

SECTION 00985 - ITS ELECTRICAL SYSTEM INSTALLATION

(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 [purple 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 purple text before preparing the final document.)

The Work covered under this Section is diverse and this boilerplate may not include Specifications for all the Work or ITS elements on the Project. Modify as necessary by adding, deleting, or revising language for the specific Project requirements. Modifications to this Section, other than deleting language not required, will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 00985, ~~which~~ is not a Standard Specification ~~and~~, is included in this Project by Special Provision.

Description

(In the following subsection .00, delete the language in purple parentheses that does not apply and delete the purple parentheses.)

00985.00 Scope - In addition to requirements of Section 00960, install ITS electrical system as shown or specified. ~~(Install Agency-furnished Equipment listed in 00160.30.)~~

00985.01 Regulations, Standards, and Codes - Comply with the following standards where applicable:

- Underwriters Laboratories (UL)
 - 50-2015 - Enclosures for Electrical Equipment, Non-Environmental Considerations
 - 508A-2018 - Standard for Industrial Control Panels
 - 1561-2011 - Standard for Dry-Type General Purpose and Power Transformers
 - 1581-2001 - Reference Standard for Electrical Wires, Cables, and Flexible Cords
 - 1685-2015 - Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
 - 83-2017 - Thermoplastic-Insulated Wires and Cables

(In the following subsection .02, delete the language that does not apply. Fill in the appropriate blanks.)

00985.02 Submittals - Submit according to 00150.37, within 30 Calendar Days after execution of the Contract, the following:

- Transformers and cabinets according to 00985.10
- Pole mounted service cabinets according to 00985.11
- Termination enclosures according to 00985.12
- Coaxial video cable according to 00985.13
- Atmospheric sensors and accessories according to 00985.14
- Pavement sensors and accessories according to 00985.14(d)
- Circuit breakers according to 00985.15
- Metal conduit according to 00985.16
- Metallic conduit fittings according to 00985.17
- Conduit seal according to 00985.18
- Electrical splice materials according to 00985.19
- Camera lowering system according to 00985.20
- Wood pole according to KB__.

(Use the following three bullets when RWIS are included in the Project.)

- Power supplies according to KB__
- Serial converter according to KB__
- Analog to Ethernet converter according to KB__

Include the manufacturer's name, model numbers, catalog sheets and other descriptive literature of proposed materials. Provide the catalog sheets and literature including technical data, physical properties and operational description in sufficient detail to demonstrate the equipment meets these specifications.

Materials

(Use the following subsection .10 when a transformer is required.)

00985.10 Transformers and Cabinets - Furnish general purpose dry type transformers with two windings 1000 Volts or less, 60 Hz, self-cooled according to UL 1561, kVA rating as shown. Furnish transformers installed in cabinets that are compliant with UL 50, Type 3R ventilated, 14-gauge Type 304 or 316 stainless steel, and rated for outdoor use. Include a cabinet door with a seamless gasket that is liquid-tight. Remove all sharp edges. Furnish two 2.5 percent taps above and two 2.5 percent taps below normal rated primary voltage minimum, as well as ground and neutral terminal lugs. Furnish an insulation rating of 150 °C winding temperature rise above ambient. The cabinet is to be padlockable.

Furnish a dead front panel within the transformer cabinet, such that when the door is opened only circuit breakers and no live parts are exposed. Dead front material is to be the same as the rest of the cabinet and hinged to allow access to live parts.

(Use the following paragraph only if a safety switch is NOT used with the transformer.)

Furnish a primary protection circuit breaker that is lockable in the "OFF" position, but not on the "ON" position.

(Include following paragraph only if a safety switch is used with the transformer)

Furnish safety switches that comply with NEMA KS 1 and are heavy duty, NEMA 3R, 4, or 4X type. Voltage, current rating, number of poles, and fusing as shown. The cover or door cannot be opened while the switch handle is in the "ON" position. Furnish a safety switch that is made to lock the handle in the "OFF" position but not the "ON" position. Switches are to be of the quick make, quick break type.

(Use the following subsection .11 when a pole mounted service cabinet is required.)

00985.11 Pole Mounted Service Cabinet - Furnish pole mount service cabinets formed from 10-gauge thick sheet metal hot-dipped galvanized after fabrication according to 02530.70, or 12-gauge Type 304 or 306 stainless steel. Furnish cabinets that are UL 508A listed with a top hinged lift cover including provision to hold cover in open position and dead fronts. Include cabinet doors with a seamless gasket that are liquid-tight. Accommodate for eight single pole circuit breakers or four double pole circuit breakers. Install copper buss bars in cabinets for main and branch circuits. Furnish a minimum of 2 locator studs near top for dead fronts, and handle on dead front near bottom. The cabinet is to be padlockable.

