



Civil & Electrical Specifications

Sedro Woolley|Substation

Comment [MLT1]: Engineer Edits

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SECTION 01300
SUBMITTALS

PART 1. GENERAL

1.01 No materials shall be delivered to the site until the proposed source material tests have been approved by the Owner.

1.02 All submittals are for Owner information and approval. Contractor shall order specific submittal items only when materials have been approved or directed to do so by Owner.

1.03 The Contractor shall review and approve all submittals prior to transmitting to Owner. Submittals shall indicate dimensions, installation details, type of material, pattern, color, weight or grade, connections required to work with other trades, and methods of finishing. Submit shop drawings for each section of the specification where indicated. Final approval of dimensions, fitting and ability to comply with the Contract documents shall be the Contractor's responsibility.

END OF SECTION 01300

SECTION 01600
DELIVERY, STORAGE, AND HANDLING

PART 1. GENERAL

1.01 SUBMITTALS

Submit a detailed plan for the unloading and handling of the transformer, metalclad switchgear, and MPAC enclosure. The plan shall include equipment to be used for unloading and shall name the SUBCONTRACTOR performing the work.

1.02 PRODUCTS

- A. Includes: new material, machinery, components, equipment, fixtures, structures, and systems forming the Work
- B. Does not include: machinery and equipment used for preparation, fabrication, conveying and erection of the Work

1.03 TRANSPORTATION AND HANDLING

- A. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage to Owner's property.
- B. Unloading of the power transformer, metalclad switchgear, and MPAC enclosure at the Project Site will be witnessed by Owner's Representative. Coordinate with Owner's Representative for arrangement and methods of receiving, loading, inspecting, unloading, and storage of Owner-furnished equipment

1.04 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Cover products subject to deterioration with impervious sheet covering. Provide ventilation and heating as required, to avoid condensation. Supply temporary electric power connections to electrical equipment anti-condensation space heaters.
- D. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- F. In addition to requirements of this section, store and protect products as specified in the individual Specification sections.

END OF SECTION 01600

SECTION 01640
SUBSTITUTION AND PRODUCT OPTION

PART 1. GENERAL

1.01 "OR APPROVED EQUAL" CLAUSE

- A. In order to establish a basis of quality, certain processes, equipment and materials may be specified, on the plans or herein, by designating a manufacturer by name and referring to a brand or product designation. It is not the intent of these specifications to exclude other processes, equipment or materials of a type and quality equal to those designated.
- B. Whenever a manufacturer's name, brand or item designation is given, it shall be understood that the words "or approved equal" follow such name or designation whether, in fact, they do so or not.

1.02 SUBSTITUTIONS

- A. Within two weeks after notice to proceed, Owner will consider formal requests from Contractor for substitution of products, construction methods or equipment in place of those specified herein.
- B. The Contractor's submittal requesting substitutions shall include:
 - 1. Detailed description of method or products.
 - 2. Comparison of proposed substitution with product or method specified.
 - 3. Data relating to changes in construction scheduling.
 - 4. Accurate cost data on proposed substitutions in comparison to method or product specified.

END OF SECTION 01640

SECTION 02110
SITE PREPARATION

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Work shall include, but not be limited to, removal of the following items within clearing limits as defined by the Grading Plans:
 - 1. Roots and debris.
 - 2. Vegetative layer, soft silt and topsoil.
- B. Following the grubbing and stripping operations, the site shall be ready for excavation and placement of embankment.

PART 2. MATERIALS

2.01 Non-applicable

PART 3. EXECUTION

3.01 EXAMINATION

- A. The Contractor shall examine the site to determine the types of materials to be removed.

3.02 PROTECTION

- A. The Contractor shall not damage trees, shrubs, plants, or other vegetation outside of the clearing limits shown on the Plans.
- B. All trees, shrubs, plants or vegetative cover damaged by the Contractor outside of the clearing limits shall be restored to the satisfaction of the Engineer at the Contractor's expense.

3.03 PERFORMANCE

- A. Grubbing
 - 1. All roots shall be removed a minimum of 12-inches below the original ground surface, except that all roots 1-inch and larger shall be removed entirely.
 - a. Deeper grub depths shall be meet in areas as noted on plans.
 - 2. The roots of all plants which normally sprout from roots, as identified by the Engineer, shall be removed.
- B. Stripping
 - 1. The existing vegetation layer and topsoil, and soft or organic rich near surface soils shall be removed from all areas of the site to be graded.
- C. Disposal

1. All trees, shrubs, roots, brush, vegetation, topsoil, debris, asphalt and concrete shall be removed from areas to be graded and disposed of in a legal manner.
2. No materials resulting from clearing and grubbing operations may be burned or disposed of on site.

END OF SECTION 02110

SECTION 02220
EXCAVATION AND EMBANKMENT

PART 1. GENERAL

1.01 SUBMITTALS

- A. Submit gradation test results for all imported fill material proposed for construction.

PART 2. MATERIALS

2.01 EMBANKMENT

- A. Material for embankment shall be well-graded and granular, free of debris, organic material, frozen material, concrete, rubble or other objectionable material
Embankment material shall meet or exceed WSDOT Section 9-03.14(2) Select Borrow.
- B. All embankment material shall be approved by the Owner prior to importing or placement. It shall be the Contractor's responsibility to use the proper fill material to suit existing weather conditions and to change fill material as directed by the Owner.
- C. Material from on-site excavation may be used for embankment if it meets the requirements specified above and is approved by the Owner. Contractor shall provide gradation tests for on-site material upon request of Engineer to obtain approval. Otherwise, material shall be imported from off-site.

PART 3. EXECUTION

3.01 STRUCTURAL EXCAVATION

- A. Excavate to lines and grades shown on the approved design drawings, or as directed by the Owner's representative. Permissible tolerances shall not exceed one-tenth of one foot variation in elevation. Over-excavation beyond designated limits shall be replaced with embankment material at Contractor's expense.
- B. If an excavation gets wet, or if exceptionally weak materials are encountered in an excavation, all softened soils should be stripped off down to undisturbed soil and replaced with compacted, embankment material. Perched groundwater, if encountered, may need to be controlled with sump pumps. Collected water shall be discharged to a suitable discharge point.
- C. Where forming is required, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, backfilling and compaction, and installation of services and inspection. Excavation walls and bottoms shall be trimmed to reasonably smooth lines and grades, without undercutting. Bottom of excavation shall be square and true within allowed tolerances.
- D. Final cut areas shall be proof rolled, where practical, with heavy construction equipment to a firm and unyielding condition prior to placing compacted fill material. Probing shall be used to evaluate subgrade if proof rolling is not feasible.

