standard listed below. Tin all stripped ends of wiring #10 AWG and smaller prior to termination under set screws.

C. Use no mechanical means for pulling wires, and no lubricant except powdered soapstone or approved substitute.

D. Branch circuit splices may be made with 3M Scotch-Lok Electrical Spring type connectors up to #8 AWG size, except motor connections.

E. Utilize crimp-type pressure connectors insulated with tape or pre-fabricated covers on motor connections and splices of wiring #6 AWG and larger.

F. Make no splices in home runs.

G. Do not inter-mix wiring from separate raceway systems unless specifically permitted by the Engineer.

H. Color Coding Standards:

3Ø, 4 Wire System:	208Y/120V	480Y/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

Control Wiring: Grey or black with identifying wire numbers at each termination

Color-coded Tape: May be used in lieu of color-coded insulation for conductors #8 AWG and larger. However, the insulation shall be black only and shall be tape-identified with color scheme shown above at splices, terminations and junction boxes.

I. Each single pole branch circuit shall contain a dedicated neutral conductor and equipment grounding conductor of the same size as the hot conductors. Shared neutral conductors and/or multi-pole breakers used on single pole loads are not permitted.

J. All wiring shall be identified with permanent wire labels, using alphanumeric designations. All terminations and splices shall be identically labeled for the same wire (i.e. common conductors

terminated in multiple locations). Wire labels shall agree with the circuit designations on the as-built drawings. Provide Thomas and Betts, Brady, or equal, printed plastic adhesive tapes to show circuit numbers. Wrap tapes at least two turns around conductor.

K. All conductors of a circuit, including the neutral and equipment grounding conductors must be installed together in the same raceway, cable, trench, cord, or cable tray, except as permitted by NEC Section 300.3 (B) (1) through (4)

L. Identify conductors in outlets, pullboxes, and similar locations where conductors are accessible.

M. Conductors in panels, cabinets, and enclosures: Provide neat and workmanlike installation with conductors tied with T&B Ty-Rap, or equal, nylon wire ties. Provide adhesive back nylon Ty-Rap 4-way bases (#TC200X200AX or equal) to group conductors in neat and orderly manner.

N. Low voltage wiring and cables specified herein by Divisions 26 shall be installed either in complete raceway system or shall be plenum rated.

3.04 WIRING DEVICES

A. Installation: Install two or more wiring devices shown in one location under a common plate. Install plates with edges in continuous contact with finished wall surfaces. Do not install more than one device in single-gang position.

B. Device Locations: Device or equipment mounting height given herein the Specifications, Contract Drawings, and/or documents are intended to provide general guidelines. Provide pre rough-in coordination and verification with other divisions. Verify that the intended mounting heights are appropriate for the intended device use, and the device location is not in conflict with other components.

C. Prior to rough-in, devices and equipment locations may be revised by the Owner's Representative within 20' of the designed contract location, at no cost. Prior to rough-in, confirm locations with Owner for devices they may wish to have relocated from the location indicated on the contract drawings.

D. If the contractor fails to provide such coordination and field verification and results of erroneous installation, the contractor shall remedy such installation per Owner Representative's direction, at contractor's cost.

E. Provide GFCI protection for receptacles requiring GFCI protection per NEC Article 511.

F. Mount wiring devices above finished floor to centerline of device as follows, unless noted otherwise or as directed by Owner's Representative.

Switches	42-inches
Receptacles	18-inches

3.05 BOXES

A. Support boxes securely and independently.

B. Mount boxes on building surfaces or support with trapeze hanger.

C. Do not use junction boxes unless the number of bends, pulling length or circuit requirement necessitates their installation.

D. Junction or pull box openings must be accessible.

E. Do not use extension rings to provide Code size space within a new junction box. Provide larger junction boxes as required in lieu of extension rings.

F. Do not intermix raceways and wiring at common junction boxes except at terminal equipment connections.

3.06 GROUNDING

A. General: Provide system and equipment grounding in accordance with the applicable codes and ordinances and as further amplified on the Drawings.

B. Ground service equipment, separately derived systems, conduits, devices and equipment in accordance with NEC, Article 250.

C. Grounding Conductor: Provide green insulated equipment grounding conductor in conduits containing wiring systems above 50 volts. Insulation and conductor type shall be the same for circuit or feeder conductors. Size conductors in accordance with NEC Article 250.

D. Bonding: All conduit systems shall be effectively grounded and bonded together by approved bonding means in accordance with the NEC. Verify ground continuity between conduits, boxes, receptacles, and equipment.

E. Inspection: Place no backfill around grounding system until it has been inspected by the Engineer, Electrical Inspector, and Owner’s Representative.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01 and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Section Includes:

1. Copper building wire rated 2000 V or less.

2. Metal-clad cable, Type MC, rated 2000 V or less.

3. Armored cable, Type AC, rated 600 V or less.

4. Connectors, splices, and terminations rated 2000 V and less.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

2. Product Data: For solvents and adhesives, indicating VOC content.

3. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: Indicate type, use, location, and termination locations.

1.04 INFORMATION SUBMITTALS

A. Qualification Data: For manufacturer’s authorized service representative.

B. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 – PRODUCTS

2.01 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 2000 V or less.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Service Wire Co. or a comparable product by one of the following:

1. Alpha Wire Company.

2. American Bare Conductor.

3. Belden Inc.

4. Cerro Wire LLC.

5. Encore Wire Corporation.

6. General Cable Technologies Corporation.

7. Okonite Company.

8. Southwire Company.

9. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. RoHS compliant.

3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide".

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type NM: Comply with UL 83 and UL 719.

2. Type RHH and Type RHW-2: Comply with UL 44.

3. Type USE-2 and Type SE: Comply with UL 854.

4. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.

5. Type THHN and Type THWN-2: Comply with UL 83.

6. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

7. Type UF: Comply with UL 83 and UL 493.

8. Type XHHW-2: Comply with UL 44 and dual rated for 600 volt and 1,000 volt.

2.02 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath, rated 600 V.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Service Wire Co., or a comparable product by one of the following:

1. AFC Cable Systems; a part of Atkore International.

2. Alpha Wire Company.

3. American Bare Conductor.

4. Belden Inc.

5. Encore Wire Corporation.

6. General Cable Technologies Corporation.

7. Okonite Company.

8. Southwire Company.

9. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Comply with UL 1569.

3. RoHS compliant.

4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide".

D. Circuits:

1. Single circuit and multicircuit with color-coded conductors.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel, interlocked.

I. Jacket: PVC applied over armor.

2.03 ARMORED CABLE, TYPE AC

A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.

2. Alpha Wire Company.

3. American Bare Conductor.

4. Belden Inc.

5. Cerro Wire LLC.

6. Encore Wire Corporation.

7. General Cable Technologies Corporation.

8. Okonite Company.

9. Southwire Company.

10. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. RoHS compliant.

3. Comply with UL 4.

4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide".

D. Circuits:

1. Single circuit and multicircuit with color-coded conductors.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: insulated.

G. Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.

H. Armor: Steel, interlocked

2.04 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Basis-of-Design Product: Subject to compliance requirements, provide Service Wire Co. or a comparable product by one of the following:

1. 3M Electrical Products.

2. AFC Cable Systems; a part of Atkore International.

3. Gardner Bender.

4. Hubbell Power Systems, Inc.

5. Ideal Industries, Inc.

6. ILSCO.

7. NSi Industries LLC.

8. O-Z/Gedney; a brand of Emerson Industrial Automation.

9. TE Connectivity Ltd.

10. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.

2. Type: One hole with standard barrels.

3. Termination: Compression.

PART 3 – EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper solid for No. 16 AWG and smaller, stranded for No. 14 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. VFC Output Circuits Cable: Flexible stranded for all sizes.

E. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

F. PV Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2 single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 “Raceways and Boxes for Electrical Systems” prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer’s recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 “Hangers and Supports for Electrical Systems”.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer’s written requirements. Provide documentation of the torque connections to engineer for closeout documentation. If values do not match manufacturer recommendation, contractor to provide additional torqueing and provide documentation that the requirements have been adhered to. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6-inches of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 “Identification for Electrical Systems”.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve-seals at penetrations of exterior floor and wall assemblies.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. After installing conductors and cables and before electrical circuitry has been energized, test conductors feeding any critical equipment as deemed critical by the Owner's Representative.

3. Perform each of the following visual and electrical tests:
   a. Inspect exposed sections of conductors and cables for physical damage and correct connections according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:
      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.
   c. Inspect compression-applied connectors for correct cable match and identification.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.
   f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
   g. Continuity test on each conductor and cable.
   h. Uniform resistance of parallel conductors.

4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to a portable scanner. Correct deficiencies determined during scan.
   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record of device.
   b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

5. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

D. Cables will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports to record the following:

1. Procedures used.

2. Results that comply with requirements.

3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01 and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Provide a complete grounding system that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

B. Provide all components necessary to complete the grounding system(s) consisting of:

1. Metal underground water pipes.

2. Metal frame of buildings.

3. Rod electrodes.

4. Building ground rings.

5. Ground bars.

6. Additional grounding and bonding components required.

7. Ground rod access (test) wells.

C. Performance Requirements: Maximum 5-ohms grounding system resistance.

1.03 REFERENCES

A. NFPA 70 – National Electrical Code (NEC); National Fire Protection Association; Most recent edition adopted by the Authority Having Jurisdiction, including all applicable amendments and supplements.

1.04 SUBMITTALS

A. Product Data: Provide manufacturers catalog cuts for grounding electrodes, conductors, and connections.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of the Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Cooper Power Systems.

B. Storm Copper Components Co.

C. Harger.

D. Or other reviewed and approved Manufacturers.

2.02 GROUND RODS

A. Minimum size: 5/8” diameter by 8’-0” long, copper clad steel rods.

2.03 GROUND ROD TEST WELLS

A. Minimum size: 12” diameter by 24” long, schedule 40 PVC with belled hub.

B. Cover type: Flat steel with identification nameplate “GROUND TEST WELL”.

2.04 GROUND BARS

A. Copper bar with pre-punched holes.

B. UL recognized standoff insulators for wall mounting.

C. Stainless steel mounting brackets, stainless steel assembly bolts and lock washers.

D. Suitable for indoor and outdoor installations.

E. Size as required.

2.05 GROUND CONDUCTORS

A. Grounding conductors shall be soft drawn, bare, stranded copper unless otherwise noted. Size as shown on the plans and per NEC, Article 250.

1. Grounding Electrode Conductors for AC Systems:
   a. See NEC Table 250.66.

2. Equipment Grounding Conductors:
   a. See NEC Table 250.122.

b. Equipment grounding conductors may be insulated; provide green insulation and/or approved permanent identification for conductors larger than #6 AWG.

2.06 GROUND ELECTRODE CONNECTORS

A. Connectors for grounding electrode conductor to ground rod shall be of thermal fusion type; conductor-to-conductor connections may be either thermal fusion or approved hydraulically applied compression type.

2.07 GROUNDING BUSHINGS

A. Grounding bushings shall be matched to the ampacity of the grounding conductor and shall have approved set-screw type grounding lug connectors.

2.08 GROUNDING CONNECTORS

A. Shall meet the requirements of ground bushings, cast, set-screw, or bolted type.

B. Clamps shall be matched to the ampacity of the grounding conductor. Provide approved raceway hub where grounding conductor is shown protected by conduit or armored cable. Clamps shall be U-bolt type for connection to water pipes.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

C. Prior to making mechanical or thermal connections, all conductors shall be clean, dry and bright with the bonding surface thoroughly cleaned of any oxides, mill, scale, or other foreign matter.

3.02 INSTALLATION

A. Provide system and equipment grounding in accordance with the applicable codes and ordinances and as indicated on the Plans.

B. Ground service equipment, separately derived systems, conduits, devices, and equipment in accordance with NEC, Article 250.

C. Grounding Conductor: Provide green insulated equipment grounding conductor in conduits containing wiring systems above 50V. Insulation and conductor type shall be the same for circuit or feeder conductors. Size conductors in accordance with NEC Article 250.

D. Inspection: Place no backfill around made electrode earth grounding systems until the installation is inspected and approved by the Owner’s Representative and Electrical Inspector.

E. Bonding: Conduit systems shall be effectively grounded and bonded together by approved bonding means in accordance with the NEC. Verify ground continuity between conduits, boxes, receptacles, and equipment.

F. Install ground electrodes at locations indicated on Plans or required by NEC.

1. Unless otherwise indicated, top of electrode shall be 6” below finished surface.

2. Bury electrode conductors below finished surface.

G. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.

H. Provide bonding to meet requirements described in Section 1 of this Specification.

3.03 GROUND CONTINUITY

A. Maintain ground continuity throughout the entire electrical system.

B. Permanently connect the electrical system neutral to the water service. The system shall be grounded only at transformer secondaries and at the main switchboard. Branch panel neutrals must be isolated from additional points of grounding.

C. Provide approved grounding bushings or locknuts on all conduits terminating in panelboards, pullboxes, or other enclosures to insure continuity of conduit grounding connections.

D. Securely ground lighting fixtures via the conduit system or by a separate suitable grounding conductor where flexible conduit is used.

E. Provide a separate grounding conductor in all non-metallic conduits and in all flexible metallic conduit runs. Connect to the grounding system in an approved manner.

F. All plug-in receptacles shall be bonded to the box and raceway ground system unless specific isolated ground connections are shown on the Drawings.

3.04 GROUND CONNECTIONS

A. All grounding connections shall be carefully made to insure low system impedance. Locate grounding connections to allow future servicing and expansion.

3.05 PROTECTION

A. Ground conductors shall be protected from mechanical injury during construction. Provide protective coverings or rigid non-ferrous conduit.

3.06 GROUND RODS

A. Ground rods shall be driven into undisturbed soil to full depth. Provide additional rods, ionic salt solutions and the like where special low-resistant grounds are specified.

3.07 THROUGH-SLAB GROUND PENETRATIONS

A. Ground conductors extending through the slab shall be protected by a rigid conduit sleeve; the void portion of the sleeve shall be packed with a non-hardening type duct seal.

3.08 HIGH VOLTAGE CABLE GROUNDS

A. Metallic shielding components, such as tapes, wires or braids, and their associated conducting or semi-conducting components shall be grounded per NEC Article 250. Ground terminations shall be made according to the manufacturer's written specifications.

3.09 TESTING

A. Measure the Ohmic value of the electrical service entrance metallic "Electrical System Ground" with reference to "Earth Ground" using the "Multiple Ground Rods" method and suitable instruments. Maximum resistance to ground shall be less than 5 ohms. If this resistance cannot be obtained, notify the Owner's Representative in writing.

B. Provide a paper copy of the test results and in the record O&M Manuals.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
   a. Slotted support systems, hardware, and accessories.
   b. Clamps.
   c. Hangers.
   d. Sockets.
   e. Eye nuts.
   f. Fasteners.
   g. Anchors.
   h. Saddles.
   i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.

2. Slotted support systems.

3. Equipment supports.

4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.

2. Include design calculations for seismic restraints.

1.04 INFORMATION SUBMITTALS

A. Coordination Drawings. Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ductwork, piping, fittings, and supports.

2. Structural members to which hangers and supports will be attached.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.05 QUALITY ASSURANCE

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

1. AWS D1.1/D1.1M.

2. AWS D1.2/D1.2M.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements", to design hanger and support system.

B. Seismic Performance for Electrical Component Supports located within structures falling under seismic design categories C, D, E, and F: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event".

2. Component Importance Factor: 1.5.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.

2. Self-extinguishing according to ASTM D 635.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch diameter holes at maximum of 8 inches o.c. in at least one surface.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Gripple, Inc., pipe support and hanging systems, or comparable products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. B-line, an Eaton business.
   c. ERICO International Corporation.
   d. Flex-Strut Inc.
   e. GS Metals Corp.
   f. G-Strut.
   g. Haydon Corporation.
   h. Metal Ties Innovation.
   i. Thomas & Betts Corporation; A Member of the ABB Group.
   j. Unistrut; Part of Atkore International
   k. Wesanco, Inc.

2. Pipe Bracket Kit Description: Pipe Bracket (PB1FT / PB2FT / PB3FT / PB4FT) and Universal (GC2-T) clamps or Compact (GC2-C) clamps. Manually assembled in the field to support multiple parallel pipes.

3. Approvals: ISO 17025, MSS-SP 58, IAPMO/ANSI UPC 1-2012, UL 2239, and UL 2043.

4. Material for Channel: Pregalvanized steel G90 (Z275).

5. Channel Width: Selected for applicable load criteria. Default is 1-3/4 inches.

6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cooper Industries, Inc.
   b. Flex-Strut Inc.
   c. Haydon Corporation
   d. MKT Metal Manufacturing
   e. Thomas & Betts Corporation; A Member of the ABB Group.
   f. Unistrut; Part of Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

3. Channel Material: 6063-T5 aluminum alloy.

4. Fittings and Accessories Material: 5052-H32 aluminum alloy.

5. Channel Width: selected for applicable load criteria. Defaults are: 1-5/8 inches or 1-1/4 inches.

6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch diameter holes at a maximum of 8 inches o.c., in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. B-line, an Eaton Business.
   c. Fabco Plastics Wholesale Limited.
   d. G-Strut.
   e. Haydon Corporation.
   f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

3. Channel Width: Selected for applicable load criteria. Defaults are: 1-5/8 inches or 1-1/4 inches.

4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.

5. Fitting and Accessory Materials: Same as those for the channels and angles, except metal items may be stainless steel.

6. Rated Strength: Selected to suit applicable load criteria.

7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: Steel and malleable iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Gripple, Inc.; adjustable clamp and pipe bracket system for suspension of conduits 4-inch and smaller, or comparable products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. B-line, an Eaton Business.
   c. Fabco Plastics Wholesale Limited.
   d. G-Strut.
   e. Haydon Corporation.
   f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.

2. Wire Rope Type 1: High tensile steel wire rope, to ASTM A1023/1023M, class A zinc coating; 7 by 7 and 7 by 19 cross-sectional construction; having a tensile strength of 256,000 psi; lengths, diameters, and wire construction as indicated on Shop Drawings. Cables are pre-cut lengths with fused ends. Pre-made end attachments are available depending on the application.

3. Wire Rope Type 2: High tensile steel wire rope, to ASTM A492, Type 316 stainless steel, 7 by 7 cross-sectional construction; having a tensile strength of 256,000 psi; lengths, diameters, and wire construction as indicated on Shop Drawings. Cables are pre-cut lengths with fused ends. Pre-made end attachments are available depending on the application.

4. Y-Fit: Two wire ropes, arranged to form two leg attachment points at one end with a ferrule. Factory-crimped with a 30-ton hydraulic press. For loads up to 200 lbs (5:1 safety factor).

5. Adjustable Fastener Type 1: One-piece die cast type ZA2 zinc two-channel housing; encasing a series of Type 302 stainless-steel springs with serrated self-locking steel wedges, adjustable with setting key or integrated mechanism; UV stabilized homopolymer polypropylene end caps. Sizes as indicated on Shop Drawings. Safe working load (SWL) with 5:1 safety factor. Gripple model HF/XP Adjustable Fastener.

6. Adjustable Fastener Type 2: One-piece Type 316 stainless-steel two channel housing to ASTM A167; encasing a series of Type 302 stainless-steel springs with serrated self-locking ceramic wedges, adjustable with setting key; Type 316 A4 stainless-steel end caps. For load of 200 lb or 500 lb. SWL with 5:1 safety factor. Model: Gripple No. 3 or 4 Stainless Steel Adjustable Fastener.

7. Adjustable Fastener Type 3: One-piece die cast type ZA2 zinc one-channel housing; encasing a series of Type 302 stainless-steel springs with serrated self-locking ceramic wedge adjustable with setting key; Type 316 A4 stainless-steel end caps. For load of 200 lb or 500 lb. SWL with 5:1 safety factor. Model: Gripple No. 3 or 4 Stainless Steel Adjustable Fastener.

8. Adjustable Fastener Type 4: One-piece die cast type ZA2 zinc one-channel housing; encasing a series of Type 302 stainless-steel springs with serrated self-locking steel wedge, adjustable with integrated mechanism; UV stabilized homopolymer polypropylene end caps. Sizes as indicated on Shop Drawings. SWL with 5:1 safety factor. Gripple model STZ2/TZ3 Adjustable Fastener.

9. Adjustable Fastener Type 5: Mild steel (type EN1A), bright zinc plated, one-channel body; encasing a series of Type 302 stainless-steel springs with serrated self-locking grade 40 chrome steel balls, adjustable by means of an integrated mechanism, capable of accommodating load of 100 lb, 200 lb, or 500 lb as required. Model No. 2, 3, or 4 Trapeze Plus Adjustable Fastener.

10. Adjustable Fastener Type 6: One-piece die cast type ZA2 zinc two-channel housing; encasing a series of Type 302 stainless-steel springs with serrated self-locking ceramic rollers, adjustable with setting key and extra allen key locking mechanism; UV stabilized homopolymer polypropylene end caps. UL/CSA listed. Manufactured in an ISO 9002 facility. Sizes as indicated on Shop Drawings. SWL with 5:1 safety factor. Gripple Lockable Plus Adjustable Fastener.

11. Adjustable Fastener Type 7: Bright nickel-plated, type ZA2 zinc housing; encasing a Delrin 511P NC010 spring with self-locking brass roller, adjustable with integrated mechanism. For loads up to 30 lb. SWL with 5:1 safety factor. Model: Gripple Angle Hanger Family

12. End Fixing Type 1: Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit (loop, stud, toggle, hook, 90-degree eyelet, or shot fire).

13. End Fixing Type 2 (C-Clip): Zinc ZA2 for load of 100 lb (Gripple No. 2). C-Clip: 1/8 inch or ¼ inch with crimped loop fastener. Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

14. End Fixing Type 2 (Shot Fire Ceiling Clip and Pin): Galvanized steel pin and clip for load of 25 lb (Gripple No. 1) or 100 lb (Gripple No. 2). Shot Fire: C925 with crimped loop fastener. Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

15. End Fixing Type 3 (Eyelag): Galvanized steel eyelag screw for load of 25 lb (Gripple No. 1) or 100 lb (Gripple No. 2). Eyelag: ELD with crimpled loop fastener. Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

16. End Fixing Type 4 (Swivel Toggle): Zinc-plated steel, 1-1/2 inches, for load of 100 lb (Gripple No. 2) or 200 lb (Gripple No. 3). Swivel Toggle: Gripple Spider/MDI. Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

17. End Fixing Type 5 (Loop Ferrule): Type 316 stainless-steel, ASTM A167, 1/2 inch by 5/16 inch, for load of 100 lb (Gripple No. 2) or 200 lb (Gripple No. 3). Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

18. End Fixing Type 6 (Toggle Plate and Endstop): Type 304/A2 stainless-steel, 1/4 inch thickness, 5/16 inch by 1-9/16 inch, for load of 100 lb (Gripple No. 2). Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

19. End Fixing Type 7 (Threaded Stud): Type 304/A2 stainless-steel, 1/4 – 20 (M6 x 1) threaded rod, for load of 100 lb (Gripple No. 2) or 200 lb (Gripple No. 3). Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

20. End Fixing Type 8 (Hook Stud): Type 304/A2 stainless-steel, 1/4 inch thickness, 5/8 inch by 3 inches, for load of 100 lb (Gripple No. 2). Mechanically-spliced wire rope with factory end fixing using a 30-ton hydraulic press; to accommodate the design load and safety factor of the fastener kit.

21. End Fixing Type 9 (Barrel): Zinc-plated steel with aesthetic fixing for use with up to 1/4 inch or 3/8 inch threaded anchor, for load of 200 lb. SWL with 5:1 safety factor.

E. Accessories:

1. Cable Basket Adaptor: Galvanized steel adaptor for load of 100 lb (Gripple No. 2), to suspend cable basket with wire diameter up to 1/4 inch.

2. Y-Fit: Two wire ropes, arranged to form two leg attachment points at one end with a ferrule. Factory-crimped with a 30-ton hydraulic press. For loads of 50 lb (Gripple No. 1), 100 lb (Gripple No. 2) or 200 lb (Gripple No. 3).

3. Karabiner: Galvanized steel karabiner for load of 200 lb with 5:1 safety factor, to suspend cable basket.

4. G-Bracket: Cold formed mild steel bracket (BS EN 10346:2009 DX51D) with slots to support cable trays, for load up to 100 lb (SWL with 3:1 safety rating), compatible with Y-fit range.

5. GF Bracket: Ductile iron with hot dip galvanized finish. Bracket for clamping onto wide flange beam section, suitable for 1/4 inch to 1/2 inch flange thickness, and for use with 1/2 inch diameter threaded rod supplied by others.

F. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedge plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

H. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti, Inc.
      2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert wedge type, zinc-coated or stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) B-line, an Eaton business.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti, Inc.
      4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All stainless-steel springhead type.

7. Hanger Rods: Threaded steel.

PART 3 – EXECUTION

3.01 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.

2. NECA 101.

3. NECA 102.

4. NECA 105.

5. NECA 111.

B. Comply with requirements for raceways and boxes specified in Section 260533 “Raceways and Boxes for Electrical Systems”.

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25-percent in the future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Section.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not us for anchorage to lightweight-aggregate concrete for slabs less than 4 inches thick.

6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or spring-tension clamps.

7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10-bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 “Cast-in-Place Concrete”.

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer’s setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer’s written instructions.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with manufacturer requirements for painting as required for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01 and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.

2. Nonmetal conduits, tubing, and fittings.

3. Metal wireways and auxiliary gutters.

4. Boxes, enclosures, and cabinets.

5. Handholes and boxes for exterior underground cabling.

1.03 DEFINTIONS

A. ARC: Aluminum rigid conduit.

B. EMT: Electrical metallic tubing.

C. GRC: Galvanized rigid steel conduit.

D. IMC: Intermediate metal conduit.

1.04 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways, nonmetallic wireways and surface raceways and for each color and texture specified, provide 12-inch long sample(s).

1.05 INFORMATION SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 – PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.

2. Allied Tube & Conduit.

3. Anamet Electrical, Inc.

4. Electri-Flex Company.

5. FSR Inc.

6. O-Z/Gedney; and EGS Electrical Group brand.

7. Patriot Aluminum Products, LLC.

8. Picoma Industries.

9. Republic Conduit.
10. Robroy Industries.
11. Southwire Company.
12. Thomas & Betts Corporation, A Member of the ABB Group.
13. Western Tube and Conduit Corporation.
14. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. FMC: Comply with UL 1; zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel.
   b. Type: Compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX INC.
5. CertainTeed Corporation.
6. Condux International Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions.
10. Niedax Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation, A Member of the ABB Group.

B. Listing and labeling: Nonmetallic conduits, tubings, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651B.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 1684A and NEMA TC 14.

J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

M. Solvent cements and adhesive primers shall comply with the testing and product requirements as required for approval from the AHJ.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.

2. Hoffman; a brand of Pentair Equipment Protection.

3. MonoSystems, Inc.

4. Square D.

5. Wiegmann; division of Hubbell Incorporated.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be NEMA-3R and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged Type, unless otherwise indicated.

E. Finish: Manufacturer’s standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; steel boxes or comparable product by one of the following:

1. Adalet.

2. Cooper Technologies Company.

3. EGS/Appleton Electric.

4. Erickson Electrical Equipment Company.

5. FSR Inc.

6. Hoffman; a brand of Pentair Equipment Protection.
7. Kraloy.
8. Milbank Manufacturing Co.
9. MonoSystems, Inc.
10. Oldcastle Enclosure Solutions.
11. O-Z/Gedney; an EGS Electrical Group brand.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation, A Member of the ABB Group.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing up to 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are allowed.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous hinge cover with flush latch unless otherwise indicated. Enclosures outside or interior wet locations shall be NEMA Type 3R.

1. Metal Enclosures: Steel finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic or fiberglass.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Enclosures outside or interior wet locations shall be NEMA Type 3R.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.05 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. NewBasis.
   d. Oldcastle Precast, Inc.
   e. Quazite: Hubbell Power Systems, Inc.
   f. Synertech Moulded Products.

2. Standard: Comply with SCTE 77.

3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

4. Cover: Cobalt SSL Anti-theft Vault Lid. Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molding lettering, “ELECTRIC” or “SYSTEMS”.

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 inches wide by 24 inches long and larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.06 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied:

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 – EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.

2. Concealed Conduit, Aboveground: EMT.

3. Underground Conduit: RNC, Type EPC-40-PVC. Concrete encased under roadways and streets, or areas subject to vehicular traffic.

4. Connection to vibrating equipment (Including transformers and hydraulic, pneumatic, electric solenoid, or motor-driven equipment): LFMC.

5. Boxes and enclosures, aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, not subject to physical damage: EMT.

2. Exposed, not subject to severe physical damage: EMT.

3. Exposed, and subject to severe physical damage: GRC. Raceway locations include the following:
   a. Loading docks.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical Rooms.
   d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to vibrating equipment (Including transformers and hydraulic, pneumatic, electric solenoid, or motor-driven equipment): FMC, except use LFMC in damp or wet locations.

6. Damp or Wet Locations: GRC.

7. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4 inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this Section are stricter. Comply with NECA 102 for aluminum conduits.

Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 “Hangers and Supports for Electrical Systems” for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slabs.

F. Install no more than the equivalent of four (4) 90-degree bends in any conduit run except for control wiring circuits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer’s written instructions.

J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways as designated as spare above grade alongside raceways in use.

Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.

3. Where otherwise required by NFPA 70.

S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment, including light fixtures, subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

X. Locate boxes so that cover or plate will not span different building finishes.

Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 310000 “Earthwork” for pipe less than 6 inches in nominal diameter

2. Install backfill as specified in Section 310000 “Earthwork”.

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 310000 “Earthwork”.

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Section 260553 “Identification for Electrical Systems”.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.06 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 41
UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, Division 26, Division 27, and Division 28.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. This Section includes the requirements for trenching, backfilling, and installation of underground conduits, ducts, and ductbanks, and the design, fabrication, delivery and installation of pullboxes, handholes, vaults, and manholes.

1.03 RELATED SECTIONS

A. Division 03 “Concrete”.

B. Division 31 “Earthwork”.

C. Division 26 Section “Grounding and Bonding”.

D. Division 26 Section “Hangers and Supports for Electrical Systems”.

E. Division 26 Section “Raceways and Boxes”.

F. Division 26 Section “Low-Voltage Electrical Power Conductors and Cables”.

G. Division 26 Section “Medium-Voltage Cables”.

H. Division 27 Section “Basic Materials and Methods for Communication Systems”.

1.04 REFERENCES

A. ASTM (American Society for Testing and Materials).

B. NFPA 70 (National Fire Protection Association) – National Electrical Code.

C. ANSI C2 “National Electrical Safety Code”.

1.05 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit catalog cuts for all items proposed to be furnished and installed under this Section.

nittals which shall include the following:

1. Provide product data for accessories for vaults and handholes, conduit, duct, ductbank materials, and miscellaneous components.

2. Shop drawings showing details and design calculations for precast vaults and handholes, including reinforcing steel.

3. Certificate for concrete and steel used in underground precast concrete utility structures, according to ASTM C 858.

4. Inspection report for factory inspections, according to ASTM C 1037.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

C. Provide products listed and classified by Underwriters Laboratories (UL) as suitable for the purpose specified and indicated.

D. Conform to requirements of ANSI C2 "National Electrical Safety Code" for components and installation.

1.07 DEFINITIONS

A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or concrete.

B. Ductbank: Two or more conduits or other raceway installed underground in the same trench or concrete envelope.

C. Handhole: An underground junction box in a duct or ductbank.

D. Vault: An underground utility structure, large enough for a person to enter, with facilities for installing, operating, and maintaining equipment and wiring.

1.08 COORDINATION

A. Coordinate layout and installation of ducts, vaults, and handholes with final arrangement of other utilities as determined by field verification. Revise locations and elevations from those indicated as required to suit field conditions and ensure that duct runs drain to vaults and handholes.

1.09 SAFETY REQUIREMENTS

A. Perform work in accordance with the safety requirements of the Department of Labor Occupational Safety and Health Administration, Volume 36, Number 75, Part II, Subpart P, "Excavations, Trenching, and Shoring", and with Section 7 of the Manual of Accident Prevention in Construction as published by the Association of General Contractors of America, Inc.

B. Educate supervisors and employees on safety requirements and practices to be followed during the course of the work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to the site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store pre-cast concrete units at the site as recommended by the manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support pre-cast concrete units only at designated lifting or supporting points.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manholes, Vaults, and Handholes: Subject to compliance with requirements, provide products by one of the following:

1. Utility Vault Company (OldCastle Precast).

2. Jensen Precast.

3. Hubbell Quazite.

4. Or other reviewed and approved Manufacturers.

2.02 CONDUIT AND DUCTS

A. Metallic Conduit: Rigid Galvanized Steel Conduit (RMC): ANSI C80.1.

B. Non-Metallic Conduit:

1. Rigid PVC Conduit: NEMA TC 2, UL 651A, Schedule 40 and Schedule 80 PVC, sunlight resistant, rated for use with 90 deg C conductors under all installation conditions and UL labeled for underground use, direct burial, or aboveground.

2.03 CONDUIT FITTINGS

A. Steel Fittings: Zinc coated, cast malleable, ferrous metal, threaded fittings, with neoprene cover gasket on each fitting installed outdoors.

B. PVC Conduit and Tubing Fittings: NEMA TC 3.

C. “Mogul Fittings”: Provide “Mogul” size fittings for all conduit.

D. Seal Bushings: Compound filled bushing on each conduit entering a building from outside underground and on each conduit passing from one space into another, which is normally at a lower temperature.

E. Hubs: Appleton “Hub”, “Hub-U” Series, Thomas & Betts “370” Series, or approved equal hub on each conduit terminating in a box where a hub was not previously provided.

F. Unions: Three piece threaded conduit unions where necessary.

2.04 DUCT SUPPORTS

A. Rigid PVC spacers selected to provide 3-1/2 inch minimum duct spacing or as indicated on Drawings.

2.05 PULLBOXES

A. Cast Metal Boxes: Cast aluminum, sized as indicated on drawings or per codes, with outside flanges and recessed, gasketed cover for flush mounting. Non-skid finish on cover with legend reading “ELECTRIC”, “COMMUNICATIONS”, or “SIGNAL” as appropriate. Provide traffic-rated, H20 minimum loading, in areas subject to vehicle traffic or access drives.

2.06 HANDHOLES

A. General: Pre-cast concrete or structural plastic with the following standard features:

1. Cover with insert or other device to facilitate lifting.

2. Cover with locking devices similar to REA or FARGO.

3. Drain hole in base, 2 inch minimum diameter.

4. Knockouts in sides of adequate number and spacing to accommodate ductbank shown on Drawings.

B. Exterior Lighting: Reinforced plastic mortar designed and tested to temperatures of -50 degrees F meeting ASTM D635-91 flammability test.

C. Handhole Covers: Reinforced concrete, cast iron, or structural plastic, capable of supporting designed loads. Where located in roadways or traffic areas, covers shall be designed to support H20 minimum loading. Cast iron cover with cast-in-legend “ELECTRIC”, “COMMUNICATIONS”, or “SIGNAL” as appropriate. Machine cover-to-frame bearing surfaces.

2.07 MANHOLES AND VAULTS

A. Pre-Cast Concrete Units: Interlocking, mating sections, complete with accessory items, hardware, and features as indicated on Drawings. Include concrete knockout panels for conduit entrances and sleeves for ground rods.

B. Covers: As indicated on Drawings. Reinforced concrete or cast iron, capable of supporting designed loads. Where located in roadways or traffic areas, covers shall be designed to support H20 minimum loading. Cast iron cover with cast-in-legend “ELECTRIC”, “COMMUNICATIONS”, or “SIGNAL” as appropriate. Machine cover-to-frame bearing surfaces.

C. Design structure according to ASTM C 858.

D. Joint Sealant: Continuous extrusion of asphaltic butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand the maximum hydrostatic pressures at the installation location with the ground water level at grade.

E. Source Quality Control: Inspect structures according to ASTM C 1037. Units shall be capable of supporting designed loads.

2.08 ACCESSORIES

A. Duct Supports: Rigid PVC spacers selected to provide 3-1/2 inch minimum duct spacings and concrete cover depths as indicated on the Drawings, while supporting ducts during concrete pour.

B. Manhole/Vault Lifting Means:

1. Pulling Eyes in Walls: Eyebolt with reinforcing bar fastening insert. 2-inch diameter eye, 1 inch by 4 inch bolt. Working load with 6 inch embedment in 4000 psi concrete: 13,000 pounds minimum tension.

2. Pulling and Lifting Irons in Floor: 7/8-inch diameter, hot dipped galvanized, bent steel rod, stress relieved after forming, and fastened to reinforced rod. Exposed triangular opening. Ultimate yield strength: 40,000 pounds shear and 60,000 pounds tension.

C. Sump Frame and Grate: Comply with FS RR-F-621, Type-VII for frame and Type-I for cover.

D. Bolting Inserts for Cable Racks: Flared, threaded inserts of non-corrosive, chemical resistant, non-conductive thermoplastic material 36-inches on center; 1/2-inch internal diameter by 2-3/4 inches deep, flared to 1-1/4 inch minimum at base. Tested ultimate pull-out strength: 12,000 pounds minimum.

E. Expansion Anchors for Installation after Concrete is Cast: Zinc plated carbon steel wedge type with stainless steel expander clip, 1/2-inch bolt size, 5300-pound rated pull-out strength, and 6800-pound rated shear strength minimum.

F. Cable Racks: Non-metallic cable rack stanchion, 36-inch high X 4-inch wide, yellow Glass Reinforced Polymer, elongated mounting holes.

G. Cable Arms: Non-metallic cable rack arms. Size and weight capacity in accordance with manufacturer’s load rating.

H. Cable Support Insulators: High glaze, wet process porcelain arranged for mounting on cable arms.

I. Ground Rods: Solid copper clad steel, 3/4-inch diameter by 10-feet length or as indicated on Drawings.

J. Ground Wire: Stranded bare copper, #4/0 AWG minimum or as indicated on the Drawings.

K. Duct Sealing Compound: Non-hardening, safe for human skin contact, not deleterious to cable insulation, workable at temperatures as lows as 35 deg F withstands temperature of 300 deg F without slump, and adheres to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals.

2.09 DUCTBANK CONCRETE

A. Ductbanks below roads, driveways, and anywhere where vehicles will travel shall be installed in concrete. Ductbanks entering buildings shall be installed in concrete within 10-feet of building.

B. Material:

1. Gravel: 3/8-inch maximum.

2. Slump: 4-inch maximum.

3. Compressive Strength: 3,000 psi at 28-days.

4. Color: Dye ductbank concrete red.

5. Reinforcing (except when RMC is used): Steel conforming to ASTM A15. Provide No. 4 rebar top and bottom, 24-inch lap at splices (typical 4 places) and No. 4 at 18-inches on center around perimeter with 3-inch minimum cover. Ductbank crossing below wall footings or within line of soil influence below the footing requires No. 4 rebar at 6-inches on center around perimeter.

2.10 BACKFILL MATERIAL

A. Reinforced Concrete Ductbanks: Provide in accordance with Division 31 Section “Earthwork” in locations shown on Drawings:

1. Below Concrete Encasement: 6-inches minimum compacted 5/8-inch minus crushed rock.

2. Above Concrete Encasement: 3-inch minimum sand.

3. Upper Trench:
   a. Areas under Pavement: Controlled Density Fill:
      1) Content: A mixture of Portland cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating, self-consolidating and free flowing material which will result in a hardened, dense, non-settling and excavatable fill. Batch and mix in accordance with Division 03 to provide a flowing, non-segregating mix with a slump between 6-inch and 8-inch.
   b. Areas not under Pavement: Select Native Fill:
      1) Unsaturated excavated earth free of rocks, broken concrete and debris 6-inch and larger, and compacted in 12-inch lifts to prevent settlement.
   c. Provide Underground Warning Tape 3-inches (76 mm) wide polyethylene tape, detectable type colored red with suitable warning label describing buried electrical lines, buried 12-inches below grade.

B. Direct Burial Conduit:

1. Initial Bedding: 3-inches of sand below conduits.

2. Secondary Bedding: Unsaturated excavated earth free of rocks, broken concrete, and debris 2-inches and larger, and compacted to 6-inch minimum above conduits.

3. Upper Trench:
   a. Areas under Pavement: Controlled Density Fill:
      1) Content: A mixture of Portland cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating, self-consolidating, and free flowing material which will result in a hardened, dense, non-settling and excavatable fill. Batch and mix in accordance with Division 03 to provide a flowing, non-segregating mix with a slump between 6-inch and 8-inch.
   b. Areas not under Pavement: Select Native Fill:
      1) Unsaturated excavated earth free of rocks, broken concrete, and debris 6-inch and larger, and compacted in 12-inch lifts to prevent settlement.
   c. Provide Underground Warning Tape 3-inches (76 mm) wide polyethylene tape, detectable type colored red with suitable warning label describing buried electrical lines, buried 12-inches below grade.

C. Material:

1. Gravel: 3/8-inch maximum.

2. Slump: 4-inch maximum.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine site to receive ducts and vaults for compliance with installation tolerances and other conditions affecting performance of the underground ducts and vaults. Do not proceed with installation until unsatisfactory conditions have been corrected and installations have been inspected by WA State Labor & Industries (LnI) Inspectors.

B. Existing Utilities: Locate all existing utilities in the area prior to performing any trenching or excavation work. Coordinate with Civil.

3.02 EARTHWORK

A. Comply with Division 31, Earthwork.

B. Trenching:

1. Comply with OSHA/WISHA safety standards for trenching, including stable slope and shoring requirements.

2. Depth: Refer to drawings for trench depth requirements. Correct points of over-excavation using mechanically compacted backfill to form a smooth trench bottom.

3. Width: Excavate to minimum width consistent with stability of sides.

4. Slope: Slope trenches so that conduit and ducts drain toward vaults and handholes and away from buildings and equipment.

5. Muck Excavation: Where much or unstable material is encountered, over excavate and backfill to attain proper grade with coarse sand, gravel, or controlled density fill.

6. Pile backfill material in an orderly manner; a sufficient distance from the trench to avoid overloading trench banks.

7. Bedding: The entire bottom of the excavation is to be firm, stable, and at uniform density.

C. Excavating for Handholes and Vaults: Provide 12-inch minimum clearance between outer surfaces of unit and embankment or timber used for shoring.

3.03 BACKFILLING

A. See Division 31, Section “Earthwork”.

3.04 RACEWAY APPLICATIONS

A. Refer to Specifications and Drawings for raceway materials.

B. Metallic Conduit: Only use as specified in Division 26, Section “Raceways and Boxes”.

C. Non-Metallic Conduit: Use underground only:

1. Underground in Reinforced, Concrete Encased Ductbanks: Use Schedule 80 Rigid Plastic Conduit as standard (except rigid steel under roadways). Use rigid steel on bends 45 degrees or greater. Use of Schedule 40 PVC Conduit under non-traffic areas is acceptable.

2. Underground Direct Burial: For low voltage applications only where identified on Contract Drawings. Use in reinforced, concrete encased ductbanks: Use Schedule 80 Rigid Plastic Conduit as standard (except rigid steel under roadways). Use rigid steel on bends 45 degrees or greater. Use of Schedule 40 PVC Conduit under non-traffic areas is acceptable.

3. All underground conduit shall be a minimum of 2-inch standard trade size, except as permissible to use 1-inch for exterior lighting, control, etc. as shown in Drawings.

4. Use PVC fittings for PVC conduit and suitable watertight connections where PVC conduit connects to galvanized steel conduit.

5. Galvanized rigid steel conduit installations underground or under concrete slab shall be factory coated with 3-mil bitumastic or protected with 3M Scotchrap pipe primer and Scotchrap 50 (10-mil) spirally applied half-lapped tape.

3.05 CONDUIT AND DUCT INSTALLATION

A. Install conduit and as indicated on Drawings and according to manufacturer’s written instructions.

B. Ductbanks with electric and communications service conduits for Utility Companies service conductors and cables shall be installed in concrete.

C. Ductbanks below roads, driveways, and any locations where vehicles will travel shall be installed in concrete.

D. Ductbanks entering buildings shall be installed in concrete within 10-feet of building.

E. Slope: Pitch ducts minimum of 4-inches per 100 feet to drain toward vaults and handholes and away from buildings and equipment or as indicated on the Drawings. Slope ducts from a high point in runs between (2) vaults to drain in both directions.

F. Curves and Bends: Use manufactured galvanized rigid steel elbows for stub-ups at equipment and at building entrances with a minimum radius of 36-inches. Use long sweep bends with a minimum radius of 25-feet both horizontally and vertically at other locations, not to exceed 20 degrees for field bends or as indicated on the Drawings.

G. Make joints in ducts and fittings watertight according to manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

H. Duct Entrances to Vaults and Handholes: Space end bells approximately 8-inches on center for 4-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end bell spacing 10-feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into vault walls from both sides to provide watertight entrances.

I. Building Entrances: Transition from underground duct to rigid steel conduit 5-feet minimum outside the building wall. Use fittings manufactured for the purpose. Follow appropriate installation instructions below:

    1. Concrete Encased Ducts: Install reinforcing in ductbanks passing through disturbed earth near buildings and other excavations. Provide ductbank support at wall without reducing structural or watertight integrity of building wall.

    2. Direct Buried, Non-encased Duct entering non-waterproofed walls: provide a Schedule 40 galvanized steel pipe sleeve for each duct. Caulk space between the conduit and sleeve with duct sealing compound on both sides for moisture-tight seal.

    3. Waterproofed Wall and Floor Entrances: provide a watertight entrance sealing device with the sealing gland assembly on the inside. Anchor device into masonry construction with one or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight. Manufactured by OZ/Gedney or approved equal.

J. Separation between direct buried, non-encased ducts: Provide 3-inches minimum separation for like services, and 12-inches minimum between power and communication/signal ducts.