Fabricate dead fronts from code thickness galvanized sheet metal or type 304 or 316 stainless steel. For galvanized sheet metal dead fronts, treat cut edges with zinc-rich paint. Prime with vinyl wash primer and finish with exterior polyurethane enamel.

(Use the following subsection .12 when a termination enclosure is required.)

00985.12 Termination Enclosure - Furnish enclosures constructed from 14-gauge Type 304 or 316 stainless steel, as well as be UL 50 compliant and Type 4X rated with a #4 brushed finish. Remove all sharp edges. Include doors with a continuous hinge and seamless gasket that is liquid-tight. Enclosures are to be padlockable. Dimensions are location specific as shown.

(Use the following subsection .13, when Cables are required.)

00985.13 Coaxial Video Cable - Furnish RG-59/U or RG-6 coaxial cable, 75 ohms with 18 AWG solid bare copper center conductor with 95 percent or greater bare copper braided shield for fixed mounted cameras with UL 1581 or UL 1685 rating. Furnish video cable suitable for wet locations. Video cable may be hybrid type combining the coaxial video cable and multi-conductors for providing power in one single cable assembly. Install nickel plated body, for corrosion resistant, BNC connector on end of cable. Furnish video cable that is one continuous conductor from the camera assembly to the video encoder. Splices are not allowed, unless approved in writing by the Engineer.

(Use the following subsection .14, when atmospheric sensors are required.)

00985.14 Atmospheric Sensors and Accessories - ~~Furnish~~ Provide the following list of Equipment and install as shown:

(a) Temperature/Relative Humidity Sensor

- RM Young Model 41382LC2 (4-20 mA option)
- RM Young Model 41003P-24 radiation shield
- RM Young Model 18446 five conductor cable

(b) Anemometer

- RM Young Model 05106-12M (12-meter cable included)
- RM Young Model 05631C wind line driver
- RM Young Model 18446 five conductor cable

(c) Sensor Mounting Bracket

- Vaisala DRUNIVARM-US with band straps included

(d) Pavement Sensors

- Vaisala DSC111 with the DSCVIS visibility option enabled non-invasive surface state sensor
- Vaisala DST111 non-invasive surface temperature sensor
- Vaisala 216548 communication cable between DSC111 and DST111
- Vaisala non-remote pole installation kit for non-invasive sensors with 28VDC power supply with cables at 50-meter length minimum

(Use the following subsection .15, when circuit breakers are required.)

00985.15 Circuit Breakers - Furnish UL489 listed circuit breakers of the voltage rating shown or specified, unenclosed, molded case bolt-on type with end conductor terminals, and suitable for surface mounting in the cabinet on a false back or bracket. The interrupting rating is to meet or exceed the short circuit rating of the specified electrical system.

(Use the following subsection .16, when metal conduit is required.)

00985.16 Metal Conduit - Furnish metal conduit meeting the following requirements:

- **Rigid Metal Conduit** - Galvanized rigid metal manufactured of mild steel conforming to UL 6, Rigid Metal Electrical Conduit.
- **Liquid-Tight Flexible Metal Conduit** - Furnish UL 360 listed, liquid-tight, nonmetallic, sunlight resistant outer jacket over an inner flexible metal core.

(Use the following subsection .17, when conduit fittings are required.)

00985.17 Metallic Conduit Fittings - Furnish conduit fittings meeting the following requirements:

- **Metallic Expansion Fittings** - Weatherproof, hot dip galvanized malleable iron expansion head and body. Where the Plans do not specify an Equipment grounding wire in the conduit run, furnish fittings with external bonding jumpers. Permit a 4-inch conduit movement minimum.

- **Metallic Bushings** - Galvanized steel or die cast zinc with insulated throat. Include a bonding lug if required.
- **Conduit Hub** - Hot-dip galvanized malleable iron screw-on style with neoprene "O" ring.

00985.18 Conduit Seal - Furnish conduit plug Material used to seal the ends of conduit composed of duct seal that is UL listed clay putty material designed to seal electrical conduit. Seal all conduit impacted by the Project.

00985.19 Electrical Splice Materials - Furnish electrical splice Material meeting the following requirements:

- **Split Bolt** - Made of silicon bronze to securely join the wires both mechanically and electrically.
- **Heat-Shrink Tubing** - Surface-irradiated tube complying with UL 486, rated at 194 °F, with 600 V inner melting wall or liner to provide void-free encapsulated insulation.
- **Insulating Rubber Tape** - Electrical grade, nondrying, rubber based, elastic type ~~conforming~~ according to ASTM D4388.
- **Insulating Vinyl Plastic Tape** - Comply with ASTM D3005, Type II and UL 510.

