

SP01201 (Special Provisions for the 2021 Book)

(Bidding on or after: ~~094-01-232~~

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*This Section requires SP00253,
SP00535, SP01210 SP01215,
SP01220, SP01235, SP01240,
SP01245, SP01260, SP01270,
SP01280, & SP01285)*

(This Section requires SP00120 Contractor Special Prequalification to ensure that the contractor prequalification requirements are included in the Contract.)

SECTION 01201 - COMMON PROVISIONS FOR CATHODIC PROTECTION SYSTEMS

(Follow all instructions and make all edits with “Track Changes” turned on. This Section is not published in the Oregon Standard. If there are no instructions [orange text] above a subsection, paragraph, sentence, or bullet, then include it in the project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all orange text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Impressed current cathodic protection systems are not intended for pre-stressing, post-tensioning, or any structure where reinforcement yield strength exceeds 100ksi. If corrosion protection of this type of structure is necessary, contact the ODOT Technical Resource.)

Section 01201, which is not a Standard Specification, is included in this Project by Special Provision.

Description

01201.00 Scope - This Work consists of furnishing and installing Materials and Equipment for cathodic protection of existing Bridges.

To the extent feasible, and in conformance with the Plans, perform the Work without degrading the visual and architectural character of the Bridge.

01201.01 Abbreviations and Definitions:

(a) Abbreviations:

CP - Cathodic Protection

PVC - Polyvinyl chloride

(b) Definitions:

CP Zone - An area of the Bridge surface marked by edge boundaries of the anode, as defined in the Plans. CP Zones are established for the purpose of managing the power needed to operate the cathodic protection system effectively.

Damaged Concrete - Concrete that is spalled or delaminated; concrete with near-surface rock pockets; concrete that is unbonded from reinforcing bars; unsound or delaminated concrete in existing patches; and concrete that has been drilled, excavated, or removed during prior maintenance work or during the Work of this Project. Areas of near-surface metal removal in sound concrete less than 1/2 square foot will not be considered Damaged Concrete.

Essential Near-Surface Metal - Metal located less than 1/2 inch below the surface of the concrete, and that has a structural or functional purpose. Essential near surface metal includes objects such as reinforcing bars, reinforcing mesh, bearing devices, drains, conduits, Bridge supports, and anchors.

Hold Point - A time at which the Contractor must cease a particular activity until a phase of Work is inspected by or tested in the presence of the Engineer. If the Engineer finds this phase conforms to the Specifications, the subsequent phase of Work may proceed.

King Bar - Primary connection of the direct current power source of a cathodic protection system to the reinforcement of a concrete structure (cathode).

Non-Essential Near-Surface Metal - Metal located less than 1/2 inch below the surface of the concrete, and that does not have a structural or functional purpose. Non-essential near surface metal includes objects such as form ties, wires, nails, rebar supports, staples, and abandoned conduits.

Primary Deck Bar - Reinforcing bars in the Bridge deck slab, which span between the members that support the deck slab.

Pumped Concrete - Portland cement, Sand and admixtures or a pre-packaged repair mortar thoroughly mixed and hydrated that is suitable for placement by pumping into restricted liquid tight formwork.

QCE Work - Quality Critical Elements (QCE) of Work is any Work that requires trained personnel to complete the Work. QCE Work consists of the following:

- Quality Control according to Section 01210
- Locate and Remove Near Surface Metal according to Section 01215
- Replace Damaged Concrete according to Section 01235
- Install Reference Cells according to Section 01240
- Locate and Eliminate Electrical Discontinuities in Rebar according to Section 01245
- Prepare Surfaces and Apply Zinc Anodes according to Section 01260

Saturated Surface Dry Condition - Surface condition where hardened concrete is thoroughly saturated with water without any free standing water.

Secondary Deck Bar - Reinforcing bars in the Bridge deck slab, oriented perpendicular to the Primary Deck Bars.

Shallow Rebar - Rebar that is less than 1/2 inch below the surface of the concrete.

Materials

01201.10 Hand Patching Materials - Provide hand patching Materials from Section 02015.30 of the QPL designated for vertical and overhead application.

01201.11 Non-Conductive Resin - Provide non-conductive resin from Section 00535.10 of the QPL designated as "high strength".