K. Concrete Encased Non-Metallic Ducts: Support on plastic separators coordinated with duct size and required duct spacing, and install according to the following:

    1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts at 8-feet maximum, and secure separators to the earth and to ducts to prevent floating

during concreting. Do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concrete: Do not pour concrete until conduit installation has been approved by Owner's Representative and WA State LnI Inspector. Spade concrete carefully during pours to prevent voids under and between conduits and at the exterior surface of the envelope. Do not use power driven agitating equipment unless specifically designed for ductbank application. Pour each ductbank between vaults or other terminations in one continuous operation. When more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18-inches into the concrete on both sides of the joint near the corners of the envelope.

3. Reinforcing: Reinforce ductbanks where they cross disturbed earth.

4. Forms: Use the walls of the trench to form the side walls of the ductbank where the soil is self-supporting and the concrete envelope can be poured without soil inclusions; otherwise, use forms.

5. Minimum Clearances Between Ducts: 3-inches between ducts and exterior envelope wall, 3-inches between ducts for like services, and 12-inches between power and communication/signal ducts, or as indicated on the Drawings.

6. Depth: Install top of ductbank at least 18-inches below finished grade in non-traffic areas and at least 24-inches below finished grade in vehicular traffic areas.

L. Stub-Ups: Use rigid steel conduit for stub-ups through concrete to equipment. Install insulated grounding bushings at the conduit terminations. For equipment mounted on outdoor concrete pads, extend steel conduit a minimum of 4-inches beyond the edge of the pad. Couple steel conduits to the ducts with adapters designed for the purpose and then encase the coupling with 3-inches of concrete.

M. Sealing: Provide temporary closure at all duct terminations in vaults installed on this Project. Use sealing compound and plugs to withstand a minimum of 15 psi hydrostatic pressure.

N. Pulling Wire: Install 100-pound test nylon cord in installed ducts, including spares, or pull rope as indicated on the Drawings.

3.06 MANHOLES

A. Manholes shall be constructed approximately where shown. The exact location of each manhole shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. The location of each manhole shall be approved by the Architect. Manholes shall be the type noted on the Drawings and shall be constructed in accordance with the applicable details as indicated. The top of manhole covers shall be flush with the finished surface of the paving or as noted on the Drawings. In unpaved areas, the top of manhole covers shall be approximately 1/2 inch above the finished grade. Where existing grades that are higher than finished grades are encountered, a sufficient number of courses of brick shall be installed between the top of manhole and manhole frame to elevate temporarily the manhole cover to existing grade level. Where duct lines enter manholes, the sections of duct may be either cast in the concrete or may enter the manhole through a square or rectangular opening of suitable dimensions provided in the manhole walls. Where openings are provided for the entrance of

duct lines, the space between ducts and between ducts and manhole walls shall be calked tight with lead wool or approved equal. A cast metal grille-type sump frame and cover shall be installed over the manhole sump. A cable pulling iron shall be installed in the wall opposite each duct line entrance.

3.07 MANHOLES, VAULTS, AND HANDHOLES INSTALLATION

A. Install as indicated on Drawings according to manufacturer's written instructions, ASTM C 891, and Divisions 03 and 31:

1. Install units plumb and level and with orientation and depth coordinated with arrangement of connecting ducts to minimize bends and deflections required for proper entrances.

2. Support units on a level bed of crushed stone or gravel, graded from the 1-inch sieve to the No. 4 sieve and compacted to the same density as the adjacent undisturbed earth.

3. Drainage: Where vaults have drain holes in the bottom, provide 2-feet minimum of gravel below the drain hole or provide a drain line to the nearest storm drain.

B. Grounding: Install grounding as indicated on Drawings and/or Section 26 05 26 "Grounding and Bonding".

C. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cable and conductors and as indicated on Drawings:

1. Field Installed Bolting Anchors: Do not drill deeper and 3-7/8 inches for field-installed anchor bolts. Use a minimum of (2) anchors for each cable stanchion.

D. Train cables neatly around corners and secure to walls or ceiling using cable clamps with expansion anchors.

3.08 UNDERGROUND WARNING TAPE

A. Warning tape shall be installed directly above the pipe or concrete for encased ducts, at a depth of 12-inches below finished grade unless otherwise shown.

3.09 PERMANENT MARKERS

A. Where ducts (conduits) are stubbed below grade for future services, provide graystone Index PC 3.06 Surveyor's Monument located directly over end of stubbed duct with top at finished grade, with marking indicating system piping serves.

3.10 IDENTIFICATION

A. Identify raceways, cables, and equipment as specified in Section 26 05 53 "Identification for Electrical Systems", or as indicated on Drawings.

B. Provide warning and caution signs as required by the Authority Having Jurisdiction, these Specifications, or as indicated on Drawings.

C. Label raceways entering concealed locations from exposed locations as to the destination via the concealed area.

3.11 TESTING AND CLEANING

A. Verify that vaults and handholes are essentially dry. In the case where the presence of water will prevent the continuation of work, pump the vault or handhole dry and seal obvious leak points with epoxy grout or polyurethane-based water sealant. For plugging conduits use a plug capable of 15 psi hydrostatic pressure. Coordinate pumping discharge with the Engineer and obtain the approval from the Owner.

B. Pull brush through full length of ducts. Use round bristle brush with a diameter of 1/2-inch greater than internal diameter of duct. Clean internal surfaces of vaults and handholes, including sump.

C. Duct Integrity: Swab out ducts with a mandrel 1/4-inch smaller in diameter than internal diameter of ducts. An Owner's Representative shall be present to witness all mandrel pulls.

D. Grounding: Test vault grounding to ensure electrical continuity of bonding and grounding connections in accordance with Section 26 05 26 "Grounding and Bonding". Measure ground resistance at each ground rod and report in final test results per Section 26 08 00 "Electrical Acceptance Testing". Use an instrument specifically designed for ground resistance measurements.

E. Written certification by electrical contractor that all testing and cleaning has been tested and cleaned per Specifications. Provide written certification that vaults are grounded and meet or exceed the requirements of this section. Provide written certification as to testing and testing results to Engineer, Commissioning Authority, and included in O&M Manual.

END OF SECTION

SECTION 26 05 48
SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Section Includes:

1. Restraint channel bracings.

2. Restraint cables and accessories.

3. Seismic-restraint accessories.

4. Mechanical anchor bolts.

5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 26 05 29 “Hangers and Supports for Electrical Systems” for commonly used electrical supports and installation requirements.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic restraint component used
   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
   b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.
   a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic and Wind Restraint Details.
   a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
   c. Coordinate seismic-restrain and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
   d. Preapproval and Evaluation Documentation. By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.04 INFORMATION SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical Components include:

1. Control and Monitoring Panels.
2. Generators.
3. Luminaires.
4. Motor Control Centers.
5. Panelboards.
6. Photovoltaic System Components.
7. Substations.
8. Switchboards.
9. Switchgear.
10. Transformers.
11. Unit Substations.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel".

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 30mph.

2. Building Classification Category: I, II, III, or IV as required per Architect.

3. Minimum 10 lb/sq. ft. multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: A, B, C, D, E, or F as required per Architect.

2. Assigned Seismic Use Group or Building Category as Defined in the IBC: I, II, or III as required per Architect.
   a. Component Importance Factor: 1.0.
   b. Component Response Modification Factor: 1.5.
   c. Component Amplification Factor: 1.0.

3. Design Spectral Response Acceleration at Short Periods (0.2 seconds): percentage as required per Architect.

4. Design Spectral Response Acceleration at 1.0 Second Period: percentage as required per Architect.

2.02 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton Business.

2. Hilti, Inc.

3. Mason Industries, Inc.

4. Unistrut; Part of Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 RESTRAINT CABLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Gripple, Inc.; GS Seismic Bracing Kits, or a comparable product by one of the following:

1. Kinetics Noise Control, Inc.

2. Vibration & Seismic Technologies, LLC.

3. Vibration Mounting & Controls, Inc.

B. Restraint Cables: ASTM A 1023 galvanized-steel cables. End connections made of steel assemblies with adjustable seismic fastener, thimbles, brackets, swivel, and bolts designed for restraining cable service; with loop ferrule to accommodate the load and safety factor of the fastener kit or a minimum of two clamping bolts for cable management.

C. Adjustable Seismic Fastener: One-piece die cast type ZA2 zinc two-channel housing; encasing a series of Type 302 stainless-steel springs with serrated self-locking steel wedges, adjustable with setting key; ZA2 zinc end caps with locking screws.

2.04 SEISMIC-RESTRAINT ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Gripple, Inc.; Rod Stiffener (RS) or comparable product by one of the following:

1. B-line, an Eaton Business.

2. Kinetics Noise Control, Inc.

3. Mason Industries, Inc.

4. TOLCO; a brand of NIBCO INC.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support system sleeve with internally bolted connections to hanger rod.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment and Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.05 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton Business.

2. Hilti, Inc.

3. Kinetics Noise Control, Inc.

4. Mason Industries, Inc.

5. Powers Fasteners.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.06 ADHESIVE ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hilti, Inc.

2. Kinetics Noise Control, Inc.

3. Mason Industries, Inc.

4. Powers Fasteners.

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 “Cast-in-Place Concrete” and Section 033053 “Miscellaneous Cast-in-Place Concrete”.

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords or bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in adhesive.

5. Set anchors to manufacturer's recommended torque using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven (7) day's advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four (4) of each type and size of installed anchors and fasteners selected by Architect.

5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.06 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Provide completely identified electrical systems and equipment that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

1.03 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.

B. NFPA 70E – Standard for Electrical Safety in the Workplace.

C. ASTM International.

1.04 GENERAL REQUIREMENTS

A. Electrical vaults shall be properly labeled per ID shown on the Drawings.

B. Underground conduits shall be properly labeled in vaults and in buildings where conduits stub up from below grade. Contractor shall be responsible for the ID names/numbers.

C. Electrical and Low-Voltage Equipment shall have placards with appropriate ID on front covers of equipment.

D. All interior conduit and junction boxes shall be labelled with panel name and circuit numbers of conductors routed via conduit and junction boxes.

E. Conductors shall be properly identified with both color coding and self-adhesive labels.

F. All equipment per NFPA 70E that requires arc-flash labelling shall be properly identified per NFPA 70E.

G. All overcurrent protective devices required to be selectively coordinated per NEC 700 shall be properly coordinated and device settings shall be included in panelboard and switchboard enclosures with the corresponding panel schedules.

1.05 SUBMITTALS

A. Product Data: Provide catalog data for nameplates, labels, and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Underground Conduit Ductbanks: Provide site plan with identification names/numbers of individual conduits, vaults, and handholes for Owner's Representative and Engineer's review and approval.

1.06 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories (UL) as suitable for purpose specified as shown.

B. Comply with NFPA 70 and NFPA 70E.

1.07 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications and with those required by codes and standards.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

PART 2 – PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Buried Electrical Lines: Underground warning tapes.

B. Conduit: Conduit Markers.

C. Junction Box Load Connections: Wire Markers.

D. Outlet Box Load Connections: Wire Markers.

E. Outlet Box Wall Cover Plates: Laser Etching.

F. Panel Gutter Load Connections: Wire Markers.

G. Pull Box Load Connections: Wire Markers.

H. Electrical Vaults: Nameplates.

2.02 NAMEPLATES AND LABELS

A. Manufacturers:

1. Marking Services, Inc. (MSI): http://www.markserv.com

2. Double O Laser Services, Inc.: http://www.doubleolaser.com

3. Or other reviewed and approved manufacturers.

B. Load Equipment Nameplates: Laser engraved black impression stainless steel with brushed satin finish & permanent black impression.

1. 430 Alloy, .029 thick.

2. 1/8” holes for attachment to equipment with stainless steel self-drilling screws.

3. Letter Size:
   a. Load Equipment Name: use 0.375-inch letters.
   b. All others: use 0.25-inch letters.

C. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches, receptacles, control device stations.

D. Warning/Safety Labels: Industry standard self-adhesive warning/safety labels. Provide industry standard labeling, code required and per AHJ.

2.03 DEVICE AND JUNCTION BOXES

A. Manufacturer pre-painted junction box cover plates:

1. 208/120V Normal Power System: Blue.

B. Identify power circuits contained within junction boxes using permanent black ink marker with Panel Name and Circuit Number on cover plate of junction box.

2.04 OUTLET BOX COVER PLATES

A. Laser etched with panel name and circuit number on stainless steel cover plates. Laser etching shall be by Marking Services, Inc. (MSI). Refer to the following for examples:
Panel Name – Circuit Number - 2X4A – 22
Panel Name – Circuit Numbers- 1M4A – 1,3,5

2.05 CONDUCTOR IDENTIFICATION

A. Manufacturers:

1. Brady Corporation: Model (B-702).

2. Or other reviewed and approved Manufacturers.

B. Description: Vinyl cloth type self-adhesive wire markers.

C. Color: Black on White.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.

E. Wire Color Coding:

1. Single Phase, 3-Wire System: 120/240-Volt.

2. Three Phase, 4-Wire System: 120/208-Volt.

3. Equipment Ground Wire: Green.

4. Control wiring shall be black with identifying wire numbers at each termination.

5. Color-coded tape may be used in lieu of color-coded insulation for conductors #8 AWG and larger. However, when color coded tape is used, the conductor insulation shall be black only and shall be tape identified with color scheme shown above at splices, terminations, and junction boxes.

2.06 RACEWAY IDENTIFICATION

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Provide conduit identification at both ends of all Medium Voltage Conduits, Low Voltage Conduits, and Communications Conduits identifying systems contained within conduits and “to” location for other end of conduit. This requirement applies to both site underground conduits routed between vaults, buildings, and also conduits within Buildings.

2.07 CONDUIT MARKERS

A. Location: Furnish markers for each conduit longer than 6-feet (2m).

B. Spacing: 20-feet (6m) on center.

C. Color:

1. 208/120 Volt System: Blue.

D. Underground Conduit Entering Vaults:

1. Brass conduit tags.

2. .032-inch (20 gauge) brass.

3. 3/16-inch hole for easy mounting.

4. Top line 1/4-inch text with second line 1/2-inch number is standard.

5. Tag shall identify conduit by system and location of other end of conduit. E.g., “FIBER – RM K104”. Identify “SPARE” for system for empty conduits.

2.08 UNDERGROUND WARNING TAPE

A. Underground Warning Tape: 3-inches (76 mm) wide polyethylene tape, detectable type colored red with suitable warning label describing buried electrical lines.

B. Warning tape shall be acid and alkali-resistant and shall have a minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise, with an elongation factor of 350%.

2.09 WARNING/SAFETY LABELS

A. Self-adhesive, industry standard labels.

B. Provide labels per code requirements and per AHJ.

CABLE TIES

A. General-Purpose Cable Ties: Fungus insert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon:

1. Minimum width: 3/16”.

2. Tensile strength at 73-degrees F, according to ASTM D 638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185-degrees F.

4. Color: Black.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Degrease and clean surfaces to receive nameplates and labels.

C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Self-Adhesive Identification Products: Clean surfaces before application, using materials, and methods recommended by manufacturer of identification device.

F. Attach sign and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable leads that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

H. Install nameplates and labels parallel to equipment lines.

I. Secure nameplates to equipment front using screws or rivets.

J. Identify empty conduit at each end with permanent ink marker. Indicate function and termination location of other end.

K. Identify underground conduits using underground warning tape. Install one tape per trench at 3-inches, or as indicated in Drawings, below finished grade.

L. Each outdoor conduit shall be labeled with the location of the opposite end of the conduit, and numbered as C# (Where C stands for conduit and # is increased with each conduit in the set).

1. For example, if 2 conduits are installed between vault 101 and vault 102, both conduits in vault 101 shall have a weatherproof label and be labeled “C1 To Vault 102” and “C2 To Vault 102” while both conduits in vault 102 shall be labeled “C1 To Vault 101” and “C2 To Vault 101” respectively. If a conduit ends in a building, the building name and room number shall be labeled as the destination.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that apply to work under this Specification.

1.02 SUMMARY

A. Lighting Control Panel (LCP).

B. Daylight Harvesting Controls.

C. Remote/Low-Voltage Switches.

D. Occupancy/Vacancy Sensors.

E. Provide complete installation of the occupancy sensor/daylight harvesting sensor based lighting control system using the approved factory shop drawings so that lighting is turned off automatically when daylight is present. The time delay for occupancy sensors shall be set at no more than 30-minutes pursuant to the Washington State Non-Residential Energy Code.

F. The system shall include, but not be limited to the following list: pre-wired, microprocessor controlled relay or dimming panels with latching relays controlled via a complete list of communication based accessories including digital switches, digital photocells, digital SmartBreaker panelboards, Digital Time Clock (DTC) and interface cards to dimming systems, building automation systems, thermostats, and other devices. The type of lighting control equipment and wiring specified in this Section is covered by the description: Microprocessor Controlled Digital Lighting Control system with RS-485 bus communications. Requirements are indicated elsewhere in these Specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring. They are not the work of this Section.

1.03 SYSTEM DESCRIPTION

A. Extent of lighting control system work is indicated by Drawings and by the requirements of this Specification. It is the intent of this Section to provide an integrated, energy saving lighting control system from a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

B. The lighting control system is a networked system that communicates via RS-485. The system must be able to communicate with fully digital centralized relay panels, as well as contain standalone small distributed relay panels (available with 0-10 volt dimming outputs). The system will also include digital switches, photocells, and occupancy sensors as indicated on Drawings. The intent of the Specification is to have all lighting controls provided by one manufacturer. Lighting control system shall include all hardware and software. Software shall

be resident within the lighting control system. System shall provide local access to all programming functions at the master LCP. Lighting control system shall have the capability to be remotely controlled via the internet or building wide Ethernet LAN. Remote computers are not part of this Section and will be provided by others.

C. System software shall provide real time status of each relay, each zone, and each group.

D. Lighting control system shall be able to be monitored by and take commands from a remote PC. At any time, should the remote PC go offline, all system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an online PC or server for normal operation are not acceptable.

E. All programs, schedules, time of day, etc., shall be held in non-volatile memory for an indefinite time exceeding 10 years in the event of power failure. At restoration of power, lighting control system shall implement programs required by current time and date. Time of day shall be battery backed for at least 10 years.

F. System shall be capable of warning of an impending off sweep by flashing lights Off/On once or twice (programmable) by relay or by zone prior to the lights being turned off. The warning interval times between the flash and the final lights off signal shall be definable for each zone. Additionally an audible signal shall be able to be programmed that gives a mild note on the first flash and a more insistent signal on the second one. Occupants shall be able to override any scheduled Off sweep using local wall switches within the occupied space. Occupant override time shall be locally and remotely programmable and not exceed 2-hours.

G. The system shall be capable of implementing On commands, Off commands, Raise (dimming) commands, Lower (dimming) commands for any relay, group or zone by means of digital wall switches, contact closure switches, time clock schedules, including offsets from dusk and dawn by up to 10 hours, photocell, PC software, or other devices connected to programmable inputs in a lighting control panel (LCP).

H. The lighting control system shall provide the ability to control each relay and each relay group per this Specification requirements. All programming and scheduling shall be able to be done locally at the master LCP and remotely via dial up modem or via the Internet. Remote connection to the lighting control system shall provide real time control and real time feedback.

I. Micro relay panels shall be capable of taking inputs from contact closure switches and outputting up to 8 independent 0V to 10V dimming signals. All micro relay panels and all devices connected to micro relay panels (switches, photocells, and occupancy sensors, etc.) shall be wired per lighting control manufacturer’s instructions.

J. System shall control lighting on/off and dimming functions by:

1. Time.

2. Available Daylight.

3. Occupancy Sensors.

4. Remote/Low-Voltage Switches.

K. The products specified in this Section shall provide a lighting control panel system of up to three panels with a maximum of 24 relays each and with low-voltage input devices including occupancy/vacancy sensors, daylight sensors, and switch stations for indoor and outdoor lighting applications.

L. The system shall be capable of turning lighting loads on/off using inputs, schedules, time clock, and astronomical clock programming.

M. The system shall be a complete, functional, lighting control system for the control of incandescent, low-voltage, neon, cold cathode, LED, fluorescent, and HID lighting.

N. The Contractor shall furnish and install a low-voltage lighting control system consisting of, but not be limited to, panels with relays, graphic user interfaces, controllers, enclosures, switches, photo sensors, occupancy sensors, low-voltage Class 2 wiring for input devices and data wiring between master and secondary panels as required for a complete, and operable lighting control system.

O. The system shall be capable of loading and saving programming via SD Card at the user interface.

1.04 REFERENCES

A. NEMA ICS 4 – Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Associate (NEMA); 2005.

B. NFPA 70 – National Fire Protection Association; National Electrical Code; 2017.

1.05 SUBMITTALS

A. Submit the manufacturer’s installation and startup manual and operating and maintenance manual as a part of the initial equipment submittal.

B. Provide submittal data on all products specified under Section 2 of this Specification and all other associated products that may not be specified, but that are required.

C. Submit manufacturer’s data on lighting control system and components including shop drawings, detailed point to point wiring diagrams, and floor plans showing occupancy and daylighting sensor locations. Provide typical mounting details for occupancy and daylighting sensors for this application.

D. Submittal package shall include, but not be limited to, the following:

1. Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.

2. Product Data Sheets: Provide as part of the submittal package, detailed product data sheets for all major system components.

3. Shop Drawings: Submittal shall include shop drawings that accurately represent the system or systems specified herein. Shop Drawings shall include the name of the project, quantity, and physical dimensions of all major system components, wire sizes, and counts for all

required connections, for all rooms, and between system components. Shop Drawings shall also include equipment and complete wiring diagrams for site, and whole building lighting controls as well as individual wiring diagrams for rooms with standalone lighting control systems. Provide complete equipment and wiring diagrams for all scenarios.

4. Contractor/Commissioning Worksheet: must be completed prior to factory startup.

5. Specifications Compliance: Submit a line-by-line comparison that describes the differences between each Specification's requirement and the equipment/systems being proposed. Comparison shall include a complete listing of how the proposed equipment/systems differ from that specified with regard to size, quantity, quality, method of control, features and functions, control software functions, and installation requirements.

1.06 QUALITY ASSURANCE

A. All components shall meet the National Electrical Code (NFPA 70) requirements, shall be UL listed, and shall meet requirements of the WA State NREC.

B. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 10-years.

C. Comply with NEC, NEMA, and FCC Emission requirements for Class A applications.

D. UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Configured to order or custom relay panels shall be UL Listed under UL 508, Industrial Control Panels.

E. Factory Assembly: All devices shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired, and ready for installation, requiring only the connection of lighting circuits and control terminations. All connections shall be made to clearly and permanently labeled termination points.

F. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per Specifications prior to shipment.

1.07 MAINTENANCE MATERIALS

A. Provide system O&Ms electronically.

B. Once startup is complete, provide electronic copy of as-built system documentation.

1.08 PROJECT CONDITIONS

A. Do not install equipment until the following conditions can be maintained in the spaces, where equipment is to be placed:

1. Ambient temperature: 0° to 40° C (32° to 104° F).

2. Relative humidity: Maximum 95-percent, non-condensing.

3. Lighting control system must be protected from dust during installation.

1.09 WARRANTY

A. All devices in lighting control system shall have a minimum 5-year manufacturer's warranty.

B. Warranty period shall begin after the completion of the installation and the system's startup and training, the point at which the system Owner receives beneficial use of the control system or 1-year after shipment from the manufacturer, whichever occurs first.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acuity Controls; basis of design.

1. Panels: LC&D or approved equal.

2. Standalone Rooms Low-Voltage Devices: Power Pack Control: nLIGHT or approved equal.

3. Standalone Rooms Line Voltage: Sensor Switch or approved equal.

B. Or other reviewed and approved Manufacturers.

1. Substitution requests shall comply with Division 01.

2. Substitution requests shall include the following at a minimum:
   a. Equipment cut sheets for all equipment with part numbers, options, and accessories. Equipment, options, and accessories shall all be shown selected/highlighted.
   b. Warranty Information: warranties shall meet or exceed basis of design.
   c. Schematic details/diagrams that accurately represent the system or systems specified herein.
   d. Schematic diagrams shall include the name of the project, quantity, and physical dimensions of all major system components, wire sizes, and counts for all required connections, for all rooms, between system components.
   e. Schematic diagrams shall include all equipment and complete wiring diagrams for the following:
      1) Exterior lighting circuits and control equipment.
      2) Interior whole building lighting controls and equipment.
      3) Interface with emergency power – UL-924 transfer devices, UL-924 DMX bypass controllers, and UL-924 lighting control panels.
      4) Individual wiring diagrams, with room name and room number, for rooms with standalone lighting controls systems. Provide complete wiring diagrams showing all equipment, switching zones, daylight zones, complying with the basis of design and contained on the Contract Drawings.

2.02 LIGHTING CONTROL PANEL AND COMPONENTS

A. Relay Panels:

1. All lighting control panels (LCPs) shall be in a NEMA 1 rated enclosure with screw cover or hinged locking door. Other NEMA rated types are optional.

2. A barrier shall separate the high voltage and low voltage compartments of the panel and separate 120V, 208V, and 277V.

3. LCP input power shall be capable of accepting 120V, 208V, or 277V without rewiring.

4. Control electronics in the low-voltage section shall be capable of driving 2 to 48 relays, control any individual or group of relays, provide individual relay overrides, provide a master override for each panel, store all programming in non-volatile memory, after power is restored return system to the correct state for time of day, provide programmable dual blink warn timers for each relay or zone of relays, and be able to control Normally Open Latching (NOL) or Normally Closed Latching (NCL) relays.

5. Lighting control system shall be digital and consist of a Master LCP, standalone Micro LCPs (with up to 8 individual relays), digital switches, digital interface cards, occupancy sensors, and photocells. All components shall connect and be controlled via Category 5, 4 twisted pair cables with RJ-45 connectors, providing real time two-way communication with each system component. All Micro LCPs shall provide multiple inputs for photocells and occupancy sensors. Analog systems are not acceptable.

B. Micro Relay Panels:

1. Micro relay panels shall have from 2 to 8 relays and shall control all lighting in the designated area indicated on the Plans, and be part of the lighting control network. Each micro relay panel shall provide minimum 300mA at 12/24V DC for powering occupancy sensors. Micro relay panels that require a separate occupancy sensor power pack are not acceptable.

2. Micro relay panel shall provide a minimum of 4-programmable photocell inputs, a minimum of 8-programmable occupancy sensor contact closure inputs. This requirement is to insure integration of entire lighting system into one (1) networked, lighting control system.

3. Micro relay panels shall be capable of outputting a minimum of 4 and up to 8 independent 0V to 10V dimming signals, one (1) independent dimming signal per relay for each of 8 relays. In order to maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid point, end point, trim, fade up rate, fade down rate, time delay and enable/disable masking. All photocell settings must be remotely accessible. Systems providing on, off with time delay only, and systems that do not provide remote access are not acceptable.

4. Micro relay panels shall have built in capability to take commands from a fully compatible wireless switch. Wireless switches shall contain no batteries, have 32-bit unique ID and a minimum 90-foot range line of sight.

C. Standard Output Relays:

1. UL Listed 30 Amp @ 277VAC ballast and HID and 20 Amp Tungsten at 120VAC. 347V ballast and HID at 20 Amps latching relay with 18,000 Amps SCCR at 277VAC.

2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting two (2) #8AWG wires on both the line and the load side. Systems that do not

allow for individual relay replacement or additions are not acceptable. Relays to be rated for 250,000 operations minimum at a full 30 Amps of lighting load. Standard relay shall default to closed at normal power loss, Normally Closed Latching (NCL).

3. Optional relay types available shall include: Normally Open Latching (NOL) relay rated for 250,000 operations, a 600V 2-pole NO and NC and a Single Pole, Double Throw (SPDT).

D. Low-Voltage Switches:

1. All switches shall be digital and communicate via RS-485. Contact closure style switches, except as specified for connection to the micro relay panel programmable contact closure inputs, shall not be acceptable. The programming for a digital switch shall reside in the switch itself, via double EPROM memory. Any digital switch button function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.

2. Digital low voltage switches shall be devices that sit on the lighting control system bus. Digital switches shall connect to the system bus using the same cable and connection method required for relay panels. Each button shall be capable of being programmed for On only, Off only, Mix (Some On, some Off), On/Off (toggle), Raise (dim up) and Lower (dim down). Further, each button shall be able to be enabled or disabled over the bus. An audible alarm shall be available on all switches that can be programmed to beep on button push or with warning light blinks.

3. Keyed switches shall be similarly programmable and connect to the lighting control system bus.

E. DTC – Digital Electronic Time Clock:

1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept modem (RS-232) inputs.

2. The DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.

3. The DTC shall be capable of controlling digital devices at up to 127 addresses on a single bus and capable of interfacing digitally with other buses using manufacturer supplied interface cards.

4. The DTC shall accept control locally using built in button prompts and use of an 8 line 21-space display or from a computer or modem via an on-board RS-232 port. All commands shall be in plain English. The DTC shall be run rom non-volatile memory so that all system programming is retained indefinitely and time of day is battery backed for up to 10 years.

5. The DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.

F. Photocell: Photocells shall be mounted in areas indicated on the Plans. Photocells used for exterior lights shall provide multiple trip points from (1) roof mounted unit. All trip points shall

be able to be changed remotely via Internet or dial up modem. Photocells requiring manual trip point adjustment are not acceptable. Photocells used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up, fade-down, etc. All settings shall be remotely accessible and adjustable. Systems providing local adjustment only are not acceptable. Photocells shall be certified to comply with the current energy code covering this Project at time of submittal of plans for building permit.

G. Interfaces:

1. For future expansion capability, systems are to have available, all of the following interfaces. Verify and install only those interfaces indicated on the plans.

2. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card on runs over 200 feet.

2.03 NETWORKED SWITCH STATIONS

A. Electrical contractor shall provide and install Networked Switch Stations of the types and quantities shown on the Drawings and as specified herein.

B. Networked Switch Stations shall be injection molded and designed to mount in a standard single gang junction box with standard decorator-style switch plate opening.

C. Networked Switch Stations shall be available in two (2) colors: White and Ivory.

D. Networked Switch Stations shall be available in 1 to 6 button standard configurations.

E. Labeling and switch identification shall be accomplished through the use of hot stamped labels, permanently attached to the switch face itself. Silk-screened or painted labeling shall not be acceptable.

F. Each Networked Switch Station shall be provided with both pilot and non-pilot version of buttons, which can be selected by the Contractor at the time of installation or change at any time throughout the life of the system. Switch stations, which require switches to be ordered with, or without pilots and are not field modifiable shall not be considered.

G. Networked Switch Stations shall connect to the self-powered topology free network via a single pair of wires. Networked Switch Stations requiring more than 2 wires or that require the installing contractor to install them with a stick topology or maintain correct polarity are unacceptable.

H. Each button on a Networked Switch Station may be programmed to perform any of the following functions:

1. Control any individual relay in any single lighting control panel.

2. Control any group of relays in all of the lighting control panels.

3. Control any preset in all of the lighting control panels.

I. Networked Switch Stations may be programmed for active and inactive times.

J. Data Protection and Storage: All programmed data shall be stored in non-volatile flash memory that shall protect all stored programming data from loss during a power outage for a minimum period of 20 years without power of any type.

2.04 NETWORKED PHOTOSENSORS

A. Electrical contractor shall provide and install Networked Photo Sensors and Control Modules of the types and quantities shown on the Drawings and as specified herein.

B. Networked Photo Sensor Control Module shall connect to the self-powered topology free networked via a single pair of wires. Networked Photo Sensor Modules requiring more than 2 wires or that require the installing contractor install them with a stick topology or maintain correct polarity are unacceptable.

C. Each photocell shall be mounted in the appropriate location for measuring the available daylight. Each photocell will have a separate control/calibration module mounted separately and in an accessible location.

D. Networked Photo Sensor Control Module shall transmit real time foot candle levels over network to any and all devices.

E. Networked Photo Sensor Control Module shall support zero to 1,000 footcandle range with (1) footcandle resolution.

F. Networked Photo Sensor Control Module shall provide six (6) programmable ON and OFF set points.

G. Networked Photo Sensor Control Module shall mount to standard 35mm DIN rail.

H. Networked Photo Sensor Control Module may be programmed to perform any of the following functions:

1. Control any individual relay in any single lighting control panel.

2. Control any group of relays in all of the lighting control panels.

3. Control any preset in all of the lighting control panels.

I. Networked Photo Sensor Control Module shall be BacNet® certified.

J. Networked Photo Sensor Control Module may be programmed for active and inactive times.

2.05 NETWORKED DRY CONTACT INTERFACE MODULE

A. Electrical contractor shall provide and install Networked Dry Contact Interface Module of the types and quantities shown on the Drawings and as specified herein.

B. Networked Dry Contact Interface Modules shall support 1 to 6 dry contact inputs with or without pilot.

C. Networked Dry Contact Interface Modules shall connect to the self-powered topology free network via a single pair of wires. Network Dry Contact Interface Module requiring more than

2 wires or requiring that the installing contractor installs them with a stick topology or maintain correct polarity are unacceptable.

D. Each input on a Networked Dry Contact Interface Module may be programmed to perform any of the following functions:

1. Control any individual relay in any single lighting control panel.

2. Control any group of relays in all of the lighting control panels.

3. Control any preset in all of the lighting control panels.

E. Networked Dry Contact Interface Module may be programmed for active and inactive times.

F. Data Protection and Storage: All programmed data shall be stored in non-volatile flash memory that shall protect all stored programming data from loss during a power outage for a minimum period of 20 years without power of any type.

G. Network Dry Contact Interface Modules shall be LonMark® certified.

H. Networked Photo Sensor Control Modules shall mount to standard 35mm DIN rail.

2.06 UL-924 TRANSFER DEVICES

A. Electrical contractor shall provide and install UL-924 transfer devices of the types and quantities shown on the Drawings and per the basis of design contained in the Drawings. Provide all required components and accessories such that emergency lights turn automatically on and raise to full bright upon loss of normal power.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Mount relay control cabinets adjacent to respective lighting panelboard. Cabinet shall be surface or flush mount, as per plans. Wiring between relay control cabinets and panelboards shall be in accordance with local codes and acceptable industry standards. Under no circumstances will any extra payment be authorized for the Electrical Contractor or the General Contractor due to the Electrical Contractor’s lack of knowledge or understanding of any and all prevailing codes or specified manufacturer’s installation requirements. Neatly lace and rack wiring in cabinets. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to failure to protect them shall be the sole responsibility of the installing contractor.

B. Provide outlet boxes, single or multi-gang, as shown on the Drawings for the low-voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. Electrical contractor is specifically responsible to supply and install the required low-voltage cable, Category 5, 4-twisted pair, with RJ-45 connectors (commonly referred to as Cat 5 patch cable) between all switches and control panels. Field test all Cat 5 patch cable with a recognized cable tester. All low-voltage wire shall be run in conduit, per local codes.

C. Manufacturer shall provide on all systems of more than 2 control panels, a crimping kit with sufficient approved EZ Brand RJ-45 connectors to populate the whole system. A simple manual that shows all the pitfalls of crimping RJ-45s and how to do it correctly must be both provided and read by the installing contractor.

D. Wiring:

1. Do not mix low-voltage and high voltage conductors in the same conduit, no exceptions.

2. Ensure low-voltage conduits or control wires do not run parallel to current carrying conductors.

3. Place manufacturer supplied “terminators” at each end of the system bus per manufacturer’s instructions.

4. Plug in Category 5 patch cable with RJ-45 end connector that has been field tested with a recognized cable tester, at the indicated RJ-45 connector provided at each lighting control device, per manufacturer’s instructions.

5. Use Category 5 patch cable for all system low-voltage connections. Additional conductors may be required to compensate for voltage drop with specific system designs. Contact LC&D or refer to the GR2400 manual for further information. Use shielded cable for dry contact inputs on runs over 200-feet.

6. Do not exceed 4000-feet wire length for the system bus.

7. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.

8. The specified lighting control system shall be installed by the electrical contractor, whom shall make all necessary wiring connections to external devices and equipment, and also includes photocells. Electrical contractor shall install wire per manufacturer’s instructions.

3.02 INSTALLATION AND SETUP

A. Verify that conduit for line voltage wires enter the panels in line voltage areas and conduit for low-voltage control wires enter the panels in low-voltage areas. Refer to manufacturer’s plans and approved shop drawings for location of line and low-voltage areas. This is especially applicable in projects where back boxes are shipped in advance. It is the responsibility of the contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

B. For approved contact closure switches, use #18 AWG stranded conductors. For all other digital switches, provide wiring as required by the system manufacturer.

C. Contractor shall test all low-voltage cabling for integrity and proper operation prior to turn over. Verify with system manufacturer, all wiring and testing requirements.

D. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Setup, commissioning of the lighting control system, and Owner instruction includes:

1. Confirmation of entire system operation and communication to each device.

2. Confirmation of operation of individual relays, switches, occupancy sensors, and daylight sensors.

3. Confirmation of System Programming, photocell settings, override settings, etc.

4. Provide training to cover installation, maintenance, troubleshooting, programming, repair, and operation of the lighting control system.

E. Panels shall be located so that they are readily accessible and not exposed to physical damage.

F. Panel locations shall be furnished with sufficient working space around panels to comply with the National Electrical Code (NEC).

G. Panels shall be securely fastened to the mounting surface by at least 4 points.

H. Unused openings in the cabinet shall be effectively closed.

I. Cabinets shall be grounded as specified in the NEC.

J. Lugs shall be suitable and listed for installation with the conductor being connected.

K. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

L. Maintain the required bending radius of conductors inside cabinets.

M. Clean cabinets of foreign material such as cement, plaster, and paint.

N. Distribute and arrange conductors neatly in the wiring gutters.

O. Follow the manufacturer’s torque values to tighten lugs.

P. Before energizing a panel, the following steps shall be taken:

1. Retighten relay connections to the manufacturer’s torque specifications. Verify that required connections have been furnished.

2. Remove shipping blocks from component devices and the panel interior.

3. Remove debris from panel interior.

Q. Follow manufacturer’s instructions for installation and all low-voltage wiring.

R. Service and Operation Manuals:

1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.

2. Manuals shall include instructions necessary for proper operation and servicing of systems and shall include complete wiring circuit diagrams of systems, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built color coding used on cables. Programming forms of systems shall be submitted with complete information.

3. Comply with energy code lighting control system “Acceptance Requirements”. Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. These tests may require that a responsible party certify that controls are installed and calibrated properly. This is the installing contractor’s responsibility. Verify requirements with building authority.

3.03 SUPPORT SERVICES

A. System Startup and Commissioning: Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify the following:

1. All occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.

2. Occupancy sensors and daylighting sensors are operating within the manufacturers specifications.

3. Sensors and relay panels interact as a complete and operational system to meet the design intent.

B. Manufacturer to provide a written statement verifying that the system meets the above requirements.

3.04 SEQUENCE OF OPERATION

A. Order of Operation of a Network System:

1. The control network consists of physical components called devices (or ‘nodes’), each performing specific functions.

2. Each device has associated with it a number of objects that pertain to the device’s overall function. An object is not only a physical entity, but also a software entity that is embedded in the neuron chip contained within a device. If the device has several functions, it can contain several objects that affect those functions.

3. On the network the messages are transmitted between the objects. Messages are also referred to as Network Variables. Objects each are capable of receiving and sending.

4. Each device is physically addressed via 3 address wheels to locate it on the network with the Neuron chip on each device having its own firmware based ID similar to a MAC address on IP devices.

5. When the button is pushed on a switch station, or a photocell controller senses a change in light level, its object broadcasts a network variable or message, which is then read by the objects on the network to which the message is addressed. If the messages is to turn on a relay, that device (relay control panel) has an object on it that relates to the relay in question. When the relay has been turned on, a message is broadcast back and the object on the switch receives an update of the status of relay, turning on its LED.

6. Network systems are able to communicate with other control systems via BACnet, allowing for integration points from each system to be linked across one system from another.

7. The network systems can also communicate with other systems via contact closure.

B. Order of Operation of an Occupancy Sensor:

1. A dual technology occupancy sensor works by broadcasting an ultrasonic compression wave into the room. It reads the return wave and if any Doppler shifts occur in the return wave, it knows there's movement in the room and opens the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.

2. The passive infrared portion of the sensor is reading the background infrared radiation in the room. If that level changes in the range that the sensor is designed to look for, it identifies a movement in the room and opens the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.

3. When the sensor identifies movement, it closes the control signal to the Relay/Power Pack to close the relay the switch leg is connected to, turning on the lights.

4. The sensor can be programmed to require both types of sensors, Ultrasonic and Passive Infrared, to be in agreement to turn on the lights, or, that either type "seeing" movement will turn on the lights.

5. The sensor will hold the relay closed, keeping the lights on, as long as the Sensor identifies motion. If the sensor stops seeing motion for the programmed or learned amount of time, it will open the control signal that was holding closed the relay in the power pack the switch leg is connected to, turning off the lights.

6. This functionality is the same for single sensor type occupancy sensors.

C. Order of Operation of 0-10V Light Sensor Controlling a Solid State Driver (SSD):

1. A 0-10V Light Sensor works by receiving a 10VDC signal from the SSDs being controlled. Based on the amount of ambient light striking the photocell in the Light Sensor, a variable voltage level from 0 to 10VDC is returned to the SSDs being controlled.

2. A 10VDC return to the SSDs being controlled will result in maximum dimming of the SSDs.

D. Order of Operation of a Daylight Harvesting Controller within a Daylight Area:

1. The daylighting and occupancy sensing and override switches are controlled by a control module and power pack which has three 5 relays for on/off control and 5 channels of 0-10V dimming for daylight harvesting.

2. The control module receives a signal from the occupancy sensor when a person enters the room. Depending on how the LV switches are connected to the module, the lights either come on with occupancy or after the AUTO or I/O LV button is pushed. The level at which the lights come on in a given daylight zone is determined by the lighting level sensed by the open loop photocell which gathers daylight entering the controlled area.

3. If the daylight sensed is great enough in relation to the settings entered into the module, the lighting in one or multiple zones may not come on at all. The amount the lights in a given daylight zone are dimmed is determined by setting the control module with the existing light level and the desired light level in the zone. The module then takes the amount of light the photocell is seeing entering the area controlled and extrapolates that into the correct level of dimming.

4. The optional dimming control will allow all controlled zones to be dimmed even to any level below the level set by the photocell. The lighting may also be overridden off across the entire area.

5. The control module has the option of making one of the 5 zones on/off only for use as a white board zone. The white board zone is controlled by a separate LV button. The white board zone is also controlled by the master ON/OFF and occupancy sensor.

6. Minimum maintained average footcandle levels for Classrooms is 40fc, Offices 30fc, and Corridors 15fc to be programmed into the controller module for daylight harvesting, where required.

3.05 DOCUMENTATION

A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the Drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.

B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. The accurate “as-built” shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches, and location of the photocell. Original to be given to the owner, and copies placed inside the door of each LCP.

3.06 SITE VERIFICATION

A. Verify all wiring conditions installed under separate sections at the time of panel installation as acceptable to and in accordance to the manufacturer’s installation instructions supplied with the products.

3.07 FIELD MEASUREMENTS

A. The electrical contractor shall be responsible for field measurements and coordination of physical size as appropriate for the product location. The electrical contractor shall coordinate with all Architectural requirements for the space that the panel is located.

3.08 INSPECTION

A. The electrical contractor shall inspect all materials prior to installation and notify the manufacturer of any unacceptable materials prior to installation.

3.09 SITE PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of construction including storage, preparation, testing, and cleanup.

3.10 SERVICE AND SUPPORT

A. Startup: Contractor shall contact local factory representation 3 weeks prior to startup date to schedule technician to the jobsite for initial system energization, programming, and owner training. Contractor shall be available at the time of startup to perform any corrections required by the factory authorized technician.

B. Provide a factory technician for onsite training of the Owner’s Representatives and maintenance personnel. Contractor is responsible for coordinating with all trades to ensure that all Owner’s Representatives are available at the scheduled training date/time, which will occur immediately following system programming.

3.11 SYSTEM TRAINING

A. Manufacturer shall provide factory authorized technician to train Owner’s personnel in the operation, programming, and maintenance of the lighting control system, including all occupancy sensors and daylight harvesting controls.

3.12 SYSTEM PROGRAMMING

A. Manufacturer shall provide system programming including:

1. Wiring documentation.
2. Switch operation.
3. Telephone overrides (if applicable)
4. Operating schedules.

3.13 CLEANING

A. Refer to Division 01 – Execution Requirements.

B. Clean photocell lenses as recommended by the Manufacturer.

C. Clean all switch faceplates.

3.14 COMMISSIONING REQUIREMENTS

A. The equipment and systems referenced in this Section are to be commissioned per Section 01 91 13 “General Commissioning Requirements” and per Section 26 08 00 “Commissioning of Electrical Systems”. The Contractor has specific responsibilities for scheduling, coordination, startup, test development, testing, and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Section Includes:

1. Distribution Panelboards.

2. Lighting and Appliance Branch-Circuit Panelboards.

3. Electronic-Grade Panelboards.

B. Panelboards: Furnish and install panelboards as specified herein and as shown on the Drawings.

1.03 RELATED SECTIONS

A. Division 26 05 53 “Identification for Electrical Systems”.

1.04 DEFINITIONS

A. ATS: Acceptance Testing Specification.

B. GFCI: Ground-Fault Circuit Interrupter.

C. GFEP: Ground-Fault Equipment Protection.

D. HID: High-Intensity Discharge.

E. MCCB: Molded Case Circuit Breaker.

F. SPD: Surge Protective Device.

G. VPR: Voltage Protection Rating.

1.05 REFERENCES

A. NEMA PB 1 – Panelboards.

B. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards, Rated 600 Volts or Less.