- E. The Owner's representative shall be present during all proof rolling operations.
- F. Areas of soft, wet soil, or areas that exhibit "pumping" or weaving action when rolled, shall be excavated to a depth specified by the Owner and the unsuitable material replaced with embankment material.

3.02 DISPOSAL OF WASTE MATERIAL

- A. Foreign materials, buried rubble or other buried structures, and native soil materials which cannot be processed to uniform moisture or gradation necessary to achieve specified densities, shall be disposed of off-site at the appropriate waste disposal area unless stated otherwise in the Project Conditions.
- B. Excess native soil shall be disposed of off site at the appropriate disposal area unless stated otherwise in the Project Conditions.
- C. The Contractor shall be responsible for all permits required for such off site disposal.

3.03 EMBANKMENT AND COMPACTION

- A. All embankment material shall be conditioned to a moisture content suitable for compaction.
- B. Material shall be placed in lifts not to exceed 8-inches in loose thickness and each lift shall be compacted to 95 percent of maximum dry density as determined by ASTM D 1557 (latest) prior to placement of subsequent overlying lifts.
- C. Existing sloping ground over 20% shall be benched prior to the placement of fill material. Benching shall begin at the top of the slope. Fill material shall be placed in horizontal layers and keyed into the existing slope. Compaction equipment shall be operated on the slope as each successive lift is placed.
- D. If standing water occurs at the bottom of an excavation, initial fill below water level shall be quarry rock or free draining sand and gravel compacted to 95% of maximum dry density as directed.

3.04 MOISTURE CONTROL

- A. During the compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the fill. Maintain moisture content uniform throughout the lift. Insofar as practicable, supplement natural moisture, if required, by sprinkling the fill. At the time of compaction, the water content of the material shall be at optimum water content plus or minus two percentage points.
- B. Do not compact fill material which contains excessive moisture. Aerate material by blading, discing, harrowing, or as approved, to hasten the drying process prior to compaction.
- C. Any materials which become unstable as the result of improper selection of techniques, equipment, or operations during inclement wet weather shall be replaced at Contractor's expense.

3.05 COMPACTION TESTING AND EVALUATION

- A. In-place density and moisture content will be verified using ASTM D1556, D2922, or D3017. The Contractor will cooperate with this testing work by leveling small test areas as designated by the Owner.
- B. Owner's costs of retesting failed areas will be back charged to the Contractor.

END OF SECTION 02220

SECTION 02225

TRENCHING

PART 1. GENERAL

1.01 SUBMITTALS

- A. Submit gradation test results for all imported material proposed for construction.
- B. Submit working drawings and calculations for proposed shoring methods according to WSDOT Section 2-09.3(3) "Shoring and Cofferdams"

PART 2. MATERIALS

2.01 PIPE BEDDING

- A. Pipe bedding material for rigid pipe shall conform to PSE Standard Specification 1275.1340, "Gravel Backfill Aggregate for Pipe Bedding".
- B. Pipe bedding for flexible pipe shall conform to WSDOT Section 9-03.12(3) "Gravel Backfill for Pipe Zone Bedding."

2.02 TRENCH BACKFILL

- A. Embankment material is allowed for trench backfill, except the maximum particle size shall not exceed 1-inch within 12-inches of the top of the pipe.

2.03 SHORING

- A. Materials for shoring shall be in accordance with WSDOT Section 2-09.3(3)D.

PART 3. EXECUTION

3.01 TRENCH EXCAVATION AND PREPARATION

- A. Trenches shall be excavated to the width and depth that will allow placement of the pipe bedding and pipe as specified on the Plans and in these Specifications.
- B. Prior to the placement of the pipe bedding, the trench bottom shall be graded to remove any organic material, rocks larger than 4-inches in diameter, roots, and other undesirable material.
- C. Areas in the trench bottom that contain soft, wet soils, or exhibit "pumping" action shall be removed as directed by the Engineer. Embankment material shall be used to replace the unsuitable.
- D. Trenches shall either be over-excavated to provide a stable slope or shored to provide worker protection as required by law.

3.02 PLACEMENT OF BEDDING MATERIAL

- A. Prior to placement of the pipe, bedding materials shall be placed and spread along the trench bottom and compacted to a 4-inch minimum thickness to provide a uniform support along the entire length of the pipe.

- B. Subsequent lifts of pipe bedding of not more than 6-inch thickness each shall be placed along the sides of the pipe and each lift compacted prior to placement of the next lift until a total additional thickness of pipe bedding equal to one-half of the pipe diameter is reached or the thickness shown on the drawings, if greater.
- C. Care shall be taken to ensure that the bedding material is brought up simultaneously on both sides of the pipe and that it is thoroughly worked under the pipe haunches prior to compacting.

3.03 TRENCH BACKFILL

- A. Trench backfill shall be placed in lifts not to exceed 8-inches in loose thickness and each lift shall be compacted to 95 percent of maximum dry density as determined by ASTM D1557 (latest) prior to placement of subsequent lifts. Care shall be taken during compaction operations so as to not damage the pipe.
- B. Compaction equipment shall be approved by Owner prior to trench excavation.

3.04 EXCAVATION AND BACKFILL FOR CATCH BASINS

- A. Excavation for catch basins shall be sufficiently oversized to permit mechanical compaction of backfill.
- B. Backfill material and placement shall be as specified for trenches.

END OF SECTION 02225

SECTION 02231
BASE COURSE & CRUSHED SURFACING

PART 1. GENERAL

1.01 SUBMITTALS

- A. Submit gradation tests for all imported backfill material in accordance with ASTM D422 performed by an approved independent testing laboratory and certified to be in compliance with specifications.
- B. Submit 1-gallon samples of all fill material proposed for construction. Samples shall be representative and clearly marked to show the source of material and the intended use on the Project.

PART 2. MATERIALS

2.01 IMPORTED GRAVEL BACKFILL

- A. Base Course
 - 1. Base course material shall be in accordance with PSE Standard Specification 1275.1310, "Base Course Aggregate".
- B. Top Course Crushed Surfacing
 - 1. Top course materials material shall be in accordance with PSE Specification 1275.1320, "Top Course Crushed Aggregate. "
- C. Yard Course Crushed Surfacing
 - 1. Imported yard course material shall be per PSE Standard Specification 1275.1330, "Yard Course Crushed Aggregate".
- D. It shall be the Contractor's responsibility to use the proper fill material to suit existing weather conditions and to change fill material as directed by the Owner.
- E. Material finer than the No. 200 sieve shall be non-plastic. Gravel backfill material shall be free from roots, debris, and other deleterious materials, and shall be well graded, free draining and compactable.
- F. The Contractor shall make his own arrangements to obtain the necessary materials at his own expense, and all costs of acquiring, producing and placing this material in the finished work shall be included in the unit contract prices.