01201.12 Non-Conductive Sealant - Provide one of the following non-conductive sealants:

- Dow Corning 790 Silicone Building Sealant.
- GE SCS9000 SILPRUF Sealant.
- Sikaflex 1a Polyurethane Elastomeric Sealant/Adhesive.

01201.13 Heat Shrink Tubing; Electrical Tape - ~~Provide one of~~Furnish the following heavy-walled heat-shrink tubing or approved equal:

- Raychem WCSM series.
- ~~• 3M HDT series.~~
- ~~• NTE Electronics, Inc. 47 series.~~

~~Provide one of~~Furnish the following electrical tape or approved equals:

- ~~• 3M Scotch 2200 or 2210 vinyl mastic.~~
- ~~• Plymouth 10 Plyseal 2626, 2627, or 2628 Insulating Mastic.~~
- Electro Tape Specialties MW101 Mastic Rubber Wrap and 750 Premium Grade Vinyl.

01201.14 Ring Connectors; Tap Connections; Solder - ~~Provide~~Furnish UL listed, un-insulated copper ring connectors sized for #10 AWG wire.

~~Provide one of~~Furnish the following C-taps or approved equal:

- Thomas & Betts catalog number 54715.
- ~~• Burndy Products catalog number YC6L12.~~
- ~~• Panduit catalog number CTAPF6-12-C~~

~~Provide~~Furnish RoHS compliant solder meeting IPC-J-STD-004, 005 and 006.

01201.15 Conduit and Fittings - Provide UL listed, schedule 40, extruded PVC electrical conduit that conforms to UL Standard Number 651, rated for 194 °F conductors. Provide gray conduit and gray fittings.

Provide gray conduit fittings constructed from PVC or thermoplastic according to UL Standard Number 514. Provide PVC expansion fittings that are UL listed and constructed to provide a weathertight seal. Provide UL listed PVC conduit elbows.

Provide gray UL listed junction boxes constructed from PVC or thermoplastic furnished with mounting feet and a gasketed weathertight cover mounted with brass or stainless steel screws.

Provide gray UL listed, single-hole PVC conduit straps.

Provide cement recommended by the conduit manufacturer to secure conduit joints.

Provide pre-fastening plastic anchors designed for 1 1/2" minimum embedment in concrete. Fasteners shall be indoor/outdoor and damp/dry location rated for -30 °F or less and 140 °F or greater.

01201.16 Fasteners:

(a) Brass Nuts and Bolts - Provide 1/4-inch-diameter brass hex nuts and brass bolts or all-thread according to ASTM F467/468 UNS number C27000, C46200 or C46400.

(b) Stainless Steel Bolting Materials - Provide Type 316 stainless steel bolting Materials according to ASTM A193/194, Grade B8M, B8MA, B8M2, or B8M3, Class 1, 1A, 1D, or 2 or ASTM F593/594 Group 2 Condition CW.

- For conduit hangers, provide bar stock and all-thread from the same alloy group as the nuts and bolts listed in the subsection.

01201.17 Labels - Use printed labels at least 1 1/2 inches in length with a text height of at least 1/8 inch (12 point Arial). Protect labels by completely covering with clear, flexible heat shrink tubing that is CSA/UL approved meeting MIL-I-23053.

01201.18 Electrical Conductors - Provide UL listed, Type XHHW stranded copper wire with 600 volt rated insulation rated for 167 °F operation in wet or dry locations.

01201.19 Marking Tape - Provide marking tape made of red polyethylene six inches wide and a minimum of four mils thick, continuously imprinted with the message "CAUTION BURIED ELECTRIC LINE".

Equipment

01201.20 Short Circuit Detection Equipment - Use a voltage detection system that monitors the potential between the steel rebar and the zinc coating and activates an alarm if a short circuit occurs during conduit or junction box installation. Use one of the following digital panel meters, installed in a NEMA 4 enclosure:

- Newport digital panel voltmeter number Q2005AVR2-SPC
- Simpson Hawk 3 digital panel voltmeter number H345-2-12-0-1-0
- Laurel Electronics Laureate digital panel voltmeter number L10100DCV2

Labor

01201.30 Electricians - Furnish electricians licensed in the State of Oregon, holding a General Journeyman or General Supervising license.