C. NEMA AB 1 – Molded Case Circuit Breakers.

D. UL 50 – Enclosures for Electrical Equipment.

E. UL 67 – Panelboards.

F. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.

G. CSA Standard C22.2 No. 29-M1989 – Panelboards and Enclosed Panelboards.

H. CSA Standard C22.2 No. 5-M91 – Molded Case Circuit Breakers.

I. Federal Specification W-P-115C – Type 1, Class 1.

J. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service.

K. NFPA 70 – National Electrical Code (NEC).

L. ASTM – American Society of Testing Materials.

1.06 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit catalog cut sheets for all items proposed to be furnished and installed under this Section.

C. Provide complete submittal information. Approved documents shall include factory shop drawings, details, and wiring diagrams.

D. Product Data: For each type of panelboard:

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.

2. Include dimensions and manufacturer’s technical data on features, performance, electrical characteristics, ratings, and finishes.

E. Shop Drawings: For each panelboard and related equipment:

1. Provide shop drawings which contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one-line diagrams with applicable voltage systems.

2. Include dimensioned plans, elevations, sections, and details.

3. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

4. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.

5. Detail bus configuration, current, and voltage ratings.

6. Short-circuit current rating (SCCR) of panelboards and overcurrent devices.

7. Include evidence of NRTL listing for SPDs as installed in panelboards.

8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, and auxiliary components.

9. Include wiring diagrams for power, signal, and control wiring.

10. Key interlock scheme drawing and sequence of operations.

11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards. Submit and install final versions after load balancing.

1.08 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed that are packaged with protective covering for storage and identified with labels describing contents:

1. Keys: 2 spares for each type of panelboard cabinet lock.

1.09 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 “Operation and Maintenance Data”, include the following:

1. Manufacturer’s written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.10 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: ISO 9001 or 9002 certified.

C. Manufacturer shall have specialized in the manufacturing and assembly of panelboards for at least 50-years.

D. Furnish products listed by Underwriters Laboratories (UL).

E. The manufacturing facility shall be recognized by UL to the International Organization for Standardization ISO 9002 Series Standards for quality.

F. Contractor shall be responsible to provide overcurrent protective devices, which selectively coordinate as required per Codes. Contractor shall be responsible to provide Overcurrent Protective Device Coordination Study per Section 26 05 53 “Identification for Electrical Systems”.

G. Contractor shall be responsible to provide arc-flash hazards labeling as required per Codes. Contractor shall be responsible to provide Arc-Flash Hazards Calculation per Section 26 05 53 “Identification for Electrical Systems”.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Inspect and report concealed damage to carrier within their required time period.

B. Remove loose packing and flammable materials from inside panelboards.

C. Install temporary electric heating (250 W per panelboard) to prevent condensation.

D. Handle and prepare panelboards for installation according to NEMA PB 1.

E. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

F. Store in a clean, dry environment. Maintain factory packaging, and if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.12 OPERATIONS AND MAINTENANCE MANUALS

A. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards, rated 600 volts or less.

1.13 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   a. Ambient Temperature: Not exceeding 23 degrees F to plus 104 degrees F.
   b. Altitude: Not exceeding 6,600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.

2. Altitude: Not exceeding 6,600 feet.

C. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by the Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to the requirements indicated:

1. Notify the Owner no fewer than two (2) business days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Owner's written permission.

3. Comply with NFPA 70E.

1.14 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period:

1. Panelboard Warranty Period: 18-months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which the manufacturer agrees to repair or replace SPDs that fail in materials or workmanship within specified warranty period.

1. SPD Warranty Period: 5-years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Cutler-Hammer (basis of design).

B. Siemens.

C. Square D (Schneider Electric).

D. Approval of the above manufacturers is contingent on their equipment size to be suitable for the installation situation and physical space indicated on the Drawings. Manufacturer shall verify this requirement.

2.02 PANELBOARDS COMMON REQUIREMENTS

A. Load center type panelboards are not allowed.

B. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48 “Seismic Controls for Electrical Systems”.

C. All panelboards below 225A to be provided with feed-thru lugs.

D. All panelboards 225A and above shall be capable of fitting a breaker of up to 50% of the bus rating of the panel. Using feeder section of panel is allowable as long as bussing is extended.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Product selection for restricted space. Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

I. Enclosures: Flush and surface mounted, dead-front cabinets:

1. Maximum enclosure dimensions shall not exceed 21” wide and 6.5” deep and 84” high.

2. Rated for environmental conditions at installed location.
   a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   b. Outdoor Locations: NEMA 250, Type 3R.
   c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
   d. Other Wet or Damp Locations: NEMA 250, Type 3R.
   e. Indoor Locations subject to dust, falling dirt, and dripping noncorrosive liquids: NEMA 250, Type 12.

3. Type 1 Boxes:
   a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
   b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs.
   c. Box width shall be 20” wide maximum.

4. Type 1 Fronts:
   a. Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over-cleaned phosphatized steel.
   b. Fronts shall be door-in-door, hinged 1-piece. Mounting shall be flush or surface as indicated on schedules and/or Drawings. Hinged door-in-door trim shall be:
      1) Rooms or areas accessible to anyone: Hinged Door-in-Door with inner door lock and outer door is retained with screws.
      2) Electrical rooms or other locked rooms only accessible to qualified personnel: Hinged Door-in-Door with inner door lock and outer door lock. Doors shall not require screw removal to open, they shall be able to open by unlocking the locks.
   c. Hinged wiring access cover shall be secured with screws. Key-lock is not acceptable.
   d. Door for circuit breaker access shall be hinged and have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be

keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of the door.

5. Type 3R, 5, and 12:
   a. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
   b. All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of the door.

6. Skirt for Surface Mount Panelboards: Same gauge and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

7. Gutter Extension and Barrier: Same gauge and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

8. Finishes:
   a. Panels and Trim: Steel and galvanized steel, factory finish immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel and same finish as panelboards and trim.
   c. Fungus Proofing: Permanent fungicidal treatment for overcurrent devices and other components.

J. Interior:

1. Shall be voltage and ampere rated, as indicated on associated schedules and drawings, not to exceed 600 amperes maximum.

2. Short-circuit current ratings (SCCR) as specified on panel schedules. Ratings shall not be less than the following:
   a. 22,000 rms symmetrical amperes at 240 VAC or 208 VAC.
   b. 18,000 rms symmetrical amperes at 480 VAC.

3. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be plated copper. Bussing rated for 600 amperes shall be plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and –G.

4. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers over 100 amps shall be vertically mounted. Main lug interiors up to 400 amps shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mount applications.

K. Incoming Mains:

1. Location: Top, Bottom, or Convertible between top and bottom as required.

2. Main Breaker: Main lug interiors up to 400 amps shall be field convertible to main breaker.

L. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors, bonded to the box.

4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors, insulated from the box.

5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from the enclosure. Do not mount neutral bus in gutter.

6. Extra-Capacity Neutral Bus: Neutral bus rated 200-percent of the phase bus and listed and labeled by an NRTL, acceptable to Authority Having Jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on the Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on the Drawings. Do not mount neutral bus in gutter.

7. Split Bus: Vertical buses divided into individual vertical sections.

M. Conductor Connectors: Suitable for use with conductor material and sizes:

1. Material: Hard-drawn copper, 98-percent conductivity.

2. Terminations shall allow use of 75-degree C rated conductors without derating.

3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required for larger conductors.

4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

8. Gutter-Tap Lugs: Mechanical type, suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

9. Extra-Capacity Neutral Lugs: Rated 200-percent of phase lugs, mounted on extra-capacity neutral bus.

N. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.

O. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the Panel Schedules in the Drawings.

P. Split solid neutral shall be plated and located in the mains compartment up to 225 amps so all incoming neutral cable may be of the same length.

Q. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed circuit breaker knock-outs covering unused mounting space.

R. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices. Percentage of future space capacity shall be 20-percent minimum.

S. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to Authority Having Jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

T. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short-circuit current ratings shall all be displayed on the interior or in a booklet format.

2.03 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit Breaker or Lugs only as shown on Drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general purpose controller, with same SCCR as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to the main bus ahead of the contactor connection.

2. External Control-Power Source: 120 volt branch-circuit.

E. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

F. Doors: Door-in-Door construction with concealed hinges; secured with multi-point latch with tumbler locks; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed unless the outer door is open.

2.04 POWER (DISTRIBUTION) PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36-inches high, provide two latches; keyed alike.

C. Mains: Circuit Breaker, Fused Switch, or Lugs Only as shown on the Drawings.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 Amps and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 Amps: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: Fused switches if shown on Drawings.

G. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general purpose controller, with same short-circuit current rating as panelboard.

1. Internal Control-Power Source: control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

2. External Control-Power Source: 120 volt branch circuit.

2.05 ELECTRONIC-GRADE PANELBOARDS

A. Panelboards: NEMA PB 1; with factory-installed, integral SPD, labeled by an NRTL for compliance with UL 67 and UL 1449 after installing SPD.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

C. Main Overcurrent Protective Devices: Bolt-on, thermal-magnetic circuit breakers.

D. Branch Overcurrent Protective Devices: Bolt-on, thermal-magnetic circuit breakers.

E. SPD:

1. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

2. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277V or 208Y/120V, three-phase, four-wire, circuits shall not exceed the following:
   a. Line to Neutral: 1200 V for 480Y/277V and 700 V for 208Y/120V.
   b. Line to Ground: 1200 V for 480Y/277V and 700 V for 208Y/120V.
   c. Neutral to Ground: 1200 V for 480Y/277V and 700 V for 208Y/120V.
   d. Line to Line: 2000 V for 480Y/277V and 1200 V for 208Y/120V.

3. Protection modes and UL 1449 VPR for 240/120V, single-phase, three-wire, circuits shall not exceed the following:
   a. Line to Neutral: 700 V.
   b. Line to Ground: 700 V.
   c. Neutral to Ground: 700 V.
   d. Line to Line: 1200 V.

4. SCCR: Equal to the SCCR of the panelboard in which installed.

5. Nominal Rating: 20 kA minimum.

F. Buses:

1. Copper phase and neutral buses: 200-percent capacity neutral bus and lugs.

2. Copper equipment and isolated buses.

2.06 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating, circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the Drawings.

2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated in the Panel Schedules, but not less than:
      1) 22,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 18,000 rms symmetrical amperes at 480 VAC.
   b. Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated. All panels to be fully rated.

3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Shall be molded case type circuit breakers, unless required to be electronic-trip for selective coordination.

6. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.

7. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

10. Do not use tandem circuit breakers.

11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

12. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amps shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

13. Breaker handle/faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings.

14. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking the handle in the ON or OFF position.

15. Lugs shall be UL listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90 degrees C rated wire, sized according to the 75 degrees C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable.

16. The circuit breakers shall be UL listed for use with the following accessories: Shunt-Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

B. Main Circuit Breaker:

1. Shall be molded case type circuit breakers, unless required to be electronic-trip for selective coordination.

2. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.

C. Branch Circuit Breakers:

1. Circuit breakers shall be UL listed with amperage ratings, interrupting ratings, and number of poles as indicated on the associated Panel Schedules and Drawings.

2. Molded case branch circuit breakers shall have bolt-on type bus connectors.

3. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

4. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a trip indicator appearing in the clear window of the circuit breaker housing.

5. The exposed faceplates of all branch circuit breakers shall be flush with one another.

6. Lugs shall be UL listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90 degrees C rated wire, sized according to the 75 degrees C temperature rating per NEC Table 310-16. Branch circuit breakers rated 30 amps and below shall be UL listed to accept 60 degrees C rated wire.

7. Breakers shall be UL listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.

2.07 ACCESSORIES, COMPONENTS, AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device tests, inspections, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard, include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

2.08 IDENTIFICATION

A. Provide labelling as required in Section 26 05 53 “Identification for Electrical Systems”.

B. Panelboard Labels: Manufacturer’s name and trademark, voltage, amperes, number of phases, and number of poles shall be located on the interior of the panelboard door.

C. Breaker Labels: Faceplates shall list current rating, UL and IEC certification standards, and AIC rating.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 EXECUTION

3.01 EXAMINATION

A. Comply with NECA 1.

B. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1, and NEC Standards.

C. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

D. For all new panelboards, provide minimum of four (4) additional 1-inch spare conduits with pull-strings from panelboard to above accessible ceiling for future circuits. Additionally, stub four (4) 1-inch spare conduits into raised floor space or below slab not on grade.

E. Panelboard Mounting:

1. Install panelboards on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete".

2. Attach panelboard to the vertical finished or structural surface behind the panelboard.

3. Comply with requirements for seismic control devices as specified in Section 26 05 48 "Seismic Controls for Electrical Systems".

4. Mount top of trim 90-inches above finished floor, unless otherwise indicated.

5. Mount panelboard cabinet plumb and rigid without distortion of the box.

6. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

7. Mount surface-mounted panelboards to steel slotted supports 5/8 inch or 1-1/4 inch, as required, in depth. Orient steel slotted supports vertically.

F. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Seismic Controls for Electrical Systems".

G. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, brackets, and temporary blocking of moving parts from panelboards.

H. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit breaker trip ranges.

2. Tighten bolted connections and circuit breaker connections using a calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

I. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

J. Arrange conductors in gutters into groups, bundle, and wrap with wire ties after completing load balancing.

K. Install filler plates in unused spaces.

L. Panel Schedules: Provide a typed index card of circuits, listing each circuit by proper designation, on back of each cabinet door under plastic cover. Spares and spaces to be entered in pencil. Panel Schedules shall be completed with specific (what and where) information.

M. Labeling: Provide nameplate and labeling as required in Section 26 05 53.

N. Panels that are over-sprayed with wall paint must be cleaned and refinished. Otherwise, remove and replace equipment with new.

O. Cleanup: After construction is complete, vacuum panels, equipment, cabinets, and switchboards to remove dust, rust, and debris.

3.02 FIELD QUALITY CONTROL

A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

B. Manufacturer's Field Service:

1. Perform tests and inspections as required.

2. Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations; including connections, and to assist in testing.

C. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20-percent of each other. Maintain proper phasing for multi-wire branch circuits.

D. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written requirements. Provide documentation of the torque connections to engineer for closeout documentation. If values do not match manufacturer recommendation, contractor to provide additional torqueing and provide documentation that the requirements have been adhered to.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 "Circuit Breakers" and Paragraph 7.19.1 "Surge Arrestors", low-voltage. Perform optional tests. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:
   a. Initial Infrared Scanning: After substantial completion, but not more than 60-days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
   b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11-months after date of Substantial Completion.
   c. Instruments and Equipment:
      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device(s).

F. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

G. Panelboards will be considered defective if they do not pass tests and inspections.

H. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.03 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.04 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by the manufacturer.

B. Set field-adjustable circuit breaker trip ranges as indicated or as shown in the Overcurrent Protective Device Coordination Study, where applicable.

C. Load Balancing: After Substantial Completion, but not more than 60-days after Final Acceptance, measure load balancing and make circuit changes as required to keep phase loads within 20% of each other. Prior to making circuit changes to achieve load balancing, inform Owner's Representative of effect on phase color coding.

1. Measure load during period of normal facility operations.

2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Owner's Representative. Avoid disrupting services such as computers and on-line data processing, computing, transmitting and receiving equipment.

3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.

4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20-percent.

3.05 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 “Identification for Electrical Systems”.

B. Identify field-installed conductors, interconnecting wiring, and components.

C. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner’s final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

D. Panelboard Nameplates: Label each panelboard with a nameplate.

E. Device Nameplates: Label each branch circuit device in panelboards with a nameplate.

F. Install warning signs and also identify source of remote circuits where applicable.

END OF SECTION

SECTION 26 26 53
ELECTRIC VEHICLE CHARGING EQUIPMENT

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Section Includes: EV charging equipment that provides Level 2 EV charging.

1.03 DEFINITION

A. EV: Electric vehicle.

B. EV Cable: The off-board cable containing the conductors to connect the EV power controller to the EV that provides both power and communications during energy transfer.

C. EV Capable: Parking spaces that include nearby termination of raceway (conduit) to a power source with sufficient electrical panel capacity designed for simultaneous charging of electric vehicles in all planned EV parking spaces. Electrical wiring need not be pulled through raceway (conduit) until charging station is installed.

D. EV Charger or EV Charging Equipment: See “EVSE”.

E. EV Connector: A conductive device that, when electrically coupled to an EV inlet, establishes an electrical connection to the EV for the purpose of power transfer and information exchange. This device is part of the EV coupler.

F. EV Coupler: A mating EV inlet and connector set.

G. EV Inlet: The device in the vehicle into which the EV connector is inserted, and a conductive connection is made for the transfer of power and communication. This device is part of the EV coupler.

H. EV Make Ready: Parking spaces that include nearby termination of raceway (conduit) and electrical wiring pulled to a power source with sufficient electrical panel capacity for simultaneous charging of electric vehicles in all EV parking spaces.

I. EVSE: Electric Vehicle Supply Equipment. It includes the EV charging equipment and conductors, including the ungrounded, grounded, and equipment grounding conductors and EV cables, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for transferring energy between the premise wiring and the EV.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for EV charging equipment.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Plan showing location and number of EV charging units, and distance from building.

2. Plan showing “reasonable accessibility” to EV charging units.

3. Plan showing location and number of EV charging units, charging levels and connectors, and ability of EV charging units to participate in a demand-response or time-of-use pricing program, as well as a power load management system that allows for an increased number of charging stations than would otherwise be feasible without power load management.

C. Shop Drawings: For EV charging equipment:

1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Detail fabrication and assembly of mounting assemblies for EV charging equipment.

4. Include diagrams for power, signal, and control wiring.

5. Include verification of wireless communications service at each location of EV charging equipment.

D. Product Schedule: For EV charging equipment. Use same designations indicated on Drawings.

1.06 INFORMATION SUBMITTALS

A. Coordination Drawings: Area plans and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which equipment will be attached.

2. Electrical Service.

3. Communications Service, including wireless equipment.

4. Items penetrating finished floor or ceiling.

B. Qualification Data: For Installer.

C. Seismic Qualification Certificates: For equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's warranty.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For EV charging equipment to include in operation and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Online training and help documentation.

2. Station activation sticker.

1.08 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined by NFPA 70, by a qualified testing agency, and marked for intended location and use.

D. Comply with UL 2231-1, UL 2231-2, UL 2594, and NEC Article 625.

E. Comply with SAE J1772.

F. Comply with FCC Part 15 Class A.

1.09 FIELD CONDITIONS

A. Wireless Survey: Complete wireless survey to determine if wireless provider signals meet or exceed manufacturer's recommended minimum values.

B. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not exceeding minus 22 to plus 122 deg F.

2. Altitude: Not exceeding 6600 feet.

C. Rate Equipment for non-operation under the following conditions:

1. Ambient Temperature: Not exceeding minus 40 to plus 140 deg F.

2. Altitude: Not exceeding 6600 feet.

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner's Representative no fewer than two (2) days in advance of proposed interruption of electric service.

2. Do not proceed with interruption of electric service without Owner Representative's written permission.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of EV charging units that fail in materials or workmanship within specified warranty period.

1. Standard Warranty Period: One year from date of Substantial Completion.

2. Extended Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Provide SemaConnect 8 Series of electric vehicle charging stations for commercial applications.

B. Source Limitations: Obtain EV charging equipment from a single manufacturer.

2.02 EV CHARGING EQUIPMENT DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. ADA compliant.

D. Metering: +/- 2 percent from 2 percent to full scale of output (48 A).

E. EV Charging Equipment Mounting: Bollard mount or wall mounted as required.

F. Enclosures:

1. Rated for environmental conditions at installed location:
   a. Indoor Locations: NEMA 250, Type 3R.

b. Outdoor Locations: NEMA 250, Type 3R.
c. Aluminum and UV-resistant plastic.
d. Paint and Anodized.
e. Charging components protected by security screws.
f. Charging connectors in locking holsters.
g. Meter, modem, and CPU, tamper resistant.

G. EV Cable and Connectors:

1. SAE J1772 connector.

2. One or two connectors with locking holster.

3. 18-foot cable with cable management system (Cable Organizer).

H. Status Indicators:

1. LEDs to indicate power, vehicle charging, charging complete, system status, faults, and service, as well as authorization.

I. Display Screen:

1. VGA-resolution, daylight-viewable LCD screen with UV protection. Daylight readable and fingerprint resistant.

2. Displays power, charging, charging complete, remote control, system status, faults, payment and pricing details, and service.

J. Networking:

1. Data Communications: Cellular 4G LTE.

2. Communications Protocol: OCPP Compliant

3. Capable of remote configuration, diagnostics and reporting.

4. Capable of remote software updates (future proof). Over-the-Air (OTA) update enabled.

K. Payment System:

1. RFID (ISO 15693, ISO 14443), NFC, Contactless credit card reader.

2. PCI (Payment Card Industry) compliant.

3. Capable of remote control and authorization including mobile phone application or toll free phone number.

L. Charging Network: Compatible with the SemaConnect EV charging network.

1. Multiple units shall independently connect to charging network.

2. Multiple units shall have one unit designated as a master unit that is configured as a gateway unit between the EV charging equipment and the charging network.

3. Individual units shall be capable of indicating station status and availability providing or connecting user to customer support and remote control.

2.03 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

B. Surge Withstand: 6 kV at 3000 A.

C. Integral GFCI.

D. Auto-GFCI fault retry.

E. Input Power:

1. 48A or Two 48A, 240-Vac, 60 Hz, single phase per charger. Refer to Drawings.

2. Dual circuits do not need to be interlocked.

F. EV Charging Levels:

1. Single vehicle: AC Level 2 at up to 11.52 kW (8 Series) per vehicle.

2. Dual vehicles: AC Level 2 at up to 11.52 kW (8 Series) per vehicle

3. Multiple vehicles simultaneously charging at a site using Automatic Power Load Management may be charged up to 11.52 kW (8 Series) per vehicle.

2.04 GENERAL REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting the performance of the Work.

B. Examine roughing-in for EV charging equipment electrical conduit to verify actual locations of conduit connections before equipment installation.

C. Examine walls, floors, and pavement for suitable conditions where EV charging equipment will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 413.

B. Concrete Base Mounting:

1. Install EV charging equipment on 6-inch nominal-thickness concrete base. Base should be 24-inch diameter or square (minimum 12-inch from the center located conduit stub-up). Comply with requirements for concrete base specified in Section 033000 “Cast-in-Place Concrete”.
   a. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   b. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   c. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   d. Install anchor bolts to elevations required for proper attachment to supported equipment.
   e. Secure EV charging equipment to concrete base according to manufacturer’s written instructions.

2. Install EV charging equipment on 24-inch nominal diameter and 24-inch concrete base. Comply with requirements for concrete base as specified in Section 033000 “Cast-in-Place Concrete”.
   a. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   b. Install anchor bolts to elevations required for proper attachment to supported equipment.
   c. Secure EV charging equipment to concrete base according to manufacturer’s written instructions.

C. Bollard Mounting:

1. Allow a minimum of 24 inches of clearance around EV charging equipment.

2. EV charging equipment receptacles or holders shall not be less than 24 inches and not more than 4-feet above finished grade.

3. Mount EV charging equipment plumb and rigid without distortion of enclosure.

4. Secure EV charging equipment according to manufacturer’s written instructions.

D. Comply with mounting and anchoring requirements specified in Section 260548 “Seismic Controls for Electrical Systems”.

E. Wiring Method: Install cables in raceways and cable trays. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 “Raceways and Boxes for Electrical Systems”.

F. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

H. Circuit Breakers: Comply with Section 262816 "Enclosed Switches and Circuit Breakers".

I. Secure covers to enclosure.

3.03 CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables".

B. Comply with grounding requirements in Section 260526 "Grounding and Bonding for Electrical Systems".

C. Comply with requirements for installation of conduit in Section 260533 "Raceways and Boxes for Electrical Systems". Drawings indicate general arrangement of conduit, fittings, and specialties.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems".

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Perform the following tests and inspections for each unit of EV charging equipment:

1. Unit self-test.

2. Operation test with load bank.

3. Operation test with EV.

4. Network communications test.

D. EV charging equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.06 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.07 ONGOING MANAGEMENT SERVICES

A. Engage a station manufacturer that offers a service to manage the administration and policies of the electric vehicle charging stations on an ongoing basis.

3.08 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for the duration of an active SemaConnect Network Service Plan.

B. Upgrade Service: At Substantial Completion, remotely update software to latest version. Install and program software upgrades that become available while an active SemaConnect Network Service Plan is maintained. Upgrading software shall include operating system and new or revised licenses for using software.

3.09 DEMONSTRATION

A. Utilize SemaConnect Station Management Services and SemaConnect Assure Services to train Owner's maintenance personnel to adjust, operate, and maintain EV charging equipment.

END OF SECTION

SECTION 26 27 17
EQUIPMENT WIRING

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Provide complete electrical connections to equipment.

1.03 RELATED SECTIONS

A. Division 26 Section “Raceways and Boxes”.

B. Division 26 Section “Low-Voltage Electrical Power Conductors and Cables”.

C. Division 26 Section “Wiring Devices”.

D. Division 26 Section “Grounding and Bonding”.

1.04 REFERENCES

A. NEMA WD 1 – General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).

B. NEMA WD 6 – Wiring Devices – Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2012).

C. NFPA 70 – National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by the Authority Having Jurisdiction, Including all applicable amendments and supplements.

1.05 SUBMITTALS

A. Submit under provisions of Division 01.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified, indicated, and intended.

1.07 GENERAL REQUIREMENTS

A. Provide detailed wiring diagrams to interconnect components for complete operation of various electrical systems, including devices and components provided under other Sections of the Construction Documents.

B. Provide layouts of equipment and details of mounting method for approval prior to installation to ensure proper execution of the Work.

C. Drawings are diagrammatic and indicated generally the locations of materials and equipment, and shall be followed as closely as possible. Coordinate the Work under this Section with the Architectural, Structural, Plumbing, Heating and Air Conditioning, and the Drawings of other trades for exact dimensions, clearances, and roughing-in locations. Cooperate with other trades in order to make minor field adjustments to accommodate the work of others.

D. All devices, outlets, cabinets, equipment, panels, light fixtures, and switches can be field located by Owner's Representative within 20-feet of designed locations prior to rough-in work without extra compensation.

E. Coordinate electrical work with mechanical installations. Verify final mechanical equipment locations with mechanical installer prior to commencement of electrical work. Connect power wiring to mechanical equipment through starters, VFDs, and contactors as required. Maintain clearances around mechanical equipment to allow access for maintenance per NEC codes and local codes.

F. Coordinate wiring interconnections for the complete operation of electrical-mechanical equipment to include items provided by other divisions. Examine equipment connection information with manufacturer's shop drawings and submittals.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provide with equipment.

1. Colors: Conform to NEMA WD 1.

2. Cord Construction NFPA 70, Type SO, multi-conductor, flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Sections 26 28 16 "Enclosed Switches" and 26 29 13 "Enclosed Controllers", and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26 "Wiring Devices".

D. Raceways and Boxes: As specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems".

E. Wires and Cables: As specified in Section 26 05 19 “Low-Voltage Electrical Power Conductors and Cables”.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer’s instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connections in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet(s) to accommodate connection(s) with attachment plug(s).

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 56 19
EXTERIOR LIGHTING

PART 1 – GENERAL

1.01 GENERAL

A. Conform to General Conditions, Supplementary Conditions, Division 01, and Division 26.

B. Review the Specifications and Drawings for coordination with additional requirements and information that applies to work under this Specification.

1.02 SUMMARY

A. Base Bid:

1. Electrical Contractor:
   a. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
   b. Luminaire supports.
   c. Luminaire mounted photoelectric relays.

1.03 RELATED WORK

A. Specified Elsewhere: Drawings and general provisions of the Contract apply to this Section.

B. Section 26 09 23 “Lighting Control System” for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multiple lighting relays and contactors.

1.04 SYSTEM DESCRIPTION

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.

2. Luminaire supports.

3. Luminaire mounted photoelectric relays.

1.05 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers’ laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experiences and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer(s).

1.06 REGULATORY REQUIREMENTS

A. National Electrical Code 2017 (NFPA 70).

1.07 ABBREVIATIONS AND DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See “Luminaire”.

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp(s), reflector, and housing.

1.08 SUBMITTALS

A. Product Data: For each type of luminaire:

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.

4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

5. Photometric data and adjustment factors based on laboratory tests, complying with IES lighting measurements and test and calculation guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaires as applied in this Project.
   a. Manufacturer’s Certified Data: Photometric data certified by manufacturer’s laboratory with a current accreditation under the NVLAP for energy efficient lighting products.
   b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.

8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Product Schedule: For luminaire and lamps.

C. Delegated Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

1.09 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.

2. Structural members to which equipment and luminaires will be attached.

3. Underground utilities and structures.

4. Existing underground utilities and structures.

5. Above grade utilities and structures.

6. Existing above grade utilities and structures.

7. Building features.

8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer(s):

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.

2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

F. Source quality control reports.

G. Sample warranty.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.11 OPERATION AND MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and ratings installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and ratings installed. Furnish at least one of each type.

3. Globes and Guards: One for every 20 of each type and ratings installed. Furnish at least one of each type.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.13 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.14 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within the specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including luminaire support components.
   b. Faulty operation of luminaires and accessories.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 5 years from the date of Substantial Completion.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term “withstand” means “the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified”.

2.02 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for the intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by and NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 80, CCT of 4000 K.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: Refer to drawings.

L. Lamp Rating: Lamp marked for outdoor use.

M. Source Limitations: Obtain luminaires from single source from a single manufacturer. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.03 LUMINAIRE MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the ON position, and factory set to turn light on at 1.5 to 3 fc and off at 4.5 to 10 fc with a 15-second minimum time delay.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.

2. Adjustable window slide for adjusting on/off set points.

2.04 LUMINAIRE TYPES

A. Refer to Drawings.

2.05 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: For and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without the use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in the operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2. Glass: Annealed crystal glass unless otherwise indicated.

3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.

2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. “USE ONLY” and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.06 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer’s standard paint applied to factory-assembled and –tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard coat wax.

3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
   a. Color: Black.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Exterior Surfaces: Manufacturer’s standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build, polyurethane enamel.
   a. Color: As selected from manufacturer’s standard catalog of colors.
   b. Color: Match Architect’s sample of manufacturer’s standard color.
   c. Color: As selected by Architect from manufacturer’s full range.

2.07 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 “Hangers and Supports for Electrical Systems” for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by the manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.

2. Able to maintain luminaire position after cleaning and relamping.

3. Support luminaires without causing deflection of finished surface.

4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install luminaires at height and aiming angle as indicated on Drawings.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in Section 26 05 19 “Low-Voltage Electrical Power Conductors and Cables” and 26 05 33 “Raceways and Boxes for Electrical Systems” for wiring connections and wiring methods.

3.04 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 “Raceways and Boxes for Electrical Systems”. In concrete foundations, wrap conduit with 0.010 inch thick, pipe wrapping plastic tape applied with a 50 percent overlap.

3.05 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 “Identification for Electrical Systems”.

3.06 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Verify operation of photoelectric controls.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to the lighting system, retest to demonstrate compliance with standards.

3.07 DEMONSTRATION

A. Train Owner’s personnel to adjust, operate, and maintain luminaires and photocell relays.

3.08 ADJUSTING

A. Occupancy Adjustments: When requested within 12-months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two site visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 31 00 00
EARTHWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Grading to finish sub grade and preparing sub grades for slabs-on-grades, walks, pavements, and plantings.

1.03 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) consists of all labor, tools, materials, tests, permits and other related items necessary for the finished Grades.

1.04 REFERENCES

A. This specification section incorporates by reference the latest revisions or editions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
   2. Manual on Design Guidelines and Specifications for Road and Bridge Construction in Pierce County (Pierce County Manual).

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.05 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
B. Excavation: Removal of materials encountered above sub grade elevations.
   1. Additional Excavation: Excavation below sub grade elevations as directed by Pierce County's Representative. Additional excavation and replacement material will be paid for according to contract provisions for changes in the work.
   2. Unauthorized Excavation: Excavation below sub grade elevations or beyond indicated dimensions without direction by Pierce County's Representative. Unauthorized excavation, as well as remedial work directed by Pierce County's Representative, shall be without additional compensation.
C. Fill: Soil materials used to raise existing grades.
D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
E. Sub grade: Surface or elevation remaining after complete excavation, or top surface of a fill or backfill immediately below sub base, drainage fill or topsoil materials.
F. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.06 SUBMITTALS

A. Samples: For the following:
   1. Use section 3-04 from WSDOT Standard Specifications For road, Bridge, and Municipal construction M41-10 for samples of each proposed soil material from borrow sources.
B. Material Test Report: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Sieve analysis by a certified testing laboratory of each material specified, showing the percent passing for each sieve size specified.
C. Geotextile Fabric: Composite date sheet

1.07 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at project site.

1.08 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Pierce County or others unless permitted in writing by Pierce County and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify Pierce County and Utility Franchise not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Pierce County's written permission.
   3. Contact utility-locator service for area where Project is located before excavation.

PART 2 PRODUCTS

2.01 NONWOVEN GEOTEXTILE FABRIC

A. Nonwoven geotextile meeting or exceeding mullen burst of 220 psi (ASTM D3786 / D3786M), trapezoidal tear of 40 lbs. (ASTM D4533 / D4533M), and puncture strength of 65 lbs. (ASTM D4833 /D4833M). Mirafi 140N or approved equal.

2.02 SOIL MATERIALS

A. Satisfactory Soils: On-site soil free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
B. Unsatisfactory Soil: All other soils including:
   1. Satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
C. Borrow (WSDOT 9-03.14) Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Aggregate for gravel borrow shall consist of granular material, either naturally occurring or processed, and shall meet grading requirements per Table om WSDOT Section 9-03.14(1).
D. Backfill and fill: Satisfactory soil materials.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect sub grades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge soil-bearing water runoff or airborne dust to adjacent properties and walkway.

3.02 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub grades, and from flooding Project site and surrounding area.
B. Protect sub grades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep sub grades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to sub grade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

3.04 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus one tenth foot (0.10’). Extend excavation a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footing and Foundations: Do not disturb the bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus one tenth foot (0.10’). Do not disturb bottom of excavations intended for bearing surface.

3.05 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surface under walks and pavements to indicated cross sections, elevations, and grades.

3.06 APPROVAL OF SUBGRADE

A. Notify Pierce County’s Representative when excavations have reached required sub grade.
B. Cut Areas: After cutting to finish sub grade, proof roll sub grade at all cut areas to receive paving or structures with heavy pneumatic-tired equipment or a 2000-lb. roller to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated sub grade.
   1. Any soft cut areas identified by the Pierce County’s Representative, and if directed by the Pierce County’s Representative, shall be over excavated to a depth determined by Pierce County’s Representative, and the excavated material re-compacted.
   2. Payment for removal and re-compaction shall be negotiated.
   3. In the event the Pierce County’s Representative determines the existing soil to be unsuitable, the cost for removal and replacement with borrow shall be negotiated.
C. Reconstruct sub grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, at the Contractor’s expense.

3.07 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Pierce County's Representative.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Pierce County's Representative.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavation soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from the edge of excavations. Do not store within drip line of remaining trees.

3.09 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Surveying locations of underground utilities for record documents.
   2. Inspecting and testing underground utilities.
   3. Removing concrete formwork.
   4. Removing trash and debris.
   5. Removing temporary shoring and bracing, and sheeting.
   6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.10 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
C. Place and compact fill material in layers as specified to required elevations to the specified densities.

3.11 MOISTURE CONTROL

A. Uniformly moisten or aerate sub grade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, pavements, scarify and re-compact top 12 inches of existing sub grade and each layer of backfill or fill material at 95 percent.
2. Under walkway, scarify and re-compact top 6 inches below sub grade and compact each layer of backfill or fill material at 95 percent
3. Under unpaved areas, scarify and re-compact to 6 inches below sub grade and compact each layer of backfill or fill material at 95 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spats, and trim high spots to comply with required surface tolerances.
B. Site Grading: Slope grades to water away from building pad sites and to prevent ponding. Finish sub grades to required elevations within the following tolerances:
   1. Unpaved Areas: Plus or minus one tenth foot (0.10’).
   2. Pavement: Plus or minus five hundredths foot (0.05’)
   3. Walk: Plus or minus one tenth foot (0.10’)
C. Grading Inside Building Lines: Finish sub grade to a tolerance of 0.05’ when tested with a 10-foot straightedge.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Pierce County will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.
B. Allow testing agency to inspect and test sub grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.
C. Footing Sub Grade: At footing sub grades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing sub grades may be based on a visual comparison of the sub grade with tested sub grade when approved by Pierce County’s Representative.
D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922 and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Area: at sub grade and at each compacted fill and backfill layer, at least one test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
   3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
E. When testing agency reports that sub grades, fill, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

3.15 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to the specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Pierce County's Representative; reshape and re-compact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Unless otherwise specified, remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Pierce County's property.

3.17 BORROW

A. The Contractor shall be responsible for determining quantities of cut and fill. In the event there is insufficient on-site fill material, use import borrow. The cost for import borrow shall be included in the lump sum contract price.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for soil testing that meet the standards referenced as well as the preparation, safety, and quality control measures.

END OF SECTION 31 00 00

SECTION 31 05 16
AGGREGATES

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and place aggregates to install new improvements using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish the following aggregates:
   1. Crushed Surfacing Top Course.
   2. Crushed Surfacing Base Course.
   3. Backfill Material included in pipe installation and other items.
   4. Storm Drainage Materials.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
   2. Washinton Administrative Code (WAC)
   3. Revised Code of Washington (RCW)

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 31 20 00 – EARTH MOVING
   2. Specification 31 23 33 – TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES
   3. Specification 33 40 00 – STORM DRAINAGE

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for aggregate furnishing and placing.

1.06 SUBMITTALS

A. Material Sources: Submit name of imported materials suppliers.

B. Import Aggregate Material Certifications: All imported aggregates shall be provided with certifications confirming that each aggregate does not consist of contaminated soils, petroleum products or dangerous wastes.
   1. If the aggregate product consists of no recycled products and consists of only virgin soils, then the aggregate supplier shall provide certification stating that the aggregate products consist of virgin soils/rock and provide WSDOT source certification for all import materials. The supplier shall also provide a written description of the aggregate manufacturing process, from the mine source to project delivery. The description shall

include stockpiling at the source, the source of wash water used if applicable, and chain of material custody.

2. If the aggregate products consist of recycled products, the products shall comply with the following requirements:
   a. WSDOT 9-03.21 excepting recycled glass and slag. Recycled glass and slag products are prohibited.
   b. WAC 173-303 and RCW 70.105 requirements to certify that the soils do not contain dangerous waste. The products shall be chemically tested to determine the waste constituents and the levels found. Soils must have levels below published threshold limits.
3. Gradation Analysis: Submit gradation analysis certification documents from an independent qualified testing agency indicating and interpreting test results for compliance of specified aggregate materials. The testing, test results and documentation certificate shall be for this specific project. In the event that the documents are not project specific, provide certificates within one year of the submittal date and certify that the manufacturing processes performed for the other project are the same for the Project. Certificates older than one year from the submittal date will not be acceptable.

C. Import Aggregate Material Certificates: One certificate shall be provided for each of the following materials included in the contract plans:
   1. Crushed Surfacing Base Course
   2. Crushed Surfacing Base Course
   3. Structural Fill
   4. Gravel Backfill for Drains
   5. Gravel Backfill for Pipe Zone Bedding
   6. Bank Run Gravel for Trench Backfill
   7. Pipe Bedding Material
   8. Permeable Ballast
   9. Streambed Cobbles
   10. Quarry Spalls
   11. Riprap

PART 2 PRODUCTS

2.01 AGGREGATE MATERIALS

A. Crushed Surfacing Top Course: Shall conform to WSDOT Section 9-03.9(3) requirements.
B. Crushed Surfacing Base Course: Shall conform to WSDOT Section 9-03.9(3) requirements.
C. Structural Fill: Shall consist of a granular soil free of debris, organic matter, trash and cobbles greater than 6-inches in diameter. Structural fill during wet weather conditions shall meet the following gradation requirements: well-graded sand and gravel with less than 5 percent (by weight) passing the US No. 200 sieve based on that fraction passing the 3/4-inch sieve. All material placed as fill associated with mass grading or as utility trench backfill should be placed as structural fill. The structural fill should be placed in horizontal lifts of appropriate thickness to allow adequate and uniform compaction of each lift. Fill should be compacted to at least 95 percent of MDD (maximum dry density as determined in accordance with ASTM D-1557).
D. Gravel Backfill for Drains: Shall conform to WSDOT Section 9-03.12(4).
E. Common Soils: Shall be existing native, naturally occurring soils. If excavated common soils are used on-site, they shall comply with the respective aggregate specification for the intended use. All excess common soils shall be used (wasted) on-site in grading areas outside of structural fill, per the grading plan or as designated by the owner.
F. Bank Run Gravel for Trench Backfill: Shall conform to WSDOT Section 9-03.19.

G. Pipe Bedding Material: Shall conform to WSDOT Section 9-03.12(3).
H. Gravel Shoulder: Shall conform to WSDOT Section 9-03.9(3).

PART 3 EXECUTION

3.01 GENERAL

A. Do not place aggregates over frozen or spongy subgrade surfaces.

3.02 EXCAVATION

A. Excavate in accordance with Section 31 20 00.

3.03 BEDDING, BACKFILL, AND FILL PLACEMENT

A. Place in accordance with Section 31 20 00 and 31 23 33.

3.04 GEOTEXTILE FABRIC PLACEMENT

A. Place in accordance with manufacturer’s specifications

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for collecting and installing aggregates that meet the standards referenced as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1 GENERAL

1.01 SUMMARY

A. Accomplishing indicated and required stripping, excavation, filling, compaction, sub-grade preparation, rough and finish grading, and the like as required to install new improvements as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Excavate and backfill trenches as necessary for water, storm drain, foundation drains, sanitary sewer installation and other work as shown on drawings.
B. Removing materials from the site which are unsuitable for use.
C. Importing additional operations with other work of the project.
D. Dewatering requirements including providing, operating, maintaining and removing temporary dewatering systems for controlling surface water in the construction area.
E. Preparing subgrades for walks, pavements, turf and grasses, underdrains, and plants.
F. Excavating and backfilling for structures.
G. Subbase course for concrete, asphalt, gravel, or mulch walks and pavements.
H. Subbase course and base and top course for asphalt paving.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.
B. Base Course: Aggregate layer placed between the subbase course and the next course, i.e. HMA, concrete, crushed surfacing base course, crushed surfacing top course, etc.
C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.
F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subbase Course: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below base course, drainage fill, drainage course, or topsoil materials.
H. Utilities: On-site underground pipes, conduits, ducts, and cables.
I. Pre-excavation Conference: Conduct conference at Project site.

1.05 PERMITS, CODES, & REGULATIONS

A. Obtain and pay for all necessary permits and fees as required by the Local Authority and prevailing ordinances and/or codes.
B. Keep fully informed and comply with all existing laws, codes, ordinances and regulations that in any way affect the conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor must promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
C. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract must apply, unless otherwise expressly set forth.
D. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard must apply or Owner's Representative will determine which must govern.

1.06 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, and other adjacent occupied or used facilities during earth moving operations.
B. Utility Locator Services: Notify "Call Before You Dig" for area where Project is located before beginning earth moving operations.
C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 31 25 00, are in place.
D. The following practices are prohibited within protection zones:
    1. Storage of construction materials, debris, or excavated material.
    2. Parking vehicles or equipment.
    3. Excavation or other digging unless otherwise indicated.
    4. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
E. Do not direct vehicle or equipment exhaust towards protection zones.
F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

1.07 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
    1. Specification 31 25 00 – EROSION AND SEDIMENTATION CONTROL
    2. Specification 31 05 16 – AGGREGATES

1.08 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for earth moving and/or excavation.

1.09 SUBMITTALS

A. Sieve analysis reports or certifications on all granular materials.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Per Section 31 05 16 AGGREGATES

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications. Shall conform to WSDOT Section 9-33.2(1) Table 1 with the following measured per test methods referenced:
   1. Grab Tensile Strength: 160 lbf: ASTM D4632
   2. Grab Failure Strength: <50%; ASTM D4632
   3. Sewn Seam Strength: 140 lbf; ASTM D4632
   4. Tear Strength: 50 lbf; ASTM D4533
   5. Puncture Resistance: 310 lb min; ASTM D6241
   6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751
   7. Permittivity: 0.4 per second, minimum; ASTM D4491
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355
B. Pavement Subbase Geotextile: Tensar Technology – TriAx TX160 geogrid or equivalent approved by the engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Protect adjacent existing improvements from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
B. Protect and maintain erosion and sedimentation controls during earth moving operations.
C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DETWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
C. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. If such materials are encountered, Contractor is to use a force account (FA) WSDOT item named “Extra Road Excavation” as directed by the Engineer with a maximum of $10,000 for all bidders.
B. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.05 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
B. Stockpile soil materials away from edge of excavations, in areas approved by Owner.

3.06 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable and subdrainage.
   2. Surveying locations of underground utilities for Record Documents.
   3. Removing concrete formwork.
   4. Removing trash and debris.
   5. Compact existing grade prior to placing fill.
B. Place backfill on subgrades free of mud, frost, snow, or ice.
C. Backfill voids with satisfactory soil while removing shoring and bracing.
D. Place and compact initial backfill of subbase material, satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping. Coordinate backfilling with utilities testing.
E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
F. Backfill the holes after stump removal using native onsite materials.

3.07 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks, use satisfactory soil material.
   3. Under steps and ramps, use structural fill.
C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.08 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer as necessary for compaction or as directed by Owner’s Representative.
B. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
C. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that is too wet to compact to specified dry unit weight or as directed by Owner’s Representative.

3.09 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances.
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.