2.02 COMPACTION EQUIPMENT

- A. Compaction equipment shall be of suitable type and adequate to obtain the densities specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort.

PART 3. EXECUTION

3.01 PLACEMENT AND COMPACTION

- A. All aggregate material shall be placed at the locations and to the depths and grades as shown on the Plans. All depths indicated on the Plans are compacted depths.
- B. Yard and driveways shall have a minimum 9-inch thick base course. Station yard and shoulders shall be surfaced with a minimum 4-inch yard course.
- C. The following nominal depth of compacted material shall not be exceeded in any one lift without the approval of Owner.
 - 1. Base Course: 9"
 - 2. Top Course: 3"
- D. Each lift shall be compacted to 95 percent maximum dry density as determined by ASTM D1557 (latest) and/or D3017 prior to placement of the next lift.
- E. Backfill shall not be placed until forms, rubbish, and deleterious materials have been removed from area of work, and all inspections and approvals obtained.
- F. No backfill shall be placed against any concrete structure until concrete has set and cured for at least seven days or as approved by Owner.
- G. Structures against which backfill is to be placed shall be adequately braced and shored to prevent displacement or damage during backfilling and compaction.

3.02 REMOVAL AND REPLACEMENT

- A. Where aggregate (base course, top course, or yard course) must be removed for the installation of underground facilities, care shall be taken that the different aggregate materials are not mixed or that the aggregate materials are not contaminated with other materials such as embankment fill. Contaminated material shall not be reused but shall be removed from the site and replaced with materials as originally specified.
- B. After the installation of underground materials, structures, and equipment, aggregate shall be placed and re-compacted as originally specified. Special care shall be taken to ensure compaction in trenches and around foundations and drainage structures.

END OF SECTION 02231

SECTION 02275

RIPRAP

PART 1. GENERAL

1.01 SUBMITTALS

- A. Submit gradation test results for riprap demonstrating compliance with specifications.

PART 2. MATERIALS

2.01 STONE

- A. Stone for riprap shall be hard, sound, durable and free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather.

2.02 GRADING

- A. Riprap shall be free of any rock fines, soil, organics, debris, or other extraneous material.
- B. Unless shown otherwise in the drawings, riprap shall meet the following requirements for grading:

PART 3.	Sieve	PART 4.	Percent
Size		Passing	
PART 5.	8"	PART 6.	100
PART 7.	3"	PART 8.	40
		(max)	
PART 9.	¾"	PART 10.	10
		(max)	

PART 11. EXECUTION

11.01 PLACEMENT

- A. Riprap shall be placed at the locations and to the depths indicated on the Plans.
- B. Material shall be placed in such a way that all relatively large stones are in contact with each other and the voids between filled with the finer materials to provide a well-graded, compacted mass.
- C. Care shall be taken not to disturb the underlying materials when placing riprap material.
- D. After placement, the riprap shall be compacted by tracked equipment making a minimum of three passes.

END OF SECTION 02275

SECTION 02722
SITE STORM DRAINAGE SYSTEM

PART 1. GENERAL

1.01 SUBMITTALS

1. Submit shop drawings for custom formed Type 2 manholes proposed for project

Comment [MLT2]: Engineer to verify if this submittal is warranted based on complexity of structures.

1.02 TRENCHING AND BACKFILL

- A. Requirements for trenching, pipe bedding, trench backfill, and excavation, and backfill for catch basins are included in SECTION 02225.

PART 2. MATERIALS

2.01 DRAIN AND CULVERT PIPES

- A. Drain and culvert pipes shall be constructed of round, plain or perforated, high density polyethylene corrugated pipe or PVC pipe as noted on the Drainage Plan.
1. PVC pipe for gravity storm sewer shall conform to ASTM D3034, "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings", SDR35. PVC pipe shall have integral wall bell and spigot joints. Joints shall conform to ASTM D3212, "Joints for Drain and Sewer Pipes Using Flexible Elastomeric Seals".
2. High Density Polyethylene (HDPE) pipe and fitting material shall comply with the requirements of ASTM D3350 Cell Classification 324420C; or ASTM D1248 Type III, Class C, Category 4, Grade P33.
3. HDPE pipe shall have a smooth interior and corrugated exterior. Four through ten inch pipe shall meet the requirements of AASHTO M252 Type S.
4. Fittings shall meet the requirements of AASHTO M252 or AASHTO M294. Fabricated fittings shall be welded on the interior and exterior at all junctions.
5. Corrugated pipe shall be joined with coupling bands or external snap couplers covering at least two full corrugations on each end of the pipe. Silt-tight (gasketed) connections shall be used and incorporate a closed-cell synthetic expanded rubber gasket conforming to ASTM D1056 Grade 2A2. Gaskets shall be installed on the connection by the pipe manufacturer.

2.02 CATCH BASINS AND INLETS

- A. Catch basins and inlets shall be pre-cast concrete as noted on the Plans.
1. Type 1 catch basin shall conform to Washington State Department of Transportation (WSDOT) Standard Plan B-5.20-00, latest revision.
2. Inlets shall conform to Washington State Department of Transportation (WSDOT) Standard Plan B-25.60.00, latest revision.

2.03 METAL FRAME AND GRATE

- A. Metal frame and grate for all Inlets and Type 1 catch basins shall conform to WSDOT Standard Plan B-30.10-00 and B-30.20-01 or B-30.50-00, latest revision.

PART 3. EXECUTION

3.01 DRAIN AND CULVERT PIPES

- A. Pipe shall be installed true to line and grade as shown in the Drainage Plan, and in accordance with the typical pipe bedding detail.
- B. Care shall be taken to ensure that the pipe is properly aligned before joints are forced home and that joints are not contaminated with mud, silt, gravel, or other foreign materials prior to or during construction.
- C. All perforated pipes shall be installed with perforations down.

3.02 CATCH BASINS

- A. All catch basins shall be installed on a level compacted or undisturbed foundation, true to line and grade as shown on the Plans.
- B. All basins shall be water-tight and covers shall be seated properly to prevent rocking.
- C. All joints and wall openings shall be thoroughly grouted to be watertight.
- D. The ends of all pipes shall be trimmed flush with the inside walls.
- E. Grates and solid covers shall be adjusted to the grades shown on the Plans.

