

652 Electrical Conduit

652.1 Description

- (1) This section describes providing rigid metallic or rigid nonmetallic conduit for traffic signals, lighting, and other electrical work, and rigid nonmetallic conduit for traffic signal detectors.

652.2 Materials

652.2.1 General

- (1) Furnish electrical conduit and fittings with a UL or NRTL label on each piece installed.

652.2.2 Rigid Metallic Conduit

- (1) Furnish conduit and fittings conforming to ANSI C 80.1 for rigid metallic conduit.

652.2.3 Rigid Nonmetallic Conduit

- (1) Furnish PVC electrical conduit conforming to UL 651. Use schedule 40 heavy wall type for enclosed locations. Use schedule 80 extra-heavy wall type for locations exposed to the elements.

652.2.4 Reinforced Thermosetting Resin Conduit

- (1) Furnish reinforced thermosetting resin conduit (RTRC) electrical conduit marked type AG conforming to UL 2515. Ensure that wall thickness, coupling type or method, fittings, and hanger system conform to manufacturer recommendations for installation on the outside of structures.

652.2.5 Loop Detector Conduit

- (1) Furnish one-inch schedule 40 PVC electrical conduit conforming to [652.2.3](#). Use PVC fittings and attachments designed specifically for the conduit furnished to join and terminate PVC conduit. Use engineer-approved PVC terminal adaptor fittings to connect cast iron T-condulets to PVC conduit.
- (2) Furnish cast iron T-condulets made by a department-approved manufacturer. Use steel, domed-type, wedge-nut style covers with neoprene gaskets on cast iron condulets.

652.3 Construction

652.3.1 Installation of Conduit

652.3.1.1 General

- (1) Under the Conduit Special bid item, the contractor may use either rigid metallic or rigid nonmetallic conduit.
- (2) Use conduit of the nominal inside diameter the plans show. Make each run of conduit the distance the plans show or as the engineer directs. Install each run of conduit between adjacent access points using one size for its entire length. A run is the conduit from pull box to pull box, junction box to junction box, or pull box to junction box. If the engineer approves, the contractor may substitute a larger size of conduit than the contract shows for that run.
- (3) Install tracer wire in each conduit run that will receive future conductors as the conduit is laid. Unless the contract specifies wire or cable, install a 12 AWG. XLP insulated, stranded, copper, 600-volt AC, wire. Provide wire 4 feet longer than the conduit run and double it back at least 2 feet at each raceway access point. Anchor the tracer wire at each access point.
- (4) Ream and thread the ends of rigid metallic conduit and use WSEC-approved bushings. If not installing wire or cable, install engineer-approved threaded caps with anti-seize compound applied to the threads.
- (5) Cap or plug rigid nonmetallic conduit immediately after installation, unless the conduit terminates in a pull box, and keep capped or plugged until installing the wire or cable. Install end bells on rigid nonmetallic conduit raceway access points before installing wire or cable. Ream non-metallic conduits to eliminate internal sharp edges before installing end bells. Use only UL or NRTL listed adapter fittings to connect rigid nonmetallic conduit to rigid metallic conduit.

652.3.1.2 Installing Underground

- (1) Unless the plans specify otherwise, install conduit in trenches excavated with vertical sides and of a depth and width sufficient to accommodate the outside diameter of the conduit couplings. Lay the conduit at the depth below grade the plans show. Backfill the trench with select material passing a one-inch sieve.
- (2) Excavate trenches true to line and grade to provide the conduit uniform bearing throughout its length. Do not backfill the trench before inspecting the conduit. Carefully tamp the backfill in place as specified for placing backfill in layers in [651.3](#). Place at least 0.7 cubic feet of size No. 2 coarse aggregate conforming to [501.2.7.4.2](#) directly under each drainage hole.

- (3) If cinders are present when laying rigid conduit, encase the conduit in at least 2 inches of concrete, or remove for at least 12 inches below the conduit and backfill the excavation with suitable material.
- (4) Apply an engineer-approved zinc-rich paint to field-cut threads not covered by fittings and to other areas with damaged or missing galvanization. Clean application and adjacent areas before painting.

652.3.1.3 Installing Conduit Special Underground

- (1) Under the Conduit Special bid items, conform to [652.3.1.2](#) except install by jacking, boring, auguring, or other engineer-approved methods that do not disturb the existing overlying pavement, curb and gutter, or sidewalk. Use conduit suitable for the installation method used. Repair pavement, curb and gutter, or sidewalk that the engineer determines damaged by the installation.