C. Finish Grading:
   1. Correct, adjust and/or repair rough graded areas:
      a. Cut off mounds and ridges.
      b. Fill gullies and depressions.
      c. Perform other necessary repairs.
      d. Bring all subgrades to specified contours, even, and properly compacted.
      e. Loosen surface to depth of 2 in. minimum.
   2. Place excess excavated material on site at locations identified on the plans or in areas as directed by the owner following the tolerances identified above.

3.10 SUBBASE AND BASE COURSES UNDER WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.
B. On prepared subgrade, place subbase course and base course under walks as follows:
   1. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Owner; reshape and recompact.
C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner’s property.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary to complete the earth moving process to the satisfaction of the project plans as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 31 23 00
TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Complete all structure and trench excavation, backfilling, compaction, and trench safety measures for all structures and underground utilities as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Perform excavation for utility trenches and underground structures.
B. Install backfill and perform compaction for all underground utilities.
C. Implement trench safety measures per Washington State Safety Standards.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
   2. Pierce County Accommodating Utilities Manual.
B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 31 05 16 – AGGREGATES
   2. Specification 26 05 41 – UNDERGROUND ELECTRICAL CONSTRUCTION

1.05 QUALITY ASSURANCE

A. Contractor will hire an independent soils laboratory to conduct in-place moisture- density tests for backfilling and provide results to Owner to assure that all work complies with this Specification Section.

1.06 SUBMITTALS

A. Sieve analysis reports on all granular materials.
B. Certified test results of moisture content and chemical constituents for the imported fill materials, either through documentation of existing chemical analyses or by project-specific testing and analysis, as directed by Parks. At minimum, materials obtained from commercial quarries shall have a total arsenic level less than 20 mg/kg for diesel and oil range hydrocarbons and below laboratory reporting limits for gasoline. Borrow from sources other than commercial quarries may be subject to additional testing depending on the source and as directed by the Engineer.
C. Modified proctor results for materials to be compacted.
D. Respective pipe or conduit manufacturer’s data regarding bedding methods of installation and general recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Per Section 31 05 16 AGGREGATES

PART 3 EXECUTION

3.01 GENERAL

A. Remove unsuitable materials and legally dispose of them off the Owner's property.

3.02 EXCAVATION AND PREPARATION OF THE TRENCH

A. Shall conform to the requirements of WSDOT Section 7-08.3(1)
B. Avoid overloading or surcharge. Place excavation material a sufficient distance back from edge of excavation to prevent slides or caving.
   1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.
C. Provide full access to public and private premises.
D. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed replace items to full satisfaction of Owner and contracting agency.
E. Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stones as directed by Engineer.
F. Groundwater Dewatering:
   1. Where groundwater is, or is expected to be, encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade to allow subgrade stabilization, pipe, bedding and backfill material to be placed in the dry, and to maintain a stable trench wall or side slope.
   2. Groundwater shall be drawn down and maintained at least 3 feet below the bottom of any trench or manhole excavation prior to excavation.
   3. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation.
   4. Keep dewatering system in operation until dead load of pipe, structure, and backfill exceeds possible buoyant uplift force on pipe or structure.
   5. Dispose of groundwater to an area which will not interfere with construction operations or damage existing conditions.
   6. Install groundwater monitoring wells as necessary.
   7. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
G. Trench Excavation:
   1. Excavate trenches by open cut method to depth shown on the Contract Plans as necessary to accommodate work.
   2. Any trench or portion of trench, which is opened and remains idle for seven (7) calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled without completion of work, at no additional cost to Owner.
      a. Said trench may not be reopened until Owner is satisfied that work associated with trench will be promptly completed.
   3. Observe following trenching criterion:
      a. Trench size:
         1) Excavate trench to widths in accordance with WSDOT Section 3-07.4 and 7-08.3(1).

2) Keep trenches free of surface water runoff.

3.03 TRENCH SAFETY SYSTEMS

A. Trench safety systems shall meet the requirements of WSDOT Standard Specification Section 7-08.3(1)B.
B. Trench boxes or other similar protection systems shall be utilized.

3.04 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Placement of bedding material shall precede the installation of all pipe. This shall include necessary leveling of the native trench bottom of the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on a uniformly dense unyielding foundation.
B. Pipe Bedding:
   1. Shall conform to WSDOT Section 7-08.3(1)C.
   2. Pipe zone bedding shall be placed in loose layers and compacted to 90 percent maximum density.
C. Subgrade Stabilization:
   1. Stabilize the subgrade when directed by the Engineer.
   2. Observe the following requirements when unstable trench bottom materials are encountered:
      a. Notify the Engineer when unstable materials are encountered.
         1) Define by drawing station locations and limits.
      b. Removal of unstable trench bottom caused by the Contractor's failure to dewater, lack of preparation for rainfall, or other Contractor operations.
         1) Replace with subgrade stabilization with no additional compensation.

3.05 BACKFILLING

A. Shall conform with the requirements of WSDOT Section 7-08.3(3).
B. Do not backfill until tests to be performed on system show system is in full compliance with specified requirements.
C. Pipe Zone Backfill:
   1. Pipe zone backfill shall be placed in loose layers and compacted to 90 percent maximum density.
   2. Backfill shall be brought up simultaneously on each side of the pipe to the top of the pipe zone.
   3. The pipe shall be covered to the top of the pipe zone and the materials compacted in a manner to avoid damaging or disturbing the completed pipe.
D. Backfill above the pipe zone:
   1. If pipe is being placed under paved areas or roadways, backfill above the pipe shall be placed in horizontal layers no more than 6 inches thick and compacted to 95 percent maximum density.
   2. If pipe is being placed in non-traffic areas, backfill above the pipe zone shall be placed in horizontal layers no more than 6 inches thick and shall be compacted to 85 percent maximum density.
E. All compaction shall be in accordance with the WSDOT Compaction Control Test of Section 3-03.3(14)D. Testing shall be performed as needed per the Owner's Representative.
F. Water flushing for consolidation is not permitted.
G. Backfilling for Electrical Installations:
   1. Underground electrical construction shall comply with Specification 26 05 41.

2. Modify excavation and backfilling for electrical installation and conform to WSDOT 8-20.3(2).

3.06 FIELD QUALITY CONTROL

A. Testing
   1. Perform in-place moisture-density tests as directed by the Owner's Representative.
   2. Perform tests through recognized testing laboratory approved by Owner.
   3. Perform additional tests as directed until compaction meets or exceeds requirements.
      a. Compaction testing to be performed as needed per the Owner's Representative.
B. Ensure excavations are safe for testing personnel.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for trenching, backfilling, and compacting for utilities to the satisfaction of the project plans as well as the preparation, safety, and quality control measures.
   1. No separate payment for surface water runoff pumping will be made.

END OF SECTION

SECTION 31 24 00
EMBANKMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Construct the pond embankment using the materials as shown in the Contract Drawings and as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor, and related items necessary to complete the work shown in the Contract Drawings and as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the installation of the detention pond earthen embankment in a quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest versions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction.
   2. Pierce County: Stormwater Management & Site Development Manual

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 03 11 00 – CONCRETE FORMWORK.
   2. Specification 03 20 00 – REINFORCING CONCRETE.
   3. Specification 03 30 00 – CAST IN PLACE CONCRETE.
   4. Specification 31 20 00 – EARTH MOVING.
   5. Specification 33 40 00 – STORM DRAINAGE.

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for earth moving and/or excavation.

1.06 SUBMITTALS

A. Sieve analysis reports or certifications on all materials.

B. Certified test results of moisture content and chemical constituents for the imported fill materials, either through documentation of existing chemical analyses or by project-specific testing and analysis, as directed by Parks. At a minimum, materials obtained from commercial quarries shall have a total arsenic level less than 20 mg/kg for diesel and oil range hydrocarbons and below laboratory reporting limits for gasoline. Borrow from sources other than commercial quarries may be subject to additional testing depending on the source and as directed by the Engineer.

C. Modified proctor results for materials to be compacted.

PART 2 PRODUCTS

2.01 MATERIALS

A. Embankment core material shall be:
   1. Minimum 30% clay
   2. Maximum 60% sand
   3. Maximum 60% silt
   4. Nominal gravel and cobble content
B. Embankment shell material may be engineer approved on-site soils.
C. Water stop shall be Sika Swellstop product, ConSeal CS-1900, or approved equal.
   1. Alternate products shall be a non-clay, moisture-activated expansion, hydrophilic sealant for non-moving concrete joint applications. Strip applied or extruded products are acceptable.
   2. Material shall be applied according to manufacturer's instructions.

PART 3 EXECUTION

3.01 GENERAL

1. Remove unsuitable materials, per WSDOT Section 3-07.3(1)C, and dispose per Specification 31 00 00.

3.02 EXCAVATION

A. The contractor shall excavate foundation pits to the depth the Plans require, or to the revised depth ordered by the engineer.
B. The subgrade shall be prepared as part of excavation.
   1. The subgrade shall be free of loose surface soil materials, roots, and other organic debris. Removal of unstable and unsuitable materials shall conform to WSDOT 3-03.3(14)E.
   2. Compact the subgrade to a depth of 6 inches. Compaction shall achieve 95 percent of the maximum density determined under the tests described in WSDOT Section 3-03.3(14)D, if the density of the natural earth under any area of the embankment cannot meet this compaction then the Engineer may order the Contractor to perform any or all of the following:
      a. Scarify the earth to a depth of 6 inches.
      b. Aerate or water.
      c. Compact the scarified area to the required density.
      d. Excavate to a specific depth.
      e. Backfill the excavated area in layers, using the previously excavated material or other imported material.
      f. Compact each layer to meet the compaction requirements for embankments.

3.03 EMBANKMENT CONSTRUCTION

A. Shall conform to the requirements of WSDOT Section 3-03.3(14), except as noted below:
   1. Contractor shall not terrace or create a rock embankment.
   2. Contractor shall comply with Compaction Method C from WSDOT Section 3-03.3(14)C.
   3. Each layer of the entire embankment shall not exceed 6 inches in depth after compaction.
B. Compaction and moisture control tests shall comply with WSDOT Section 3-03.3(14)D and provided by a certified test lab.
C. Embankment Keyway

1. The keyway shall be a minimum of 4 feet in depth and 50 percent of the cross-sectional width of the embankment.
    a. The keyway depth may be reduced to 1 foot of excavation into glacial till.
    b. Keyway shall be constructed directly on compacted subgrade.
2. Contractor shall provide test results from certified lab to the Engineer after subgrade compaction.
3. Engineer to verify subgrade before placement of material.
4. Keep the keyway free of surface water runoff.
5. The keyway shall be constructed free of standing water and of ground-water intrusion.

D. Embankment Core
1. The keyway and embankment core shall be constructed of homogeneous materials.
2. The embankment core shall be constructed directly on compacted subgrade.

E. Emergency overflow spillway shall be constructed with a concrete anti-seep collar and anchored to a concrete footing using rebar. All concrete construction shall conform to Specifications 03 11 00 Concrete Formwork, 03 20 00 Reinforcing Concrete, and 03 30 00 Cast in Place Concrete.
1. Concrete anti-seep collar and concrete footing shall be cast in place and shall cure for at least 7 days before compaction of core material may continue over it.
2. Water stop shall be placed in a continuous line as shown in the Plans.
3. Contractor shall take all necessary steps to ensure the anti-seep collar does not crack during construction.

F. Groundwater Dewatering:
1. Where groundwater is, or is expected to be, encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade to allow subgrade stabilization, backfill material to be placed in the dry, and to maintain a stable wall or side slope.
2. Groundwater shall be drawn down and maintained at least 3 feet below the bottom of any trench or manhole excavation prior to excavation.
3. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation.
4. Keep dewatering system in operation until dead load structure and backfill exceeds possible buoyant uplift force on structure.
5. Dispose of groundwater to an area which will not interfere with construction operations or damage existing conditions.
6. Install groundwater monitoring wells as necessary.
7. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.

PART 4 PAYMENT

1. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary to provide the embankment to the satisfaction of the project plans as well as the preparation, safety, and quality measures.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Installation and maintenance of temporary erosion and sediment control measures for the site, as shown in the contract drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Install temporary erosion and sediment control measures as shown in the contract drawings.
B. Maintain temporary erosion and sediment control measures.
C. Adjust or implement additional measures as needed/recommended by the Certified Erosion and Sediment Control Lead.
D. Removal of temporary erosion and sediment control measures upon construction completion and stabilization of the site.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
   2. Washington State Department of Ecology Stormwater Management Manual for Western Washington.
   3. Pierce County Stormwater Management and Site Development Manual (Pierce County Stormwater Manual).
   4. ASTM American Society of Testing and Materials
      a. ASTM D4751: Apparent Opening Size of Geotextiles
      b. ASTM D4491: Permittivity of Geotextiles
      c. ASTM D4632: Breaking Load and Elongation of Geotextile Fabrics
      d. ASTM D4355: Deterioration of Geotextiles
B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 33 40 00 – STORM DRAINAGE

1.05 PERMITS, CODES, & REGULATIONS

A. Obtain and pay for all necessary permits and fees as required by the Local Authority and prevailing ordinances and/or codes.
B. Keep fully informed and comply with all existing laws, codes, ordinances and regulations that in any way affect the conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor must promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.

C. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract must apply, unless otherwise expressly set forth.
D. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard must apply or Owner's Representative will determine which must govern.

1.06 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington.

1.07 SUBMITTALS

A. Manufacturer's literature and test results on the silt fence, erosion control matting, plastic sheeting, and any other necessary erosion control materials.

1.08 DURATION

A. Maintain erosion and sediment control measures needed to perform the Work of this Contract, including periods when construction activities are reduced, suspended, or shut down.
B. Contractor shall maintain erosion and sediment control measures until hydroseeded grass, sod, and landscaped areas have become established and site soils are stabilized to prevent any site erosion or turbidity in site storm water runoff.

1.09 MAINTENANCE

A. Monitor and maintain erosion and sediment control measures installed for the duration of the project.
B. Repair or replace any control measures that become damaged or ineffective.
C. Take measures to prevent any erosion or sediment control problems from occurring both on the project site and off site.

PART 2 PRODUCTS

2.01 HIGH VISIBILITY SILT FENCE

A. Refer to plans to determine applicable differences between Extra-Strength and Standard-Strength High Visibility Silt Fences. The following requirements in Specs shall adhere to any type of silt fence.
B. High visibility silt fence shall be a minimum of 5 feet in height, high visibility orange, UV stabilized and shall meet the geotextile requirements WSDOT Specification 9-33 Table 6. Support posts shall be in accordance with WSDOT Standard Plans. The posts shall have sufficient strength and durability to support the fence through the life of the project.
C. High visibility silt fence geotextile requirements shall conform to WSDOT Specification 9-33.2 (Table 6) with Geotextile Properties tested and conforming to the following:
    1. Apparent Opening Size (AOS)
        a. Test Method: ASTM D4751
        b. Geotextile Property Requirements:
            1) 0.60 mm maximum for silt film woven (#30 sieve)
            2) 0.30 mm maximum for all other geotextile types (#59 sieve) 0.15 mm minimum (#100 sieve).
    2. Water Permittivity:
        a. Test Method: ASTM D4491

b. Geotextile Property Requirements: 0.02 sec – 1 min.
3. Grab Failure Strain, Minimum in machine direction only:
   a. Test Method: ASTM D4632
   b. Geotextile Property Requirements: 100 pounds minimum.
4. Ultraviolet (UV) Radiation Stability:
   a. Test Method: ASTM D4355
   b. Geotextile Property Requirements: 70% strength retained minimum after 500 hours in weatherometer.

2.02 HYDROSEED

A. Hydroseeding for erosion control shall comply with the requirements of WSDOT Specification 8-01.3(2); using a seed mix found in Specification [XX HBB].
   1. Fertilizer: Add 10-20-20 fertilizer to the hydroseed mix.
   2. Alternative to hydroseeding is hand seeding complying with WSDOT Section 8-01.3(2).

2.03 STRAW MULCHING

A. Conform to WSDOT Specification Section 9-14.5.

2.04 PLASTIC SHEETING

A. Clear plastic sheeting shall be minimum 6-mil thick, polyethylene film.
B. Sandbags shall consist of clean washed sand in a woven polyethylene sack.
C. Stakes: Wood stakes of size and length required to secure sandbags and rope in place.
D. Rope: Polyethylene or nylon rope, ½ inch diameter minimum, or larger size as required to secure plastic sheeting and sandbags in place.

2.05 GEOSYNTHETIC TEXTILE

A. Filter fabric shall conform to WSDOT Specification 9-33.2 (Table 6) with Geotextile Properties tested and the approved ASTM geotextile test procedures, except for geotextile sampling and specimen conditioning, which are in accordance with WSDOT SOP 914.

2.06 CONSTRUCTION ENTRANCE

A. Refer to WSDOT Standard Specifications 8-01.3(7) and WSDOT Standard plans for detail of stabilized construction entrance.
   1. No wheel wash unless the Owner's Representative deems it necessary.

2.07 STORM DRAIN INLET PROTECTION

A. Refer to WSDOT Section 8-01.3(9)D for specifications on inlet protection as well as plans for details.

2.08 STORMWATER OUTLET PROTECTION

A. Refer to WSDOT Section 8-01.3(11) for specifications on outlet protection as well as plans for detail.

2.09 COMPOST SOCK

A. Refer to WSDOT Section 8-01.3(12) and plans for detail of compost sock.

2.10 PERMANENT CULVERT

A. Conform to WSDOT Section 9-05 for all culvert-related operations. Refer to plans for design instructions.

2.11 STRAW WATTLE

A. Refer to WSDOT Section 9-14.6(5) and plans for detail of straw wattle.

2.12 SEDIMENT TRAP AND INTERCEPTOR SWALES AND DIKES

A. Sediment Trap
   1. A sediment trap shall be placed at the downstream end of all interceptor swales and dikes.
   2. Sediment traps shall be sized according to Pierce County Stormwater Manual Volume II Section 3.2 BMP C240.

B. Interceptor Swales
   1. Swales shall be constructed per details in plans.
   2. Swale slopes shall be a minimum of 0.5% and maximum of 5%.

C. Interceptor Dikes
   1. No dikes are anticipated for construction.

PART 3 EXECUTION

3.01 COORDINATION

A. Review, coordinate and accommodate work of other Sections that interface with, affect or are affected by the work of this Section so as to facilitate the execution of the overall work of this project in a coordinated and efficient manner.

B. Coordinate exact layout of erosion and sediment control structures to facilitate construction operations and work on the site.

C. The Owner is obtaining coverage under Department of Ecology's Statewide Construction Stormwater General Permit for this project. All requirements of the Statewide Construction Stormwater General Permit shall be binding on the Contractor as part of this Contract.

D. The Owner will transfer coverage to the Contractor after the Notice of Award and prior to the Notice to Proceed. The Contractor shall complete the Transfer of Coverage form as the New Operator/Permittee for a complete transfer of the Construction Stormwater General Permit Coverage from the Owner to the Contractor. It shall be the Contractor's responsibility to submit the completed Transfer of Coverage form to Ecology.

E. The Contractor shall prepare the Stormwater Pollution Prevention Plan (SWPPP) for this project in compliance with Ecology's Construction Stormwater General Permit requirements and submit copies of the SWPPP to the Owner and Engineer.

F. The Contractor shall perform all work in this Contract in compliance with the Construction Stormwater General Permit requirements and shall use adaptive management practices to meet all water quality standards. The Contractor shall ensure that discharges from the site do not exceed 25 NTU.

G. The cost of transferring construction stormwater permit coverage and preparation of the SWPPP in accordance with Ecology's requirements shall be included in the Contractor's Mobilization, and therefore no additional compensation will be allowed.

3.02 GENERAL

A. During construction the runoff of stormwater and wastewater flows shall be controlled and treated to minimize water quality impacts. The Contractor shall plan and execute the work in a manner which protects the project, and downstream water ways. Runoff from undisturbed areas

shall be diverted from areas of construction activity by utilizing drainage ways as much as possible. Where this is not possible, and as practicable, diversion dikes and swales shall be constructed, so runoff from undisturbed areas will not be deposited or stored in or alongside drainage ways where the materials can be eroded by storm runoff.

B. Stormwater from disturbed areas within the limits of construction shall be collected and treated before releasing. The extent of erosion control measures required will depend on the extent of the Contractor's earthwork and ground cover disturbance and resulting erosion potential. The Contractor is responsible for meeting water quality criteria.

3.03 TEMPORARY CONVEYANCE SYSTEMS

A. Ditches, pipes, swales, berms, sandbag walls, sumps and other means shall be employed to collect stormwater from the construction area. Materials excavated from swale construction may be used to construct berms.
B. Ditches and swales shall be scarified, seeded and rolled where used for temporary drainage conveyance.

3.04 GROUND COVER

A. Do not clear any areas until construction is ready to begin. Disturb only the minimum area necessary to accomplish the work. Cover all disturbed areas with plastic sheeting during any stoppages of work. Protect all disturbed areas from erosion including cleared, stripped, cut, fill, or other areas of reduced plant cover or bare dirt caused by work in this contract. Protection shall include plastic sheeting, erosion control matting, temporary seeding, and straw mulch.
B. Slopes (2 Horizontal to 1 Vertical and Steeper): After earthwork and grading has been completed, cover cut and fill slopes that are 2:1 and steeper with plastic sheeting secured with stakes and sandbags set on a maximum 20 foot grid or as required to secure sheeting and prevent it from blowing away.
C. Slopes (Flatter Than 2 Horizontal to 1 Vertical): Hydroseed slopes that are flatter than 2:1 as specified herein.

3.05 STOCKPILE PROTECTION

A. Temporary stockpile slopes shall not exceed 2:1.
B. Grade slopes of stockpile uniformly smooth with a slightly concave shape to prevent hollow spots that would allow the plastic sheeting cover to ripple and flap in the wind.
C. Cover stockpiles with plastic sheeting; install sheeting to fit tight to shape of stockpile free of wrinkles or loose areas; overlap seams two feet and tape down exposed edges continuously.
    1. Install sheeting in largest sections possible with minimum number of seams.
    2. Secure plastic sheet with stakes, rope and sandbags to prevent it from blowing away or from any seam from coming loose.
    3. Space stakes and sandbags at no more than a 15 foot grid or as required to secure sheeting.
    4. Secure each sandbag with a stake; run rope between each stake (under sandbags).
    5. Place stakes and sandbags along all seams.
    6. Entire installation shall withstand high winds for an entire winter without the plastic sheeting coming loose or blowing away.

3.06 EARTHWORK

A. Do not cause foreign or waste material to enter surface waters. Materials shall be carefully excavated and moved to an approved spoil or waste area.
B. Earthwork slopes shall be left in a condition that will minimize erosion during rainfall. This includes temporary erosion control as specified herein.

3.07 DUST CONTROL

A. Control and prevent the production of airborne dust due to wind or construction equipment traffic at any time during construction by watering the work area and site, comply with all local and State air quality regulations.
B. Do not permit conditions on the site that would allow airborne dust resulting from the work of this project to drift onto adjacent properties.
C. Wet down unpaved roadways used for construction traffic to prevent dust.

3.08 HYDROSEED

A. Hydroseed bare exposed soil disturbed by the work of this project except in the following areas:
   1. Slopes covered with plastic sheeting.
B. Hydroseed mix shall be applied at the following rates:
   1. Seed mix at rate of 100 pounds per acre.
   2. Fertilizer at rate of 500 pounds per acre.
   3. Mulch at rate of 2000 pounds per acre.
   4. Soil stabilizer at rate of 40 pounds per acre.
C. Apply water to hydroseeded areas as required for seeds to germinate, root and grow vigorously; maintain hydroseeded areas through Final Completion.

3.09 SITE RESTORATION

A. As soon as practical after completion of a portion of the Work, or when a work or waste area is no longer required, commence site restoration.

3.10 PROTECTION, MAINTENANCE, AND REPAIR

A. Maintain and repair erosion control facilities and protective fencing throughout construction until Final Completion.
B. Protection:
   1. Where possible, maintain natural/existing vegetation for silt control.
   2. Prevent silt-laden water from leaving the site or from entering offsite storm sewer system.
   3. Stabilize slope, cut or fill areas where work is stopped for more than 30 days by mulching, polyethylene sheeting or other method to prevent erosion and sediment transport.
   4. Keep pavements and emergency access clean from construction activities. Keep paved areas clean using mechanical sweeping equipment and hand tools as applicable; pavement washing is not allowed.
C. Supplementary Measures: Provide additional silt and erosion control measures as required to protect soils and prevent silt-laden runoff from leaving the project site.
D. Maintenance: Monitor and maintain temporary silt and erosion control measures for the duration of the project.
E. Inspection: Inspect the entire system to ensure proper operation a minimum of once per week, during and after storms and prior to weekends and holidays.

3.11 REMOVAL

A. Remove temporary erosion control facilities only after site soils are stabilized to prevent any erosion or turbidity in storm water runoff from the site during a heavy rain storm event.

3.12 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for erosion and sedimentation control to the satisfaction of the project plans as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 31 37 00
RIPRAP

PART 1 GENERAL

1.01 SUMMARY

A. Install Riprap using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) consists of all labor, tools, materials, tests, permits and other related items necessary for Riprap

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions or editions of the following documents.
   1. Pierce County Development Guidelines and Public Works Standards.
   2. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 SUBMITTALS

A. Submit Manufacturer's Literature on proposed material prior to the start of any work, submit three copies of product information correlated to specified requirements.

B. Include the following information with each submittal:
   1. The Contractor’s submittal identification number marked on each item.
   2. Date and revision dates.
   3. Port project title and number.
   4. The names of: The Contractor, subcontractor, supplier, and manufacturer.
   5. Identification of product or material, with the appropriate specification section and paragraph number marked on each item.
   6. Relation to adjacent critical features of work or materials.
      a. A clearly detailed sectional drawing of each system, identifying all components and their method of attachment to supporting structure, adjacent Contractor-designed work, or both.
   7. Field dimensions clearly identified as such.
   8. Applicable standards.
   9. Identification of deviations from contract documents. Products shall be accompanied by a substitution request form.
   10. The Contractor’s stamp.

C. Samples: Submit, in air-tight containers

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. General: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary craft and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.
B. Furnish each material from a single source throughout the Work.
C. Perform Work in accordance with the WSDOT Standard Specifications

PART 2 PRODUCTS

2.01 MATERIALS

1. Furnish materials in accordance with WSDOT Standard Specification for Road, Bridge and Municipal Construction, Section 9-13 Riprap, Quarry Spalls, Slope Protection, and Rock for Erosion and Scour Protection and Rock Walls.

2.02 EXECUTION

A. Verification of existing conditions before starting work.
B. Place geotextile fabric over substrate, lap edges and ends.
C. Place riprap at culvert pipe ends, and as indicated on Drawings.
D. Installed Thickness: As indicated on Drawings.
E. Installed per WSDOT Standard Specifications Section 8-15 Riprap

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Furnishing and placing asphalt paving materials as required to construct the new improvements as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of asphalt pavement in a first quality workmanlike manner. Materials including but not limited to:
   1. All base course materials.
   2. HMA Cl ½ in. PG 58S-22 asphalt pavement.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
   2. Manual on Design Guidelines and Specifications for Road and Bridge Construction in Pierce County – Chapter 4 Roadway Elements.
   3. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 31 05 16 – AGGREGATES

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for asphalt paving
B. Manufacturer Qualifications: Manufacturer shall be a paving-mix manufacturer registered with and approved by WSDOT.
C. Asphalt paving Regulatory Requirements: Comply with WSDOT Section 5-04, HMA Class 1/2-inch PG 58S-22 asphalt for asphalt paving work.
D. Warranty:
   1. Time Period: One year after date of project substantial completion.
   2. Note that work correction is to include aggregate separation, soft spots, and excess porosity.
   3. Repair cracks; repair unsatisfactory elevation irregularities immediately upon notification; replace any paving not draining properly.
   4. Pavement Repair: One year after the date of project substantial completion, the Owner, the Architect and the Contractor shall walk the site to identify areas of asphalt pavement cracking, raveling or other types of pavement failure. The Contractor shall repair the identified areas of failure in a method to prevent continued failure.

1.06 SUBMITTALS

A. Job-Mix Designs: WSDOT certification and approval of each job mix proposed for the Work.
B. Material for each paving and aggregate material provide from an independent third party qualified testing agency indicating and interpreting test results for compliance of specified materials.

1.07 PERFORMANCE REQUIREMENTS

A. Standards: Comply with applicable provisions of Standard Specifications for Road, Bridge and Municipal Construction 2026 (WSDOT/APWA Publication M41-10) for asphalt paving.
B. Weather Limitations: Conform to requirements of Section 5-04.3(1) of WSDOT/APWA Standard Specifications for Weather Limitations.
C. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.
D. Layout: Have layout of work under this section by Washington State Licensed Land Surveyor who is acceptable to Architect/Engineer. If discrepancies are found by surveyor between Drawings and actual conditions at site, Architect/Engineer reserves the right to make such minor adjustments in work specified as necessary to accomplish intent of Contract Documents without increased cost to Owner.
E. Grade Control: Establish and maintain required lines and elevations.
F. Prework Meeting: The Contractor shall schedule and coordinate a preconstruction meeting with the Owner prior to commencing any project work. Comply with inspection requirements.

PART 2 PRODUCTS

2.01 ASPHALT MATERIALS

A. Asphalt Pavement: Provide dense, hot laid, hot mix asphalt plant mixes approved by WSDOT. Provide Class 1/2-inch PG 58S-22 HMA, thickness as indicated on plans, conforming to WSDOT Standard Specification 5-04 requirements.

2.02 AGGREGATE MATERIALS

A. Aggregates shall be per Section 31 05 16.
B. Recycled Asphalt Pavement Materials: The use of recycled asphalt pavement materials in the proposed mix design is acceptable provided it conforms to the requirements of Section 9-03.21 of the WSDOT Standard Specifications.

2.03 ACCESSORIES

A. Joint Sealant: Shall conform to the requirements of Section 9-04 of WSDOT Standard Specifications.
B. Asphalt Pavement Crack Sealant: Shall conform to the requirements of WSDOT Section 5-03.3(3).

2.04 MIXES

A. Asphalt Pavement: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by WSDOT. Provide HMA Class 1/2 -inch PG 58S- 22, thickness as indicated on the Plans, conforming to WSDOT Standard Specification 5-04 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
B. Verify compacted subgrade, granular, stabilized soil, subbase is dry and ready to support paving and imposed loads.
   1. All exposed, compacted subgrade for pavement section crushed surfacing materials shall be verified by a minimum of one nondestructive field density test (i.e. Nuclear Densitometer) per 2,000 square feet, but in no case less than three (3) tests. Or the Geotechnical Engineer shall determine whether the subgrade for pavement section crushed surfacing materials is acceptable by probe testing and utilizing their observations and experience. If additional compaction is required, retesting of subgrade shall be at contractor's expense.
C. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Aggregate Subbase: Shall be uniformly spread upon the prepared Subgrade to the depth, width, and cross-section shown in the Plans. Construction methods used shall meet the applicable requirements of WSDOT Section 4-04.3. Payment shall be the per ton pay item in WSDOT Section 4-04.5.

3.03 SURFACE PREPARATION

A. Examination: Verify that subgrade is dry and in suitable condition to support paving and imposed loads. Proof-roll to locate areas that are unstable or that require further compaction. Advise Architect/Engineer of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving. Proceed with paving only after unsatisfactory conditions have been corrected.
B. Loose Material: Remove from compacted subbase surface immediately before applying asphalt-aggregate mixture.
C. Tack Coat: Per WSDOT Section 5-04.3(4).

3.04 PLACEMENT

A. General: Place asphalt concrete pavement per Section 5-04 of WSDOT Standard Specifications for asphalt concrete pavement.
   1. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place the asphalt mix by hand in areas that are not accessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Place hot-mix asphalt surface course in number of lifts and thickness indicated. Spread mix at minimum temperature of 250 degrees Fahrenheit. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated. Regulate number of lifts and thicknesses indicated at speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
   2. Place the asphalt in strips not less than ten feet wide unless otherwise acceptable to Architect/Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphaltic base course lift before placing asphaltic surface wearing course lift.

3. Promptly correct surface irregularities in paving course behind paving machine. 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.

B. Joints: Make joints between existing and Contract pavements or between successive days work to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean the contact surfaces. Tack joints where cement concrete and asphalt concrete paving or metal castings abut.

3.05 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot-hand tampers or vibrating plate compactors in areas inaccessible to rollers.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas with hot material.

C. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect Barricades: Protect paving from traffic until mixture has cooled enough not to become marked.

G. Patching: Install asphalt pavement section materials to required Plan depths. Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12-inches or 1- foot into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound aggregate base course to form new subgrade. Apply tack coat uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.15-gallons/square yard. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

3.06 FIELD QUALITY CONTROL

A. General: The Contractor shall coordinate and schedule the Owner's testing representative to be onsite for temperature testing of the mix prior to placement. Should temperatures be noncompliant, the truck shall be rejected at no additional cost to the Owner. Testing service may test in place asphalt concrete courses for compliance with requirements for compaction, thickness (five core tests) and surface smoothness in locations selected by Architect/Engineer. Patch holes from test coring. Repair or remove and replace unacceptable paving as directed by Architect/Engineer. Each failed test may require up to ten (10) additional tests at Contractor's expense.

B. Compaction: Asphalt concrete surfacing shall be compacted to at least 92 percent of maximum density as determined by WSDOT Test Method 705. Level of compaction attained will be determined as average of not less than five (5) nuclear density gauge tests taken by testing service on day mix is placed (after completion of finish rolling) at randomly selected locations within each lot. Quantity represented by each lot will be not greater than single day's production or approximately 40 tons, whichever is less. Cores may be used as alternate to nuclear density gauge tests.

C. Thickness: The compacted thickness will not be acceptable if it exceeds the following allowance variations:
   1. First Lift or Base Course: 3/8", plus or minus.
   2. Second Lift or Surface Course: 1/8” plus or minus.

D. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness using ten foot straightedge applied parallel with, and at right angles to, centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:
   1. Surface Course:
      a. $^{1}/_{8}$” parallel to centerline.
      b. $^{1}/_{4}$” transverse to centerline.
      c. $^{3}/_{16}$” when no discernable centerline.
   2. The Contractor shall provide the straightedge equipment and labor to be present during the Owner's testing agency surface smoothness testing.

3.07 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect paving from mechanical equipment until surface temperature is less than 140 degrees F.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of the asphalt sections to the satisfaction of the plans as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 32 16 13
CURBS AND GUTTERS

PART 1 GENERAL

1.01 SUMMARY

A. Install cement concrete traffic curb and gutters using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the construction of cement concrete traffic curb and gutters.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Manual on Design Guidelines and Specifications for Road and Bridge Construction in Pierce County – Chapter 4: Roadway Elements
   2. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
   1. Specification 03 11 00 – CONCRETE FORMWORK
   2. Specification 03 20 00 – REINFORCING CONCRETE
   3. Specification 03 30 00 – CAST IN PLACE CONCRETE

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for concrete paving.

B. Manufacturer Qualifications: Manufacturer shall be a paving-mix manufacturer registered with and approved by WSDOT.

C. Concrete paving Regulatory Requirements: Comply with WSDOT Standard Specifications Section 6-02.3(2)B, Commercial Concrete for Curbs and Gutters.

D. Warranty:
   1. Time Period: One year after date of project substantial completion.
   2. Note that work correction is to include:
      a. Repair cracks: repair unsatisfactory elevation irregularities immediately upon notification.
      b. Pavement Repair: One year after the date of the project substantial completion, the Owner, the Architect, and the Contractor shall walk the site to identify areas of concrete cracking, raveling, or other types of pavement failure. The Contractor shall repair the identified areas of failure in a method to prevent continued failure.

1.06 SUBMITTALS

A. Job-Mix Designs: WSDOT certification and approval of each job mix proposed for the Work.
B. Material for each paving and aggregate material provided from an independent third-party qualified testing agency indicating test results for compliance of specified materials.

PART 2 PRODUCTS

2.01 GENERAL

A. Concrete curbs and sidewalks shall be air entrained concrete class 3000 concrete per Section 8-04.3(1) of WSDOT.
B. Concrete Mix: Comply with requirements of Section 6-02 of the WSDOT Standard Specifications.

2.02 FORMS

A. Forms shall be metal or wood and comply with Section 8-04.3(1) and Section 6-02.3(17) of the WSDOT Standard Specifications.

2.03 MATERIALS

A. Portland Cement shall be in accordance with Section 9-01.2(1) Type 1 of the WSDOT Standard Specifications. Use one brand of cement throughout the project unless otherwise acceptable by the Owner.
B. Fine Aggregate shall be in accordance with Section 9-03.1(2) of WSDOT Standard Specifications. Provide aggregates from a single source.
C. Coarse Aggregate shall be in accordance with Section 9-03.1(4) of WSDOT Standard Specifications. Provide aggregates from a single source.
D. Water shall be in accordance with Section 9-25.1 of WSDOT Standard Specifications.

PART 3 EXECUTION

3.01 PLACING AND FINISHING

A. Comply with the requirements of Section 8-04.3(1) and Section 6-02.3(6) of WSDOT Standard Specifications. Refer to project plans.

3.02 CURING

A. Comply with the requirements of Section 8-04.3(1), Section 6-02.3(11), and Section 6-02.3(14) of WSDOT Standard Specifications.

3.03 CONCRETE CURBS

A. Forming: Form straight sides against wood or metal. Form tapered sides with a metal mule constructed to required section profile.
B. Mixing and Placing Concrete: Conform to the requirements for mixing and placing concrete. Concrete to be placed per Section 8-04 of WSDOT Standard Specifications.
C. Joints: Expansion joints shall comply with Section 6-02.3(13) of WSDOT Standard Specifications. Joints to be placed at a minimum, 30 feet on center.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of curbs and gutters to the satisfaction of the plans as well as the preparation, safety, and quality control measures.

END OF SECTION

SECTION 32 17 00
PAVING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Apply painted pavement markings, marker tape, and remove existing markings as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the application of painted pavement markings, marker tape, and the removal of existing markings in a first quality workmanlike manner.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction.
   2. Manual on Uniform Traffic Control Devices (MUTCD).

1.04 RELATED WORK

A. Contractor shall refer to work in other sections as appropriate, including but not limited to sections referenced in this document.

1.05 QUALITY ASSURANCE

A. All work shall be performed by a licensed and bonded Contractor registered in the State of Washington and shall be qualified for applying pavement markings.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated include technical data and tested physical and performance properties.
   1. Paint
   2. Glass beads
   3. Temporary Marking Tape

PART 2 PRODUCTS

2.01 PAVEMENT MARKINGS

A. Pavement Markings shall be provided in accordance with Plan requirements.
B. Pavement Markings shall comply with WSDOT Standard Specifications Section 8-22.
C. The County Engineer reserves the right to do all striping, buttoning, and delineation work. Reimbursement to the Department shall be made before the County releases the financial guarantee. See Pierce County Design Manual Section 8.2 for additional information.
   1. The Contractor shall bid the project assuming Pierce County has declined the opportunity to supply and install pavement markings.

2.02 WHEEL STOPS

A. Provide 6 ft length minimum wheel stops as shown in project plans and approved by the Engineer.
B. Hydraulic Concrete: Concrete shall conform to WSDOT Section 6-02.
C. Reinforcing Steel: Must conform to WSDOT Section 9-07. Minimum reinforcing is two No. 4 or No. 3 bars placed longitudinally.
D. Precast: Submit Commercially available wheel stop designs for approval.
E. Payment: The work performed and materials furnished in accordance with this item and measured as provided under "Measurements" will be paid for at unit price bid for "Precast Concrete Wheel Stops." This price is full compensation for furnishing, preparing, hauling, and placing materials, as well as for labor, tools, tolls, equipment, and incidentals.

2.03 SURFACE APPLIED DETECTABLE WARNING SURFACE

A. Detectable Warning Surface: Provide in accordance with Plan requirements.
B. Onsite Detectable Warning Surface: Per WSDOT Standard Specifications section 8-14.3(5)C; tested and approved for use by Washington State Department of Transportation.

2.04 PAINT

A. Provide low V.O.C. marking paint in conformance with WSDOT Section 9-34.2(2). and the following:
   1. White: 37875
   2. Yellow: 33538
   3. Red: 11136
   4. Or paint of equivalent color, visibility, and quality, as approved by the Engineer.

2.05 STENCILS

A. Pavement markings will be applied with the use of stencils made from 1/2-inch exterior grade plywood.
B. Curb markings will be applied with the use of stencils made from plastic.

2.06 TEMPORARY MARKING TAPE

A. Provide foil-backed temporary pavement marking tape manufactured by 3M, or equal.

2.07 GLASS BEADS

A. In accordance with WSDOT Section 9-34.4, glass beads shall be used with the plastic traffic markings per the manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not apply plastic to concrete surfaces until concrete has cured for 28 days.
B. Do not apply plastic to hot mix asphalt surfaces until asphalt has cured for 21 days.

3.02 PREPARATION

A. Surface Preparation:
   1. Surface preparation shall comply with WSDOT Section 8-22.3(2).
   2. Clean and dry paved surface prior to painting.

3. Blow or sweep surface free of dirt, debris, oil, grease or gasoline. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
4. Notify Architect/Engineer after placing pavement spots and minimum 3 days prior to applying traffic lines.

3.03 WHEEL STOPS

A. Wheels stops shall be installed in accordance with the manufacturer's directions and project plan detail.
B. Use an anchoring method and anchor rod type as shown on the plans or as approved by the Engineer.

3.04 FIELD QUALITY CONTROL

A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured, or discolored material, and insufficient bonding.
B. Repair lines and markings, which after application and curing do not meet following criteria:
1. Incorrect Location: Remove and replace incorrectly placed patterns.
2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

3.05 PAVEMENT MARKINGS

A. The following markings, as well as any not mentioned here that are included in the plans, shall adhere to the Special Provisions.
1. Double Yellow Centerline
2. Stop Bar
3. Marked Crosswalks
4. Red Painted Curb. Conform to curb installation requirements WSDOT Section 8-04. Sections of curb to be painted shall be determined in the project plans.
5. Traffic Arrow
6. Access Parking Space Symbol
7. Profile Plastic Pavement Lines
8. RPM Placement: Refer to Section 8-09 for Raised Pavement Markers.

3.06 CURB MARKINGS

A. Where indicated in plans, curbs shall be painted red, with the words "NO PARKING – FIRE LANE" stenciled in 4-inch- tall letters in white on the vertical side of the curb.
B. Such curb painting shall be provided at the beginning and end of the fire lane.

3.07 REMOVAL OF EXISTING PAVEMENT MARKING

A. Remove any existing marking not required as part of the finished marking layout.
B. Remove paint down to pavement surface by sandblasting, water blasting, shot steel, or other approved means. Removal method shall not damage pavement surface.

C. Before chemical solvents may be used, submit a Material Safety Data Sheet (MSDS) and manufacturer's material information to Pierce County's Representative at least three days prior to their application. Any chemical product used in the removal or application of pavement markings shall not be harmful to the environment.

3.08 WEATHER LIMITATIONS

A. Perform painting, temporary marking, and taping only when the following conditions are met:
   1. Existing surfaces are dry and clean.
   2. The ambient temperature is above 40ºF (50ºF if water-based paint is specified) and no greater than 95ºF. Maintain paint temperatures within the same limits.
   3. Weather conditions are not excessively windy, dusty, or foggy. Weather suitability will be determined by Pierce County's Representative.

3.09 TRAFFIC CONTROL

A. Coordinate related work and requirements specified in other parts of the Contract Documents, including but not limited to the following:
   1. Section 01 50 00 – Temporary Facilities and Controls

3.10 EQUIPMENT

A. Equipment necessary for satisfactory completion of the work includes apparatus to properly clean pavement surfaces, mechanical marking devices, and auxiliary hand painting equipment. Obtain the Pierce County's approval of equipment prior to use.
B. Provide adequate stand-by equipment in the event of equipment failure due to delay of traffic.

3.11 LAYOUT AND ALIGNMENT

A. Provide layout and alignment markings necessary to establish permanent striping as indicated on the drawings and as follows:
   1. Provide temporary paint markings for pavement marking layout.

3.12 MARKING TAPE INSTALLATION

A. Temporary Marking Tape
   1. Refer to WSDOT Section 9-34.5 for Temporary Pavement Marking Tape. Apply tape for temporary lane lines until the application of paint markings has been accomplished.
B. Permanent Marking Tape
   1. Apply marking tape at intersections to provide guidance through the intersection. Install 6-inch lengths of tape on 15-foot spacings as shown on the drawings.

3.13 PREPARATION OF EXISTING SURFACE

A. Prepare surface in conformance to Section 8-22 of Standard Specifications. Paint only when temperature of the area and surface to be painted are above 50 degrees F. Line width shall not vary more than plus or minus 1/4".
   1. Immediately prior to the application of paint, clean pavement of dirt, rust, grease, oil, acids, or other foreign matter which may reduce paint bond to the pavement.
B. Scrub areas which cannot be satisfactorily cleaned by brooming and blowing with a solution of water and trisodium phosphate (10% Na_3PO_4 by weight), or equal. Rinse cleaned areas of solution and foreign matter. Dry before painting.

3.14 PAINT APPLICATION

A. Wait a minimum of two weeks from installation of pavement surface course to paint marking, unless otherwise directed by the Pierce County.
B. Apply paint markings in accordance with dimensions, locations, and spacings shown on the plans, unless otherwise approved by the Pierce County.
C. Apply paint only to a dry surface.
D. Apply paint only after the Pierce County approves layout and surface conditions.
E. Thoroughly mix paint in strict accordance with the manufacturer's written instructions before and during application. Apply paint at its original consistency without the addition of thinners.
F. Apply paint uniformly, with suitable equipment, at rates of not less than 105 nor more than 115 square feet per gallon.
G. Deviations in the edges of straight stripes exceeding 1/2-inch in 50 feet shall be removed and the marking corrected. The width of the markings shall be as designated on the drawings, within a tolerance of 5 percent. Perform painting in a neat and workmanlike manner to the satisfaction of the Pierce County.
H. Paint shall not bleed or discolor when in contact with bituminous materials.
I. Apply glass beads uniformly by suitable equipment at a rate of not less than 5 pounds per gallon of paint.