END OF SECTION 02722

SECTION 02731

SPILL PREVENTION, COUNTERMEASURE & CONTROL APPARATUS (SPCC)

PART 1. GENERAL

1.01 SUBMITTALS

- A. Provide cut sheets for Rock Containment System

PART 2. MATERIALS

2.01 OIL STOP VALVE ASSEMBLY

- A. The oil stop valve assembly shall conform to the requirements of an AFL/Clark Oil Stop Valve Model OSV- 6 or equal.

2.02 PIPING

- A. Piping for the oil stop valve assembly shall be Schedule 80 PVC, ASTM C-14. Perforated pipe shall be Schedule 80 PVC with holes drilled as shown on drawings.

2.03 GRATE INLET

- A. The enclosure for the oil stop valve assembly shall be a Type 2 grate inlet per WSDOT Standard Plan B-35.40-00 (latest) with a 1/8" thick powder coated (safety yellow) steel diamond plate lid, as noted on the Drainage Plan Details.

2.04 GATE VALVE

- A. Gate valve shall be heavy duty bronze conforming to the requirements of ASTM B62.
- B. Valve shall be of the double disc, taper seat type, with rising stem, union bonnet and handwheel for operation.
- C. Manufacturer's name, type of valve, and size shall be cast on the valve.
- D. Connection to the pipe shall be with a mechanical union joint with suitable transition gasket.

2.05 VALVE BOX AND LID

- A. The valve box and lid shall be manufactured from cast iron. The box shall be extendible to obtain the depth required.

2.06 OPERATING HANDLE

- A. A standard hand wheel shall operate the valve.

2.07 BENTONITE

- A. Shall be a granular, low dust sodium bentonite.

2.08 ROCK CONTAINMENT SYSTEM

- A. EnviroGrid Cellular containment system shall be utilized to stabilize yard rock in SPCC curb. Use product identified on plans.

PART 3. EXECUTION

3.01 VAULT

- A. The oil stop valve vault shall be installed in accordance with the Plan.

3.02 VALVE ASSEMBLY INSTALLATION

- A. The assembly shall be installed in the Type 2 grate inlet as noted on the Plan details.
- B. All PVC joints shall be solvent welded per manufacturer's specifications.
- C. The gate valve box shall be adjusted to be flush with finished grade.

3.03 BENTONITE SEAL

- A. The bentonite seal shall be spread evenly and uniformly over the sand blanket at the rate of 100 pounds of bentonite per 100 square feet.

END OF SECTION 02731

SECTION 02901

TEMPORARY EROSION/SEDIMENT CONTROL

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Work shall consist of providing temporary erosion/sedimentation control during the construction phase of the project. Control facilities shall be installed prior to clearing when possible. They shall be constructed in accordance with local regulations and shall ensure sediment laden water does not enter natural drainage or storm sewer systems.

1.02 SUBMITTAL

- A. Provide first revision prior to mobilization indicating and/or verifying start of construction BMPs to be utilized. The accepted submittal shall be the first update in the project's Construction SWPPP that shall be maintained on site by the Contractor's designated CESCL (Certified Erosion and Sediment Control Lead)

1.03 MAINTENANCE

- A. The Contractor shall maintain all temporary erosion control devices in good condition and shall immediately repair any non-functioning devices and notify Construction Manager.

PART 2. MATERIALS

2.01 FILTER FABRIC FENCE

- A. Fence filter material shall be as specified on the drawing details.
- B. Fence supports shall be 2" X 4" Douglas Fir or equivalent.
- C. Wire fabric shall be 14-gauge material welded into 2" X 2" mesh openings.

2.02 STABILIZED CONSTRUCTION ENTRANCE

- A. Material shall be 4 to 8-inch quarry spalls.

PART 3. EXECUTION

3.01 FILTER FABRIC FENCE

- A. Fences shall be constructed to be 2 ft. in height above grade.
- B. Support posts shall be installed at 6 feet on center and buried a minimum of 1 ft. below grade.
- C. The 14-gauge wire mesh fabric shall be securely fastened to the support posts with wire staples for the total height of the post above ground.
- D. The filter fabric material shall be fastened to the wire mesh on the project side of the fence using staples or wire rings.

- E. The bottom of the filter fabric material shall be buried in a 4-inch deep trench the full length of the fence.
- F. Tie-back wires shall be installed as directed by the Engineer to prevent fence overturning due to heavy sediment loads.

3.02 Stabilized Construction Entrance

- A. Quarry spalls shall be installed to a minimum depth of 12-inches.

3.03 SEEDED AREAS

- A. Unsurfaced graded areas shall be seeded as a means of erosion control immediately following completion of earth work.
- B. All areas except the station yard, driveways, the shoulder around the perimeter of the station fence, and any other areas specified to be covered with crushed surfacing or paving shall be seeded as specified.
- C. Special care shall be taken to ensure exclusion of seed from the areas outlined above.
- D. All two to one slopes or steeper, except for rock slopes, shall be covered with excelsior matting or straw tacked with asphalt emulsion in order to reduce erosion and enhance vegetative establishment.

END OF SECTION 02901

SECTION 03110
FORMWORK FOR STRUCTURAL CAST-IN-PLACE CONCRETE

PART 1. GENERAL

1.01 CODES

- A. Materials, preparation and installation shall conform to the latest International Building Code and ACI Standards.

PART 2. MATERIALS

2.01 FORM RELEASE AGENT

- A. Form release agent for surfaces not exposed for view shall be clear light petroleum form oil.

2.02 SNAP TIES

- A. Snap ties, with cones, shall have a minimum assembled working strength to resist imposed loads of freshly placed concrete, with a break-off point one-inch minimum back from surface. Removable form bolts and clamps with cones shall meet requirements of snap ties. Wire ties and wood spreaders shall not be used.

2.03 PLYWOOD

- A. Plywood shall be new or in new condition BB Plyform Class I exterior grade 3/4 inch minimum thickness.

2.04 FRAMING

- A. Framing, studding and bracing shall be "standard" grade or better, West Coast species lumber.

2.05 CHAMFER STRIPS

- A. Chamfer strips shall be 3/4-inch, 45 degree bevel wood strips for all exposed edges, when specified.

2.06 EMBEDDED ITEMS

- A. Items required for mechanical and electrical installation shall conform to ACI Standard 318, "Building Code Requirements for Reinforced Concrete Construction," paragraph 6.3, for embedment of pipes and conduits.
- B. Aluminum and copper materials shall not be used.

PART 3. EXECUTION

3.01 LAYOUT

- A. Forms shall be located, leveled, and aligned by engineering level or transit. Forms shall be properly braced and tied together to maintain position and shape under all load conditions.

3.02 FORM RELEASE AGENT

- A. Contact surface of forms shall be coated as required with releasing agent before first use and after each subsequent use.

3.03 SNAP TIES

- A. Snap ties shall be spaced for job conditions and as required for rate of concrete placement.