(Use the following subsection .20, when a camera lowering system is required.)

00985.20 Camera Lowering System:

(a) General Description - Design the camera lowering system to support and lower a traffic surveillance IP camera, lens, Pan/Tilt mechanism, associated cabling and connectors, and other supporting field components without damage or causing degradation of camera operations. Provide a lowering system that consists of a suspension contact unit, divided channel support arm, and a pole adapter for attachment to a pole top junction box and camera connection box. Design the divided support arm and receiver brackets to self-align the contact unit with the pole centerline during installation and ensure the contact unit cannot twist under high wind conditions.

(b) Lowering Tool - Operate the camera lowering system by the use of a portable lowering tool. The lowering tool consists of a metal frame winch assembly with a cable, a quick release connector, and adjustable clutch and a variable speed heavy duty electric motor. Provide a lowering tool that is compatible with accessing the support cable through the hand hole of the pole. Provide a lowering tool with a reduction gear for ease of service and operation. Equip the lowering tool with a positive braking mechanism to secure the cable reel during raising and lowering operations and to prevent freewheeling. The use of a strap to attach the lowering device will not be accepted.

(c) Materials - Furnish pulleys that have sealed, self-lubricating bearings. Provide Furnish a lowering cable that is a stainless steel cable with a minimum breaking strength of 1700 lbs.

Protect all electrical and video connections between the fixed assembly and the lowering portion of the connection block from exposure to the weather by a waterproof seal. Design

the electrical connections (contacts) to minimize loss. The ~~ground wire or pin shall be the~~ last electrical connection to disengage when servicing is the ground wire or pin.

(d) Suspension Contact Unit - ~~Provide~~ Furnish a suspension contact unit that allows the camera, Pan/Tilt Unit and dome assembly to easily separate from the camera pole for lowering purposes. Only the stainless steel lowering cable is permitted to move within the pole or lowering device during lowering or raising. ~~Provide~~ Furnish a locking mechanism between the fixed and moveable components ~~that~~ When latched, ~~has~~ all weight shall be removed from the lowering cable. ~~Provide~~ Furnish a suspension contact unit that has a heavy duty cast tracking guide to allow latching in the same position every time. House the suspension contact unit in a weatherproof enclosure with a gasket to seal the interior.

Construction

(In the following subsection .40, delete the language in purple parentheses that does not apply and delete the purple parentheses.)

00985.40 Installation - Install the Materials as specified, shown, and according to the manufacturer's instructions.

(Install the Agency-furnished Materials listed in 00160.30; and all other Incidental items necessary to complete the Work as shown.)

00985.41 Metallic Conduit - If corrosive Soil conditions exist, coat metallic conduit with a nonmetallic coating or wrap with corrosion protection tape at least 10 mils thick.

(a) Metallic Conduit - Paint the following with rust-preventative coating:

- Threads on all metal conduit
- Areas where the coating has been damaged so underlying metal is exposed.
- Exposed, non-galvanized threads resulting from field cuts.

(b) Bushings - Furnish and install bushing according to the following:

- **Metallic Bushing** - Use metallic bushings with rigid metallic elbows, metallic risers, and junction boxes containing circuits less than 25 V.
- **Metallic Bonding Bushing** - Use metallic bonding bushings with rigid metallic elbows, metallic risers, and junction boxes containing 25 V or greater circuits.

00985.42 Cable and Wire - Install No. 16 AWG TFFN orange base with blue tracitone wire in all conduits as a locate wire. Leave slack as required in 00985.43 and install a wire nut. Do not join multiple locate wires under a common wire nut unless otherwise shown.

Tape the ends of unused conductors with insulated vinyl plastic tape.

Install polyethylene pull line in all new conduits for future use. Leave 6 feet of slack pull line. If an existing pull line is used, replace the existing pull line with a new pull line during the installation.

Arrange wiring neatly within cabinets and junction boxes. Use electrical lubricants when inserting conductors in conduit. Before pulling wires through underground conduit runs, blow the conduit out with 120 cubic feet per minute compressed air.

Do not use tapes, straps, ties or other binding materials to bundle single conductors or cables together inside conduits or poles. Bundling of conductors or cables are allowed at the terminating end points for pulling only.

Pull all wire and cable by hand and on a straight line with the conduit opening to prevent damage to wire and cable insulation. Use a pulley device to achieve a straight pull if pulls are made with poles or controller cabinet in place.