3.15 PROTECTION

A. Protect striping and other markings from damage of any kind while the paint is drying. Protect paint from disfigurement by traffic, spatter, splashes, spillage, drippings, weather, etc. Place suitable warning signs, cones, flags, barricades, or protective screens as required.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of all pavement markings as well as preparation, safety, and quality control measures.

END OF SECTION

SECTION 32 18 16.13
PLAYGROUND SURFACING

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, equipment and materials to install the Playground Surfacing as shown on the plans and details or as otherwise specified.

1.02 SCOPE OF WORK

A. The work in this section includes:
   1. Play Area Surfacing.
   2. All other related items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. ASTM F1292 – Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
   2. ASTM F2223 – Standards on Playground Surfacing.
   3. ASTM F1951-08 – Accessibility of Surface Systems Under and Around Playground Equipment.
   4. ASTM F2479 – Standard Guide for Specification, Purchase, Installation and Maintenance of Poured-in-Place Playground Surfacing.

1.04 QUALITY ASSURANCE

A. Manufacturer's Instructions: Strictly adhere to the manufacturer's instructions regarding product handling, sub-base preparation, surfacing system application and all other aspects of the surfacing installation.

B. The contractor who is installing the surfacing shall have at least 5 recent (within the last 5 years) installations of Engineered Wood Safety Surfacing and Rubber Tile Playground Surfacing, and shall have personnel, facilities and equipment for the specified work. The contractor shall also submit evidence of the recent installations of the surfacing materials.

C. Site Inspections will be made by the Owner's Representative.
   1. Request Owner's Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following is required:
      a. Inspection of temporarily marked/staked locations of poured-in-place surfacing pattern as shown on contract drawings.
      b. For Substantial Completion of all work (development of physical punch list items).
      c. For Physical Completion of all work (physical punch list items satisfactorily completed).

1.05 SUBMITTALS

A. For each product specified, submit the following for approval prior to delivery:
   1. Manufacturer's product data including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.

c. Assembly and installation instructions.
d. Maintenance instructions.

2. Submit proof of certification and conformance with the following standards for the exact depths and for each depth as shown in the Contract Drawings:
   a. Certifications for EWSS in accordance with ASTM F2075-04.
   b. Certifications for impact attenuation in accordance with ASTM F1292; the Playground Surfacing shall have fall or shock attenuation to meet or exceed the Consumer Product Safety Commission 200g and 1000 HIC guidelines for an 10 foot fall height.
   c. Certifications for wheelchair accessibility in accordance with ASTM F1951-08.
   d. Certifications for Poured-in-Place Playground Surfacing in accordance with ASTM F2479.
3. Warranties: Provide the manufacturer's 10 year materials warranty for all playground surfacing systems materials.

B. Submit a sample of the following item:
1. Poured-in Place Surfacing for each color specified.

1.06 GUARANTEE

A. Guarantee that all work performed under this section is free from any defects in materials and workmanship. Upon notice in writing from the owner, within one (1) year of Substantial Completion, make all necessary repairs or replacements of the defective work in question at no cost to the owner. During this guarantee period, the owner shall perform normal maintenance of playground surfacing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store playground surfacing items in accordance with manufacturer's written recommendations. Handle with sufficient care to prevent damage.

PART 2 PRODUCTS

2.01 POURED-IN-PLACE SURFACING

A. Poured-in-Place Playground Surfacing must meet minimum standards of ASTM F2479 and critical fall heights up to 10 feet per ASTM F1292-04.
1. Base Layer: SBR (Styrene Butadiene Rubber).
2. Top Layer: EPDM (Ethylene Propylene Diene Monomer) rubber and aliphatic urethane binder.
3. Top Layer Colors:
   a. Teal: 50% Teal and 50% Black.
   b. Sky Blue: 50% Sky Blue and 50% Black

B. Poured-in Place Surfacing is available from the following recommended source:
1. PlayBound Poured-in-Place by Surface America and supplied by PlayCreation, Inc; 2104 SW 152nd ST. Suite #1 Burien, WA 98166; 206-932-6366; www.playcreation.com.
2. Or approved equal.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the work of this section will be completed. Do not proceed until conditions detrimental to the proper and timely completion of the work have been satisfactorily corrected and thus meet the manufacturer's instructions. Beginning of work constitutes the acceptance of site conditions as satisfactory.

3.02 PLAY AREA SURFACING INSTALLATION

A. Install surfacing to the compacted depth as shown in the Contract Drawings and as specified by the manufacturer. Install surfacing carefully to avoid contamination of dirt, gravel or other materials.

3.03 PROTECTION

A. Protect the installed playground surface from damage resulting from subsequent construction activity on the site.

3.04 CLEANUP

A. Sweep and/or rake playground surfacing materials away from all paved surfaces and remove it from all surrounding turf or planted areas. Clean and sweep the installed playground surfacing. Remove any excess materials from the job site.

END OF SECTION

SECTION 32 31 13
CHAINLINK FENCE & GATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required to construct and install fence and gate system as indicated on the drawings or specified herein.
B. Include all other related items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.02 QUALITY ASSURANCE

A. The Contractor must be experienced with chain-link fence installations. Provide at least 3 representative chain-link fence projects provided by and installed by Contractor for the Owner's Representative's review.
B. Thoroughly inspect the site and other related work. Notify the Owner's Representative prior to commencing installation of any conditions adversely affecting the performance of fence installation.
C. Provide a warranty stating that the fence is secure and stable, tight, corrosion-fee, in proper alignment, complete in detail and finish, and free of hazardous conditions. Any defects that develop within one year from the date of Substantial Completion shall be replaced at the expense of the Contractor.
D. Standard Specifications: All work shall conform to all applicable requirements of the following Specifications, whether specifically referred to or not, except as specifically modified herein.
    1. Comply with the requirements of the American Society for Testing and Materials (ASTM) especially the ASTM Committee F-14 Standards on Fences (latest edition).
    2. Perform all shop and field welding in accordance with the pertinent recommendations of the American Welding Society.
    3. Pipe ASTM A 53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    4. ASTM A 392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
    5. ASTM F 626 – Standard Specification for Fence Fittings.
    6. ASTM F 668-88 – Standard Specification for Polyvinyl Chloride (PVC) Coated Chain Link Fence Fabric.
E. Site Inspections will be made by the Owner's Representative.
    1. Request Owner's Representative inspection at least 72 hours in advance of the time inspection is required. Inspections for the following are required:
        a. Preconstruction on-site conference: At least 21 days prior to commencement of work, schedule an on-site meeting with the Owner's Representative, Owner, and Contractor in attendance.
        b. Prior to the start of installation for Owner's Representative review of staked locations of chain-link fence and gates.
        c. During the initial installation of fence posts in forested areas.
        d. At 50% completion of installation.
        e. Substantial Completion of all work (development of physical punch list items).
        f. Physical Completion of all work (physical punch list items satisfactorily completed).

1.03 SUBMITTALS

A. Product Data. For each product specified, submit the following for approval prior to delivery:

1. Manufacturer's product data including:
   a. Preparation instructions and recommendations.
   b. Storage and handling requirements and recommendations.
   c. Material descriptions and shop drawings of fence and gate components with profiles and finishes for: posts, rails, latches, fittings, chain-link fabric, reinforcement, and attachments.

1.04 PRODUCT HANDLING

A. Provide new materials delivered to the site in undamaged condition. Store materials off the ground and protect materials from damage.
B. In the event of damage, immediately replace as necessary to the approval of the Owner's Representative.

PART 2 PRODUCTS

2.01 GENERAL

A. All piping for fence and gates shall be Schedule 40, hot-dipped galvanized steel, or approved equal, for size, finish, material composition, strength, appearance, performance and ease of maintainability.
B. Galvanizing shall be in accordance with ASTM F 668-88. All fence fittings shall comply with ASTM F 626-89a.
C. All materials except nuts, bolts, and washers shall have the PVC coating extruded and adhered to the galvanized steel core per ASTM F 668 Class 2a. Color to be black.

2.02 CHAIN LINK FENCE & GATE FABRIC

A. Chain link fence fabric shall be woven 9-gauge (finished gauge after vinyl coating) for fence and gates. All fabric shall have a galvanized steel wire core, in a continuous 2 inch mesh, with black vinyl coating extruded and bonded to the galvanized wire. Steel core wire shall have a minimum breaking strength 1290 lbs.
   1. Height of fabric as shown on the drawings.
   2. Fabric shall be installed on inside of posts (on inside of off-leash area).
   3. Lower edge of fabric shall be 2" to 4" above finished grade.
   4. Mesh shall have knuckled top and bottom selvage.

2.03 FENCES & FENCE POSTS

A. All post, rails, and framework shall have 10-15 mils of black vinyl coating. No hand painting, except for minor touch-up painting. Sizes shall be as specified in the following table:

Type	**4' Height**
Terminal / Corner Posts	2-3/8" OD
Line Posts	1-7/8" OD
Gate Posts	2-7/8" OD
Grate Framework	1-7/8 OD
Top Rails	1-5/8" OD
Mid Rails (at gates)	1-5/8" OD
Removable Posts	2-7/8" OD
Bottom Rails	1-5/8" OD

2.04 GATES & GATE POSTS

A. General: Gate posts, frames, and hardware shall be hot-dipped galvanized, as noted, for framework. All fittings shall be galvanized after welding and black vinyl coated. Gates shall maintain a gap no greater than 2 inches between gateposts and frames or ground.
   1. Gate Frames: Shall be 1-7/8 inch OD steel pipe with joints notched and welded to form a rigid frame. Welds shall be coated with cold galvanized coating. Frames shall be filled with same fabric as fence and fastened in the frame by means of tension bars and tension bands.
   2. Hinges: Shall be pressed steel to suit gate size, black vinyl coated, non-lift-off type, offset to permit 180-degree gate opening. Provide 2 hinges for each leaf. Drill, tap, and set screw or weld to frame and post to prevent rotation. Hinges shall be Bulldog Industrial hinge, as supplied by Hoover Fence Co.; (800) 355-2335; or approved equal.
   3. Gate Latch: Provide heavy-duty gate fork latch, black vinyl coated, of correct size malleable iron to permit operation from either side of gate, with padlock eye as integral part of latch. Padlocks to be provided by Owner.
   4. Chain-link Gate Lock for Pedestrian Gate: K-BXMOR2 Weldable box; type: Mortise. With 45H7R15M-626 Mortise Lock. Lock or unlock from outside, always free to exit from inside. Provide two (2) keys. As manufactured by Best Access Systems. Supplied by Stanley Security Solutions; www.stanleysecuritysolutions.com; (206)-963-8933.

2.05 FITTINGS

A. Fittings shall be hot-dipped galvanized pressed steel in accordance with ASTM F 626. All fittings shall be industrial quality. All fittings except nuts, washers, and bolts shall be black vinyl coated after galvanizing, with 10-15 mils of thermally bonded PVC. Prior to installation, spray all nuts and bolts with two coats of black, flat alkyd enamel paint suitable for metal.

2.06 ACCESSORIES

A. Post tops shall be pressed steel and designed as a weather tight closure cap for tubular posts, and shall be black vinyl coated.
B. Tension bars shall be of one piece lengths equal to full height of fabric with a minimum cross section of 3/16” x 3/4”. Provide a black, vinyl coated tension bar for each gate, end post, and corner posts.
C. Tension bar bands (vinyl or powder coated), shall be pressed steel per ASTM F 626-89a spaced not over 12 inches OC to secure tension bars to end, corner, and gate posts.
D. Wire ties: 8-guage, black vinyl or powder coated, aluminum wire ties (with 9-guage core wire) on all fencing & gates, as shown on plans.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Temporarily mark locations of fence alignment and gate locations for review by Owner’s Representative prior to installation.
B. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.
C. Install rigid, plumb, and true to lines and levels shown. Verify that all elements called for in this Section fit according to the Drawings, design intent, and existing site features.

3.02 FENCE CONSTRUCTION

A. Posts:
   1. Auger holes for post footings in firm, undisturbed or compacted soil. Holes for post footings shall be sized as shown on the Contract Drawings.
   2. Place concrete around posts in a continuous placement, tamp for consolidation, checking each post for vertical and top alignment. Support posts plumb until concrete has cured. Set and secure sleeves, and other accessories into concrete as required.
   3. Tops of post footings shall be flush with adjacent finished grade, troweled and sloped outward to drain. Top of footing shall appear true and circular in shape with post at center of circle.

B. Sleeved Posts:
   1. Insert gate posts into sleeves provided in concrete footing as shown in the Contract Drawings. Check each post for vertical (plumb) and top alignment.

C. Rails:
   1. Securely fasten the top rail to terminal posts and pass through tops of line post fittings, forming a continuous rail for the full length of fence. Furnish the top rail in lengths that are approximately 21 feet long with standard hot dip galvanized, black vinyl coated, steel expansion couplings not less than 6" in length. Do not use lengths less than 10 feet adjacent to terminal posts.
   2. Mid and bottom rails shall conform to the same specification as top rail.
   3. Joined mid and bottom rails at line posts with double-end socket clamps with one inverted to maintain smooth line.

D. Fabric: Pull fabric taut and tie to posts and rails. Anchor fabric to framework so that the fabric remains in tension after pulling force is released. Set the lower edge of fabric level with finished grades.

E. Wire Ties: Tie fabric to line posts, and rails at spacing shown in Contract Drawings.
   1. Tie fabric to tension wire with 7-gauge hog rings.
   2. Attach all wire ties per accepted industry standards and as described as follows: Attach hooked end of tie to fabric above and close to the top or side of the rail or post and wrap the end of tie under so that the wire tie locks into place and will not come loose under normal use. Then wrap the wire tie around the rail snugly and affix to fabric below and close to the rail and twist the end of the wire tie at least one full revolution around the fabric so that the tie will not come loose under normal use. Turn wire ties into fabric to avoid sharp burrs.

F. Tension Bars: Attach chain-link fabric to the terminal posts by means of single piece tension bars. Thread through fabric and secure to posts with metal tension bands.

G. Welding: All welds shall be fully filled, ground flush and smooth, and cold galvanized by brushing on 2 coats of black color paint for vinyl fencing.

3.03 GATES

A. Install gates as shown on the Contract Drawings. Openings between frame or gate members shall not exceed 2 inches.

B. Install gates plumb, level, and secure for full opening without interference. Adjust hardware for smooth operation and lubricate where necessary. After the Owner’s Representative approval of operation, drill, tap, and setscrew all hinges and latch hardware to prevent rotation.

3.04 CLEANUP

A. Clear the working area of all excess fencing and gate material (concrete, wire, rails, pipe, etc.).

END OF SECTION

SECTION 32 31 29
SPLIT RAIL FENCE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, equipment, labor, and related items necessary to complete the work on the Contract Drawings and/or Contract Specifications. The items of work to be performed shall include but are not limited to:
   1. Cedar wood, split rail fence.
   2. Concrete footings with metal hardware attachment to fence posts.
   3. All other related and incidental items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.02 GRADING RULES

A. Provide lumber in accordance with the West Coast Lumber Inspection Bureau, latest edition and as modified hereinafter.
B. Association grade mark and trademark must appear on each piece of material, or each shipment must be accompanied by an official certificate of inspection by lumber grading agency.

1.03 QUALITY ASSURANCE

A. In addition to complying with all pertinent codes and regulations, all materials of this section shall comply with the pertinent provisions of the West Coast Limber Inspection Bureau, latest edition for Western Red Cedar.
B. Before proceeding with any work, the Contractor shall inspect the site, carefully check all grades, and verify all dimensions and conditions affecting the work. The Contractor shall immediately notify the Owner's Representative of any discrepancy on line and level.
C. Maximum moisture content
   1. All materials to have maximum moisture content of 15 percent to 19 percent or less and shall be "Kiln-Dried" based upon lumber thickness.
   2. Furnish moisture content Certificates upon request.
D. Conformance with standards and tests: Materials and handling shall conform to the following organizations' standards for materials testing and handling. Each standard is hereafter referred to by its organizational designation only. All materials and handling techniques shall conform to the appropriate standard.
   1. American Wood Protection Association – AWPA Standards for wood preservation.
   2. American Wood Preservers Bureau – AWPB Standards for Pressure Treated Material.
   3. International Building Code (IBC), latest edition.
   4. Western Wood Products Association – WWPA Grading Rules for Lumber and Plywood.
   5. West Coast Lumber Inspection Bureau – WCLIB Grading Rules for Lumber or Plywood.
   6. ASTM A153 – Standards for Zinc Coating (Hot-Dip) on Iron and Steel hardware.
   7. ASTM A307 – Standards for Carbon Steel Externally Threaded Standard Fasteners.
   8. ASTM A563 – Standards for Carbon and Alloy Steel Nuts.
E. Site Inspections must be made by the Owner's Representative.
   1. Request Owner's Representative inspection at least 72 hours in advance of the time inspection is required. Inspections for the following is required:
      a. Prior to the start of installation for Owner's Representative review of staked locations.
      b. Substantial Completion of all work (development of physical punch list items).
      c. Physical Completion of all work (physical punch list items satisfactorily completed).

1.04 PRODUCT HANDLING, STORAGE, AND DELIVERY

A. Deliver materials to site at specified moisture content.
B. Store materials under cover, off the ground with adequate blocking and support. Do not store materials directly in contact with the ground. Stack lumber flat with spacers between each bundle to provide air circulation.
C. Protect finished appearance of all members and parts to be left exposed.
D. Store in a safe location, out of pedestrian and vehicular traffic, and protected from weather.
E. Repair or replace any damaged components before installation.

1.05 SUBMITTALS

A. Submit for Owner's Representative's review and approval:
   1. Complete list of wood members with dimensions, sizes, and quantities. Include name and address of the supplier(s) for wood products.
   2. Manufacturer's product data for wood preservative treatments and certification that treatment materials comply with requirements herein.

1.06 SAFETY REQUIREMENTS

A. Manage all wood fence materials used in the execution of the work to avoid loss into the surrounding site.
B. Cover adjacent areas with protective tarps or other approved means to prevent contamination of the surrounding surfaces and landscape with loose nails, screws, wood and metal scraps, and splinters.
C. Collect loose materials on a daily basis to avoid unintentional loss.

1.07 PROTECTION

A. Protect new work and work-in-progress from vandalism and damage that might be incurred by construction traffic, equipment, property, and persons.
B. Replace damaged products prior to substantial completion.

1.08 PERMITS, CODES, AND REGULATIONS

A. The Contractor shall obtain and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.
B. The Contractor shall keep fully informed and shall comply with all existing laws, codes, ordinances, and regulations, which in any way affect the conduct of the work.

1.09 GUARANTEE

A. Guarantee work of this Contract Specification section for one (1) year against all defects of materials and workmanship. The guarantee period begins after the date of Substantial Completion.
B. Repair any damage caused by the settlement and defects at no cost to the Owner.

PART 2 PRODUCTS

2.01 HARDWARE

A. Provide all necessary nails, screws, bolts, nuts, and washers for proper installation of wood fence with attachments to concrete footings.
B. Provide hot dip galvanized finish or stainless-steel hardware suitable for contact with pressure-treated wood and outdoor applications.
C. Use washers under all bolt head and nuts in contact with wood.

2.02 STEEL PLATE CONNECTOR

A. Provide 12-gauge, ABU 66, Steel Plate Connectors; galvanize connectors after welding; manufactured by Simpson Strong-Tie Company Inc.; (800) 999-5099; www.strongtie.com; or approved equal.

2.03 WOOD TREATMENT

A. Wood Preservative must be alkaline copper quaternary (ACQ), a water-based wood preservative that prevents decay from fungi, prevents deterioration due to insects, and creates a dry surface on treated surfaces. Basis of Design: “Preserve ACQ” as manufactured by Viance LLC and supplied by Capitol Lumber Inc.; 2835 Marvin Rd NE; Lacey, WA 98516; (360) 438-0760 or approved equal.

2.04 SPLIT RAIL FENCE

A. Cedar Split Rail Fencing manufactured by Idaho Cedar Sales; 221 Main Street; Troy, Idaho 83871; (208) 835-2161.
   1. Western Red Cedar wood, consisting of heartwood, with a maximum moisture content of 15 percent to 19 percent or less and "Kiln-Dried" based upon lumber thickness.
   2. Splinter free, and free of surface knots, burrs, and holes
   3. Rails must be standard weight red cedar split rail; 10’ length x 14” girth.
   4. Posts must be standard weight red cedar split rail; 5’-4” length x 18” girth to fit 2 rails.

B. Or, approved equal.

2.05 LUMBER SCHEDULE

Product	Nominal Size	Grade	Wood Species
Fence Posts	6” x 6”	No 2 or better	Western Red Cedar
Fence Rails	2” x 4”	No. 2 or better	Western Red Cedar

PART 3 EXECUTION

3.01 INSTALLATION

A. Construct concrete footings and crown the top of the concrete footings. Embed the lower part of hardware post anchors, and secure anchors on wood posts as detailed in the plans. For bolt connections, drill pilot holes 1/16” larger diameter than the bolt diameter.

B. Install all posts plumb. Allow additional height for adjustment of horizontal members in the event that post bases are not installed at exact, equal elevations.

C. Install all rails parallel to finish grade. Prior to making final connection, trim added height from vertical members to achieve the intent of the drawings.

3.02 WOOD TREATMENT

A. Provide preservative treatment to AWPA Quality Standard C2 on all wood members.

B. Treat all cut surfaces, bolt holes, and contact surfaces with Wood Treatment per manufacturer’s written instructions.

3.03 WORKMANSHIP

A. Carefully layout, fit, and install miscellaneous wood fence and footing items. Use sufficient hardware to insure rigidity and permanence.

3.04 MISCELLANEOUS

A. Provide all miscellaneous carpentry work including furring, blocking, and bracing.

3.05 CLEAN-UP

A. Remove all construction debris including sawdust, wood scraps, and splinters from all adjacent and surrounding surfaces and landscaped areas as work progresses and at completion of work.
B. Use magnets or metal detectors to verify for the Owner's Representative that no loose nails or screws remain in surrounding soils.
C. Do not leave any nail, screw ends or heads, or other hardware sticking out of face of wood.

END OF SECTION

SECTION 32 33 00
ROCKERY WALL

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all labor, materials, and equipment to procure and install the Rockery Wall work of the Contract, including incidentals related to that work and coordination and support of other work specified elsewhere in the Contract Documents.

1.02 QUALITY ASSURANCE

A. Single-Source Responsibility for rockery materials: Obtain boulders from a single quarry with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to place the material without delaying the progress of the work.
B. Information on the Drawings and in the Specifications establishes the requirements for both aesthetic effects and performance of the rockery wall.
   a. Aesthetic effects relative to the formal characteristics are indicated by dimensions, arrangement, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction;
   b. Performance is indicated by criteria subject to verification either by preconstruction or field test, if applicable, or by in-service experience.
C. Do not modify intended aesthetic effects, except with the Engineer's approval, and only to the extent exclusively needed to comply with the performance requirements. Where modifications are proposed, submit comprehensive explanatory data for review.
D. Installer Qualifications: Installer shall be an experienced rockery wall placement technician with at least 3 years of experience placing and forming rockery walls.
E. Site inspections will be made by the Owner’s Representative.
   a. Request Owner’s Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following are required:
      i. Location of rockery wall staked in the field and subgrade preparation prior to installation of any boulders.
      ii. After partial construction of rockery wall is complete, showing full height.
      iii. Substantial Completion of all work (development of physical punch list items).
      iv. Physical Completion of all work (physical punch list items satisfactorily completed).

1.03 SUBMITTALS

A. Submit the following in accordance with Division 1 Specifications.
   1. Product data and source for boulders.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver boulder rock to the project site in undamaged condition. Store and handle the boulder rock to prevent their deterioration or damage due to moisture, temperature change, contaminants, corrosion, breaks, chipping, or other causes.
B. Store and handle the boulder rock and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes
C. Do not use pinch or use wrecking bars.

D. Lift with wide-belt-type slings where possible; do not use wire rope or ropes containing tar or other substances that might cause staining.

PART 2 PRODUCTS

2.01 TYPE M (FILTER DRAIN ROCK) AGGREGATE

A. For use as drain rock behind rockery;
B. Use well rounded, clean, and washed Type M Aggregate; composed of hard, durable, sound pieces having a specific gravity of not less than 2.65. Conform to following gradation:

U.S. Standard Sieve Size	Percent Passing
4 inch	100
3 inch	80 – 100
1-1/2 inch	40 – 90
1 inch	20 – 65
3/4 inch	5 – 50
3/8 inch	0 – 15

2.02 TYPE N (FOUNDATION MATERIAL) AGGREGATE

A. For use as base aggregate under rockery wall;
B. Free of stones greater than 2-1/2 inches in the greatest dimension, free from clay and organic matter, moisture content that is less than the material's optimum value and compacts readily. Conform to following gradation:

U.S. Standard Sieve Size	Percent Passing
1-1/2 inch	99 – 100
1 inch	75 –100
5/8 inch	50 –100
No. 4	20 –80
No. 40	3 – 24
No. 200	10.0 maximum wet
Sand Equivalent	35 min

2.03 GEOTEXTILE FOR ROCKERY WALL

A. Provide nonwoven geotextile for rockery wall and conform to the following:

Property	Test	Requirements
AOS	ASTM D4751	No. 40 max.
Water permittivity	ASTM D4491	0.50 sec to 1 min
Grab Tensile Strength	ASTM D4632	115 lbs min
Grab Tensile Elongation	ASTM D4632	< 50%
Puncture	ASTM D6241	220 lbs min

2.04 ROCKERY WALL ROCK

A. Preselect boulders at the supplier's yard with approval by the Engineer prior to delivery to project site.
B. Provide rock that is as rectangular as possible, free from cracks, and substantial flaking and deterioration.
C. Granite Boulders: High Cascade Weathered Granite or approved equal.
Supplier: Marenakos Rock Center, Ph. (425) 392-3313.

Finish:	Naturally occurring
Size:	2 to 3 man rock per schedule on detail.

PART 3 EXECUTION

3.01 SELECTION AND PLACEMENT

A. Select and place rock such that there will be minimum voids and, in the exposed face, no open voids over 6 inches across in any direction. Provide a continuous appearance in the final course and place final course to minimize erosion of the backfill material.
B. Set the rockery to comply with the requirements indicated on the Drawings.
   1. Place the larger rocks at the base of the facing so that it will be stable and have a stable appearance.
   2. Place rocks in a manner such that the longitudinal axis of the rock shall be at right angles to the face.
   3. Inclined faces of rocks to slope to the back of the facing.
   4. Seat each course of rocks as tightly and evenly as possible on the course beneath.
   5. Place the rocks so that there are no continuous joint planes either horizontally or vertically.
   6. After setting each course of rock, chink all voids between the rocks on the back with quarry rock to eliminate any void sufficient to pass a two-inch square probe.
C. Replace broken, chipped, stained or otherwise damaged rockery until the methods and results are acceptable to the Engineer.

3.02 PROTECTION

A. Prevent staining of the rockery from caulking or paving materials. Immediately remove such materials from the rockery without damage to the latter.
B. Protect rockery from damage from construction machines and materials.
C. Clean rockery surfaces that have become dirty and stained prior to setting. Remove soil, stains, and foreign materials.

3.03 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove from the Owner's property, all waste materials, including unacceptable or unused excavated material, trash and debris, and dispose of it off site in a legal and timely manner.
B. Provide dump receipts from an approved dumpsite.

END OF SECTION

SECTION 32 33 00
SITE FURNISHINGS

PART 1 GENERAL

1.01 SUMMARY

A. Provide and install all site furnishings items hereinafter identified.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section must include but is not limited to:
   1. Trash and Recycle Receptacle
   2. Bike Rack
   3. Picnic Table A
   4. Accessible Picnic Table A
   5. Picnic Table B
   6. Accessible Picnic Table B
   7. Bench
   8. Removable Bollard
   9. Dog Mitt Station
   10. Car Counter
   11. Trail Counter
   12. Vehicular Access Gate
   13. Vehicular Park Entry Sign
   14. Park Info & Rules Sign
   15. Trail Entry – Large Sign
   16. Trail Directional Sign
   17. Amenity Info & Rules Sign – Playground Rules
   18. Playground Welcome Sign
   19. Amenity Info & Rules Sign – Off Leash Area Rules
   20. Amenity Info & Rules Sign – Park Shelter Rules
   21. General Sign – Pedestrian Scale
   22. Low Profile Informational Sign
   23. Boardwalk
   24. Knoxbox

B. All other related items required to complete the work shown on the Contract Drawings and as specified in the Contract Specifications.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions of the following documents.
   1. Pierce County Parks and Recreation – Sign Standards. Document dated 02/23/2017. (Appendix D)
      a. Sign standards document includes dimension, materials, mounting type, finishes, graphic standards, and general graphic layouts for all signs.
      b. Fonts and vector .eps artwork of all logos and symbols included in the Sign Standards document available from Pierce County Parks and Recreation.

c. Adobe InDesign templates of informational panels (Park Info and Rules, Playground Info and Rules, Maps, Etc.) available from Pierce County Parks and Recreation.

2. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.
3. ASTM A312/A312M – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes; 2009.
4. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
5. All standards must include the latest additions and amendments as of the date of advertisement for bids.
6. Comply with environmental agencies, building codes and other local requirements that are more stringent than the above.
7. Comply with Title III of the Americans and Disabilities Act, Public Law 101-336.

1.04 QUALITY ASSURANCE

A. Before proceeding with any work, the Contractor must inspect the site, carefully check all grades, and verify all dimensions and conditions affecting the work. The Contractor must immediately notify the Owner's Representative of any discrepancy on line and level.
B. Site furnishing work must be performed by a company with experience in work of similar scope and quality.
C. Adhere to manufacturer's instructions for product storage and handling, assembly, installation, and maintenance.
D. Manufacturer's original factory finish must be intact for the installation of the furnishing to be considered satisfactory.
E. Standard Contract Specifications Reference Standards
   1. American Society for Testing Materials (ASTM), Latest Edition.
F. Site Inspections will be made by the Owner's Representative.
   1. Request Owner's Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following is required:
      a. Inspection of temporarily marked/staked locations and alignments of site furnishings items and/or footings prior to installation.
      b. Substantial Completion of all work (development of physical punch list items).
      c. Physical Completion of all work (physical punch list items satisfactorily completed).

1.05 SUBMITTALS

A. For each product specified, submit the following for approval prior to delivery:
   1. Manufacturer's product data including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Manufacturer's written assembly and installation instructions.
      d. Maintenance instructions.
      e. Manufacturer warranties.
   2. Provide shop drawing for all panels and signs for review and approval prior to construction.
      a. Shop drawings must include sign type, footings with reinforcements, structure, hardware, lettering, font, icon use, materials, finishes, concrete finish, locations, and dimensions of each sign.
      b. Submit samples of all finish materials
      c. Manufacturer's written installation instructions, installation template, and attachment devices.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store site furnishings items in accordance with manufacturer's written recommendations.
B. Handle all site furnishings with sufficient care to prevent scratches to the finish and other damage.
C. Deliver products in good condition.
D. Store products to prevent corrosion, deterioration, and damage.
E. Bent, dented, scratched, chipped, or otherwise damaged items are not acceptable and must be replaced by items and components in new condition.

1.07 ENVIRONMENTAL CONDITIONS

A. Do not install site furnishings items during heavy rain, freezing temperature, or snowfall.

1.08 PROTECTION

A. Protect new work and work-in-progress from vandalism and damage that might be incurred by construction traffic, equipment, property, and persons.
B. Replace damaged products before substantial completion as directed by Owner's Representative.

1.09 PERMITS, CODES, AND REGULATIONS

A. The Contractor must obtain and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.
B. The Contractor must keep fully informed and must comply with all existing laws, codes, ordinances, and regulations, which in any way affect the conduct of the work.

1.10 CONDUCT OF WORK

A. The Contractor must continuously maintain a competent superintendent or foreman during the progress of the work, with the authority to act for the Contractor in all matters pertaining to the work.
B. The Contractor must confine operations to the working areas allotted by the Owner for operations, including material and equipment storage.
C. The Contractor must progressively clean the work site of debris and rubbish as the work proceeds.

1.11 GUARANTEE PERIOD

A. Guarantee work of this Contract Specification section for one (1) year against all defects of materials and workmanship. The guarantee period begins after the date of Substantial Completion.
B. Repair any damage caused by settlement and defects at no cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. As required to complete the work as shown on the Contract Drawings and/or as specified in the Contract Specifications.

2.02 CRUSHED SURFACING BASE COURSE

A. Provide thickness as shown on the Contract Drawings.
B. Base course aggregate shall be as specified in WSDOT Standard Specifications for Road and Bridge Construction: Section 9-03 Aggregates, as required to construct the project.

2.03 CAST-IN-PLACE CONCRETE

A. Include concrete footings, thickened concrete, and other items as specified in Section 03 30 00 Cast-In Place Concrete as required to construct the project.

2.04 REINFORCING BARS

A. All reinforcing steel shall conform to ASTM A615, number four (4) bar or otherwise indicated, unpainted, uncoated, free from rust, dirt and other defects, as required to construct the project.

2.05 SURFACE TREATMENTS

A. Surface treatment for manufactured products shall conform to manufacturer's standard finish specifications.
B. Provide no treatments that void the warranty on manufacturer's products.

2.06 HARDWARE

A. All metal hardware not supplied by the manufacturer including bolts, nuts, washers, and anchor bolts must be Stainless Steel Type 304 unless otherwise noted. All stainless steel bolts must have stainless steel nuts and standard cut stainless steel washers at each end; size respectively unless otherwise noted in Contract Drawings. Hardware not noted by size must be sufficient to draw and hold members securely.

2.07 TRASH/ RECYCLE RECEPTACLE

A. Provide Plaza Series, flared receptacle with 35-gallon black polyethylene liner, hinged top with dome for round receptacle and pedestal base. One receptacle to receive "Recycle " logo and the other to receive "Trash" logo. Color to be "Teal" Semi-gloss, as distributed by Tournesol Siteworks. www.tournesol.com
B. Installation type: Surface mount
C. Lid: Attached and welded on
D. Receptacle Liner: ABS
E. Or approved equal.

2.08 BIKE RACK

A. Provide "Emerson" bike rack. Manufactured by Landscapeforms; 7800 E. Michigan Ave., Kalamazoo, MI 49048; (269) 381-0396; https://www.landscapeforms.com/en-US/Pages/default.aspx.
   1. Installation type: Surface mount.
   2. Finish: Metallic Silver per manufacturer.
B. Or approved equal.

2.09 PICNIC TABLE A

A. Picnic Table A shall be "Southern PikNik" accessible aluminum picnic table as manufactured by Folding ChairsandTables.com; 1701 Whittle Springs Rd.; Knoxville, TN 37917; (888) 858-7529; sales@foldingchairsandtables.com; www.foldingchairsandtables.com.

1. Finish: Matte Silver per manufacturer.

B. Or approved equal.

2.10 ACCESSIBLE PICNIC TABLE A

A. Accessible Picnic Table A shall be “Southern PikNik” ADA wheelchair accessible aluminum picnic table as manufactured by Folding ChairsandTables.com; 1701 Whittle Springs Rd.; Knoxville, TN 37917; (888) 858-7529; sales@foldingchairsandtables.com; www.foldingchairsandtables.com.
   1. Finish: Matte Silver per manufacturer.

B. Or approved equal.

2.11 PICNIC TABLE B

A. Provide Plaza Collection Steel Strap Table, Surface Mount, 36” square, Table, FW part no. F-7 Model PZ-1000-3636 with four (4) Plaza Collection Backless surface mount, 30" long, FW part no. F-7, Standard Seats, Model PZ-0400-30 per table. Color to be "Teal" Semi-gloss , as distributed by Tournesol Siteworks, www.tournesol.com

B. Or approved equal.

2.12 ACCESSIBLE PICNIC TABLE B

A. Provide Plaza Collection Steel Strap Table, ADA wheelchair accessible, surface mount, 36” square, FW part no. F-7, model PZ-1000-3636A with three (3) Plaza Collection Backless Bench, ADA Compatible, Surface Mount, 30" long, FW part no. F-7 ADA Seats, Model PZ-0400-30A benches per table. Color to be "Teal" Semi-gloss , as distributed by Tournesol Siteworks, www.tournesol.com.

B. Or approved equal.

2.13 BENCH

A. General: Provide Plaza Village Series, Model PZ-0100 surface-mount Bench with back and arm rests, six-foot length when located along the trail and eight-foot length for the location in the trailhead plaza. Color to be "Teal" Semi-gloss, as distributed by Tournesol Siteworks, www.tournesol.com.

B. Or approved equal.

2.14 REMOVABLE BOLLARD

A. Removable bollard shall be RP3503 - 3.5” outside diameter, 36” height. Manufactured by TrafficGuard, Inc.; P.O. Box 201, Geneva, IL 60134; (877) 727-7347; http://www.trafficguard.net; sales@traffiguard.net.
   1. Installation type: In-ground mount.
   2. Finish: Black with reflective warning label sticker per manufacturer. Place reflective warning label sticker on bollard per Owner’s Rep direction.
   3. Include additional sleeves for in-ground bollard receivers where shown on Contract Drawings.

B. Or approved equal.

2.15 DOG MITT STATION

A. Provide Modern Dog Kit; 54% recycled aluminum material; powder coated, brushed aluminum color, with stainless steel locking mechanism; Supplied by: PetPickUps.com; P.O. Box 460547, Denver, Co 80246; service@petpickups.com; www.petpickups.com; 303-443-8914.

1. Kit Components
   a. Modern Dog Dispenser
   b. Modern Dog Sign
   c. Modern Dog Receptacle: 13 gallon locking receptacle with galvanized steel liner
   d. Universal key for dispenser and receptacle
2. Bare Bone Mitts; 1 case = 3,000 mitts; Supplied by: PetPickUps.com; P.O. Box 460547, Denver, Co 80246; service@petpickups.com; www.petpickups.com; 303-443-8914.

B. Or approved equal.

2.16 DOG MITT STATION MOUNTING HARDWARE

A. Mounting hardware for the Off-Leash Area Waste Station to be a set of two One-Sided Post Clamps to fit 2-3/8" post. Material shall be aluminum and stainless steel; each set to include 2 of each of the following: clamps, stainless steel u-bolts, and sign fasteners. As manufactured and supplied by Sign Company Supply; 6088 Corte Del Cedro; Carlsbad; CA 92011; (760) 707-5424; sales@signcompanysupply.com.

B. Or approved equal.

2.17 CAR COUNTER

A. Provide ZELT Counter for Car; with direction, 2 loops, activated manufactured by Eco-Counter (www.eco-counter.com).

B. Power system:
   1. Model 901 Battery
   2. Four (4) Raygel connectors
   3. Smart Connect

C. Sensor and Logger system:
   1. PYRO - Passive infrared sensor.
   2. Eco-Combo Logger.
   3. 2-loop ZELT GW Electromagnetic Sensor
   4. Two (2) Loop Wire with four (4) watertight connectors
   5. PYRO extension cable

D. Water-tight Enclosure
   1. Enclosure Hubbell Wiegmann Enclosure. Grainger Item # 52XC30 or approved alternate.
   2. Cord Connector: Liquid Tight Cord Connector w/ ¾" MNPT or approved alternate. Available from Grainger item # 2DPE6.
   3. Wire Connector: Rainbird WC20 Series Wire Connector or approved alternate.

E. Outer Vault box: Rainbird Super Jumbo Valve Box Model VBSPRH with locking green lid.

F. Or approved equal.

2.18 TRAIL COUNTER

A. Provide Eco-Counter Multi manufactured by Eco-Counter (www.eco-counter.com) or approved alternate.

B. Power system:
   1. (1) Model 901 Battery
   2. Four (4) Raygel connectors
   3. (1) Smart Connect

C. Sensor and Logger system:
   1. PYRO - Passive infrared sensor.
   2. Eco-Combo Logger.
   3. 2-loop ZELT GW Electromagnetic Sensor

4. Two (2) Loop Wire with four (4) watertight connectors
5. PYRO extension cable

D. Water-tight Enclosure
1. Enclosure Hubbell Wiegmann Enclosure. Grainger Item # 52XC30 or approved alternate.
2. Cord Connector: Liquid Tight Cord Connector w/ ¾" MNPT or approved alternate. Available from Grainger item # 2DPE6.
3. Wire Connector: Rainbird WC20 Series Wire Connector or approved alternate.

E. Outer Vault box: Rainbird Super Jumbo Valve Box Model VBSPRH with locking green lid or approved alternate.

2.19 VEHICULAR ACCESS GATE

1. Gate.
   a. Gate construction shall be a hinge-less design as shown on Contract Drawings, with a minimal swing/operation of 270 with latches, two (2) gate receptable posts, and roadway markers. The sleeve shall have grease fittings as shown on the fittings at the appropriate locations to allow regular maintenance.
   b. Galvanized steel gate post shall minimally conform to ASTM F1043 Group IA Intermediate Strength, with a minimum yield strength of 50,000 psi.
   c. Allow for thermal action resulting from the maximum range (change) in ambient temperature in the design, fabrication, and installation of gate, to prevent opening of joints, buckling, and other detrimental effects, including over stressing of connections and components.
   d. Provide weep holes or other means to exit entrapped water from hollow sections of gate frame members exposed to exterior condensation, or moisture from other sources.
   e. Coordinate with the Owner's Representative during construction to verify gate receptacle post locations.
2. Finish: polyester texture powder coat with flat finish. Color shall be White.

2.20 VEHICULAR PARK ENTRY SIGN

A. Vehicular Park Entry Sign to conform with Pierce County Parks and Recreation – Sign Standards for Vehicular Scale Park Entry Sign; Appendix D. Sign components include:
1. Sign Panel Face: Double Face
2. Mounting: Surface Mount to Cast-in-Place Footing, Appendix D
3. Lettering
   a. First Line: ORANGEGATE
   b. Second Line: PARK
4. Symbol Squares:
   a. [DOG PARK]
      [PARKING]
   b. [RESTROOM/TOILET]
   c. [PLAYGROUND SYMBOL]
   d. [PICNIC SHELTER SYMBOL]

2.21 PARK INFO & RULES SIGN

A. Park Entry Sign to conform with Pierce County Parks and Recreation – Sign Standards for Pedestrian Scale Park Info & Rules Sign; Appendix D. Sign components include:
1. Sign Panel Face: Single Face
2. Mounting: Surface Mount to Cast-in-Place Footing
3. Lettering per Appendix D.

4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.22 TRAIL ENTRY – LARGE SIGN

A. Trail Entry - Large Sign to conform with Pierce County Parks and Recreation – Sign Standards for Trail Entry -Large Sign; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Footing: Cast-in-place, cement concrete footing, 3000 psi.@ 28 days with reinforcing and dimensions indicated in Appendix D
   3. Mounting: Surface Mount to Cast-in-place Footing(s), Appendix D
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.23 TRAIL DIRECTIONAL SIGN

A. Trail Directional Sign to conform with Pierce County Parks and Recreation – Sign Standards for Pedestrian Scale Trail Directional Sign; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Mounting: Embedded
   3. Lettering:
      a. Sign for Goblin Ring
         1) First Line: GOBLIN RING
      b. Sign at Pipeline Trail
         1) First Line: TRAIL TO
         2) Second Line: ORANGEGATE PARK
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.24 AMENITY INFO & RULES SIGN – PLAYGROUND RULES

A. Amenity Info & Rules Sign – Playground Rules to conform with Pierce County Parks and Recreation – Sign Standards for Pedestrian Scale Amenity Info & Rules Sign – Playground Rules; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Footing: Cast-in-place cement concrete footing, 3000 psi @ 28 days, with reinforcing and dimensions indicated in Appendix D
   3. Mounting: Surface Mount to Cast-in-place Footing –Appendix D
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.25 PLAYGROUND WELCOME SIGN

A. Playground Welcome Sign to conform with Pierce County Parks and Recreation – Sign Standards for Pedestrian Scale Playground Welcome Sign - Welcome! Ages 2-12; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Footing: Cast-in-place cement concrete footing, 3000 psi @ 28 days, with reinforcing and dimensions indicated in Appendix D
   3. Mounting: Surface Mount to Cast-in-place Footing –Appendix D
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.26 AMENITY INFO & RULES SIGN – OFF LEASH AREA RULES

A. Amenity Info & Rules Sign – Off Leash Area Rules to conform with Pierce County Parks and Recreation – Sign Standards for Amenity Info & Rules Sign – Off Leash Area Rules Fence Mount. Sign components include:
   1. Face: Single Face
   2. Mounting: Mount to fence
   3. Informational Panel: Use MTL1 (1/8" thick aluminum panel) & GFM1 (Graphic film). Graphic file and text provided by Pierce County Parks and Recreation.

2.27 AMENITY INFO & RULES SIGN – PARK SHELTER RULES

A. Amenity Info & Rules Sign – Park Shelter Rules to conform with Pierce County Parks and Recreation – Sign Standards for Amenity Info & Rules Sign – Park Shelter Rules Panel mounted on Park Shelter Column. Sign components include:
   1. Face: Single Face
   2. Mounting: Secure to shelter column in location determined by Owner. Mount to each column with ¼ in. diameter, galvanized machine bolts two (2) per post, with washers and hex nut. Maximum ¼ in. thread exposed past nut. Note: Do not obscure any part of the sign messaging when installing the mounting bolts.
   3. Lettering:
      a. Shelter Name (Sign 1): SHELTER 1
      b. Shelter Name (Sign 2): SHELTER 2 (for bid add shelter)
      c. Secondary text (Sign 1-2): Text file and layout example provided by Pierce County Parks and Recreation.
      d. QR Code Graphic: Graphic file provided by Pierce County Parks and Recreation.