3.04 FORM CONSTRUCTION

- A. Before concrete is placed in any form, verify horizontal and vertical form position and correct all inaccuracies. Complete all wedging and bracing in advance of placing of concrete.
- B. When setting form ties, leave no metal to remain in wall closer than one-inch from surface. Ties shall fit tight to prevent mortar leakage at holes in form. Ties shall be protected from rusting at all times. No wire ties or wood spreaders will be permitted. Cutting ties back from concrete face will not be permitted.
- C. Coordinate the installation of all items to be inserted or embedded in concrete. Support all items to maintain accurate alignment and prevent distortion during concrete placement.

3.05 BLOCKOUTS

- A. Where pipes or conduits pass through the slab, place such conduits in the form prior to pouring the concrete.

3.06 NOTIFICATION AND INSPECTION

- A. Prior to placing of any concrete, and after placement of reinforcing steel in the forms, notify the Owner at least 24 hours in advance of placing concrete to permit inspection.

END OF SECTION 03110

SECTION 03200
CONCRETE REINFORCEMENT

PART 1. GENERAL

1.01 Codes and Standards

- A. Materials, preparation and installation shall conform to the latest International Building Code and ACI Standard 318, "Building Code Requirements for Reinforced Concrete"; and CRSI, "Manual of Standard Practice."

1.02 Storage

- A. Materials are to be stored on-site, neatly separated, and racked up on skids off the ground, with identification tags plainly visible for convenient identification.

1.03 Submittals

- A. Provide shop drawings showing steel reinforcing details in accordance with the drawings and as specified herein.

- 1. List required shop drawings for project or utilize the following language: None required for this Project. Steel reinforcement placement shall match Plan details.

Comment [MLT3]: Engineer determines if complexity of project warrants review of rebar shop drawings for foundations

PART 2. MATERIALS

2.01 Deformed Steel Bars

- A. Bars for reinforcement shall meet the requirements of ASTM A615, Grade 60, "Billet Steel Bars for Concrete Reinforcement," unless shown otherwise on the drawings. Deformed steel bars shall be per PSE Standard 1275.1200.

2.02 TIE WIRE

- A. Tie wire shall be 16 gauge minimum, black annealed steel, meeting requirements of Federal Specification FS QQ-W-461G.

2.03 WELDS

- A. Reinforcing steel shall not be welded.

PART 3. EXECUTION

3.01 PLACEMENT AND SUPPORT

- A. Reinforcement shall be placed in accordance with PSE Standard Practice Number 8350.2150, INSTALLATION REQUIREMENTS FOR DEFORMED STEEL REINFORCING BARS.
- B. Maintain minimum concrete cover over reinforcement and tolerances as specified in ACI 318.

3.02 SPLICES

- A. Splices for reinforcing bars shall be located and lapped as shown on the drawings and approved shop drawings.

END OF SECTION 03200

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1. GENERAL

1.01 CODES AND STANDARDS

- A. Unless shown otherwise on the drawings, materials, preparation, and installation shall conform to the latest International Building Code, ACI Standard 318, "Building Code Requirements for Reinforced Concrete Construction"; and ACI Standard 301, "Structural Concrete for Building."

1.02 SUBMITTALS

- A. If requested, Contractor shall provide manufacturer's certification that materials meet specified requirements. Contractor shall also provide certification of material content per cubic yard of ready-mixed concrete furnished.
- B. Submit concrete design mix indicating compliance with specifications. Design mix may be used, as approved by Owner, at Contractor's option.

1.03 NOTIFICATION AND INSPECTION

- A. Prior to placing any concrete, and after placement of reinforcing steel in the forms, notify the Owner at least 24 hours in advance to allow time for inspection.

PART 2. MATERIALS

2.01 CONCRETE

- A. Concrete shall be per PSE Standard Specification 1275.1130.

2.02 CURING AGENT

- A. A curing agent shall be required for the building foundation and floor and other slabs. The curing agent shall be non-yellowing and meet requirements of ASTM C309, Type 1, Classes A and B, such as Day-Chem Cure and Seal 315.

PART 3. EXECUTION

3.01 PREPARATION

- A. Water shall be removed from place of deposit before concrete is placed.
- B. All laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.

3.02 PLACEMENT

- A. Concrete shall be placed in accordance with ACI 301.
- 1. Concrete shall be placed so as to avoid segregation due to handling or flowing, and at such rate that it remains plastic and flows easily into spaces between reinforcement.

2. After concrete placement is started, it shall be carried on as a continuous operation until placing of a panel or section, as defined by its boundaries or predetermined joints, is completed.
3. All concrete shall be thoroughly consolidated by suitable means during placement and shall be worked around reinforcement and embedded fixtures and into corners of forms.
4. No addition of water to increase slump will be allowed unless approved by the Owner.
5. A bonding agent shall be used when placing concrete against existing concrete surfaces.
- B. Concrete placement during hot and cold weather shall be in accordance with ACI 305 and ACI 306.
 1. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather.
 2. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used.
 3. During hot weather, proper attention shall be given to handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that may impair required strength or serviceability of the member or structure.

3.03 CURING

- A. Concrete shall be protected from premature drying and excessive hot or cold temperature extremes. Curing procedures shall be maintained for seven days after placement.
- B. The curing agent shall be applied per manufacturer's instructions. Agent shall be applied immediately after the final finishing when the water sheen has disappeared. Care shall be taken to ensure an even film without under or over-application.

END OF SECTION 03300

SECTION 03345
CONCRETE FINISHES

PART 1. GENERAL

1.01 SCOPE

- A. All surfaces shall be finished as specified herein.

PART 2. MATERIALS

- A. Not Used

PART 3. EXECUTION

- A. Working on unformed surfaces in various finishing operations shall be held to the minimum required to produce the desired finish. Use of any finishing tool in areas where water has accumulated will not be allowed. Work in these areas shall be delayed until the water has been absorbed or has been removed. In no case shall cement or mixture of cement and sand be spread on the surface to absorb excess moisture, nor shall such materials or water be added to facilitate troweling. Joints and edges, unless specified otherwise, shall be carefully finished with edging tools.
- B. Surfaces shall be worked to an even, uniform finish. Consolidate, level and screed to true levels or slopes. Float concrete surface by hand or power equipment to within an allowable tolerance of 1/8-inch in ten feet. Floating shall be started after some stiffening has taken place in the surface concrete and the moisture has disappeared.
- C. The area of slab in front of exterior doorways shall receive a light broom finish, as shown on the drawings.
- D. Exterior slabs and tops of foundations shall receive a light broom finish following screeding and floating. After brooming, neatly tool joints and edges.
- E. Snap-tie holes shall be filled with grout or dry-pack after forms are removed.