Construction

01201.40 Short Circuit Detection - Monitor the potential between the steel rebar and the zinc to detect short circuits. A short circuit is indicated if the measured potential is less than 100 mV.

Connect the negative input terminal of the detection Equipment to the anode terminal plate connection in the zone in which Work is being performed and connect the positive input terminal to a terminal on the rebar at the nearest reference cell rebar connection or King Bar connection.

Operate the short circuit monitoring system during any Work capable of causing a short circuit between the zinc anode and the rebar including conduit installation over zinc anode surfaces. If this alarm is actuated, stop installation Work until the short circuit has been eliminated. Perform elimination of short circuits using a method approved by the Engineer.

Use a separate short circuit detector for each concurrent Work area where the anode is discontinuous. When a short is detected, Work may continue in other areas not continuous with the affected anode.

01201.41 Installing Conduit and Fittings:

(a) Conduit - Provide conduit of the sizes shown. If the size is not shown, meet the requirements of the conduit fill limits listed in Table 4 of Chapter 9 of the NEC.

Support major conduit runs through Bridge Utility holes under the Bridge using stainless steel all-thread and plate hangers. Provide an insulated threaded hole for plate hangers by drilling into the concrete surface, inserting non-conductive sealant into the hole, and inserting a plastic anchor. Secure all-thread with non-conductive resin. Maintain major conduit runs straight and level between transverse beams through which the conduit is run.

Support surface-mounted conduit with conduit straps. Provide an insulated threaded hole for the strap by drilling into the concrete surface, inserting non-conductive sealant into the hole, and inserting a plastic anchor. Mount the conduit straps with stainless steel bolts and secure with non-conductive resin.

Provide square-cut or square-formed ends on all sections of conduit. Remove any internal and external sharp edges if the conduit is cut. Cap conduit ends, and provide protection for wires that are exposed at the end of a Work shift until the Work can be completed.

If obstructions require conduit runs to deviate from the routing shown, locate the conduit to minimize visual impact after obtaining written approval from the Engineer. Only drill through concrete with written approval from the Engineer. Locate reinforcing bars before drilling through concrete. Perform drilling through concrete without drilling through

reinforcing bars unless otherwise approved. Repair any damage to the surrounding concrete.

(b) Conduit Fittings - When fittings require removable access holes for pulling conductors, provide conduit fittings with a gasketed cover mounted with stainless steel or brass screws according to 01201.16, to form a weathertight fit. Install conduit fittings as follows:

(1) Expansion Fittings - Provide expansion fittings with at least a 6-inch throw for all major conduit runs at all Bridge expansion joints.

Secure the expansion fitting to the surface only at the barrel end of the fitting. Adjust the initial setting of the fitting to account for installation temperature and future expansion/contraction movement based on a minimum design temperature of 10 °F and a maximum design temperature of 110 °F.

(2) Conduit Elbows - Wherever possible, provide factory made bends. If a field bend is necessary, provide a bending radius not less than six times the inside diameter of the conduit. Do not use conduit that is damaged or flattened during bending.

(3) Reducer Couplings - Reducer couplings are not allowed.

(4) Junction Boxes - Provide insulated threaded holes for mounting junction boxes by drilling into the concrete surface, inserting non-conductive sealant into the hole, and inserting a plastic anchor. Mount junction boxes with stainless steel screws. If no size is shown, provide junction boxes sized according to the guidelines given in the NEC.

Field removal of the bottom of junction boxes is allowed, if the Plans show the box without a bottom. Accomplish field removal of box bottoms without damaging the box mounting feet and leaving a minimum of 3/4 inch of box bottom along each side of box.

Install junction boxes with the bottom flush on the concrete surface. Drill a 1/8-inch-diameter hole through the lowest point in each junction box to provide drainage. Junction boxes without mounting feet are acceptable if a hole is drilled in each corner of the bottom for fasteners.

(5) Conduit Cement - Apply cement only within the manufacturer's recommended installation temperature range. Follow all other manufacturer's recommendations.

Temporary

01201.70 Electrical Service - Install and remove any temporary electrical service needed to perform the Work at no additional cost to the Agency. Use electricians meeting the requirements of 01201.30.