2.28 GENERAL SIGN – PEDESTRIAN SCALE

A. General Sign-Pedestrian Scale to conform with Pierce County Parks and Recreation – Sign Standards for General Sign-Pedestrian Scale; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Footing: Cast-in-place cement concrete footing, 3000 psi @ 28 days, with reinforcing and dimensions indicated in Appendix D
   3. Mounting: Surface Mount to Cast-in-place Footing –Appendix D
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.29 LOW PROFILE INFORMATIONAL SIGN

A. Low Profile Informational Sign to conform with Pierce County Parks and Recreation – Sign Standards for Low Profile Informational Sign; Appendix D. Sign components include:
   1. Sign Panel Face: Single Face
   2. Footing: Cast-in-place cement concrete footing, 3000 psi @ 28 days, with reinforcing and dimensions indicated in Appendix D
   3. Mounting: Surface Mount to Cast-in-place Footing –Appendix D
   4. Informational Panel: Use CHPL-1 Custom High-Pressure Laminate. Artwork template and edits used for fabrication provided by Pierce County Parks and Recreation.

2.30 BOARDWALK

A. Boardwalk components include:
   1. Ledger Board: 2x8 pressure treated wood.

2. Joist: 2x6 12-gauge, galvanized steel rectangular tube; compliant with ASTM A653.
3. Beam: 4x6 1/4" galvanized steel rectangular tube; compliant with ASTM A500.
4. Rigid Connector Angle: Rigid Connector Angle RCA-C223/97 manufactured by Simpson; (800) 999-5099; www.strongtie.com.
5. Steel Joist hanger bracket must be HU Heavy Face-Mount Joist Hanger manufactured by Simpson; (800) 999-5099; www.strongtie.com.
6. Bullrail and spacer: Trex Transcend 2x4 Square Edge Board manufactured by Trex; 2500 Trex Way, Winchester, VA 22601 USA; 1-800-289-8739; www.trex.com.
   a. Color: Tiki Torch
7. Planking: Trex Transcend 1x6 Square Edge Board manufactured by Trex; 2500 Trex Way, Winchester, VA 22601 USA; 1-800-289-8739; www.trex.com.
   a. Color: Tiki Torch
8. Fasteners and fittings per contract drawings.

B. Or approved equal.

2.31 KNOXBOX

A. Knoxbox to be KnoxBox® 3200, surface mount, black, mechanical Lock model #3261 manufactured by KNOX Company; 1601 W. Deer Valley Road, Phoenix, AZ 85027; 800-566-9269; www.knoxbox.com
   1. Galvanized steel post, fasteners, and footing per Contract Drawings.

PART 3 EXECUTION

3.01 GENERAL

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.
B. Mark alignment, orientation, and locations of all site furnishings for review by Owner's Representative prior to installation. Incorrectly located work must be removed and/or replaced by the Contractor at no additional cost to the Owner.
C. Install site furnishings items rigid, plumb and true to lines and levels shown in contract drawings.
D. Assemble (if required) and install all equipment specified by name and/or manufacturer as per approved manufacturer's written instructions and/or recommendations.

3.02 SUBGRADE PREPARATION

A. The Contractor must verify that subgrade has been properly compacted and compaction tests, if required, have been accomplished.

3.03 CRUSHED SURFACING TOP COURSE

A. Provide thickness as shown on the Contract Drawings.

3.04 CAST-IN-PLACE CONCRETE

A. Layout and size concrete pads, footings, and foundations per manufacturer's written instructions or as shown in the Contract Drawings.
B. Cast-In-Place Concrete for site furnishings footings and foundations must be per Section 03 31 00 of these Contract Specifications.
C. Unless otherwise indicated, exposed concrete must have a medium broom finish.

3.05 DIRECT BURIAL INSTALLATIONS

A. All below-grade steel components scheduled for direct burial installation must be coated in an approved manner prior to installation, typically either factory powder coating or hot-dipped galvanized.
B. Provide footing excavations sized as shown in the Contract Drawings and per manufacturer's written installation instructions.
C. All site furnishings scheduled for direct burial installation within new paved areas are to be installed prior to paving.
    1. Do not core completed work of the Contract to accomplish product installation without prior approval of the Owner's Representative.
    2. Where the Owner's Representative has approved coring of pavement installed as part of the work of the Contract, the Contractor must ensure an adequate supply of clean water and continuously flush and clean cuttings from pavement surfaces to remain.
D. Concrete footings not within new paving areas must be neatly and evenly crowned slightly above adjacent finish grade where adjacent finish grade is generally level, or matching adjacent finished grade where adjacent finish grade is sloped.

3.06 SURFACE INSTALLATIONS

A. Surface installations must be made only upon approved concrete surfaces.
B. Use only manufacturer approved anchoring devices unless otherwise shown in the Contract Drawings and Contract Specifications.
C. Shim as required to level; with aluminum or galvanized steel shims or equal as approved by Owner's Representative.
D. Where the manufacturer does not provide a specification for anchoring, use only approved stainless steel wedge anchors as follows:
    1. Do not proceed with anchor installation until concrete pavement has had a minimum of 14 days cure time under normal conditions. Where weather conditions are beyond the range of normal, do not proceed with anchor installation without the approval of the Engineer.
    2. Size to the largest standard diameter that the manufacturer's pre-made hole will accommodate without force.
    3. Size for embedment of ¾ of the actual depth of concrete to support the installation, in no case less than 2½". Allow for depth of washer and vandal resistant cap nut.
    4. Do not over drill beyond 1/8" the depth necessary to accommodate the anchor.
    5. Torque to 80-85% of the anchor manufacturers recommended maximum.
    6. Provide at least one anchor for every bolt location hole for any site furnishing.

3.07 INSTALLATION OF MANUFACTURED ITEMS

A. Install all equipment in accordance with Specifications, Drawings and manufacturer's directions. Where these may be in conflict, the more stringent requirements govern.

3.08 INSTALLATION OF FABRICATED ITEMS

A. All fabricated items shall be installed consistent with the measured plans provided in the Contract Drawings and/or Shop Drawings as applicable, utilizing materials as shown on plans and details.

3.09 CLEAN-UP

A. Clean site furnishings promptly after installation. Remove all residues, stains, scuffs, abrasions, and marks from the finished product in accordance with the manufacturer's instructions. Do not use harsh or abrasive cleaning materials or methods that could damage the finishes.
B. Touch-up and repair minor damages to the finish in accordance with manufacturer's instructions and as approved by the Owner's Representative.
C. Remove and replace damaged components that cannot be successfully repaired as determined by the Owner's Representative.
D. Remove all metal, wood, and concrete slurry and debris, protective wrappings and coverings, and shipping materials from the project site.
E. Fully restore all areas of the site that were impacted by the installation activities.

3.10 SUBSTANTIAL AND PHYSICAL COMPLETION

A. Inspection to determine Substantial and Physical Completion of site furnishings will be made by the Owner's Representative upon the Contractor's request.

END OF SECTION

SECTION 32 50 00
LANDSCAPE BOULDER

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide to the site and place landscape boulders in conformance with the Contract Drawings and under the direction of the Owner's Representative.

1.02 SUBMITTALS

A. Submit the following in accordance with Division 1 Specifications.
   1. Product data and source for boulders.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility for Landscape Boulder: Obtain boulders from a single quarry with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to place the material without delaying the progress of the work.
B. Information on the Contract Drawings and in the Specifications establishes the requirements for both aesthetic effects and performance of the stone material.
   1. Aesthetic effects relative to the formal characteristics are indicated by dimensions, arrangement, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction;
   2. Performance is indicated by criteria subject to verification either by preconstruction or field test, if applicable, or by in-service experience.
C. Do not modify intended aesthetic effects, except with the Owner's Representative approval, and only to the extent exclusively needed to comply with the performance requirements. Where modifications are proposed, submit comprehensive explanation and data for review.
D. Installer Qualifications: Installer shall be an experienced landscape boulder placement technician with at least 3 years of experience placing boulders.
E. Site inspections will be made by the Owner's Representative.
   1. Request Owner's Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following are required:
      a. Boulder selection in-person at quarry or boulder supplier's yard prior to delivery to the site.
      b. Placement, depth buried, and orientation prior during installation.
      c. Substantial Completion of all work (development of physical punch list items).
      d. Physical Completion of all work (physical punch list items satisfactorily completed).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver boulders to the project site in undamaged condition. Store and handle the boulders to prevent their deterioration or damage due to moisture, temperature change, contaminants, corrosion, breaks, chipping, or other causes.
B. Do not use pinch or use wrecking bars.
C. Lift with wide-belt-type slings where possible; do not use wire rope or ropes containing tar or other substances that might cause staining.

PART 2 PRODUCTS

2.01 MATERIALS

A. Preselect boulders at the supplier's yard with approval by the Owner's Representative prior to delivery to project site.
B. Provide 'High Cascade Weathered Granite' boulders that have smooth surface, free of cracking, with no sharp edges, and free of flaking.
C. Size: 3 to 8 man rock per schedule on detail.

2.02 STONE SUPPLIERS

A. Marenakos Rock Center, Ph. (425) 392-3313.
B. Triple R Aggregate, Ph (360) 668-3007.
C. Quarry S/E, Ph (206) 522-8670
D. Or approved equal quarry or quarries with resources to provide materials of consistent quality in appearance and physical properties.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the areas where the boulders will be placed, and the conditions under which the boulders will be installed, with the Installer present, for compliance with the requirements for installation and other conditions affecting the performance of the placement.
B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect the boulder during setting as follows:
   a. Prevent staining of the stone from caulking or paving materials.
   b. Immediately remove such materials from the stone without damage to the latter.
B. Protect boulders from damage from construction machines and materials.
C. Remove soil, debris, and foreign materials from surface of boulders.
D. Clean stone surfaces that have become dirty and stained prior to setting. Clean stones by thoroughly scrubbing stones with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.

3.03 SETTING BOULDERS

A. Set the boulders to comply with the requirements indicated on the Contract Drawings.
B. Lift all boulders with wide-belt type slings where possible. Do not use pinch or use wrecking bars. Do not use wire rope or ropes containing tar or other substance that might cause staining of the boulder surface.
C. Replace broken, chipped, stained, or otherwise damaged boulders by boulders acceptable to the Owner's Representative.

3.04 PROTECTION

A. Provide final protection and maintain conditions to ensure that no damage occurs to the boulders until Substantial Completion is approved.

3.06 CLEANUP

A. Remove all residues, repair all stains, scuffs, abrasions, and marks from the finished product

prior to requesting inspection.

B. Fully restore all areas of the site that were impacted or disturbed by the installation activities.

END OF SECTION

SECTION 32 84 00
IRRIGATION

PART 1 GENERAL

1.01 GENERAL

A. Furnish and install an automatically-controlled, underground irrigation system and associated equipment, labor, and materials as indicated.
B. This Section also includes the Guarantee of the irrigation system during the planting Guarantee Period of one (1) year duration to ensure the health and establishment of plant materials. Refer to Section 32 90 00 Planting.
C. This Section includes the maintenance of the irrigation system during the one (1) year Maintenance Period.

1.02 SCOPE OF WORK

A. Furnish and install a complete underground sprinkler irrigation system to provide efficient and even irrigation with head-to-head coverage of all planting areas shown on the Contract Drawings. Irrigation system shall have minimum overspray onto signs, paved or non-planted areas and no overspray onto buildings and as specified in the Specifications and be complete and ready for operation.
B. The work included in this Specification (whether mentioned or not) shall consist of all tools, materials, tests, permits and other related items necessary for the installation and operation of the irrigation system. Included shall be all labor necessary for installation, including trenching, plumbing, back-filling, electrical wiring, adjustments, and all other items of labor necessary for a satisfactory operating system.
C. Locate piping in planting areas unless shown in sleeves between planting areas. Avoid conflicts with plant materials, lighting fixtures, signs, architectural features, above and below ground utilities, and drainage systems.
D. Any item of labor, material or equipment not specified or shown in detail, but incidental to or necessary for the complete installation and proper operation of the system, shall be furnished by the Contractor without additional cost to the Owner.
E. All sleeving required for the execution of the work is to be provided as specified. Coordinate locations and installation of pipe sleeving with the general contractor prior to paving operations.

1.03 QUALITY ASSURANCE

A. Contractor must be a bonded irrigation contractor. The sprinkler irrigation system must be installed by an experienced irrigation mechanic, Certified Irrigation Technician, or Journeyman Plumber.
B. All electrical service connection work must be completed by a licensed Electrical Contractor with at least 5 years of documented experience in performing irrigation work of comparable size, scope, and quality.
C. All potable water system components shall be installed by a Washington State Licensed Plumber.
D. All testing of the backflow prevention equipment shall be done by a Washington State Certified Backflow Assembly Device Tester.
E. Site Reviews will be made by the Owner Representative.
    1. Request Owner Representative reviews at least 3 working days in advance of the time review is required.
    2. Reviews of the following critical path items are required:

a. To observe all testing as outlined in these Specifications.
b. Trenching and irrigation pipe layout prior to backfilling.
c. Head layout and coverage.
d. For Substantial Completion of all work (development of physical punch list items).
e. For Physical Completion of all work (physical punch list items satisfactorily completed).
f. Guarantee Period: quarterly site reviews up to Final Acceptance.
g. For Final Acceptance at completion of Guarantee Period.

1.04 VERIFICATION

A. Before proceeding with any work, inspect the site, carefully check all grades and verify all dimensions and conditions affecting the work in order to proceed safely. Changes or alterations to the system to meet actual conditions shall be made at no additional cost to the Owner.
B. Report to the Owner's Representative all deviation and/or conflicts between Drawings, Specifications and site conditions. Extra work arising from failure to do so shall be completed at the Contractor's expense.
C. Prior to the start of any work, verify available static water pressure (PSI) and gallons per minute (GPM) at point-of-connection to water service. Submit written verification of available PSI to Owner's Representative prior to beginning work. Any replacement, relocation or additional materials required as a failure to check (PSI) shall be completed at the Contractor's expense.

1.05 CHANGE ORDERS AND SUBSTITUTIONS

A. Do no work for extra compensation without prior written approval of the Owner in the form of a Change Order.
B. The intent of the Contract Drawings and Specifications is to provide a totally integrated irrigation system. Substitutions will be accepted only if they are proven to be wholly compatible with this system. If standardization of products is requested by the Owner, no substitutions will be permitted.

1.06 PERMITS, CODES AND REGULATIONS

A. Apply for and pay for all necessary permits and fees as required by Local Authority and prevailing ordinances and/or codes.
B. Keep fully informed and shall comply with all existing laws, codes, ordinances, and regulations which in any way affect the conduct of the work.

1.07 INTERPRETATION OF THE CONTRACT DRAWINGS

A. Irrigation Drawings are diagrammatic and are not intended to show exact location of such items as piping, valves, controllers, and other equipment. Locate these items as per related details to edges of paving. Locate such items as piping, valves, controllers and other equipment inside property line unless otherwise noted on the Contract Drawings.
B. Pipe lines shown parallel on the Contract Drawings may be placed in a common trench. Sprinkler heads are shown accurately and shall be installed as indicated by center of symbol.
C. Trenching that may potentially disturb root systems of existing trees is to be brought to the attention of the Owner's Representative before proceeding.

1.08 PROTECTION OF WORK, PROPERTY AND PERSONS

A. Take all necessary precautions to protect work in progress, all property, persons, utilities, walks, curbs, pavement and buildings from any damage that might be incurred arising from this

Contract. Repair to the satisfaction of the Owner, at Contractor's expense, any damage to the above and existing landscape.

1.09 CONDUCT OF WORK

A. Continuously maintain a competent superintendent or foreman during progress of the work, with the authority to act in all matters pertaining to the work. The Contractor shall give personal attention to the fulfillment of the contact and shall keep the work under control.
B. Confine operations to the working areas allotted by the Owner, including material and equipment storage.
C. Progressively clean the work site of debris and rubbish as the work proceeds. Keep sidewalks and site clean, free from debris and affected drains open and free flowing at all times.
D. Locate and identify all underground utilities (on or near Public Rights-of-Way / Property Lines) prior to digging and/or driving stakes.
E. Repair to the satisfaction of the Owner any damage to existing utilities. Existing known utilities have been shown on the Architectural/Engineering and/or Survey Drawings and will be made available from the Owner and/or Utility Companies. It will be the Contractor's responsibility to verify utility locations on the ground with a pipe-finder or by other means. Contact Utility Locate at 1-800-424-5555 in advance of any digging to have existing utilities located and marked on-site. The Contractor shall be responsible for the protection of existing known utilities. Should the ditching intercept and damage any existing utilities, all further work within said area shall stop until the Owner is advised and the Owner can review a repair method and schedule.
F. Provide barricades and safety guards, and any other structures or improvements necessary for the complete protection of the public.
G. The Contractor shall bear sole responsibility for damage to and/or water leaks on the Owner’s property and any property located outside of the project site, which is caused by the Contractor’s negligence during construction of the project. The Contractor shall also bear sole responsibility for any pollution of rivers, streams, groundwater or other waters that may occur as a result of construction operations. The Contractor shall replace, repair and pay for all damages caused by his/her negligence to the satisfaction of the Owner prior to final payment.

1.10 SYSTEM PROTECTION

A. As a part of the guarantee under this contract, the Contractor shall be responsible for the deactivating and draining of the system prior to the onset of the freezing season and for reactivating the system at the onset of the spring growing season; each task must be accomplished once during the one (1) year Guarantee Period.
B. In the event the system is completed in a season when the system will not be in use, the Contractor will winterize the system upon acceptance and will reactivate the system in the spring. The Contractor shall, upon completion of the winterizing phase, submit a letter to the Owner and the Owner’s Representative certifying that the system was winterized and drained, and indicates the date when such action was accomplished. The Contractor shall be liable for any damage resulting from failure to comply. The Contractor shall notify both the Owner and the Owner’s Representative 48 hours prior to the work so that the Owner’s Representative can be present during the winterizing and reactivating phases of work.

1.11 GUARANTEE

A. Guarantee the irrigation system for all workmanship and material for a period of one (1) year, coinciding with planting Guarantee Period. Repair and/or replace defective irrigation equipment as determined by the Owner for the duration of the guarantee period. Repairs and/or

replacements shall be made in the same manner as specified for the original irrigation system and shall be completed at no cost to the Owner.

B. Should any trouble develop within one (1) year which, in the opinion of the Owner, is due to inferior or faulty material and/or workmanship, the trouble shall be corrected, without delay, to the satisfaction of the Owner and at the Contractor's expense.

C. Any settling of backfilled trenches shall be repaired by the Contractor at the Contractor's expense, including but not limited to, restoration of pavement, seeded areas, and/or planted areas.

1.12 MAINTENANCE

A. It is expressly understood the Contractor will be responsible during the one (1) year Guarantee Period for normal maintenance of the project, as defined in the Contractor’s Operation and Maintenance Manual and Watering Schedule Submittals. Irrigation Maintenance shall coincide with the one (1) year Guarantee Period. After the completion of the one (1) year Guarantee Period, the Owner will be responsible for the maintenance of the irrigation system.

1.13 TESTS

A. Pre-test for Pressure Test and Coverage Test prior to the Owner’s Representative's review of said tests to confirm that the irrigation system will meet the requirements of the specified tests.

B. Once pre-tests are completed and acceptable results are confirmed by the Contractor, tests shall be witnessed by the Owner’s Representative. The Contractor shall give at least 48 hours advance notice of tests.

C. Should additional test reviews be required due to conditions found to be the Contractors responsibility, reimburse the Owner for billed costs for the participation of the Owner’s Representative in repeated test reviews. Billed costs may include time, telephone, travel expenses, and per diem allowances for meals and lodging incurred as a direct consequence of the additional activities.

1.14 SUBMITTALS

A. Irrigation Material Documentation
   1. Submit 4 sets of samples and/or manufacturer's "Catalog Cuts" of all material as noted in Specifications. Failure to do so may result in non-acceptance of materials already used or hauled to the site. Any removal or delays incurred will be at the expense of the Contractor. All samples submitted for approval must be unaltered and of quantity sufficient to allow for proper inspection and review.

B. Manufacturer’s Instruction / Maintenance / Operation Information:
   1. The Contractor shall provide 2 sets of the following, in three-ring binders with sections indexed and tabbed.
      a. List of authorized distributers and service representatives for each item of equipment used, including names, addresses and phone numbers.
      b. Instruction manuals for all equipment installed.
      c. Parts list with specifications numbers for each item installed.
      d. Winterization and start up procedures.
      e. Controller wire color code chart.
   2. Controller Charts:
      a. The Chart shall be a bond copy print with a different pastel transparent color to show each separate zone. Verify that the zone number as shown on the Controller Chart matches the number on the actual control valve identification tag.

b. Provide one controller chart per controller. Controller chart shall fit in behind controller door.
c. When completed and approved, hermetically seal (laminate) the chart between two pieces of plastic.
d. The charts shall be completed before the project can obtain Physical Completion.

C. Watering Schedule Submittal: Contractor shall cooperate with Landscape Contractor in providing Owner with a written "watering schedule" to ensure adequate watering of all plant materials during the Warranty Period of this Contract.
D. As-Built Drawings: See As-Built Drawing Section herein.
E. Backflow Preventer Assembly inspection and test results.
F. Written documentation of the date the irrigation system was winterized.
G. Written documentation of existing static water pressure (PSI) and flow (GPM).
H. Spare Parts
1. The Contractor shall provide to the Owners Representative the following items as spare parts at no additional cost.
a. 2 sets of Controller cabinet keys.
b. 2 of each type and size of head and nozzle used on this project.
c. 2 lid keys per valve box
d. 2 valve keys per valve box

1.15 AS-BUILT DRAWINGS

A. The Contractor shall be responsible for maintaining a current and accurate record of all equipment installed and record any deviations to the plans (all deviations to the plans shall be approved by the Owners Representative). As-Built records shall be updated daily on site and shall be available for review by Owners Representative at any time. All mainline, sleeves, automatic control valves, manual gate valves, electrical splice boxes, controllers, shall be dimensioned on As-Built drawings to two permanent monuments. Upon completion of the system and prior to acceptance, the Contractor shall provide the Owner's Representative with a neat and clean reproducible hard copy set of As-Built drawings. The contractor shall also provide the As-Built drawings as a scanned PDF. Coordinates shall be based upon Washington State grid.
B. After acceptance of the As-Built drawings, the Contractor shall place a reduced, non-fading, laminated copy inside the controller cabinet door.

1.16 PIPE SLEEVES

A. Provide and install pipe sleeves as shown on the Contract Drawings and as specified in these Specifications. Coordinate location and installation of pipe sleeves with general contractor prior to paving operations.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials and equipment shall be new and of the best quality. All items of equipment or material shall be as specified or approved equal.

2.02 PLASTIC PIPE AND FITTINGS

A. PVC pipe upstream and downstream of the control valves shall be Schedule 40 complying with ASTM D1785.

B. PVC pipe downstream of the control valves Class 200 (pressure rated for 200 psi), and conform to all requirements of ASTM D2241, SDR21.
C. PVC pipe sleeving: Schedule 80 and conform to all requirements of ASTM D2464.
D. All glued and threaded fittings for lateral lines shall conform to the requirements of ASTM D2466 Schedule 40 PVC. All fittings shall be of the solvent weld type except where risers, valves, etc. require threaded transition fittings.
E. All threaded fittings for mainlines shall conform to requirements of ASTM D2464 Schedule 80 PVC. All glued fittings for mainline shall conform to requirements of ASTM D2466.
F. All pipe shall be marked with manufacturer's name, class of pipe and NSF seal. Pipe shall bear no evidence of interior or exterior extrusion marks. Pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.
G. All threaded fittings for mainlines shall conform to requirements of ASTM D2464 Schedule 80 PVC. All glued fittings for mainlines shall conform to the requirements of ASTM D2466, Schedule 40 PVC.
H. PVC Threaded Nipples: Schedule 80, complying with ASTM D1785.
I. All pipe must be delivered in at least 20-foot lengths.
J. All PVC pipe and fittings shall conform to the following minimums:

1.	Tensile strength 78F	5,000 psi
2.	Izod impact strength (notched)	0.65 ft. lb./in.
3.	Modulus of elasticity	300,000 psi
4.	Compressive strength	8,500 psi
5.	Flexural strength	10,000 psi

2.03 PVC PIPE JOINT COMPOUND AND PRIMER

A. Joint compound: Slow drying, heavy-duty PVC solvent cement type.
B. Primer: Tinted, compatible with joint compound; color: purple.

2.04 AUTOMATIC CONTROLLER

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.05 QUICK COUPLER VALVES

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.06 ROOT WATERING SYSTEM

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.07 POP-UP SPRAY HEADS

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.08 AUTOMATIC CONTROL VALVES

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.09 CONTROL WIRE FOR AUTOMATIC CONTROL VALVE OPERATIONS

A. Control wire must be insulated single strand copper designed for 24 to 50 volts and UL approved as Type U.F. (Underground Feeder). UL and U.F. designations must be clearly marked on insulation jacket of wire.
B. Copper conductor must meet or exceed ASTM B-3 requirements.

C. Minimum wire size shall be No. 14 AWG. Size wire to control valve per valve manufacturer's recommendations.
D. Red color shall be available for lead (hot) wires.
E. White color shall be available for common ground wires.
F. Yellow color shall be provided for spare wires.
G. Wire Splice Connections: 3M, DBY, Rainbird Penn-Tite, Scotchlok or approved equal.

2.10 MANUAL GATE VALVES

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal.

2.11 MANUAL DRAIN VALVE

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal. AUTOMATIC DRAIN VALVES WILL NOT BE ACCEPTED.

2.12 VALVE BOXES

A. Unless otherwise specified, all automatic valves and manual gate valves shall be enclosed in Carson Industries with locking lid or approved equal.
B. Manual drain valves shall be enclosed in a Carson industries 910-128, 10-inch round box with green bolt down cover or approved equal.
C. Backflow preventers shall be enclosed in a Carson Industries Number 1730 PB-18 Body Box or approved equal.
D. Provide two lid keys and two valve keys per Valve Box type to the Owner.
E. Size valve boxes as required to provide approximately 3 inches clear between valve box and valve on all sides. Provide and install valve box extensions as required.

2.13 BACKFLOW PREVENTER

A. Shall be of the type, manufacturer and size shown on the Contract Drawings or approved equal. All backflow preventers must be inspected and approved by the controlling agency before final acceptance.

2.14 IRRIGATION WATER METER

A. Water Meter shall be of the type and manufacturer as required by local authority and prevailing ordinances and/or codes.
B. For size, see Civil drawings.

2.15 BACKFILL MATERIALS

A. Gravel Backfill (for use under valve boxes only):
   1. Three-quarter minus round, water worn, washed gravel.
B. Sand (backfill soils around PVC pipe):
   1. Fine granular material naturally produced by rock disintegration and free from organic material, loam, clay and other deleterious substances.
C. Native Material (backfill soil around PVC pipe):
   1. Soil native to project site free of wood and other deleterious materials and rocks over 1-inch diameter.

2.16 POLYETHYLENE SWING RISER

A. All polyethylene swing risers shall be "Hunter SJ Swing Joint" or approved equal.

2.17 OTHER SUPPLIES

A. Electrical tape shall be black plastic, three-quarters (3/4) inch wide and a minimum of 0.007 inches thick and the all-weather type.
B. All electrical wire splices must be made watertight with sealing 3M Direct Burial Splice Kit or approved equal.
C. Thrust blocking shall be on 3-inch and larger mainline only.

PART 3 EXECUTION

3.01 EXISTING SYSTEM PROTECTION

A. Protect and maintain existing irrigation system during the entire construction period. All interruptions to existing irrigation water service must be approved by Owner prior to periodic shutdowns. Repair and/or replace any damage to existing system. All new pipe and fittings are subject to hydrostatic testing per specifications.

3.02 TRENCHING

A. Trenches shall allow for 12 inches of cover over lateral lines, 18 inches of cover for irrigation main lines and 24 inches of cover for main supply line from point-of-connection to backflow preventer unless otherwise noted on the Contract Drawings. Maintain a minimum clearance of 3 inches between irrigation lines within a common trench. Trenches for sleeves shall allow for a minimum of 18 inches of cover unless otherwise noted on the Contract Drawings. Excavate no wider at any point than is necessary to lay pipe or install equipment. Excavate with vertical sides and provide bracing and shoring as required.
B. All trenches must be straight and not have abrupt changes in grade. Trenching that may potentially disturb root systems of existing trees shall be brought to the attention of the Owner's Representative before proceeding with work.
C. The trench bottoms and bedding material surrounding all pipes must be free of rocks greater than one inch in diameter and all sharp-edged objects. Bed and surround all pipe with Backfill Material as specified in these Specifications.
D. Pulling of pipe is not permitted unless otherwise reviewed by Owner's Representative and approved by the Owner.

3.03 INSTALLATION

A. PVC Pipe and Fittings (Includes Pipe Sleeves):
    1. Due to the nature of PVC pipe and fittings, the Contractor shall exercise care in handling, loading, unloading and storing to avoid damage. Any pipe that has been dented or damaged shall be discarded until such damage has been cut out and the pipe is rejoined with a coupling.
    2. PVC pipe ends shall be cut to 90 degrees to the pipe length and cleaned of all cutting burrs prior to cementing. Use approved reaming tool. Pipe ends shall be wiped clean with a rag lightly wetted with PVC thinner. Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excessive use of cement is not permitted. Pipe will be tested as indicated elsewhere in these specifications. No backfilling will be permitted other than at the centers of pipe lengths until the pressure test is completed.
    3. Backfilling shall be completed when pipe is not in an expanded condition due to heat or pressure. Cooling of the pipe can be accomplished by operating the system for a short time before backfill or by backfilling in the early part of the morning before the heat of the day.

4. No PVC pipe may be threaded or connected to a threaded fitting without an adapter.
5. Great care must be taken to ensure that the inside of the pipe is absolutely clean. Any pipe ends not being worked on must be protected and not left open.
6. All threaded joints shall have Teflon tape installed per manufacturer recommendations.

B. Head Locations
1. Heads immediately adjacent to walks, curbs, pavement, unit pavers, shrub/groundcover planting bed edge, etc. shall have 1-inch clearance between head and walks, curbs, pavement, unit pavers, shrub/groundcover planting bed edge etc. unless otherwise noted on the Contract Drawings. Sprinkler heads located adjacent to parking area curbs shall be located on-center with parking stall striping unless otherwise shown on the Contract Drawings.
2. Remove and dispose of off-site pavement (that portion of pavement for head and pipe only) adjacent to curbs to allow one (1) inch clearance per the above.

C. Control Wire
1. Control wires are to be taped together at 5-foot intervals; then this bundle is to be taped to the bottom of the supply line at 10 foot intervals with at least 3 wraps of electrical tape.
2. All wire splices must be made watertight with sealing 3M Direct Burial Splice Kit and contained in valve boxes.
3. Splices will be permitted only at the valves and never between valves or valve and controller unless in a separate valve box. There must be a separate lead (hot) wire to each automatic valve. One ground wire will be acceptable.
4. Minimum size of wire is to be determined strictly by the wire sizing chart provided by control valve manufacturer.
5. The control wires shall be color coded as follows:
   a. Ground Wire – White
   b. Lead (Hot) Wire – Red
   c. Spare Wire – Yellow.
6. Arrange valve stations to operate in sequence shown on “As-Built” Drawings.
7. One or more spare wire(s) shall be provided to all control valves. The spare wire(s) shall be shared by all the valves and shall complete the circuit back to the controller. Wire sizes shall be the same as the sizing chart provided by the control valve manufacturer.

D. Risers:
1. All sprinklers shall be installed per details shown on Contract Drawings. The pipe risers must have the same inlet size as the sprinkler heads.
2. Minimum riser size shall be the pipe size of the sprinkler head.
3. Risers are to be capped after installation to keep inside of pipe clean.
4. Care must be taken not to over-tighten the threaded pipe into the PVC fittings.

E. Automatic Controller(s):
1. Electrical wiring shall be installed according to local code requirements. The cost of all electrical work necessary to make the automatic equipment operate properly at the electrical service stub-out to the controller(s) shall be included in this contract. Electrical service from an approved source to the controller location(s) shall be provided by the general contractor.
2. Controller location(s) and type of mounting of controller(s) shall be as specified and as shown on the Contract Drawings. Contractor shall coordinate location and installation of the Automatic Controller(s) with the General Contractor prior to installing the irrigation system.
3. The Contractor shall use readable handwriting to post the valve schedule in the controller to facilitate the selection of the valves to be operated.

F. Backflow Preventer:

1. Install in accordance with local plumbing code. See detail shown on the Contract Drawings.
2. Verify location with Owners Representative prior to installation. Install no closer than 18 inches and no more 36 inches from pavement edge.
3. A manual shut-off valve shall be located upstream of Backflow Preventer to allow full isolation of system from water supply.
4. Inspect and test the backflow preventer assembly before use in accordance with applicable portions of the Washington Administrative Code and other applicable regulations as set forth by the Washington State Department of Health and local jurisdiction.
5. These inspections and tests are to be completed and results recorded by a licensed Backflow Assembly Tester. Inspection and test results shall be submitted to Owners Representative prior to operating the irrigation system.
6. Contractor shall be responsible for all testing and testing fees.

G. Manual Drain Valve:
1. Install per detail shown on the Contract Drawings. Drain valves are not required for drainage of the entire irrigation system unless otherwise noted on the Contract Drawings.

H. Automatic Control Valves:
1. Install per detail shown on the Contract Drawings.
2. Before installation of any automatic valves, the supply line must be thoroughly flushed.
3. All automatic valves shall be enclosed in valve boxes set above finish grade as shown on details. Valve box extension may be required. Locate valve boxes in shrub and groundcover planting beds wherever possible and at points of easy access from paved and/or lawn areas.
4. Locate outside of paved areas and grouped together where possible. Where valves occur adjacent to paved areas, install valves so that valve boxes will not be closer than 12 inches to paving unit pavers. Valve boxes shall be perpendicular or parallel to pavement and grouped to provide a neat appearance.

I. Manual Gate Valve
1. Install per detail shown on the Contract Drawings.

J. Quick Coupling Valve
1. Install per detail shown on the Contract Drawings.

K. Root Watering System
1. Install per detail shown on the Contract Drawings.

L. Backflow Preventer Assembly
1. Install per detail shown on the Contract Drawings.

M. Irrigation Water Meter(s):
1. Install irrigation water meter per prevailing ordinances and/or code requirements. The cost of all work necessary to make the irrigation system operate properly from the Point-of-Connection (downside of water meter) shall be included in this contract. Water service from an approved source to the point-of-connection shall be provided by the General Contractor. The approved water meter shall also be provided by the General Contractor.
2. Locate water meter as shown on the Contract Drawings.
3. See Civil Drawings.

N. Pipe Sleeves:
1. All sleeves shall extend a minimum of 12 inches beyond the edges of pavement.
2. Pipe for irrigation mains and laterals may be installed with sleeves but shall not include any pipes with couplers whenever possible.
3. Plug all ends of sleeves and irrigation mains and laterals to prevent soil from entering.

O. Backfilling:

1. In refilling trenches, the bedding around the pipe and fittings shall be approved “Backfill Materials” and shall be well tamped. If necessary, provide suitable imported backfill. Trenches shall be thoroughly compacted and water-settled. Trenches shall be backfilled uniform with the surrounding grade, raked to a slight mound, then rolled with a 250 pound roller, or compact with a vibrator.
2. All roots, rocks and surplus excavation shall be removed from the site unless otherwise directed.
3. Trenches and pipe sleeves under roads or paved areas shall be backfilled and tamped with a mechanical tamper in successive six-inch lifts to at least 95% density as determined by ASTM D1557. Paving shall be replaced to the satisfaction of the Owner.
4. Before backfilling, all underground appurtenances including risers, valves, backflow preventers, drain valves, etc., must remain exposed so that they can be viewed during testing. Leave all joints exposed; then complete backfilling after flushing, pressure testing, inspection and preparation of "As-Built Drawings". The location, inspecting and testing provisions of these specifications will be strictly adhered to. If, for any reason, any part of the sprinkler system is backfilled before approved location, testing, or inspection is authorized by Owner’s Representative, it must be completely uncovered and exposed until approved for backfilling by the Owner’s Representative.

3.04 PRESSURE TESTING

A. For PVC components of irrigation system:
   1. All PVC system joints, connections, couplings, valves, and all other junction points shall be left exposed until completion and acceptance of the pressure test. All leaks, however minor, shall be repaired and corrected.
   2. Before any testing, all piping shall be thoroughly flushed. No automatic control valves shall be connected to the main line prior to testing. All pipe, fittings, gate valves, and automatic control valve stub-outs shall be exposed for inspections during pressure tests. Center load pipe with a small amount of backfill to prevent arching or movement under pressure.
   3. Mainlines shall be purged of air and tested with a minimum static water pressure of 150 psi for 60 minutes without the introduction of additional water service or pumping pressure. The maximum allowable pressure loss shall be 5 psi within 30 minutes. Pressure gauge shall be installed on the mainline at a point approved by Owners Representative.
   4. Lateral lines shall be tested at static water pressure. All swing joints shall be capped. All pipe, fittings and swing joints shall be left exposed for inspection. Prior to inspection lines shall be filled with water and air removed from the line. Inspection of lateral lines will be visually.
B. The Owner’s Representative shall be present during all tests. The total irrigation system shall be pressure tested for acceptance.
C. Rejected systems or portions thereof shall be repaired and re-tested as specified.
D. Contractor shall furnish all equipment, gauges, pumps, materials, and labor for all testing.

3.05 COVERAGE TESTING

A. Before acceptance of the sprinkler system, the Contractor, in the presence of the Owner’s Representative, shall perform an irrigation water "Coverage Test" to determine if the water coverage and operation of the entire irrigation system is complete and satisfactory. If any part of the system is inadequate, it shall be repaired or replaced at the Contractor's expense and the test repeated until accepted. The Contractor must give 48 hours written notice to the Owner’s Representative prior to the field review.

B. The Contractor shall also adjust and balance sprinkler heads for optimum and uniform coverage without excessive fogging or overthrow on to signage, pavement(s), structure(s) and building(s); adjust all sprinkler head heights and set all valve boxes to proper grade prior to final review by Owner's Representative.
C. After coverage test, the Owner's Representative may request up to 5% of total emitters and pressure-compensating screens to be replaced at no additional cost.

3.06 COMPLETE SYSTEM FUNCTIONALITY TEST (PUNCH LIST)

A. Upon approved completion of the Coverage Test, trenching and installation of all equipment, the Contractor shall request a Complete System Functionality Test of the entire irrigation system including: backfilling, irrigation heads, valves, valve boxes, controller and all other equipment.
B. From this inspection, a punch list shall be prepared by the Owner's Representative and presented to the Contractor for completion. The Owner's Representative shall give a date for completion of the punch list, not to exceed 10 working days.

3.07 CLEAN-UP

A. Clean and remove all debris from work areas including paving or unit pavers, curbs, catch basins, manholes and planting areas, etc. caused by the Contractor's work on this project prior to watering. All hard surface areas shall be washed clean. Daily clean up shall be required on all areas used for circulation, parking, or other daily use.

3.08 SYSTEM FAMILIARIZATION

1. Upon acceptance of the system by the Owner, the Contractor shall provide the Owner necessary keys and/or other tools necessary to operate/drain/activate the system and spend sufficient time with the Owner to ensure that the system operation/maintenance/winterizing can continue after the departure of the Contractor. The Contractor will be liable for all damages or losses resulting from failure to comply with the provisions of this paragraph.
2. The Contractor shall cooperate with Landscape Contractor in providing the Owner with a written "watering schedule" to ensure adequate watering of all plant materials during the Guarantee Period of this Contract.

END OF SECTION

SECTION 32 90 00
PLANTING

PART 1 GENERAL

1.01 SUMMARY

A. Install planting, brush piles, habitat logs, and barrier logs using the materials as shown in the Contract Drawings and/or as specified in the Specifications.
B. Work includes all areas within the limits of clearing and grading; and landscape areas outside of the limits which are disturbed in the course of construction activities. Confine operations to the working areas allotted by the Owner for operations, including material and equipment storage.
C. Restore landscape areas impacted by construction to preconstruction or improved condition.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) consists of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of all plant materials in a first quality workmanlike manner.
B. Coordinate the layout and installation of plant materials with the installation of the irrigation system to ensure complete and full irrigation coverage of the planted areas.
C. This section includes a Guarantee Period of one (1) year duration from Substantial Completion to ensure the health and establishment of plant materials.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions or editions of the following documents.
   1. American Nursery & Landscape Association/American National Standards Institute (ANSI): Z60.1, American Standard for Nursery Stock (ASNS).
   2. International Society of Arboriculture Best Management Practice Series.
   3. Tree Care Industry Association (TCIA): Standards for Tree Care Operations ANSI A300.
   4. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 DEFINITIONS

A. Nomenclature for plants and varieties shall be in accordance with the current edition of:
   1. Hortus Third, The Staff of the L. H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York, or
   2. Flora of the Pacific Northwest, Hitchcock and Chronquist, University of Washington Press, 1998, or
   3. PLANTS Database Website, as published and maintained by the United States Department of Agriculture, Natural Resources Conservation Service, (http://plants.usda.gov/).
B. The term "Contractor" as used in this Specification section shall refer to the Landscape Contractor.
C. Trees, shrubs, groundcovers, live stakes, and seedlings will hereinafter be collectively referred to as, “plants” or “plant material.”

1.05 PERMITS, CODES, AND REGULATIONS

A. Obtain and pay for all necessary permits and fees as required by the Local Authority and prevailing ordinances and/or codes.
B. Keep fully informed and comply with all existing laws, codes, ordinances and regulations that in any way affect the conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor must promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
C. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract must apply, unless otherwise expressly set forth.
D. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the Specifications, the more restrictive standard must apply or Owner's Representative will determine which must govern.

1.06 QUALITY ASSURANCE

A. All work must be performed by a licensed and bonded Contractor registered in the State of Washington and be qualified for landscaping work through certification by the Washington Association of Landscape Professionals (WALP) or by the Washington State Nursery and Landscape Association (WSNLA).
B. Have at least 5 years of documented experience in performing landscape work of comparable size, scope, and quality.
C. Be familiar and comply with "American Standard for Nursery Stock" (ANSI Z60.1) published by the American Nursery & Landscape Association.
D. Maintain a competent superintendent or foreman during the progress of the work, with the authority to act for the Contractor in all matters pertaining to the landscape work. That individual, who must direct the work, must be thoroughly familiar with the types of materials being installed and the proper methods for their installation.
E. Progressively clean the work site of debris and rubbish as the landscape work proceeds.
F. Perform all necessary pruning of trees (existing or new) by an International Society of Arboriculture (ISA) certified arborist who is licensed as an arborist in the State of Washington.
G. Site Reviews will be made by the Owner Representative.
    1. Request Owner Representative reviews at least 3 working days in advance of the time review is required.
    2. Reviews of the following critical path items are required:
        a. Preconstruction meeting prior to start of landscape work.
        b. Finish grading prior to any planting.
        c. Inspection of plant materials before planting.
        d. Layout of plant material.
        e. Tree planting and proper staking.
        f. During Plant Installation and Planting of each Plant Material Type (Tree, Shrub, Groundcover, Live Stake, and Seedling).
        g. For Substantial Completion of all work (development of physical punch list items).
        h. For Physical Completion of all work (physical punch list items satisfactorily completed).
        i. Guarantee Period: quarterly site reviews up to Final Acceptance.
        j. For Final Acceptance at completion of Guarantee Period.

1.07 SUBMITTALS

A. Quality Assurance Documentation:
   1. Submit Landscape Subcontractor's State of Washington registration, and current certification by the Washington Association of Landscape Professionals (WALP) or by the Washington State Nursery and Landscape Association (WSNLA).
   2. Submit documentation of Landscape Subcontractor's experience in performing landscape work of comparable size, scope, and quality over the past five (5) years.

B. Plant Material Documentation:
   1. Within 30 calendar days after award of a Contract, submit written documentation to the Owner's Representative that all specified plant materials have been ordered or procured.
   2. List plant suppliers' names, addresses, and phone numbers and list respective growing or storage locations with addresses.
   3. Submit color photographs from the respective nursery of representative specimens of each species of plant material listed in the Plant Schedule. Photos must be minimum 300 DPI digital *.jpg format, taken from an angle that depicts the typical size and the typical condition of the plant to be furnished.
      a. Show foliage, canopy form, rootball, and trunk conditions.
      b. Include a scale rod or other measuring devise in the photograph.
      c. For species where more than 20 plants are required, include a minimum of three photos that show the average plant, the best quality plant, and the worst quality plant to be provided.
      d. Label each photograph with the plant name, plant size, and name of the growing nursery.
   4. Approval of plant material documentation is not be considered final acceptance of the plant material itself.

C. Watering Schedule: Submit a written "watering schedule" to the Owner's Representative prior to final acceptance of the Landscape that includes water application time and duration to maintain plant materials in a healthy, growing condition during the Guarantee Period of this Contract.

D. Temporary Storage: 10 working days prior to delivery of plant material to the project site, submit proposed on-site temporary storage location, water source, and proposed protection measures during various seasonal conditions.

E. Weed and Pest Control Plan (including Invasive Species Removal Plan).

F. Submit a copy of each pesticide and/or herbicide applicator's license for the specific class of chemical being applied. Also, submit documentation that all chemicals are registered for the proposed use by the Washington Department of Agriculture according to the Washington Control Act (RCW 15.58.050 through 130) and the General Pesticide Rules (WAC 16-228-1400 through 1460).

G. Submit suppliers, source locations (with addresses and phone numbers), and photographs of representative examples for:
   1. Live Stakes.
   2. Seedlings.