END OF SECTION 03345

SECTION 03602
NON-METALLIC GROUT

PART 1. GENERAL

1.01 REFERENCES

- A. Conform Non-Shrink Grouts to the following minimum standards:
 - 1. ASTM C827 - Standard Test Method for Early Volume Changes of Cementitious Mixtures
 - 2. ASTM C938 - Nonshrink Grout
- B. PSE Standard 8350.0100, "Installing Grout"

1.02 NOTIFICATIONS

- A. Notify Owner's Representative at least 24 hours, or the Friday before the following Monday, before grouting structures and equipment. Inform of activities taken to avoid damage to grout from freezing temperatures and/or conditions causing significant moisture loss before proper curing occurs.

1.03 SUBMITTALS

- A. Submit manufacturer's data, grout mix, aggregate gradations, and additive manufacturer's product literature to the Owner's Representative for review prior to beginning concrete construction work. Provide subsequent submittals when mix design changes for any reason.
- B. Provide manufacturer's literature on any proprietary grouts used in construction, and indicated as required in this Section.
- C. Submit for review membrane curing compound and the method of curing for all grout, for review by the Owner's Representative.

PART 2. PRODUCTS

2.01 MATERIALS FOR EQUIPMENT BASES AND GROUTED CONNECTIONS

- A. Grout for use under equipment bases shall be a flowable non-shrink non-metallic type made with shrinkage compensating cement passing ASTM C878 and installed in accordance with the manufacturer's instructions.
- B. Furnish acceptable materials by one of the following manufacturers or approved equal:
 - 1. MTB Masterflow 713 Plus by Master Builders, or approved equal
- C. Membrane curing compound shall meet the requirements of ASTM C309.

PART 3. EXECUTION

3.01 INSTALLATION OF GROUT

- A. Grout all substation structures.

- B. Shim columns and rails of equipment to plumb alignment, or install surfaces to be grouted to tolerances recommended.
- C. Grout items in place using a minimum of 1 inch of grout, selected for the application.
 - 1. Provide strength equal to 8000 psi, minimum, at 28 days.
 - 2. Assure temperature of air and surfaces in contact with grout are 40 F or above.
 - 3. Clean all surfaces to which grout is to be placed just before grouting; remove laitance and roughen surfaces with a wire brush.
 - 4. Immediately after placing grout, trim surfaces with a trowel and cover exposed grout with clean wet rags and maintain moisture for a minimum of 6 hours.
 - 5. After removing wet rags cure all exposed grout with a membrane curing compound.
- D. Grout shall be applied in such a manner as to provide drainage of any water likely to become trapped under the equipment bearing surface or bearing plate.

Install and cure proprietary grout in accordance with manufacturer's recommendations.

END OF SECTION 03602

SECTION 05091

WELDING

PART 1. GENERAL

1.01 SUBMITTALS

- A. Welder's Qualifications

1.02 QUALITY ASSURANCE

- A. Installer Qualifications: All welders are required to be currently certified by AWS or Washington Association of Building Officials (WABO) for structural welding.
- B. American Welding Society Structural Code - Steel, ANSI/AWS D1.1, edition current as of Bid Date
- C. American Welding Society Structural Code - Reinforcing Steel, ANSI/AWS D1.4, edition current as of Bid Date

1.03 REFERENCES

- A. PSE Standard 8575.6120, "Installing Welded Substation Connections"

PART 1. PRODUCTS

1.01 OWNER-FURNISHED MATERIALS

- A. Substation busses and conductors, as indicated in the Contract Documents

1.02 MISCELLANEOUS MATERIALS

- A. Welded aluminum substation connections shall use filler wire, 4043 alloy.
- B. Contractor shall supply all welding supply materials required to provide a complete installation.

PART 1. EXECUTION

1.01 PREPARATION

A. Welding:

- A. Remove all paint and galvanizing prior to welding.
 - B. Shape edges to be joined as indicated on drawings or as required by AWS.
 - C. Prepare and clean edges of all oil, grease, scale and rust in accordance with AWS.
- ###### B. Protection:
- A. Take all precautions required by regulations and Standard Specifications to protect personnel and property.
 - B. Carefully mask or shield all adjacent surfaces to prevent damage from heat or welding materials.
 - C. Take particular care to prevent fires.

- D. When welding finished assemblies located adjacent to or above finished materials, protect surfaces from damage due to welding.

1.02 WELDING PROCEDURES

- A. Perform the work for welded substation connections in accordance with procedures written and qualified in accordance with AWS requirements and PSE Standard 8575.6120 "Installing Welded Substation Connections".

1.03 SCHEDULING

- A. Coordinate work with fabrication and erection required to meet approved Construction Schedule.

1.04 CLEANING

- A. Clean in accordance with AWS requirements.

1.05 REPAIR

- A. Repairs shall be performed in accordance with AWS requirements.
- B. Repair all damaged finishes as directed, or replace damaged items at no additional cost to Owner.

END OF SECTION 05091

SECTION 05110
STRUCTURAL STEEL ERECTION

PART 1. GENERAL

1.01 QUALITY ASSURANCE

- A. Perform Contract work in accordance with the specifications of the American Institute of Steel Construction (AISC); in particular, provisions of the "Code of Standard Practice for Steel Buildings and Bridges," and the "Specification for Design, Fabrication and Erection of Structural Steel for Buildings," latest editions.
- B. Construct structure joints in accordance with the "Specification for Structural Joints using ASTM A325 or A490 Bolts."

PART 1. PRODUCTS

1.01 INCIDENTAL STRUCTURAL SHAPES AND PLATES:

- A. Conform to the requirements of ASTM A-36.
- B. Exposed surfaces are to be galvanized in accordance with ASTM A-123.

1.02 MATERIALS REQUIRED FOR ERECTION

- A. Provide all miscellaneous materials required for erection of steel structures to Owner's Representative, including but not limited to the following:
 - 1. Miscellaneous steel framing required for support and bracing of steel during erection.
 - 2. Minor steel components not specifically indicated on drawings including shim stock, spacer steel plates, and similar materials.

PART 3. EXECUTION

1.02 GENERAL REQUIREMENTS

- A. Erect framing and accessories in accordance with this Section and the referenced publications of the American Institute of Steel Construction, unless otherwise specified.
- B. Notify the Owner's Representative when shop errors or damaged members are found.
- C. Do not erect any structure on concrete foundations that have cured for less than 7 days. If high temperatures are consistently less than 45 degrees during the previous seven-day period, allow at least 14 days curing before erection.
- D. Align and level baseplates with leveling nuts, and grout for full and even bearing.
- E. Erect supports plumb and aligned for proper fitting.