652.3.1.4 Installing on Structures

- (1) Install conduit on structures as the plans show either by embedding in concrete or mounting on the outside of the structure. Unless specifically provided otherwise, do not leave openings in the structure for subsequent conduit placement. Install engineer-approved expansion fittings where the conduit crosses an expansion joint in a structure. Install additional expansion fittings conforming to the WSEC and adjust for the ambient temperature at the time of concrete pour.
- (2) If embedding conduit in concrete, hold it rigidly in place while pouring the concrete. Provide drainage for embedded raceways.
- (3) If mounting on the outside of the structure, use reinforced thermosetting resin conduit (RTRC) and hardware conforming to manufacturer recommendations. Use only manufactured bends and sweeps. Do not make field bends. Ensure that the installer is certified by the manufacturer of the conduit and conforms to manufacturer recommendations for installation on the outside of structures. Provide evidence of installer certification to the engineer before installation.

652.3.1.5 Constructing Loop Detector Slots

- (1) Under the Loop Detector Slots bid item, construct slots in existing asphalt or concrete pavement for loop detector conduit, as the plans show or the engineer directs.
- (2) Construct by sawing the full width and depth of the slot, or by sawing both edges of the slot full depth and removing the remainder by chipping, or other engineer-approved methods. Clean the slots with jets of water and compressed air; remove dirt, dust, and debris; and thoroughly dry before installing the detector loop conduit. Remove and dispose of surplus material.

652.3.1.6 Installing Loop Detector Conduit

- (1) Under the Conduit Loop Detector bid item, provide loop detector conduit and related fittings as the plans show.
- (2) After installation, protect the loop detector conduit from any damage that could occur. Repair or replace damaged loop detector conduit at no expense to the department. The engineer will approve the replacement or repair method, and the resulting finished work.

652.3.2 Marking and Inspecting

- (1) Mark the location of each conduit as the plans show.
- (2) After the conduit installation is complete, inspect each installed conduit before any wire is pulled. During this inspection, ensure that the conduit raceway is fully open for its entire length. Replace any conduit that the engineer determines is crushed, damaged, or unsatisfactory.
- (3) If the engineer directs, expose the conduit at a randomly selected conduit arrow mark. If the distance from that conduit's centerline to a plumb line projected down from the tip of the arrow mark is more than six inches, expose all arrow marked conduits. Destroy arrow marks not meeting the six-inch limit and remark the conduit.

652.4 Measurement

- (1) The department will measure the Conduit Rigid Metallic, Conduit Rigid Nonmetallic, and Conduit Reinforced Thermosetting Resin bid items by the linear foot acceptably completed, measured along the conduit centerline from center-to-center of concrete bases, pull boxes, junction boxes, vaults, or from capped conduit ends. The department will not deduct for the length of intermediate concrete bases, pull boxes, junction boxes, vaults, or fittings. The department will measure engineer-specified drain duct from a pull box to a ditch or sewer.
- (2) The department will measure the Conduit Special bid items by the linear foot acceptably completed, measured from center of pull box to center of pull box.
- (3) The department will measure Conduit Loop Detector by the linear foot acceptably completed, measured around the loop and from the loop to the nearest center of pull box.

(4) The department will measure Loop Detector Slots by the linear foot acceptably completed.

652.5 Payment

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
652.0100 -0199	Conduit Rigid Metallic (size)	LF
652.0200 - 0399	Conduit Rigid Nonmetallic (schedule) (size)	LF
652.0400 - 0599	Conduit Reinforced Thermosetting Resin (size)	LF
652.0600 - 0699	Conduit Special (size)	LF
652.0800	Conduit Loop Detector	LF
652.0900	Loop Detector Slots	LF

- (2) Payment for the Conduit Rigid Metallic, Conduit Rigid Nonmetallic, Conduit Reinforced Thermosetting Resin, and Conduit Special bid items is full compensation for providing the conduit, conduit bodies, and fittings; for providing conduit hangers, clips, attachments, and fittings used to support conduit on structures; for pull wires or ropes; for expansion fittings and caps; for excavating, bedding, and backfilling, including any sand, concrete, or other required materials; and for making inspections.
- (3) Payment for the Conduit Special bid items also includes repairing overlying pavement, curb and gutter, or sidewalk the contractor disturbs or damages.
- (4) Payment for the Conduit Rigid Nonmetallic bid items also includes pull box drain duct the engineer directs under the [653](#) Pull Box bid items.
- (5) Payment for Conduit Loop Detector is full compensation for providing materials, including conduit, compacted backfill, surface sealer, pull wire, condulets, and conduit fittings.
- (6) Payment for Loop Detector Slots is full compensation for sawing; for chipping; for removing waste; and for cleaning the slot.
- (7) The department will not pay extra for conduit the contractor substitutes under [652.3.1.1](#). The department will pay separately for tracer wires under the appropriate Electrical Wire bid items specified in [655.5](#).