H. Submit suppliers and catalogue cutsheets for planting accessories
   1. Root Barrier.
   2. Tree Staking.

I. Substitutions
   1. No substitution of plant material, species, size, grade, or variety, will be permitted unless evidence is submitted in writing to the Owner's Representative that a specified plant cannot be obtained and has been unobtainable since the Award of the Contract.

a. Provide the names and telephone numbers of at least 5 nursery suppliers that the Contractor has contacted.
b. If substitution is permitted, it can be made only with written approval by the Owner's Representative and the nearest variety, size, and grade as approved by the Owner must then be furnished.

2. Should at any time, the procured nursery stock be lost or compromised due to weather or other natural occurrences, notify the Owner's Representative immediately in writing of the need to locate new material.
3. The manufacturers, products, and suppliers are acceptable as specified herein. Substitutions may be allowed if proof of equivalent quality, suitable product specifications, manufacturer's literature, and other detailed information is provided to the Owner's Representative for review and acceptance, unless otherwise specified.

J. Planting Schedule
1. Within 30 calendar days after award of a Contract, submit written documentation to the Owner's Representative showing when trees, shrubs, groundcovers, live stakes, seedings, and other plant materials are anticipated to be procured and also planted.

K. Operations and Maintenance Manual.
1. Provide an Operations and Maintenance Manual documenting the care for all plantings on a monthly schedule for one (1) calendar year.
2. See Specification 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.08 PROJECT CONDITIONS

A. Inspect the site before proceeding with any work, carefully check all grades, elevations, service and utility locations, irrigation system components, and verify all dimensions and conditions affecting the work. Immediately request in writing the need for clarification(s) regarding any discrepancies, conflicts, or deviations between the Contract Drawings, Specifications, and site conditions. Work done after discovery, unless authorized by the Owner's Representative in writing, and extra work arising from failure to notify in writing, is at the Contractor's risk and expense.

B. Verify, locate, and protect all known underground and above-ground utilities prior to digging or other earthwork activities. Promptly notify the Owner's Representative of any conflict between proposed work and obstruction(s). Failure to follow this procedure places upon the Contractor the responsibility and expense of making any and all repairs for damage from work therefrom.

C. Underground Obstructions
1. In the event that undisclosed clay soil, boulder, groundwater, cobble rock, concrete, soils contaminated with toxic substances, hardpan, or other underground obstructions are encountered in the subgrade, notify Owner's Representative immediately in writing.
2. Owner's Representative will determine recommended corrective action that may be needed for removal and/or alternative planting where underground obstructions occur.
3. If additional work is required to solve the underground obstruction problem, such as removal of obstruction and replacement with acceptable material, a Change Order may be required prior to commencement of work. Cost shall be determined on a unit price basis and agreed upon by a Change Order prior to commencement of additional subgrade work.

D. Confine work to designated areas. Do not disturb existing vegetation outside project limits and protect all plant materials within project limits not designated to be removed, unless approved by the Owner's Representative prior to construction. Do not permit vehicular traffic or materials storage under or around new or existing trees.

1.09 PROTECTION OF WORK, PROPERTY, AND PERSONS

A. Take all necessary precautions to protect work in progress, all property, persons, walks, curbs, rooftop membranes and structures, utilities, pavement, and buildings from any damage that might be incurred arising from this Contract.
B. Protect all paved surfaces from staining by planting soil and mulch. Do not remove protection until after initial acceptance of all work. Remove excess soil and debris from the site and repair all damage resulting from construction operations.
C. Protect all landscape work from theft and vandalism until Physical Completion of work.
D. Pay for any damage incurred by failure to take precautions.

1.10 MAINTENANCE PRIOR TO PHYSICAL COMPLETION

A. Begin maintenance immediately after each plant is planted. Water, mulch, weed, spray, fertilize, cultivate, rake and remove leaves, and otherwise maintain and protect plants and landscape work on a regular basis (at least weekly) until Physical Completion. Tighten and repair tree ties and stakes as required.
B. Maintain mulch in planting beds at required compacted depths indicated in Contract Drawings.
C. Correct defective work as soon as possible after it becomes apparent, and the weather and the season permit. Reset settled plants to proper grade and position, and remove and replace dead plant material.
D. Prune only with written approval of the Owner's Representative or as indicated on Contract Drawings.

1.11 GUARANTEE PERIOD

A. The Guarantee Period begins when:
   1. All planting is alive, healthy, growing and installed as specified.
   2. The landscape work is deemed Substantially Complete.
B. Guarantee Period shall be 365 calendar days after the Substantial Completion date of the landscape, including irrigation system(s), to ensure healthy, vigorous growth and establishment of plant material and will end with Final Acceptance.
C. Guarantee the work of this specification section against all defects of materials and workmanship, and plant material is established, remains alive, and is in a healthy, vigorous condition.
D. The guarantee is applicable to any growing conditions through which plants of like kind could be expected to survive. However, this would not apply to plant losses due to:
   1. Extreme weather conditions such as wildfires, floods, freezing rain, wind storms (with recorded wind speeds greater than 60 MPH), drought, and winter kill caused by extreme cold (hard freeze where sustained temperatures are below 28°F for more than 24 hours) as determined by the National Weather Service.
E. Site Access: Contractor has the right to enter upon the property for maintenance inspection and curative treatment of any plants and materials needing such during the entire Guarantee Period. Owner is to be notified in advance of any inspection, corrective treatment measures, or curative treatment measures so as to arrange for approved, security clearance (if applicable) and convenient access to the area.
F. Plant Replacement during the Guarantee Period
   1. Any plant material that is 25% or more dead or disfigured must be considered dead and must be replaced at no charge. A tree shall be considered dead when the main leader has died back or when 25% of the canopy is dead.
   2. All plants are subject to one (1) replacement per item (1) month prior to the end of the Guarantee Period. This includes dead plants, damaged plants, or plants that are, in the

opinion of the Owner in unhealthy or unsightly condition, or that have lost their natural shape and symmetry due to dead branches, excessive and unnecessary pruning, incorrect staking, or excessive defoliation.

a. Replace unacceptable plants with the same species, caliper, and/or equal size as the plants they replace, unless the Owner determines a substitute species plant of equal value may be provided.

3. If plants are stolen (theft) or damaged by acts of others (vandalism), the Owner will pay invoice cost only for the replacement plants with no mark-up and the Contractor will be responsible for the cost of labor to install the replacement plants.
4. Plant material replacements made by the Contractor must be completed during the spring (March 15 to May 15) or autumn planting periods (Sept 20 to Nov 15) unless approved by Owner's Representative. Plant material replacement and lawn repair must be subject to the same conditions and must be made in the same manner as specified for the original planting and must be done at no extra cost to the Owner.
5. After each replacement, the Contractor must submit a marked planting plan showing the exact location of each item replaced and the date when the replacement was made. Guarantee all replaced material during the Guarantee Period for an additional 365 calendar days from the date of replacement.

G. Plants will be reviewed prior to Final Acceptance by the Owner's Representative during the Guarantee Period to determine if any plant material replacement is required.

1.12 LANDSCAPE MAINTENANCE DURING GUARANTEE PERIOD

A. It is expressly understood that the Owner will be responsible, during the Guarantee Period, for normal establishment and maintenance of the project landscape.

1.13 WEED AND PEST CONTROL PLAN

A. Submit a Weed and Pest Control Plan for review and approval to the Owner's Representative prior to starting any landscape work.
   1. The Weed and Pest Control Plan includes:
      a. methods and scheduling of removal of weeds and control of pests located inside the tree and plant protection fencing where shown on Contract Drawings.
      b. methods of removal and scheduling of removal of weeds that occur in newly planted areas.
      c. methods of removal and scheduling of removal of invasive species and/or noxious weeds that occur within the project limit of work.
      d. timing and scheduling of control operations, and the name, application rate, and Material Safety Data Sheets (MSDS) of all proposed herbicides and pesticides.
         1) Furnish the Owner's Representative with a copy of the current product label and MSDS for each herbicide / pesticide and spray adjuvant to be used.
         2) Identify and list the target weeds and target pests to be removed specific to the project site.
   2. The plan shall be prepared and signed by a licensed commercial operator with a Washington State Department of Agriculture (WSDA) Commercial Applicator pesticide license.

B. Store herbicides and pesticides in an offsite location.

C. Consider herbicide and pesticide applications only as a last resort and only after other methods of control have proven ineffective. Preferred methods of weed control include mechanically or hand pulled weeds, reapply bark mulch after weed removal, and adjust watering schedule to avoid overwatering which encourages weed growth.

D. Use care to ensure confinement of chemicals within the areas designated. The use of spray chemicals must require the use of anti-drift and activating agents, and a spray pattern indicator, unless otherwise allowed by the Owner's Representative. Herbicides and pesticides must not be applied within 100-foot radius of on-site and off-site wells or open water bodies. Weed removal inside this 100-foot radius must be by hand or mechanical methods.
E. Apply post-emergent herbicides while plant material is green and growing tissue is present. Should unwanted vegetation reach the seed stage in violation of these Specifications, physically remove and bag the seed heads. Dispose of all physically removed vegetation and seed heads off-site.
F. Completely remove from the limits of work all noxious weeds (Class A, B & C) as defined by Pierce County Weed Control Board and invasive weeds, including but not limited to Horsetail (Equisetum sp.), reed canary grass, English Ivy, Himalayan blackberry, evergreen blackberry, policeman's helmet, bamboo, yellow flag iris, and Japanese knotweed.
    1. Where noxious or invasive weeds exist, remove the weed's foliage and roots, planting soil and subgrade soils and replace to a depth necessary to completely remove all viable weed seeds, roots, corms, and rhizomes.
    2. In areas where existing trees are to remain, remove all invasive species removal with hand tools. Use of heavy mechanical equipment under the drip lines of existing trees to remain is prohibited. Avoid damaging existing tree roots during invasive species removal. If existing tree roots are exposed outside of the tree's drip line, remove invasive species roots with hand tools to avoid further damage to the tree roots.
    3. Contractor is responsible for all costs to remove weeds, remove, and replace existing soil, and replant the plant material.
G. Schedule the chemical treatment for weed removal for the late summer or the early autumn unless the project construction working days fall outside of this time period, in which case determine the schedule in consultation with Owner's Representative. Alternative dates may be submitted for review & approval, provided treatments occur within a minimum of 3 weeks prior to mechanical removal of invasive plants.
H. The approved Weed and Pest Control Plan will be subject to revision dependent on results of the implemented Plan.
I. The Contractor assumes all responsibility for rendering any area unsatisfactory for planting by reasons of herbicide or pesticide application. Replace, repair and pay for all damages caused by negligence to the satisfaction of the Owner prior to final payment.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide all materials and equipment as required to complete the work as shown on the Contract Drawings and/or as described in the Specifications.

2.02 WATER

A. Make, at Contractor expense, whatever arrangements are necessary to ensure an adequate supply of water to meet the needs of this Contract.
B. Furnish necessary hose, equipment, attachments, and accessories for the adequate irrigation of planted areas.
C. All costs for water incurred during the contract period must be borne by the Contractor unless other arrangements are made with the Owner.

2.03 PLANT MATERIAL

A. The Contractor has two (2) options to secure approval of plant materials:
   1. Have plant material available at the project site for review during scheduled site visits.
   2. Have Owner's Representative review plants at the place of growth at the Contractor's expense.

B. Owner reserves the right to reject any or all plant material at any time until final review and acceptance. Remove rejected plants immediately from the site.

C. All plant material furnished by the Contractor must conform to the requirements of the current issue of "American Standard for Nursery Stock" (ASNS) and in addition, must comply with the following provisions:
   1. No less than 10% of each variety and/or species of plant delivered to the project must be accurately labeled with a securely attached, waterproof tag bearing the legible designation of the common name and full scientific name and size of plant. Include the nomenclature for hybrid, variety, or cultivar. Whether or not labeled, any plants, which do not conform to the Plant Schedule and/or Contract Drawings, must be replaced immediately with plants that conform to specifications.
   2. All plant material must meet State and Federal requirements with respect to plant health and absence of diseases and insect infestation.
   3. All plant material must be nursery grown stock that has been held in a nursery for at least one year.
   4. All plant material specified must be first-class representatives of their normal species or varieties in healthy growing condition with normal well-developed branch system and vigorous root systems.
      a. They must be free from disease and insect infestation, disfiguring knots, sun-scalds, abrasions of the bark, broken tops, broken branches, torn roots, and any other objectionable features.
      b. Plants, which have suffered damage as the result of girdling of the roots, stem, or a major branch; have deformities of the stem or major branches; have a lack of symmetry; have dead or defoliated tops or branches; or have any defect, injury, or condition which renders the plant unsuitable for its intended use, will be rejected.
   5. Large plants cut back to meet specified sizes will be rejected. Plants must not have cuts or pruning wounds over 3/4-inch diameter that are not satisfactorily callusing over.
   6. Plant material must not have weeds at the tops of rootballs or any foreign plant growth.
   7. Root balls of all plant materials must be solidly held together by a fibrous root system and must be composed only of the soil in which the plant has been actually growing. The ball must be securely wrapped with non-treated, jute burlap, or other packing material that is not injurious to the plant's life.
   8. Provide the number of plants shown on the Plant Schedule in Contract Drawings, or to cover at specified spacing's whichever is greater.
   9. Collected plant material may be used only when accepted by the Owner's Representative.
   10. Trees
      a. Trees must have been grown with sufficient spacing to allow for symmetrical branch development and full canopy which reflects the natural characteristics of the species. Tree trunks must not be noticeably imperfect in vertical alignment, have straight leaders, and there must be no "included bark" in the crotches between the trunk and side branches.
      b. Trees with multiple leaders, unless specified, must be rejected.
      c. Trees with a damaged or crooked leader, "Y" crotches, missing leaders, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over 3/4 inch in diameter that are not completely closed will be rejected.

d. Evergreen and deciduous trees must be furnished balled and burlapped (B&B) unless otherwise specified in the Contract. Broken or "made" root balls will not be accepted.
e. Trees grown in fabric bags must have a well-established root system reaching the sides of the fabric bag to maintain a firm ball when the fabric is removed, but must not have excessive root growth encircling the fabric bag. Fabric bags must be entirely removed prior to planting.
f. No pruning wounds must be present with a diameter of more than one (1) inch and such wounds must show vigorous callous on all edges. Trees must not be pruned within 6 months prior to delivery.

11. Provide tree root ball sizes complying with the latest edition of the ASNS. Cracked or mushroomed tree root balls are not acceptable.
12. Container-grown Stock:
    a. Plants grown in a pot or container must have been given a sufficient length of time for new fibrous root system to have developed to hold its soil together and keep the root mass firm and whole when removed from the container.
    b. Plants must not be loose in the container.
    c. Container stock must not be pot or root bound.
    d. Plants furnished in pots or other containers must be acclimated to outside conditions and equal to field grown stock. To acclimate plants to Northwest conditions, all plants used on the project must be grown continuously outdoors north of the 42nd Latitude (Oregon-California border) from not later than April 1 of the year prior to the time of planting.
13. Live Stakes:
    a. Live stakes are live woody plant cuttings without a previously developed root system. Source plants for live stake cuttings shall be dormant when cuttings are taken and all cuts shall be made with a sharp instrument. Cuttings must be obtained from a reputable nursery. Live stake cuttings shall have a straight top cut immediately above a bud. The lower rooting end shall be cut from one to two-year old wood. Live stake cuttings shall be cut and installed with the bark intact with no branches or stems attached, and be ½ to 1.5 IN diameter.
14. Seedlings:
    a. Seedling quality and size shall be either Plug +1(P+1), 1+1, and/or 2+1. Seedling stem and foliage shall be a minimum 8" in height.

2.04 PLANTING ACCESSORIES

A. Tree Stake Materials
   1. Tree Stakes must be 8-foot long 2-inch diameter pressure-treated lodgepole pine wood stakes, with chamfered tops and 6-inch long, conical points.
   2. Fastening must be webbed fabric tape, ½" – 1" wide, "Arbor Tie".
   3. Or approved equals.

B. Root Barrier
   1. Root barrier must be made of copolymer polypropylene, containing 50% postconsumer, recycled plastic with ultraviolet light inhibitors. Panels must be interlocking.
   2. Root barrier panels must be .08" thick, the color black, and at the height/depth indicated in the Contract Drawings.
   3. Root barrier available from the following sources:
      a. "DeepRoot", as manufactured by Deep Root, Inc., and distributed locally by Berkey Supply, Inc., Woodinville, WA, Ph. 425-487-3310 or www.berkeysupply.com.
      b. "Biobarrier", as manufactured by BBA Nonwovens Reemay, Inc., and distributed locally by Wilber Ellis, Auburn, WA, Ph. 253-351-6591 or www.wilberellis.com.

c. Or approved equal.

2.05 BRUSH PILE

A. Construct Brush Pile using tree branches salvaged from tree removal during site clearing and grubbing activities and from branches removed during creation of snags and habitat logs.

2.06 HABITAT LOG

A. Habitat Logs must be smooth, without bark, no burs, no split branches, or metal splinters or nails. Owner's Representative to approve source of logs and condition of logs prior to installation.
B. Construct habitat logs using tree trunks salvaged from tree removal during site clearing and grubbing activities. Remove foliage and cut back branches. Branch stubs are ok as long as maximum length does not exceed 12 inches.

2.07 BARRIER LOG

A. Barrier Logs must have no burs or metal splinters or nails. Owner's Representative to approve source of logs and condition of logs prior to installation.
B. Construct barrier logs using tree trunks salvaged from tree removal during site clearing and grubbing activities. Remove foliage and cut back branches. Branch stubs are ok as long as maximum length does not exceed 12 inches.

2.08 HERBICIDE & PESTICIDE

A. All chemical herbicides pesticides must be labeled and used in accordance with governing agencies defined in the Weed and Pest Control Plan. The Contractor must use extreme care to ensure confinement of the chemicals within the areas designated. The use of chemical herbicides and pesticides must require the use of anti-drift and activating agents and a spray pattern indicator, unless otherwise allowed by the Owner.
B. All chemical herbicide and pesticides must be carefully selected in accordance with U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology, Washington State Department of Agriculture, King County Noxious Weed Control Board, and local sensitive area ordinances and regulations.

2.09 WATER BAGS

A. Water bags must be Treegator, slow-release watering bags, supplied by Spectrum Products Inc (886-873-3428), or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Provide adequate and proper care of all plant material (both retained and newly installed) and landscape work, including irrigation, done on the project from the time of installation to the end of the Guarantee Period.
B. Care should be taken to avoid damage to existing trees and their roots. Where excavating for new construction is required within tree and plant protection areas, excavate by hand to minimize damage to roots and perform as follows:
   1. Use narrow tine spading forks and comb soil to expose roots.
   2. If main lateral roots are immediately adjacent to location of new construction, the contractor shall notify the Owner prior to any excavation.

3. Do not allow exposed roots to dry out.
4. Provide temporary minimum four (4) inch depth of mulch and/or plastic covering, or equivalent.
5. Maintain in moist condition until covered with planting soil or mulch.

3.02 TRANSPORT AND MOVING PLANT MATERIAL

A. Pack and ship plant material in accordance with prevailing nursery industry standard practice for the type of plant being shipped, and protect at all times against drying sun, wind, heat, freezing, and similar detrimental conditions both during shipment and during related handling.
B. Plant material transported in enclosed vehicles must receive adequate ventilation. Plant material transported in open vehicles must be protected by suitable cover material such as tarpaulins.
C. Wrap the foliage of large trees to prevent damage and windburn. Provide adequate protection so that trunks are not scarred in transport and branches are not broken.
D. Wrap tree trunks with protective covering prior to handling and loading. Remove covering at the time of plant materials inspection at the job site so that trunk bark and root crown are completely visible.
E. Move all plants carefully. Exercise care in handling, loading, unloading, and storing of plant materials. Prevent damage to all plant materials. Do not drag plant material without proper root and branch protection.
    1. Handle trees by the rootball only; not the trunks, stems, or tops.
    2. Handle container grown plants by container only; not the stems or tops.
F. Tie branches on trees and large shrubs as necessary. Protect tree bark from rope chafing and damage. No twine, rope, or wire may be used in a manner that could damage or break the branches, tree trunks, or tree bark.
G. Replace plant material damaged in any way from transport and moving activities with undamaged and acceptable plant materials.

3.03 TEMPORARY STORAGE OF PLANT MATERIAL

A. “Heel-in” plants that cannot be installed within 24 hours after arrival to the project site in accordance with accepted horticultural practice and the following requirements:
    1. Protect rootball of ‘balled and burlapped’ or ‘fabric-grow bag’ plants with moist earth, sawdust, bark mulch, or other acceptable material and the material must be kept continuously moist. Do not use straw or hay to retain moisture.
    2. Protect the root system of all container-grown plants from drying out. Set plants in shade and keep roots moist by covering with mulch, soil or other acceptable means of retaining moisture. Do not deliver nor store plant materials at the project site during freezing weather conditions or drought conditions.
    3. Protect plant materials at all times from mechanical damage, excessive wet and/or water-logged conditions, drying out, and extreme weather including drying winds, freezing temperatures (at or below 32°F), and direct sun.
    4. Spray foliage on plants with an anti-desiccant during severe drought and/or excessively hot periods. Anti-desiccant must be specifically formulated for the species of plants it will be applied to.
    5. For seedlings, stack no more than 3 bags or bundles high, allowing space for air circulation. Do not open bags until ready to plant within 8 hours of opening. Repair torn bags immediately

3.04 PLANT LAYOUT:

A. Place plants at the spacing and locations indicated in the Contract Drawings.

B. Stake or otherwise mark the location of each plant. No work may start on the installation of plant material until plant layout and staking has been verified and approved by the Owner's Representative.
C. Notify the Owner's Representative at least 5 working days in advance of projected completion of staking and allow 2 working days after the projected completion date, for layout review and any adjustments to the layout.
D. Sequence the installation of plants to minimize disturbance to any newly installed plants and any existing landscape.

3.05 PLANT INSTALLATION:

A. General
1. All plant material must be inspected and determined by the Owner's Representative to be acceptable for planting, prior to installing.
2. Do not install plants in weather conditions detrimental to plant material:
a. during freezing weather or when the ground is frozen.
b. when ground is excessively wet, water-logged, and/or saturated.
c. when ambient air temperatures drop below 40°F or rise above 85°F.
d. when wind velocity exceeds 25 MPH.
3. Remove plants from containers in a manner that prevents damage to the root system. Containers may require vertical cuts down the full depth of the container to accommodate removal. Loosen all circling roots to ensure natural directional growth after planting.
4. Soak all tree rootballs and container plants which have become dry prior to planting.
5. For work performed during weather conditions detrimental to plant material, the Contractor may be required to provide the following services at no additional cost:
a. Expert consultations with an ISA certified Arborist (for trees) or other expert as approved (for other plant material) to determine what plant care measures are required to maintain the plants installed in a healthy and vigorous condition during the unacceptable weather conditions.
b. Replacement of all work performed during unacceptable weather conditions.
c. Additional protection, such as shade structures for large trees, watering, and maintenance of the plant materials stored or installed during the unacceptable weather conditions and responsibility for all additional costs incurred.
6. Perform planting during the period between September 1 and May 15. Planting at other times only allowed by written permission by the Owner's Representative and only if an automatic irrigation system is available through the summer.

B. Tree Installation
1. Provide the Owner's Representative a minimum 5 working days advance notice of the first tree(s) to be planted. The Owner's Representative must be present to approve the planting method of the first tree(s). Apply the approved method consistently for all remaining installation of trees.
2. Tree pit excavation near a curb or sidewalk must allow a horizontal clearance of at least 3 inches from the curb or sidewalk without undermining foundation support of adjacent improvements.
3. Before planting, completely remove all twine, burlap, wrapping material, fabric grow bags, and wire baskets from tree root balls and from the planting hole. For 'ball and burlap' trees, loosen roots showing at the edge of root balls without tearing.
4. Inoculate root balls of trees with mycorrhizae inoculant in accordance with the manufacturer's recommendations.
5. Set trees in the planting hole to proper grade and alignment.

a. Set crown of the tree root ball one (1) inch above the finish grade elevation after settlement of the soil.
b. Set trees upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure(s).
c. Place tree root balls in the planting pit in a manner that ensures the roots are properly spread for lateral directional growth

6. Place backfill and compact backfill by water settling. When planting hole is 3/4 backfilled, apply water to water-settle the backfill and remove voids. After settling occurs, add enough soil to cover the roots.
a. Do not use frozen, slurry, or muddy mixtures for backfilling.
b. Do not back fill soil against trunks or stems or above grafts on grafted trees.
c. Form a watering ring of soil around the edge of each planting hole to retain water.

C. Shrub, Groundcover, Live Stake and Seedling Installation
1. Keep plants supplied in containers or bags (live stakes and seedlings) moist at all times. Remove plants from the container in a manner that prevents damage to the root system. Do not remove plants from the container by pulling on the stem(s)
2. Remove all plastic, burlap, ties, and other container material from the plant prior to installation. Containers may require vertical cuts down the full depth of the container to accommodate removal.
a. Space groundcover plants using triangular spacing in accordance with indicated dimensions and offsets. Adjust spacing as necessary to evenly uniformly fill planting bed with indicated quantity of plants.
b. Set plants in the planting hole to proper grade and alignment.
1) Set upright.
2) Install plants so that top of root ball, as indicated by the root flare, is flush with the finish grade after settlement of the soil.
c. Firmly tamp or compact backfill without voids around the roots and then cover with mulch. Water immediately after installation of plant material.

D. Pruning
1. At the time of planting, prune only per Owner's Representative field directive and only to remove minor broken or damaged twigs and branches.
a. Do not head or prune without reason or prior approval.
b. Do not prune new plant material that impacts a tree's central leader, removes more than 5% of the foliage, or if foliage has not developed, more than 5% of the foliage buds, or significantly alters the natural form of the plant material being pruned.
c. Prune branches only at the branch collar. Stubs or flush cuts are not acceptable.
d. Prune in such a manner as to retain or to encourage the natural growth characteristics and proper form of the particular plant.
e. Prune with a sharp tool to produce a clean cut without bruising or tearing the bark. Make pruning cuts only in the living wood where callous tissue can develop properly.

E. Resetting Trees and Shrubs
1. Reset trees and shrubs found that are out of plumb alignment, by loosening the soil around the root system, re-setting the tree or shrub, backfilling, and compacting. Do not adjust by pushing, pulling or restraining the trunk or stem. Replace all trees and shrubs, that in the opinion of the Owner's Representative, have damage to the root system that has occurred as a result of re-setting a tree or shrub.

3.06 PLANTING ACCESSORIES INSTALLATION

A. Root Barrier Installation

1. Install root barrier panel per manufacturer's written directions and in locations shown in the Contract Drawings.
2. Install panels immediately adjacent to paving with ribs facing towards the tree roots. Trenches must be deep enough so that top of root barrier is two (2) inches below the top of mulch.

B. Install Brush pile as indicated on Contract Drawings.
C. Install Habitat Log as indicated on Contract Drawings.
D. Install Barrier Log as indicated on Contract Drawings.
E. Install Water Bags on all proposed trees , excluding the seedling trees, that do not have root watering systems as shown on the Irrigation Drawings.
F. Install Tree Staking and Fastening
   1. Stake all trees at the time of planting as indicated on Contract Drawings.
      a. Install stakes in a workmanlike operation.
      b. Damaged stakes must be promptly removed and replaced throughout the duration of the Contract.
   2. Remove all tree stakes and ties at the end of the Guarantee Period.

3.07 CLEAN UP

A. Perform cleaning during installation of the landscape work. Water, dirt, debris, and rubbish to be kept off of all paved areas, pathways, and permeable pavements. Wash clean all paved areas.
B. Upon completion of landscape work, remove all excess materials, soil, debris, and equipment from the site.
C. Repair all damage resulting from landscape work.
D. Compact and rake planting areas immediately adjacent to walks, curbs, pavements, driveways, and other improvement to accommodate the depth of mulch cover, with the mulch surface flush with the surface of adjacent improvement.
E. Remove all metal, wood, and concrete debris, protective wrappings and coverings, and shipping materials from the project site.
F. Leave project in first quality condition.

3.08 SUBSTANTIAL & PHYSICAL COMPLETION

A. Reviews to determine Substantial Completion and Physical Completion of planted areas will be made by the Owner's Representative, upon the Contractor's written request.
B. Provide notification at least 5 working days before requested review date(s).

3.09 FINAL ACCEPTANCE

A. Upon completion of the Guarantee Period, notify Owner's Representative at least 5 working days before the Final Acceptance Review.
B. The Owner assumes all plant maintenance upon Final Acceptance
C. Final acceptance of all landscaping work described in this Specification section, with the exclusion of possible replacements of plant materials under the Guarantee Period, must be made by the Owner's Representative to determine 100% completion and acceptance of the planting work.

END OF SECTION

SECTION 32 91 13
SOIL PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. The work includes the furnishing and installation of soil and/or amendments for planted areas per 32 93 00 and seeded areas per 32 92 19.

1.02 QUALITY ASSURANCE

A. Ensure all products supplied comply with applicable state and local codes.
B. Site inspections will be made by the Owner's Representative.
   1. Request Owner's Representative inspection at least 48 hours in advance of the time inspection is required. Inspections for the following are required:
      a. Subgrade prior to installation of any soil amendments.
      b. After scarification of soil amendments into subgrade and prior to planting or installation of other surface materials.

1.03 SUBMITTALS

A. Provide soil analysis and test reports from an approved soil testing laboratory. Do not incorporate soil amendments in the planting work until the Soil Test Reports are approved by the Owner's Representative. Provide Soil Test Reports for:
   1. One (1) representative sample per acre of subgrade soil within limit of work, excluding Off-Leash Area. Each subgrade soil sample shall consist of a composite of soils collected from a one-inch, 8-inch, and 16-inch depth.
   2. One (1) representative sample of each soil mix specified.
   3. One (1) representative sample of stockpiled native topsoil.
B. The Contractor is responsible for the cost for soil testing.
C. The Contractor is responsible for cost of the soil amendments required for each specified soil mix, as recommended by the soil testing laboratory. The Contractor shall determine the cost for the subgrade soil amendments as recommended by the soil testing laboratory. Costs shall be determined on a unit price basis and agreed upon by a Change Order prior to commencement of subgrade soil amendment work.
D. Perform soil testing in accordance with the most current edition of Methods of Soil Analysis published by the Soil Science Society of America, Inc. The Soil Test Reports must include the following:
   1. Fertility Analysis:
      a. Extractable analytes: nitrate, nitrogen, ammoniacal nitrogen, phosphorous, potassium, calcium, magnesium, copper, zinc, manganese and iron.
      b. Saturation extract values: calcium, magnesium, potassium, sodium, boron, sulfate, pH, lime content, salinity and sodium adsorption ratio.
   2. Mechanical Analysis:
      a. Organic percent by over-dried weight.
      b. USDA particle size and gradation.
   3. Cation Exchange Capacity (CEC).
   4. Soil Test Report recommendations for soil amendments to effectively amend and develop a productive soil.

5. The Soil Test Report shall include a written statement from the soil testing laboratory that the laboratory has reviewed the planting plan and this planting specification, and that its recommendations respond to the specific needs of the Contract.

1.04 REVIEW OF SOIL PREPARATION

A. Site Inspections will be made by the Owner Representative
   1. Request Owner Representative inspections at least 48 hours in advance of the time inspection is required.
   2. Inspections for the following critical path items are required:
      a. When subgrade has been established and scarification completed.
      b. Observance of the subgrade percolation tests.
      c. During soil preparation and soil installation activities.
      d. Finish grading prior to any planting.

1.05 TIMING OF WORK

A. Do not work soils in the presence of standing or ponding water; nor in freezing conditions.

1.06 PRODUCT HANDLING

A. Keep streets, sidewalks and site clean, free from debris and affected drains open and free flowing at all times. Protect drains with filter fabric covers during construction. Employ appropriate erosion control measures.

1.07 PROTECTION OF WORK, PROPERTY, & PERSONS

A. Take all necessary precautions to protect work in progress, all property, persons, walks, curbs, rooftop membranes and structures, utilities, pavement, and buildings from any damage that might be incurred arising from this Contract.
B. Protect all paved surfaces (permeable and impermeable) from staining or clogging by planting soil and mulch. Do not remove protection until after initial acceptance of all work. Remove excess soil and debris from the site and repair all damage resulting from construction operations.
C. Protect all landscape work from theft and vandalism until Physical Completion of work.
D. Pay for any damage incurred by failure to take precautions.

PART 2 MATERIALS

2.01 EXISTING SUBGRADE SOIL

A. Provide soil tests of the subgrade soil per Soil Test Reports section herein.
B. Submit subgrade Soil Test Reports and change order request to the Owner's Representative for review and acceptance prior to procuring soil amendments, and incorporating into the subgrade soil.
C. Determine the quantity of soil amendments and procure all soil amendments as recommended by the subgrade soil test report results.
D. Submit a copy of the itemized sales receipt showing purchase of and quantity of soil amendments for both subgrade soil and planting soil amendment to the Owner's Representative.

Provide copy of soil amendment labels showing grade furnished, certification of quality, and guarantee information.

2.02 PLANTING SOIL

A. Planting Soil must be a two-way mix soil consisting of 1/3 compost and 2/3 sandy loam by volume Thoroughly mixed together with the soil amendments as required by the Soil Test Report. Planting Soil must have pH range of 5.0 to 7.0 and an organic content between 10% and 15% by weight as tested by the Loss on Ignitions method.
B. Provide compost, biochar, sandy loam, and sand soil components as specified herein.
C. Planting soil shall be free of pests, toxic substances and other undesirable material harmful or detrimental to ornamental plant growth. Soil mixes shall not contain any viable seeds, roots, or rhizomes capable of sprouting any State-listed noxious weeds or invasive root propagating plants including but not limited to Horsetail, Evergreen Blackberry, English Ivy, Old Man's Beard, Invasive Knotweed, etc. Remove and replace soil found to contain these prohibited viable plant materials at the Contractor's expense.

2.03 COMPOST

A. Compost must be Medium Compost and comply with the requirements of Washington State Department of Transportation Standard Specification 9-14.4(8).
B. The compost must be tested within 30 calendar days of proposed use.
C. Prior to use or installation, compost delivered to the project site must have a Solvita Compost Maturity Test of six (6) or above. Solvita Compost Maturity Test is available from Woods End Research Laboratory, phone (207) 293-2457, or 1(800)451-0337, or. The cost for testing is the Contractor's responsibility.
D. Submit compost sources to the Owner's Representative for review and approval prior to use on the project site.
E. Compost available from the following sources:
    1. Cedar Grove Compost; Maple Valley, WA; (425) 432-2395.
    2. Pacific Topsoils Inc; Everett, WA (425) 337-2700.
    3. Vern's Organic Topsoil & Bark; Poulsbo, WA (360) 779-2764.
    4. Lenz Enterprises; Stanwood, WA (360) 629-2933.

2.04 SANDY LOAM

A. Sandy Loam shall be topsoil as defined by the United States Department of Agriculture Classification system and the requirements as described herein.
B. Sandy Loam must consist of loose, moderately well-drained, and friable soil. And be free of stones, debris, and/or similar objects. Sandy Loam should be fertile and free-flowing (pulverized).
C. Sandy Loam must be free of pests, toxic substances and other undesirable material harmful or detrimental to ornamental plant growth.
D. Sandy Loam must not contain any viable seeds, roots, or rhizomes capable of sprouting any State-listed noxious weeds or invasive root propagating plants including but not limited to horsetail, English ivy, clematis, knotweed, etc. Remove and replace soil found to contain these prohibited viable plant materials at the Contractor's expense.
E. Sandy Loam must have a pH between 5.0 to 7.0 and organic matter percentage of 2% min. – 10% max. (by weight). Assume a relative compaction of 85% of modified maximum dry density (ASTM D 1557). Particle Size must meet the following sieve requirements:

Sieve Size	Percent Passing
1”	100 %
½”	> 90%
#10	> 70%

1.01 MULCH

A. Wood Chip Mulch must be coarse ground wood chips derived from the mechanical grinding of whole trees or portions of trees. It may contain wood, wood fiber, roots, bark, branches, and leaves, but must not contain visible amounts of soil. It must be free of weeds and weed seeds, including plants on the Pierce County Noxious Weed list and must be free of invasive plant portions capable of resprouting, including but not limited to horsetail, English ivy, clematis, Japanese knotweed, etc. It must not contain more than 1/2% by weight of manufactured inert material (plastic, concrete, ceramics, metal, etc.).
   1. Wood chip mulch, when tested, must meet the following loose volume gradation:

	Percent Passing	
Sieve Size	Minimum	Maximum
2”	95	100
1”	0	20
5/8”	0	50
1/4”	0	40

   2. Particles must not be longer than eight inches.
   3. Acceptable substitutes, subject to the Owner Representative’s approval, include chipped or shredded woody material left from tree trimmings, meeting the above size and inert material requirements, derived from composting operation screening (“overs”), or derived from recycling of clean dimensional lumber (e.g. pallets or framing lumber) that has passed through a metal removal process to meet the 1/2% manufactured inert standard above.

1.02 FERTILIZER AND SOIL AMENDMENTS

A. Furnish fertilizer and soil amendment manufacturer’s quality compliance certification.
B. Fertilizer and soil amendments must be packaged in new, unopened, waterproof, containers or non-overlaid bags clearly labeled as to weight, chemical analysis, manufacturer and content in accordance with State and Federal Law.
C. Store fertilizer and soil amendments in such a manner as to prevent wetting and deterioration. Do not store fertilizer and soil amendments with plant materials.
D. Agricultural lime must be dolomitic limestone containing not less than 85% of total carbonates. Limestone must be ground to such fineness that 100% will pass a No. 20 sieve.
E. Iron sulfate must be granulated ferrous sulfate containing a minimum of 20% iron and 10% sulfur.
F. Fertilizers must be according to the following:
   1. Lawn Starter Fertilizer must be ‘Starter Feed’ (7-7-2) 100% Organic Fertilizer, as manufactured by Walt’s Organic Fertilizer Co. or approved equal.
   2. Lawn Follow-Up Fertilizer must be ‘Regular Feed’ (9-3-5), and must be 100% Organic Fertilizer as manufactured by Walt’s Organic Fertilizer Co., or approved equal.
   3. Fertilizers must be a complete commercial brand with chemical analysis shown on unopened and undamaged container when delivered.
   4. A minimum of 50% of any nitrogen fertilizer must be in a slow-release form such as sulfur-coated or polymer-coated urea, IBDU, trinitromethane (Nitroform), or organic forms.

PART 3 EXECUTION

3.01 GENERAL

A. Do not be place, disk, scarify, or work soil when the ground, subgrade, or planting soil is frozen, excessively wet or saturated, if there is ponding water, or, in the opinion of the Project Representative, in a condition detrimental to the Work. Notify Project Representative immediately in writing of these detrimental conditions. Extra or corrective work arising from failure to notify in writing and continuing work in detrimental conditions, is at the Contractor's risk and expense.

B. Apply and shape the soil lifts in such a manner that the planting area has a continuously sloped final surface that allows for drainage from higher elevations to lower outer edges of the planting area.

3.02 PREPARATION OF SUBGRADE

A. Verify the existence of proper rough grades and subgrade elevations prior to beginning soil preparation work. All planting area excavation must allow for compost, sandy loam, planting soil, and mulch depths as indicated in Contract Drawings.

B. Clear subgrade of all debris including concrete, structural fill, stumps, sticks, roots, and rocks or lumps larger than one (1) inch.

C. Percolation Test
   1. After the subgrade has been prepared, perform a percolation test by excavating 3 pits that are 2 feet in depth and minimum 2 feet in diameter. Locate the pits per Owner's Representative field directive. Fill each pit with water and allow the pit to drain for 24 hours. After 24 hours, re-fill the pit with water. Notify the Owner's Representative immediately in writing, if the time required for the pit to drain completely after being filled the second time is greater than 24 hours.
   2. The Contractor must be paid for work required to solve the drainage problem, such as, installation of French drains or drainage sumps, at a unit price basis and agreed upon by a Change Order prior to commencement of work.
   3. Subgrade preparation and percolation tests must be reviewed and approved by Owner's Representative prior to proceeding with the placing of planting soil.
   4. Placing of imported material constitutes acceptance of subgrade conditions by Contractor.

3.03 SOIL PREPARATION

A. Subgrade Scarification
   1. Thoroughly scarify subgrade to the depth(s) as shown in Contract Drawings. If additional scarification is required to eliminate surface water ponding, notify Owner's Representative of problem areas.
   2. After scarification, remove all debris or rocks over one (1) inch in size and establish proper grades.
   3. The scarification process must be observed and approved by Owner's Representative prior to installing planting soil.

B. Placing Soil, Fertilizers, and Soil Amendments:
   1. For Lawn Seed and No Mow Seed Areas:
      a. Place Planting Soil and thoroughly scarify soil to a minimum depth shown on Soil Preparation Details in contract documents.

b. Incorporate specified soil amendments per soil laboratory test recommendations, by broadcasting over the entire area at an even distribution and rate, then broom rake into the top inch of soil at the application rates per soil laboratory test recommendations.
c. Owner's Representative must review and approve soil preparation work between steps.

2. For Bioretention Seed Mix, see the Civil Storm Drainage contract drawings and Specification 33 40 00 Storm Drainage.
3. For Temporary Erosion Control Seed Mix, see Specification 31 25 00 Erosion Control and Sedimentation Control Section 2.02.
4. For Planting Areas:
   a. See soil preparation details shown in Contract Drawings.
   b. Compact each lift of planting soil before installing the additional lift of soil.
   c. Apply and incorporate the following by broadcasting over planting soil at an even distribution and rate prior to installation of plants. Then, rake into the top 2 inches of planting soil. Do not rototill.
      1) Soil amendments for planting areas must be applied at rates per soil testing laboratory recommendations.
      2) Do not apply fertilizers to planting soil.
   d. Owner's Representative must review and approve soil preparation work between steps.

C. Finish Grading
1. Finish grade is defined as the top surface of soil prior to the installation of plant material, mulch and seed.
2. Provide for surface drainage, cutting all necessary drainage swales, and conform to finish grades shown in the Contract Drawings.
3. Compact the finish grade of planting and seed areas to 85% of maximum dry density as determined by ASTM: D 1557.
   a. Protect placed soils from excessive compaction during construction. Loosen soil that become excessively compacted during construction with approved methods prior planting, seeding, or sodding.
   b. Scarify any areas that have become overly compacted to a depth of 4 inches, then finish grade as described herein.
   c. If soil is dry, lightly sprinkle with water prior to compacting or rolling.
4. After installing soils, fertilizers, and amendments, drag to an even grade, remove debris and rocks larger than one (1) inch in diameter that appear at the surface, and then roll for firmness prior to planting. Roll finish grades in two directions, the second rolling at right angles to the first. Lightly rake surface at a right angle to the second rolling direction.
5. After compacting, finish grades in seed areas must be ½ inch below the top of adjacent walks, curbs and/or other hard surfaces.
6. After compacting, finish grades in planting areas must be 4 inches below the top of adjacent walks, curbs and/or other hard surfaces.
7. After compaction and settling of soil, provide additional soil as needed to bring finish grade up to the specified levels.
8. All planting and seed areas must be finish graded and accepted by the Owner's Representative before commencement of plant and sod installation.
9. Install mulch so that top of mulch is flush with the top of any adjacent paved surface such as sidewalk, curb, and other pedestrian walking area.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 SUMMARY

A. Install seeding using the materials as shown in the Contract Drawings and/or as specified in the Specifications.
B. Work includes all areas within the limits of clearing and grading where seeding is shown on the Contract Drawings; and lawn areas outside of the limits which are disturbed in the course of construction activities. Confine operations to the working areas allotted by the Owner for operations, including material and equipment storage.
C. Restore existing lawn areas impacted by construction to preconstruction or improved condition.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) consists of all labor, tools, materials, tests, permits and other related items necessary for the provision and installation of all seed mixes in a first quality workmanlike manner.
B. This section includes a Guarantee Period of one (1) year duration from Substantial Completion to ensure the health and establishment of seeding.

1.03 REFERENCES

A. This specification section incorporates by reference the latest revisions or editions of the following documents.
   1. United States Department of Agriculture (USDA): Federal Seed Act and Soil Classification.
   2. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 SUBMITTALS

A. Quality Assurance Documentation:
   1. Submit Landscape Subcontractor’s State of Washington registration, and current certification by the Washington Association of Landscape Professionals (WALP) or by the Washington State Nursery and Landscape Association (WSNLA).
   2. Submit documentation of Landscape Subcontractor’s experience in performing landscape work of comparable size, scope, and quality over the past five (5) years.
B. Submit a complete analysis of the seed shall be submitted to the Owner’s Representative, including percent of pure seed, germination, other crop seed, inert and weeds, and the germination test data. All crop seed in excess of one (1) percent must be itemized. Provide a complete copy of manufacturer’s container label or seed technical data with the seed analysis for each seed mix specified.
C. Submit manufacturer’s data sheets for Hydromulch and for Tackifier.

1.05 QUALITY ASSURANCE

A. Seed of the type specified must conform to the standards for "Certified grade seed or better as outlined by the State of Washington Department of Agriculture "Rules for Seed Certification."
B. All seed mixes must be free of weed seed listed as primary noxious by the Washington State Seed Law singly or collectively in excess of the labeling tolerance specified by the Washington State Seed Law. Reference Specification; Chapter 15.49, Washington State Seed Act.
C. Seed must be packed in clean, sound containers of uniform weight. Deliver mixed seed to the project site in the original, unopened containers bearing the manufacturer's guaranteed analysis, manufacturer's name, trademark, and conformance with law.
    1. Containers must so the following information clearly marked for each kind of seed in accordance with applicable state and federal law:
        a. Common name of seed and it's strain.
        b. Lot number.
        c. Net weight.
        d. Percentage of purity.
        e. Percentage of germination.
        f. Percentage of weed seed content and inert material.
        g. Place of origin.
        h. Amount of Pure Live Seed per bag.