1.03 ERECTION OF STEEL FRAMING

- A. Do not ream or flame cut for correction of mismatched holes due to fabrication errors. Drill bolt holes, if a minor amount of holes are discovered missing. Major errors shall be brought to the attention of the Owner's Representative.
- B. A reasonable amount of drifting will be allowed.
- C. Repair damage to prime coats.
- D. Assemble bolted connections as shown on the steel fabricators shop drawings. ASTM A 325 bolts shall be pre-tensioned with load indicator washers, or by the "turn-of-the-nut" method.
- E. Project bolts not less than 1/8 inch or more than 3/8 inch beyond the locknut when assembled.
- F. Repair damage to galvanizing in accordance with Section 09905.

END OF SECTION 05110

SECTION 09905
GALVANIZING REPAIR

PART 1. GENERAL

1.01 QUALITY ASSURANCE

- A. Conform to the requirements of SSPC, the Steel Structures Painting Council.
- B. Requirements of the paint coating systems manufacturer shall be considered minimum application requirements, and shall be supplemented by the requirements of this Section where more restrictive.
- C. Intent of this Section is for Contractor to perform touch-up Work that results in a completely coated facility devoid of tack marks or signs of construction when the Contractor completes all construction activities and demobilizes from the site

1.02 SUBMITTALS

- A. Manufacturer's information showing galvanized repair material, application information and substrate preparation required for minimum application integrity.

PART 2. PRODUCTS

2.01 ZINC RICH PAINT/PRIMER SHALL BE THE FOLLOWING, OR APPROVED EQUAL:

- A. CRC Zinc-It
- B. Aervoe 141 Zinc Rich Galvanize

PART 3. EXECUTION

3.01 SURFACE PREPARATION

- A. Wire brush or grind to bare metal to prepare area for galvanizing repair. The area repaired shall extend beyond the damaged galvanizing into the surrounding undamaged galvanizing.
- B. Remove grease, dirt and other deleterious materials in accordance with Steel Structures Painting Council Specifications, SP-10.
- C. The surface shall be dry prior to application.

3.02 APPLICATION REQUIREMENTS

- A. General:
 - 1. Apply all coatings in strict accordance with the manufacturer's instruction.
 - 2. Do not apply until any preceding coat is dry and hard.
 - 3. Apply only to thoroughly dry surfaces.
 - 4. Do not apply galvanizing repair in rainy, damp or frosty weather.

5. Do not use materials that have exceeded the manufacturer-stated pot life.
6. Where installation of equipment makes surfaces inaccessible, repair these surfaces prior to installing the equipment.

B. Workmanship requirements:

1. Coat to achieve neat appearance of finished surfaces.
2. Inspect for and repair paint ridges, sags, runs, drops, laps and unnecessary brush marks.
3. Mix coating thoroughly and limit the use of thinners.
4. Allow for proper drying time between coats.
5. Protect all surfaces to remain uncoated, and all finish coated surfaces.

C. Mechanically mix repair compound before using.

D. Thinning requirements:

1. Dilute only as required to achieve suitable viscosity.
2. Use only thinner type and amount recommended by manufacturer.

END OF SECTION 09905

SECTION 16010
GENERAL ELECTRICAL REQUIREMENTS

PART 1. GENERAL

1.01 QUALITY ASSURANCE

- A. Provide and maintain a quality control program to ensure compliance with the quality standards of the Contract Documents. Failure to maintain the quality control program throughout the Work will be considered a failure to prosecute the Work with the diligence specified by the Contract.
- B. Perform material, mechanical and electrical assembly, and dimensional, operational and shop tests to confirm that equipment meets requirements of the Contract Documents.
- C. Correct defects revealed as a result of such tests to the satisfaction of and at no additional cost to Owner.
- D. Perform electrical tests in accordance with NETA, IEEE and these Specifications.
- E. Major equipment which includes power transformer, power circuit breaker & switchgear to be electrically tested by PSE.
- F. Perform construction in accordance with Owner's standards where such standards exist.

1.02 CONSTRUCTION RECORD DRAWINGS

- A. Prepare construction record drawings in accordance with the Contract Documents.
 - 1. Initiate construction record drawings at the beginning of the work and maintain and update as the Work progresses until final acceptance.
 - 2. Include marked-up prints of drawings and such additional drawings as necessary to show the complete "as-built" work accomplished under this Contract.
 - 3. Update all drawings with the changes identified during construction and provide final electronic as well as hard copies of as-built Drawings.

1.03 LABELING

- A. PSE Standard 0900.1010, "Labeling Substation Equipment"
- B. PSE Standard 0900.1000, "Labeling Electrical Equipment"
- C. PSE Standard 8350.0015, "Minimum Electrical Clearances for Standard BIL"

1.04 CORROSION PROTECTION

- A. Coat field cuts of galvanized hardware and minor damage of the galvanized surface with galvanizing repair system, in accordance with Section 09905 – Galvanizing Repair

1.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install all equipment in accordance with the manufacturers' instructions.

- B. Do not use equipment or arrangements of equipment that reduce required clearances or exceed the available space.
- C. Install equipment so it is readily accessible for operation and maintenance.
- D. Equipment shall not be blocked or concealed.
- E. Do not install electrical equipment such that it interferes with normal maintenance requirements of other equipment.
- F. Install equipment plumbed, square and true with the building construction.
- G. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- H. Screen or seal all openings into outdoor equipment to prevent the entrance of rodents and insects.
- I. Remove all field cuttings and shavings from concrete and metal surfaces.

END OF SECTION 16010

SECTION 16131
UNDERGROUND CONDUITS, VAULTS AND TRENCHES

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. Installation of underground conduit, cable trench and vaults

1.02 REFERENCES

- A. PSE Standard 6800.6000, "PVC Conduit Installation"
- B. PSE Standard 6800.6500, "Application of Conduit Plugs and Seals"

PART 1. PART 2. PRODUCTS

1.01 CONDUIT AND FITTINGS

- A. Owner-furnished

1.02 SPACERS & BASES

- A. Owner-furnished

1.03 VAULTS

- A. Owner-furnished

1.04 MISCELLANEOUS MATERIALS

- A. All materials not listed in the Contract Documents as "Owner-furnished" that are required to provide a complete project shall be supplied by the Contractor.