00985.43 Conductor Slack - Leave slack in each wire and cable as follows:

- 2 feet in junction boxes and poles
- 6 feet in the first junction box nearest the controller cabinet
- 6 feet in controller cabinet and service cabinet

00985.44 Identification and Marking - Clearly and permanently label all cables and wiring between subsystems. Mark all conductors within 2 inches of wire terminations by means of imprinted tubular white or yellow plastic wire markers at termination points. Install marker nomenclature that is visible without moving wires or markers. Use thermal transfer label printer with minimum 3/4" tape.

00985.45 Covers and Guarding - Furnish covers or guarding for live parts of terminations on circuits of 50 V or more to ground.

00985.46 Conductor Splicing - Install all conductors as shown without splicing. Field verify lengths prior to ordering cables. If splicing is required to complete Work as shown, then submit the method using all materials listed in 00985.19 and the location of splicing for approval by Engineer before construction.

(Use the following subsection .47, when Variable Message Sign Installation is required.)

00985.47 Variable Message Sign (VMS) Installation - Install the Agency-furnished variable message signs, sign control cable, and controller cabinets as shown. Coil and stow minimum 50 feet slack of sign control cable in the sign housing and controller cabinet after pulling. Sign control cable ~~will be~~is terminated by Agency.

(Use the following paragraph when variable message signs are being removed on a Project.)

Notify the Engineer at least 14 Calendar Days before taking any individual VMS out of service, if applicable. Keep the existing VMS and cabinets in service until the new VMS and cabinets are ready to be installed, and minimize the time that the individual signs are out of service.

(Use the following subsection .48, when Variable Speed Sign Installation is required.)

00985.48 Variable Speed Sign (VAS) Installation - Install the Agency-furnished variable speed signs, sign control cable, and controller cabinets as shown. Coil and stow minimum 50 feet slack of sign control cable in the sign housing and controller cabinet after pulling. Sign control cable ~~will be~~is terminated by Agency.

(Use the following subsection .49, when Radar Traffic Sensor Installation is required.)

00985.49 Radar Traffic Sensor Installation - Install the Agency-furnished radar traffic sensors, mounting brackets, accessories, and associated wiring as shown. Configuration and final aiming of the sensor to be completed by the Agency.

(Use the following subsection .50, when Camera Installation is required.)

00985.50 Camera Installation - Install Agency-furnished camera and accessories, ~~which~~ consistings of the camera, housing, mounting bracket, power supply, and associated wiring as shown and specified. Final aiming of the camera to be completed by the Agency.

(Use the following subsection .51, when Radio Installation is required.)

00985.51 Radio Installation - Install Agency-furnished radio and accessories, ~~which~~ consistings of the radio, mounting bracket, power supply, and associated radio network cable as shown and specified. Configuration and final aiming of the radio to be completed by the Agency.

Measurement

00985.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

Payment

(Use one of the following two options for subsection .90)

[Option 1. Use this subsection .90 if site work needs to be broken out by Pay Items]

00985.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

(Add additional Pay Item(s) as required for the Schedule of Items and delete all purple parentheses.)

Pay Item

Unit of Measurement

- (a) Electrical Systems Installation, Site _____ Lump Sum
- (b) Electrical Systems Installation, Site _____ Lump Sum

(In the following paragraph delete the items that are not included as part of the Pay Item. Copy and paste the paragraph as necessary to accommodate all Work.)

Item (a) includes furnishing and installing the cabinet, riser frame, cabinet concrete foundations, junction boxes, handhole, communications bracket, pole concrete foundation, transformer with cabinet, wood pole, meter service, pole mounted service cabinet, base mounted meter service cabinet (BMC), conduits, trenching, backfill, horizontal directional drilling, conductors, grounding and bonding, and all other Incidental items necessary to complete the Work.

Payment will be payment in full for furnishing and placing all Materials; and for ~~furnishing~~ providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate or additional payment will be made for:

- ~~f~~RRequired submittals and documentation
- ~~a~~Assistance for commissioning Equipment and systems
- ~~p~~Pick-up and installation of the Agency-furnished Material listed in 00160.30, furnishing and installing the conductors and mounting hardware, and removal and disposal.

[End Option 1]

[Option 2. Use this subsection .90 if site work does NOT need to be broken out per site.)

00985.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract lump sum amount for the item "Electrical Systems Installation".

(Include following paragraphs only if Agency furnished materials are included in this specification.)

Payment will be payment in full for furnishing and placing all Materials, and for ~~furnishing~~ providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate or additional payment will be made for pick-up and installation of the Agency furnished Materials.

(Include following paragraph only if Agency furnished materials are NOT included in this specification.)

Payment will be payment in full for furnishing and placing all Materials, and for ~~furnishing~~ providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

[End Option 2]