1.06 PROJECT CONDITIONS

A. Inspect the site before proceeding with any work, carefully check all grades, elevations, service and utility locations, irrigation system components, and verify all dimensions and conditions affecting the work. Immediately request in writing the need for clarification(s) regarding any discrepancies, conflicts, or deviations between the Contract Drawings, Specifications, and site conditions. Work done after discovery, unless authorized by the Owner's Representative in writing, and extra work arising from failure to notify in writing, is at the Contractor's risk and expense.
B. Deliver seed and fertilizer materials in original unopened containers showing weight, analysis, and name of manufacturer. Store the seed in such a manner that will prevent the wetting and deterioration of the seed.
C. Protect work and adjacent property and be responsible for any damage or injury arising due to actions or neglect.
D. Confine work to areas designated. Do not disturb existing vegetation outside of limit lines. Repair or replace vegetation damaged as a result of Contractor's operation.
E. Provide necessary safeguards for the protection of seeded areas for such time as is required to ensure vigorous establishment of the plant species.

PART 2 PRODUCTS

2.01 COMPOST

A. Compost for seeded areas per Specification 32 91 00 Soil Preparation.

2.02 BIORETENTION SOIL

A. Bioretention soil per Specification 33 40 00 Storm Drainage.

2.03 LAWN SEED MIX

A. Lawn Seed Mix shall be Pro Time 303 Sun Mix. Seed Mix Available from: PT Lawn Seed; Portland, Oregon; Tel: (503) 239-7518; Email: info@ptlawnseed.com, and shall be composed of the following:
   1. Perennial Ryegrass (Lolium perenne)
   2. Chewings Fescue (Festuca rubra var commutate)
B. The Lawn Seed Mix shall also meet or exceed the following:
   1. Minimum pure seed percent - 98%
   2. Minimum germination percent - 90%
   3. Maximum weed seed percent - 0.5%
C. All Seed shall be packed in clean, sound containers of uniform weight.
D. Or approved equal.

2.04 NO MOW SEED MIX

A. Shall be Northwest Prairie Mix supplied by Northwest Meadowscape, 1240 W. Sims Way, #218 Port Townsend, WA 98368, 360-504-6415, www.northwestmeadowscapes.com, and shall be composed of the following, by weight:
   1. 16% Annual Wildflowers
      a. Globe Gilia (Gilia capitata)
      b. Farewell to Spring (Clarkia amoena)
   2. 14% Perennial Wildflowers
      a. Self Heal (Prunella vulgaris)
      b. Western Yarrow (Achillea millefolium)
      c. Large Camas (Camassia leichtinii)
      d. Riverbank Lupine (Lupinus rivularis)
      e. Wooly Sunflower (Eriophyllum lanatum)
      f. Showy Fleabane (Erigeron speciosus)
   3. 70% Native Grasses
      a. Roemer's Fescue (Festuca romerii)
      b. Tufted Hairgrass (Deschampsia cespitosa)
      c. Meadow Barley (Horedum brachyantherum)
      d. Blue Wild Rye (Elymus glaucus)
      e. California Brome (Bromus carinatus)
      f. Red Fescue (Festuca rubra)
   4. Prairie Junegrass (Koeleria macrantha)
B. The No Mow Seed Mix shall also meet or exceed the following:
   1. Minimum pure seed percent - 98%
   2. Minimum germination percent - 90%
   3. Maximum weed seed percent - 0.5%
C. All Seed shall be packed in clean, sound containers of uniform weight.
D. Or approved equal.

2.05 TEMPORARY EROSION CONTROL SEED MIX

A. Erosion Control Seed mixture must be composed of the following, by weight:
   1. 40% Chewings or annual blue grass (Festuca rubra var. commutata or Poa anna)
      a. Minimum pure seed percent - 98%
      b. Minimum germination percent - 90%
   2. 50% Perennial rye (Lolium perenne) Chewings Fescue.
      a. Minimum pure seed percent - 98%

   b. Minimum germination percent - 90%
3. 5% Redtop or colonial bentgrass (Agrostis alba or Agrostis tenuis)
   a. Minimum pure seed percent - 92%
   b. Minimum germination percent - 85%
4. 5% White dutch clover (Trifolium repens)
   a. Minimum pure seed percent - 98%
   b. Minimum germination percent - 90%
5. Maximum weed seed percent - 0.5%
6. Pack all seed in clean, sound containers of uniform weight.

2.06 BIORETENTION SEED MIX

A. Shall be composed of the following, by weight:
   1. 60-70% Tall or meadow fescue (Festuca arundinacea or Festuca elatior)
   2. 10-15% Seaside/Creeping bentgrass (Agrostis palustris)
   3. 10-15% Meadow foxtail (Alepocurus pratensis)
   4. 1-6% Alsike clover (Trifolium hybridum)
   5. 1-6% Redtop bentgrass (Agrostis alba)
B. The Bioretention Seed Mix shall also meet or exceed the following:
   1. Minimum pure seed percent - 98%
   2. Minimum germination percent - 90%
   3. Maximum weed seed percent - 0.5%
C. Pack all seed in clean, sound containers of uniform weight.

2.07 WOOD CELLULOSE FIBER (FOR HYDROSEEDING)

A. Acceptable materials:
   1. Moderate Term Mulch per WSDOT Section 9-14.5 (2) B.
   2. Short Term Mulch per WSDOT Section 9-14.5 (2) C.
B. Wood cellulose fiber must be specially processed 100% virgin wood fiber in which 30% of the fibers are 0.15 inches long or longer and containing no growth or germination-inhibiting ingredients.
C. Wood cellulose fiber must be dyed a suitable color to facilitate inspection of placements of the material. It must be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogeneous slurry.
D. When hydraulically sprayed on the ground, the material must allow the absorption and percolation of moisture.
E. Each package of cellulose fiber must be marked by the manufacturer to show the air dry weight content.

2.08 TACKIFIER

A. Tackifier must not contain growth or germination-inhibiting materials and must not reduce infiltration rates.
B. Tackifiers must hydrate in water and readily bond or blend with other slurry materials, and must meet requirements of WSDOT Standard Specification 9-14.5(7) A.
C. Provide test results documenting material meets requirements.

PART 3 EXECUTION

3.01 INITIAL PREPARATION

A. Remove existing weeds and grass growing in the area to be seeded.
B. Rough grade to a smooth finish, eliminating low spots that would cause ponding of surface water, see Seed Soil Preparation detail in contract drawings.
C. Rake rocks, stones, and any debris larger than 1-inches in diameter and dispose of offsite.
D. Remove from the site pieces of metal, wire, lumber, plastic, and other construction related debris larger than 1-inches in diameter or 2 inches in length.

3.02 FINISH GRADING

A. Fine-grade seeded areas to even finish grade.
B. Compact to produce a uniform rough textured surface free of ruts, depressions, and low spots, and be ready for seeding. A minimum of two passes is required.
C. Immediately before seed installation, lightly rake the seedbed so that rake tines run perpendicular to the slope.
D. Unless otherwise indicated, grade for seeded areas after compaction shall be approximately 1/2-inch below the level of the adjacent finished grade after settlement.
E. Correct depressed grades or dips in the grade.

3.03 HYDROSEEDING

A. Apply Seed, Fertilizer and Hydromulch in slurry in one operation with approved hydraulic equipment. Apply materials at the following rates:
   1. Lawn Seed Mix: 9lbs per 1000 square feet.
   2. No Mow Seed Mix: 20lbs. per acre
   3. Temporary Erosion Control Seed Mix: see Specification 31 25 00 3.08.
   4. Bioretention Seed Mix: 20lbs per acre.
   5. Hydromulch: 50lbs. per 1,000 square feet.
B. Tackifier: 1lb. per 1,000 square feet.
C. Do not apply Seeding during windy weather (above 25 mph) or when the ground is overly wet (saturated) or frozen. Give the Owner 48-hours of notice prior to seeding operations. Perform Seeding, fertilizing, and mulching of prepared areas during the following time frames:
   1. April 1 to May 31 or from September 15 to November 15.
   2. Do not seed before or after these dates without the Project Representative's written approval. Written permission to seed from June 1 to August 31 may be granted only if automatic irrigation is available and operational at the site. Permission to seed from November 1 to March 31 will only be given when completion of the Project is imminent and the environmental conditions are conducive to acceptable growth.
   3. Application of pre-germinated seed, moisture retention agents and/or provision for supplemental watering will be required by the Project Representative should the Contractor schedule this portion of the Work outside the time frames listed in item 1 immediately above.
   4. When environmental conditions are not conducive to acceptable results from seeding operations, the Project Representative may order the Work suspended, and resume only when the desired results are likely to be obtained.
D. Equipment shall use water as the carrying agent utilizing a continuous built-in agitation system. Equipment with a gear pump is not acceptable.
E. Pump a continuous, non-fluctuating supply of homogenous slurry to provide a uniform distribution of material over designated seeded areas.

3.04 ESTABLISHMENT AND MAINTENANCE

A. Maintain all Hydroseeded areas so that plant species are well established and exhibit a vigorous growing condition. Protect newly installed and germinating plant species from disturbance or damage from the public. All areas failing to vigorously establish within 90 days after germination shall be redone at the Contractor's expense.
B. Maintenance includes protection, watering, and weeding. Weeding is per Specification 32 90 00 Planting.
C. Do not mow seeded areas.
D. Check for bare spots larger than a 6-inch square prior to physical completion. Should bare spots develop, amend the top 1 inch of soil and overseed.

3.05 SUBSTANTIAL AND PHYSICAL COMPLETION

A. Inspection to determine Substantial Completion of seeded areas will be made by the Owner's Representative upon the Contractor's request. Provide notification at least five (5) working days before requested inspection date.
    1. Seeded areas will be accepted provided all requirements, including maintenance, have been complied with and plant species are well established and exhibit a vigorous growing condition, with no bare spots over 6" square at the time of Substantial Completion.
    2. Areas failing to show consistent vigorous growth of plant species shall be reseeded at the Contractor's expense.
B. Upon Physical Completion, the Owner will assume maintenance.

END OF SECTION

SECTION 33 10 00
WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

Install water distribution lines using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.02 SCOPE OF WORK

A. Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) shall consist of all labor, tools, materials, tests, permits and other related items necessary for the construction of water distribution lines in a first quality workmanlike manner.

A.

1.03 REFERENCES

This specification section incorporates by reference the latest revisions of the following documents.

A.
1. Washinton State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
2. Pierce County Accommodating Utilities Manual
3. Summit Water & Supply Co. Construction Specifications

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.04 RELATED WORK

A.

Related work in other sections of these Specifications includes but is not limited to:

1. Specification 31 23 33 – TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

A.

1.05 QUALITY ASSURANCE

B. Standard Compliance: In addition to complying with all codes and regulations, comply with all pertinent recommendations contained in the following documents. When a conflict arises between the following standards, the more stringent provision shall apply.

C. Manufacturer's and Installer's Qualifications: Firms regularly engaged in manufacture or installation of sewer projects consisting of similar scope and materials.

General: Use adequate numbers of skilled workmen who are thoroughly trained and

A. experienced in the necessary craft and who are completely familiar with the specified

B. requirements and methods needed for proper performance of the work in this section.

1.06 SUBMITTALS

Submit Manufacturer’s Literature on proposed material prior to the start of any work; submit three copies of product information correlated to specified requirements.

No installation of the material concerned shall be made until written approval has been obtained from the Engineer. Approval of materials and equipment shall in no way obviate compliance with the plans and specifications.

Record Drawings:

1. One complete set of drawings will be provided as record drawings which shall be separate, clean, blueline prints reserved for the purpose of showing a complete picture of the work as actually installed. The contractor shall coordinate the record drawing requirements with the Utility Inspector.
2. These drawings shall also serve as work progress report sheets and the Contractor shall
C. make any notations, neat and legible, thereon daily as work proceeds. These drawings shall be available for inspection at all times and shall be kept at the job site.
3. All buried piping and indicated future connections, exterior of any building, shall be located both by depth and by accurate measurement from a permanently established landmark. All notations on record drawings of buried piping shall be made before any backfilling is started.
4. At completion of the work, these record drawings shall be signed by the Contractor, dated, and returned to the Architect.

1.07 DELIVERY, STORAGE, AND HANDLING:

Piping: Inspect materials delivered to the site for damage. Store with minimum handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and rubber
A. gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

Cement: Store cement immediately upon receipt at site of work. Store bagged cement in a
B. suitable waterproof structure made as air-tight as practicable, and with floors elevated above ground a sufficient distance to prevent absorption of moisture. Stack bags close together to reduce circulation of air, but do not stack against outside walls; arrange storage to permit easy access for inspection and identification of each shipment.

C. Metal Items: Check upon arrival and identify and segregate as to types, functions, and sizes. Store in a manner affording easy accessibility and not causing excessive rusting or coating with
D. grease or other objectionable materials.

Handling: Handle pipe, fittings, and other accessories in such a manner as to ensure delivery to the trench in sound, undamaged condition. Take special care not to damage fittings. Carry pipe to trench; do not drag it. Do not leave rubber gaskets and plastic piping that are not to be installed immediately in the sunlight, but store under cover out of direct sunlight.

A.

1.08 CONTRACTOR REQUIREMENTS

B. The Contractor is responsible for coordinating any water system shut-downs with Pierce County, Tacoma Water, Summit Water and Supply Company, and the Central Pierce Fire and Rescue.

Contractor is responsible for coordinating the phasing of the installation of the water system and fire hydrants with the Central Pierce Fire and Rescue, Tacoma Water, Summit Water and Supply Company, and Pierce County. At all times the contractor shall provide adequate fire
A. coverage per the requirements of Central Pierce Fire and Rescue.

PART 2 PRODUCTS
B.

2.01 WATER MAIN PIPE AND FITTINGS

Ductile Iron Pipe for Water Mains shall meet the requirements of AWWA C151, Pipe shall be in conformance with WSDOT Standard Specification Section 9-30.1(1), with the exception of the thickness class, which shall be as shown in the Plans.

Fittings for Ductile Iron Pipe for Water Mains shall be in conformance with WSDOT Standard Specification Section 9-30.2(1).

2.02 METER BOX

Refer to WSDOT Section 9-30.6(7).

2.03 TAPPING SLEEVE & VALVE ASSEMBLY

Refer to WSDOT Section 9-30.3(8).

2.04 SERVICE LINES

A.

All polyethylene service lines will be domestic, high-density polyethylene pipe, minimum pressure Class 200 psi and in accordance with Summit Water & Supply Company details and Construction Specifications Chapter V: Water Service Installation and Materials.

A.

2.05 FIRE HYDRANT ASSEMBLIES

A.

Fire hydrant assembly per Summit Water Standard Drawing in plans.
Hydrant bollards per Summit Water Standard Drawing in plans.

2.06 VALVES

A.
B.

Gate Valves: Per WSDOT Standard Specification Section 9-30.3(1)
Valve Box: Per Summit Water Standard Drawing.

A. Valve Stem Extension: Per WSDOT Standard Specification Section 9-30.3(6)
B. Reduced Pressure Backflow Preventer (RPBP) assembly:
C.
D.

1. RPBP assembly shall be Watts LF009M2QT or approved equal.
2. The RPBP assembly shall be approved on the latest approved list of the Washington State Department of Health.
3. All components shall be constructed using lead free materials.
4. Seats and seat discs shall be replaceable in both check modules and the relief valve.
5. Service of all internal components shall be through a single access cover secured with stainless steel bolts.
6. Assembly shall include two isolation valves, four test cocks, and an air gap drain fitting.

A.

2.07 THRUST BLOCKING

Per WSDOT Standard Specification Section 7-09.3(21).

A.

2.08 JOINT RESTRAINT

A. Per WSDOT Standard Specification Section 9-30.2(6).
B.

2.09 DETECTABLE MARKING TAPE AND TONING WIRE

A. Per WSDOT Standard Specification Section 7-09.3(20).
Toning wire shall consist of Schedule #14 solid copper coated locator wire installed per plans.

2.10 TRENCH BEDDING AND BACKFILL MATERIAL

See Specification section 31 23 33 “Trenching, Backfilling, and Compacting for Utilities”.

PART 3 EXECUTION

3.01 EXAMINATION

Verify that trench is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.
Beginning of installation means acceptance of existing conditions.

3.02 STAKING

A. All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed as a Professional Engineer or Professional Land Surveyor by the State of Washington. A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction. The minimum staking of waterlines shall be as follows:

B.

A.

1. Stake centerline alignment every 50 feet with cut or fill to invert of pipe maintaining 42 inches of cover over pipe. Cuts are normally not required when road grade has been built to subgrade elevation.
2. Stake alignment of all fire hydrants, tees, water meters, setters and other fixtures and mark cut or fill to hydrant flange finished grade.

3.03 DELIVERY AND HANDLING

A. Handling of Pipe - Pipe shall be handled in a manner that will prevent damage to the pipe, pipe lining, or coating. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped skidded, or rolled against other pipe. Damaged pipe will be rejected, and the contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.

B. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and re-laid. When pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the City Engineer.

C. Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, or other similar supports.

D. Cutting Pipe - Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by pipe cutter. All pipe ends shall be square with the longitudinal axis of the pipe and the outside shall be beveled and otherwise smoothed so that good connections can be made without damage to the gasket. Threads shall be cleanly cut. Oxyacetylene torch cutting of ductile iron will not be allowed.

A.

B.

3.04 WATER MAIN INSTALLATION

Water main shall be installed per WSDOT Standard Specification 7-09.3 and the Pierce County Accommodating Utilities Manual.
Trench Excavation

1. Prior to any pavement cutting or removal, or excavation for pipe laying, the contractor shall verify, in the presence of the City's inspector, the location and depth of the existing water mains at the points where connections are to be made. The contractor shall verify the dimensions, type, and condition of the existing water main. If necessary, the grade shall be

adjusted so neither a high spot nor a low spot is created adjacent to the connection to the existing water mains.

2. Clearing and grubbing: Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.
3. Trenches shall be excavated to the line and depth designated by the Plans to provide a minimum of 30 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically, and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The contractor shall maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.
4. The Contractor shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots, and other obstructions shall be entirely removed or cut out to the widths of the trench and to a depth 6 inches below water main grade. Where materials are removed from below water main grade, the trench shall be backfilled to grade with pit run sand and gravel and thoroughly compacted.
5. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City Engineer, and shall be in conformance with Washington Industrial Safety and Health Administration (WlSHA) and Office of Safety and Health Administration (OSHA) Safety Standard.
6. The bottom of the trench shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.
7. Material excavated from the trench and piled adjacent to the trench shall be piled and maintained so that the toe of the slope of the material is at least 3 feet from the edge of the trench. It shall be piled in such a manner that will cause a minimum of inconvenience to travel, and provisions shall be made for traffic control as necessary. Free access shall be provided to fire hydrants, water valves, and meters, and clearance shall be left to enable free flow of storm water in gutters, other conduits, and natural watercourses.

C.

8. Trench widths for water main installation shall be as shown on the Drawings.

Trench Shoring

1. Where trench excavation equal or exceeds a depth of 4 feet, the developer/contractor shall provide, construct, maintain and remove, as required, safety systems that meet the requirements of the Washington Industrial Safety and Health Act, RCW 49.17, including WAC 296-155. The trench safety systems shall be designed by a qualified person, and meet accepted engineering requirements (see WAC 296-55-660).
2. The Contractor shall adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The method of shoring shall be according to the contractor's design. The contractor may elect to use a combination of shoring or overbreak tunneling, boring, sliding trench shields, or other methods of accomplishing the work, provided the method meets all applicable local, state, and federal safety codes. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the contractor.

D.

Dewatering of Trench

1. Where water is encountered in the trench it shall be removed during pipe-laying operations and the trench so maintained until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water or other deleterious materials shall not be allowed to enter the pipe at any time.
2. The contractor shall furnish, install, and operate all necessary equipment to keep the trench above the foundation level free from water during construction, and shall dewater and

dispose of the water so as not to cause injury to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workers for the operation of the pumping equipment.

Backfilling

1. All material placed as utility trench backfill should be placed as structural fill meeting the requirements stated in the included geotechnical reports for each of the sites.
2. Unsuitable backfill material shall be removed from the site and hauled to an approved disposal site. The Engineer shall be provided with the location of all disposal sites to be used and also copies of the permits and approvals for such disposal sites.

E.

3. Imported material shall meet the requirements of Section 7-09 of the WSDOT Standard Specifications. In backfilling the trench, the Contractor shall take all necessary precautions to protect the pipe from any damage or shifting. The contractor shall backfill from the side of the trench to a maximum uniform depth of 6 inches above the crown of the ductile iron pipe before starting mechanical compaction.
4. During all phases of the backfilling operations and testing as outlined herein, the contractor shall protect the pipe installation, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and persons.

3.05 FIRE HYDRANT INSTALLATION

A. Fire hydrant installation and materials shall be in accordance with Summit Water & Supply Company Developer Standards Section IV: Water System Facilities Installation & Materials, Part 1C. Fire Hydrant head shall be bagged.

3.06 VALVES

A. All valves shall be inspected upon delivery in the field to ensure proper working order and damage to protective coatings before installation and shall be free of all rust and dirt. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connecting ends furnished. No valves shall be located in such position as to place the valve chamber or box in any roadside ditch, drainage ditch, or channel.

B. If valves are not set in paved area, a 4-inch thick 2 foot square concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing asphalt or concrete pad. The valve and valve box shall be set plumb with the valve box centered on the operator nut. Valve boxes shall be set flush in pavement or road shoulder.

A.

B

3.07 HYDROSTATIC PRESSURE TESTS

C. Hydrostatic pressure tests shall be performed in conformance with the Pierce County Accommodating Utilities Manual.

The Engineer or his representative will inspect and observe the hydrostatic test of the pipe within 24 hours after notification by the Contractor that a section is ready for inspection and test. The Contractor shall contact the Engineer at least 24 hours in advance of the completion of sterilization and flushing and his representative shall be present when water samples are taken. Prior to the acceptance of the work, the installation shall be subjected to a hydrostatic pressure test and any leaks or imperfections developing under said pressure shall be remedied by the Contractor before final acceptance of the work. No air will be allowed in the lines. The mains shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation being tested is inspected. The Contractor shall provide all necessary

equipment and shall perform all work connected with the test. Tests shall be made after all valved connections have been made. At un-valved connection points, a temporary plug (or 2" blow-off assembly on lines without hydrants) shall be installed at the end of the new main. This shall include concrete blocking necessary to withstand pressures encountered during the hydrostatic test.

Once the new line is successfully tested and disinfected, the plug (blow-oft shall be removed and the connection to the existing main completed. The Contractor shall perform a preliminary test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the lines has been released before requesting the City Engineer witness the test. The City Engineer or his representative shall witness the test; if the test does not pass

D. inspection for any reason, additional trips required to witness the test shall be done at the Contractor's expense.

The Contractor shall provide special plugs and blocking necessary in those locations where it would be necessary to test against butterfly valves to ensure that the pressure rating of these valves is not exceeded during testing.

E.

3.08 STERILIZATION AND FLUSHING

Sterilization and Flushing shall be performed in conformance with the Pierce County Development Guidelines and Public Works Standards.

A. Sterilization of water mains shall be accomplished by the Contractor in accordance with the

B. requirements of the State Health Department and in a manner satisfaction to the Engineer. The section to be sterilized shall be thoroughly flushed at maximum flow established by the Engineer prior to chlorination. Flushing period must be approved by the City. Sections will ordinarily be sterilized between adjacent valves unless, in the opinion of the City Engineer, a longer section may be satisfactorily handled. Chlorine shall be applied by solution feed at one end of the section with a valve or hydrant at the opposite end open sufficient to permit a flow through during chlorine application. The chlorine solution shall be fed into the pipeline already mixed by an automatically proportioned applicator to provide a steady application rate of not less than 50 ppm chlorine. Hydrants along the chlorinated section shall be open during application until the presence of chlorine has been detected in each hydrant run. When a

C. chlorine concentration of not less than 50 ppm has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours.

As an alternative, the Contractor may use granulated chlorine. Granulated chlorine (dry calcium hypochlorite at 65% - 70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm. The number of ounces of 65% test calcium hypochlorite required for a 20-foot length of pipe equals .00843ld, in which "d" is the diameter in inches. The line shall then be

D. thoroughly flushed and water samples taken for approval by the local health agency. Flushing period must be approved by the City. The Contractor shall exercise special care in flushing to avoid damage to surrounding property to conform to Water Quality Considerations.

Should the initial treatment result in an unsatisfactory bacteriological test, additional chlorine using the first procedure shall be repeated by the Contractor until satisfactory results are

E. obtained. The contractor shall be responsible for disposal of treated water flushed from mains and at no time shall chlorinated water from a new main be flushed into a body of fresh water. This is to include lakes, rivers, streams storm drainage systems and any and all other waters where fish or other natural water life can be expected. Disposal may be made to any available sanitary sewer provided the rate of disposal will not overload the sewer.

Main extensions shall not be connected to the City water system until pressure and bacteriological tests have passed all required standards.

PART 4 PAYMENT

Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of all water distribution components to the satisfaction of the plans as well as the preparation, safety, and quality control measures.

END OF SECTION

A.

SECTION 33 40 00
STORM DRAINAGE

PART 1 GENERAL

1.01 SUMMARY

1.02 Install storm drainage structures, pipes, bioretention facilities, and detention pond using the materials as shown in the Contract Drawings and/or as specified in the Specifications.

1.03 SCOPE OF WORK

1.04 Furnish all materials, equipment, labor and related items necessary to complete the work shown in the Contract Drawings and/or as specified in the Specifications. The work included in this section (whether mentioned or not) consists of all labor, tools, materials, tests, permits and other related items necessary for the construction of storm drainage improvements.

1.05 REFERENCES

This specification section incorporates by reference the latest revisions of the following documents.

A.
1. Washington State Department of Transportation (WSDOT) Standard Specification for Road, Bridge and Municipal Construction.
2. Pierce County Stormwater Manual

B. In case of conflict between the requirements of this specification section and the Contract Drawings, the requirements of the contract specification section shall prevail.

1.06 RELATED WORK

A. Related work in other sections of these Specifications includes but is not limited to:
1. Specification 31 23 33 – TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

A.

1.07 QUALITY ASSURANCE

B. Manufacturer and Installer's Qualifications: Firms regularly engaged in manufacture or installation of sewer projects consisting of similar scope and materials. Installer’s current certification from Pierce County Health Department.

General: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary craft and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.

A.

B

1.08 SUBMITTALS

No installation of the material concern shall be made until written approval has been obtained from the Engineer. Approval of materials and equipment shall in no way obviate compliance with the plans and specifications.

Record drawings

1. One complete set of drawings will be provided as record drawings which shall be separate, clean, blueline prints reserved for the purpose of showing a complete picture of the work as actually installed. The contractor shall coordinate the record drawing requirements with the Utility Inspector in accordance with the Developer Extension Agreement

2. These drawings shall also serve as work progress report sheets and the Contractor shall make any notations, neat and legible, thereon daily as work proceeds. These drawings shall be available for inspection at all times and shall be kept at the job.
3. All buried piping and indicated future connections, exterior of any building, shall be located both by depth and by accurate measurement from a permanently established landmark. All notations on record drawings of buried piping shall be made before any backfilling is started.
4. At completion of the work, these record drawings shall be signed by the Contractor, dated, and return to the Architect.

Storm Structure Verification Survey:

C. 1. Contractor shall submit to the Architect an as-built survey, prepared by a Licensed Professional Surveyor, of each storm drainage structure installed by the Contractor during construction. Submit the survey on paper stamped by a Licensed Professional Surveyor and in digital format (AutoCAD). The storm structure verification survey shall include graphic horizontal location of the center of each structure (to the nearest tenth of a foot) relative to the property boundaries and right of ways (as prepared by the project surveyor) and the vertical elevations of all structure lids and grates and pipe inverts to the nearest five hundredths of a foot. Changes during construction to cleanout locations or elevations shall be noted on the Contractor's Record Drawing submittal.

PART 2 PRODUCTS

2.01 ADS N-12 PIPE (OR APPROVED EQUAL)

A. Pipe Requirements

1. ADS N-12 plain end pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.
   a. B. Pipe shall meet AASHTO M252, Type S or AASHTO M294, Type S.

Joint Performance

1. Pipe shall be joined with coupling bands covering at least two full corrugations on each end of the pipe. Standard connections shall meet or exceed the soil-tight requirements of AASHTO M252, AASHTO M294, or ASTM F2306. Gasketed connections shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of C. ASTM D1056 Grade 2A2. Gaskets, when applicable, shall be installed by the pipe D. manufacturer.

Fittings

1. Fittings shall conform to AASHTO M252, AASHTO M294 or ASTM F2306.

Materials Properties

1. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500mm) A. virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as B. specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectively.

2.02 COUPLINGS AND JOINTS

Tees on existing pipe shall be connected by core drilling and flexible connections.
Pipe to pipe connections shall be made with a flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint.

2.03 PIPE BEDDING AND BACKFILL MATERIAL

Bedding and backfill material shall conform to Section 31 05 16 “Aggregates” and the drawing details.

2.04 CONCRETE CATCH BASINS

Herringbone Grates: Per detail in the Drawings;
A. Type 1 Catch Basins: Per detail in the Drawings;
Type 2 Catch Basins: Per detail in the Drawings;
Concrete Inlet: Per detail in the Drawings;
Solid Cover: Per detail in the Drawings;
A. Beehive Grate: Per detail in the Drawings;
B. Control Structure: Per detail in the Drawings;
C. 1. Vertical Bar Grate;
D. 2. Stand Pipe.
E.
F.
G.

2.05 DETECTABLE MARKING TAPE

Utility pipe tracer tape shall be per WSDOT Section 9-15.18.

2.06 BIORETENTION FACILITIES

Bioretention Soil Mix (BSM) Primary Layer
A. 1. Aggregate Gradation for BSM

Sieve Size	Percentage Passing
3/8-inch	100
No. 4	95 to 100
No. 10	75 to 90
No. 40	25 to 40
No. 100	4 to 10
No. 200	2 to 4

2. The BSM Primary Layer media should be a blend of the following components in the following ratios:

Component	**Ratio (by volume)**
Filter Sand	70% (+/- 3%)
Coconut Coir Fiber	20% (+/- 2%)
High Carbon Wood Ash	10% (+/- 1%)

a. Coconut Coir Fiber
1) The Coconut Coir Fiber should be double rinsed and buffered, meeting the following requirements for quality:

Test/Method	Testing Responsibility	Criterion	Requirement

Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 353.2	Proponent	$NO_3 + NO_2$	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and NEMI Method SM 4500-P E-99	Proponent	Total Phosphorus	0.15 mg/L (Max.)
		Ortho-Phosphorus	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 200.8 UCT-KED	Proponent	Copper	10 $\mu g/L$ (Max.)
Test Methods for the Examination of Compost and Composting (TMECC) Method 04.10-A	Manufacturer	Electrical Conductivity	1.0 mmhos/cm (Max.)

b. Filter Sand

1) The aggregate shall be sand meeting the gradation below and the requirements of Section 9-03.1(2)B (Class 1) of the Washington State Department of Transportation Standard Specifications and shall have a Coefficient of Uniformity of four (minimum). The filter sand gradation tolerances herein apply to the aggregate in the HPBSM Primary Layer media as well as the HPBSM Polishing Layer media.

Sieve Size	**Percent Passing Min.**	**Percent Passing Max.**
3/8”	99	100
No. 4	95	100
No. 8	68	86
No. 16	47	65
No. 30	27	42
No. 50	9	20
No. 100	0	7
No. 200	0	2.5

2) The filter sand shall be thoroughly cleaned and free of dirt, clay, silt, asphalt, organic material, or other foreign matter and all aggregate passing the No. 200 sieve size shall be non-plastic. The filter sand shall meet the following requirements for quality:

Test / Method	Testing Responsibility [a]	Criterion	Requirement
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 353.2	Proponent	NO3+NO2	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and NEMI Method SM 4500-P E-99	Proponent	Total Phosphorus	0.15 mg/L (Max.)
		Ortho-phosphorus	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 200.8 UCT-KED	Proponent	Copper	10 µg/L (Max.)

c. High Carbon Wood Ash (Biochar)
   1) The High Carbon Wood Ash (HCWA) should consist of screened and processed organic and inorganic residue remaining after the thermal processing of biomass in an oxygen-controlled environment. The biomass feed-stocks should be limited to clean cellulosic material from the 1) woody by-products of pacific northwest forestry operations (including cut residues left after a timber harvest, cut trees that are not marketable as lumber), 2) chipped trees and brush from biomass reduction operations (i.e. Commercial tree trimming), and 3) agricultural residues such as nut shells, straw, orchard pruning, seeds, hulls, and pits. The biomass feedstocks should not include any post-consumer or post-industrial sourced woody biomass (i.e., construction or demolition waste, wood contaminated with paints or sealers, metal, plastic, or other deleterious materials).
   2) The HCWA should be classified as a “class 1” biochar following the international biochar initiative (IBI) guidelines (IBI 2015).
   3) The HCWA should be sourced from a producer with at least 5-years of experience producing HCWA for soil amendments and/or water filtration and meet the following requirements for quality and grading:

Test / Method	Testing Responsibility [a]	Criterion	Requirement
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 353.2	Proponent	NO3+NO2	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and NEMI Method SM 4500-P E-99	Proponent	Total Phosphorus	0.15 mg/L (Max.)
		Ortho-phosphorus	0.15 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 200.8 UCT-KED	Proponent	Copper	10 µg/L (Max.)
Total C and H analysis by dry combustion-elemental analyzer (EPA Method 440.0). Inorganic C analysis by determination of CO_2-C content with 1N HCl, as outlined in ASTM D4373 Standard Test Method for Rapid Determination of Carbonate Content of Soils. Organic C calculated as Total C – Inorganic C.	Manufacturer	Organic Carbon (C_{org})	60% (Min.)
		H: C_{org}	0.7 (Max.)
Proximate Analysis (ASTM D1762)	Manufacturer	Volatile matter	20% (Max.)
		Ash	40% (Max.)
Metals (EPA Method 6020)	Manufacturer	Arsenic	20 ppm (Max.)
		Cadmium	10 ppm (Max.)
		Lead	150 ppm (Max.)
		Mercury	8 ppm (Max.)
		Molybdenum	9 ppm (Max.)
		Nickel	210 ppm (Max.)
		Selenium	18 ppm (Max.)
		Zinc	1400 ppm (Max.)
Total polycyclic aromatic hydrocarbons by US EPA 8270 (2007) using Soxhlet extraction (US EPA 3540) and 100% toluene as the extracting solvent	Manufacturer	PAH	300 ppm (Max.)
Dioxins/Furans TEQ EPA 8290 (2007)	Manufacturer	PCDD/Fs	17 ppb WHO-TEQ [b] (Max.)
Cation Exchange Capacity (USEPA Method 9081)	Manufacturer	milliequivalents CEC/100 g dry soil	Report
Gradation (ASTM D422)	Manufacturer	# 6	100% Passing
		#100	10 % Passing (Max.)

Test / Method	Testing Responsibility [a]	Criterion	Requirement
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 353.2	Proponent	NO3+NO2	0.1 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and NEMI Method SM 4500-P E-99	Proponent	Total Phosphorus	0.1 mg/L (Max.)
	Proponent	Ortho-phosphorus	0.1 mg/L (Max.)
Synthetic Precipitation Leaching Protocol (EPA Method 1312) and EPA Method 200.8 UCT-KED	Proponent	Copper	1 µg/L (Max.)
Producer Analysis	Manufacturer	Iron Content by weight	80% - 97%
Gradation (ASTM D422) or Producer Analysis	Manufacturer	#4	100% passing
	Manufacturer	#8	95 -100% passing
	Manufacturer	#16	75-90% passing
	Manufacturer	#30	25-45% passing
	Manufacturer	#50	0-10% passing
	Manufacturer	#100	0-5% passing
	Manufacturer	#200	0-2.5% passing

B. Bioretention Underdrain Pipe Requirements

1. Slotted, thick-walled plastic pipe must be used, minimum pipe diameter of 6 inches.
2. Slotted subsurface drain PVC per Pierce County Design Guidelines and Public Works Standards and WSDOT Standard Specifications.
3. Slots should be cut perpendicular to the long axis of the pipe and be 0.04 to 0.069 inches by 1-inch long and be spaced 0.25 inches apart (spaced longitudinally). Slots should be arranged in four rows spaced on 45-degree centers and cover one-half of the circumference of the pipe. Underdrain pipe slope must be no less than 0.5 percent.
4. Pipe must be placed in filter material and have a minimum cover depth of 4 inches.
5. Filter material shall meet the requirements of Pierce County Design Guidelines and Public Works Standards Drawing (bioretention section with underdrain).
6. A 4-inch non-perforated cleanout must be connected to the underdrain every 300 feet minimum.

7. Underdrain mineral aggregate gradation:

Sieve Size	Percent Passing
¾ inch	100
¼ inch	30-60
US No. 8	20-50
US No. 50	3-12
US No. 200	0-1
Note: The above gradation is a Type 26 mineral aggregate as detailed for gravel backfill for drains in the City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction.	

2.07 PLAYGROUND DRAIN SYSTEM

Underdrain Aggregate Materials

1. Gravel Backfill for Drain: Shall conform to WSDOT Section 9-03.12(4) requirements.
2. Permeable Ballast: shall conform to WSDOT Section 9-03.9(2).

A. Underdrain Pipe Requirements

1. Perforated, thick-walled plastic pipe must be used, minimum pipe diameter of 4 inches.

B. 2. Perforated subsurface drain PVC shall meet the requirements of AASHTO M252 (standard specification for corrugated polyethylene drainage pipe).

3. Perforations shall be 3/16 inch in diameter and shall be spaced every 1 foot (spaced longitudinally). Slots should be arranged in four rows spaced on 45-degree centers. Underdrain pipe slope must be no less than 0.5 percent.
4. Pipe must be placed in filter material and have a minimum cover depth of 4 inches.
5. Filter material shall meet the requirements of WSDOT Standard Specifications Section 9-03.12(4) (gravel backfill for drains).
6. A 6-inch non-perforated cleanout must be connected to the underdrain every 300 feet minimum.

C. Fittings

1. Fittings shall conform to AASHTO M252, AASHTO M294 or ASTM F2306.

A.

2.08 LEVEL SPREADER

Quarry Spalls Requirements

B. 1. Stones shall consist of 4 inch to 2 inch uniformly graded coarse aggregate.

2. Aggregate fill shall extend a maximum of 1 foot from edge of bentonite clay core while maintaining 6 inch minimum thickness of aggregate layer.

Jute Matting Requirements

1. Matting fabric shall consist of 100% biodegradable woven fabric.
2. Fabric shall be installed using 6 inch landscaping staples placed 3 feet apart.

A. 3. Where roll ends, fabric shall overlap 3 feet with landscaping staples 1/2 foot from fabric ends. The overlap shall be measured from landscaping staples.

2.09 ROUND DRAIN BASIN

PVC surface drainage inlets shall be of the curb inlet structure type as indicated on the contract drawings and referenced with in the contract specifications. The ductile iron frame, grate and hood for each of these structures are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The curb inlet structure shall be as manufactured by Nyloplast a division OF Advanced Drainage Systems, Inc. or prior approved equal.

B. The curb inlet structure required for this contract shall be manufactured from PVC pipe stock, utilizing a thermos-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the structure. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.

C. The grate, frame and hood for all curb inlets shall be ductile iron and shall be made specifically for each so as to prove a round bottom flange that closely matches the diameter of the PVC structure body. The grate, frame and hood shall be capable of supporting H-20 wheel loading for traffic areas. The hood section will have a solid black and be adjustable by use of three (3) locking hex head bolts. The metal used in the manufacture of the casting shall conform to ASTM A536 grade 70-50-05 for ductile iron.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site and Drawings: Carefully examine the site and compare the drawings with existing conditions. By the act of submitting bids, the Contractor shall be deemed to have made such examination and to have accepted such conditions, and to have made allowance therefore in preparing his figure.

B. Verification of Existing Elevations: Verify all connection elevations prior to laying pipe.

C. Verification of Dimensions: Before proceeding with any work, the Contractor shall carefully check and verify all dimensions, sizes, etc. and shall assume full responsibility for the fitting-in of his equipment and to the structure. Where apparatus and equipment have been taken from typical equipment of the class indicated, the Contractor shall carefully check the drawings to see that the equipment he contemplates installing will fit into the spaces.

3.02 INSTALLATION

A. Drainage Structure: Construct catch basins, manholes, and other drainage structures at locations, and to the design and dimensions indicated. Set covers and grates flush with finished surface in paved and concrete areas or 3 inches above finished grade in landscaped areas. Exposed concrete work shall have a smooth troweled finish with rounded comers and edges finished plumb and true. Provide grates, frames, and covers for catch basins as detailed and indicated.

1. The specified PVC structure drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 1, class 2, or class 3 material as defined in ASTM D2321. Bedding and backfill for the curb inlet structure shall be placed and compacted uniformly in accordance with ASTM D2321. The curb inlet structure body will be cut at the time of the final grade. No brick, stone, or concrete blocks will be required to set the grate to the final grade height. For H-20 load rated installation, a concrete ring will be poured under the frame, grate, and hood. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fine, ground water, and soft foundations refer to ASTM 2321 guidelines.

ADS N-12 Pipe:

1. Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot. (0.3 m) and for 54- and 60-inch (1350 and 1500 mm) diameters, the minimum cover shall be 2 ft. (0.6 m) in single run applications.

B. Excavation, Bedding, and Backfill:

1. Trenching: The length of trench excavation in advance of pipe laying shall be kept to a minimum and in no case shall exceed 100 feet unless specifically authorized by the Engineer.
2. Excess excavated trench material shall be removed and disposed of off-site (per the conditions of all local ordinances and regulations for dumping/filling) or if deemed suitable by the Engineer, shall be placed adjacent to the trench in piles so that the toe of the slope is at least two feet from the edge of the trench. Free access shall be maintained to all fire hydrants, water valves, and meters.

C.

3. Where trench excavation equals or exceeds a depth of 4 feet, the contractor shall provide, construct, maintain and remove, as required, safety systems that meet the requirements of the Washington Industrial safety and Heal Act, RCW 49.17, including WAC 296-155.
4. Excavation for structures: shall be in accordance with Section 7-05.3 of the Standard Specifications.
5. Bedding: Bedding shall be installed in accordance with Standard Specification Section 7-04.3(1) of the Standard Specifications and the Contract Documents. Bedding shall provide uniform support along the entire pipe barrel, without load concentration at joint collars or bells. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bell holes shall be dug as required to ensure uniform support along the pipe barrel. Bedding disturbed by pipe movement or by removal of shoring or movement of a trench shield or box shall be reconsolidated prior to backfill.
6. Laying Pipe: Shall be in accordance with Section 7-04.3(2) of the Standard Specifications. The contractor shall comply with manufacturer's recommended tolerance for eccentricity.
7. Line and Grade: Variance from established line and grade shall not be greater than one thirty-second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (1/2) inch, provided that such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surface, does not exceed one sixty-fourth (1/64) per inch of pipe diameter, or one-half (1/2) inch maximum.
8. Connections: Connections to manholes shall be made in accordance with the drawings. Pipe branches, stubs or other open ends which are not to be immediately connected shall be capped or plugged.
9. Backfill: Shall be in accordance with Section 7-04.3(3) of the Standard Specifications; material shall be per Section 31 05 16 "Aggregates". Backfill shall be placed in successive layers with the first layer not to exceed 2 feet above the pipe, and the following layers not exceeding 12 inches in loose thickness, with each layer compact to the required density. Trenches shall be backfilled as soon after the pipe laying as possible. Backfill trenches in the vicinity of catch basins, manholes, or other appurtenances will not be permitted until the masonry has become thoroughly hardened. Backfill above the pipe zone will be accomplished in such a manner that the pipe will not be shift out of position nor damaged by impact or overloading.

Miscellaneous

1. Removal of Water: The contractor shall at all times provide and maintain ample means and devices to remove and dispose of all water entering the trench excavation during the process of laying the pipe.
2. Preparation of Pipe: All pipe and fittings shall be carefully inspected before being laid and cracked, broken or defective pipe shall not be used in the work.

D. Restoration: At minimum, road paved areas shall be restored to existing thickness using like materials. Disturbed roadside-shoulders shall be restored with 6 inches of crushed surfacing top course. Disturbed cut and fill slopes shall be fertilized and re-seeded.

E. Re-vegetation: It shall be the Contractors responsibility to restore all disturbed areas to their original state. Rough grade compact earth, fine grade, place topsoil, fertilize and seed disturbed areas and perform all other necessary operations in accordance with specification section 31 20 00 (Earth Moving).

F.

3.03 CLEANING AND TESTING

A. General: Cleaning and testing of the storm drainage conveyance piping systems shall be per Section 7-04.3(1) of the Standard Specifications. All new lines shall be subjected to testing aft installation. Tests shall be an exfiltration test or air pressure test. Conduct tests in the presence of the Owner's representative.

B. Cleanliness of Site: During progress of work, keep premises reasonably free of debris and waste materials.

C. Removal of Debris: Upon completion and before final acceptance of work, remove all debris, rubbish, left-over materials, tools, and equipment from site.

D. Prior to acceptance of work, each line and structure shall be cleaned to ensure that the entire system is clean and free of obstructions of any nature and provide written certification attesting thereto. Mechanically remove all sediment displaced from lines from the system, and do not flush downstream.

PART 4 PAYMENT

A. Payment shall be full compensation for the entire scope of work within this section, including all operations necessary for the complete installation of all storm drainage structures and components to the satisfaction of the project plans as well as the preparation, safety, and quality control measures.

END OF SECTION