PART 1. PART 3. EXECUTION

1.01 CONDUITS

- A. Underground conduits shall be installed with top of conduit not less than 24 inches below finished grade, unless otherwise noted in the Contract Documents.
- B. Conduits shall be clean on the inside and on the outside where the joint is made. Plugs shall be used during construction and at the termination point of the conduit to prevent entrance of water, dirt or debris.
- C. Conduit ends shall project into the vault. The projected distance shall be determined by measuring the height of the bell end.
- D. Conduits shall have bell ends installed when they terminates inside a vault.
- E. Schedule 80 Conduits, when racked on spacers & bases, shall be supported on intervals not greater than 10 feet on center. Racked conduits need to be anchored in some fashion to prevent movement during the placement of control density fill (CDF), fluidized thermal fill or concrete to prevent floating.
- F. All unused conduits shall be capped or plugged.

1.02 VAULTS

- A. Vaults shall be inspected at the site before taking receipt of the vaults to ensure there are no defects and/or damage during transporting.
- B. Verify location, orientation, elevation, etc., of vault(s) shown on the drawings with the owner's representative prior to excavating. Acquire underground locates prior to excavating.
- C. Vaults shall be placed in an excavated hole, so that they are aligned & perpendicular to the conduit runs. Prepare the bottom of the excavation so that the vault rests on solid, undisturbed earth or compacted soil with a 6-inch base of compacted 5/8" minus crushed rock. The vault shall be set level. The backfill material around vaults shall consist of compactable material such as native gravel fill, crushed rock or sand (no pea gravel).
- D. In unpaved areas inside of the substation, the top of the vault cover shall be at finished grade. In unpaved areas outside of the substation on PSE property, the top of the vault cover shall be approximately 1-inch above the finished grade. In paved areas, the top of the vault cover or lid shall be flush with the finished surface of the pavement.
- E. Grout the conduit entrance to the vault on the inside, outside and between conduits. Grout shall be tooled flush with the vault wall.

1.03 TRENCHES

- A. Trench bottom shall be smooth, level, and free from rocks, obstructions, sharp objects, construction debris and garbage.
- B. If the excavated trench material is unsuitable for backfilling around the conduit, use 5/8 minus crushed rock. Unsuitable material shall be determined based on quantity and/or size of rock, and the inability to properly compact the material.
- C. Backfill material shall be adequately compacted in lifts.

END OF SECTION 16131

SECTION 16391
GROUNDING

PART 1. GENERAL

1.01 WORK INCLUDED

- A. Installation of substation grounding system.

1.02 QUALITY ASSURANCE

- A. Perform all work in accordance with the requirements of the National Electrical Safety Code.

1.03 REFERENCES

- A. PSE Standard 8325.2000, "General Requirements for System Grounding in Stations"
- B. PSE Standard 8325.2050, "Using Cadweld Connections in Stations"

PART 1. PRODUCTS

1.01 GROUND WIRE

- A. Owner-furnished

1.02 GROUND RODS

- A. Owner-furnished

1.03 CONNECTORS

- A. Owner-furnished

PART 1. EXECUTION

1.01 INSTALLATION REQUIREMENTS AND TESTING

- A. Ground all frames and housings of electrical equipment, supporting structures, and fence.
- B. Protect all parts of grounding system against damage during construction. Observe provisions for temporary grounds as required by applicable safety codes.
- C. Thoroughly clean surfaces of wire to be part of an electrical connection with steel wool, wire brush or emery cloth, if necessary.
- D. Thoroughly dry all surfaces before applying grounding electrodes or connectors.
- E. Route ground wire along the webs of columns and beams where possible for maximum physical protection.
- F. Do not use hold-down or foundation bolts for ground connections. Ground risers shall run over foundations as indicated in the Contract Documents in a neat manner.

- G. Remove non-conductive protective coating and paint from the threads and contact surfaces of equipment ground pads, conduits and fittings before attaching grounding connection.
- H. All metal conduit shall be grounded. Connect ground wire to conduit with clamps, straps or grounding bushings manufactured for this purpose.
- I. Make all connections to ground grid as shown on the Contract Drawings.
- J. Ground all metallic conduits entering manholes.
- K. Do not run a ground cable through a metallic conduit.
- L. Do not run a ground cable through a hole or other opening in magnetic material.
- M. Drive ground rods vertically into the ground. Drilling and jetting are not acceptable methods. Drive rods into unexcavated portion of the earth where possible; where rods must be installed in excavated areas, drive rods into earth after the compaction of the backfill is completed.
- N. Separately ground all metal isolated from ground or not grounded through mechanical connection to other grounded equipment.
- O. Provide separate ground to panelboards, switchboards, panels and other structure-mounted equipment.
- P. Ground the substation fence as shown on the Contract Drawings.
- Q. Provide the transformer grounds using 4/0 AWG and 500 kcmil soft-annealed or soft-drawn copper conductor, as shown on the Contract Drawings.
- R. Contractor shall drill all holes required for installation of grounding.
- S. Owner's Representative will inspect all below grade connections prior to backfilling.
- T. PSE will perform ground resistance testing. Coordinate substation ground grid resistance test with Owner's Representative.

END OF SECTION 16391

APPENDIX A
PSE STANDARDS

The following PSE Standards, cited in the foregoing Specifications, are reproduced here in numerical order.

<u>PSE STANDARD</u>	<u>TITLE</u>
<u>0150.3200</u>	Techniques for Temporary Erosion and Sediment Control
<u>1275.1130</u>	Concrete, Structural
<u>1275.1200</u>	Deformed Steel Bars (Rebar)
<u>1275.1310</u>	Base Course Aggregate
<u>1275.1320</u>	Top Course Aggregate
<u>1275.1330</u>	Yard Course Crushed Aggregate
<u>1275.1340</u>	Gravel Backfill Aggregate for Pipe Bedding
<u>1275.1350</u>	Gravel Backfill Aggregate for Drains
<u>1275.1370</u>	Sand for Substation Oil Retention Area or Control Cable Installation
<u>1275.1380</u>	Sand Backfill for Gas Pipe, Electrical Conduit and Cable
<u>6042.1000</u>	Conduit risers
<u>6775.0040</u>	General Vault and Handhole Installation
<u>6790.0140</u>	Trench Excavation and Backfill
<u>6800.6000</u>	PVC Conduit Installation
<u>6800.6500</u>	Application of Conduit Plugs and Seals
<u>6825.6100</u>	Cable Pulling
<u>8325.2000</u>	General Requirements for System Grounding in Stations
<u>8325.2050</u>	Using Cadweld Connections in Stations
<u>8350.0015</u>	Minimum Electrical Clearances for Standard BIL
<u>8350.0100</u>	Installing Grout
<u>8350.2150</u>	Installation Requirements for Deformed Steel Reinforcing Bars
<u>8350.2163</u>	Anchor Bolt Installation
<u>8350.2200</u>	Concrete, Installation

