

SECTION 16711

TRAFFIC SIGNAL CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

All traffic signal conduit installed above ground shall be rigid steel, hot-dipped, galvanized conduit. Underground conduit installed in unpaved areas may be either rigid steel, hot-dipped galvanized conduit or Schedule 80 polyvinyl chloride (PVC) conduit, unless specified on the plans. Underground conduit installed under paved roadways and shoulders shall be rigid steel, hot-dipped galvanized conduit.

Unless otherwise shown on the drawings, all conductors shall be in conduit except when in metal poles. All conduits and fittings shall be of the sizes and types shown on the drawings. Each section of conduit shall bear evidence of approval of Underwriter's Laboratories.

The contractor may, at his own expense, use conduit of larger size than specified on the drawings providing that the larger size is used for the entire length of the conduit run.

1.02 UNIT PRICES

A. Measurement

This Item will be measured by the linear foot of the various sizes and types of conduit installed based on the type of surface as indicated in the bid item. Conduit shall be measured horizontally along the surface from center of pullbox to center of pullbar or foundation. Risers shall be measured as the amount of conduit extending from the ground surface.

B. Payment

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Conduit" of the various types and sizes specified. The price shall be full compensation for furnishing and installing conduit; for directional drilling, boring, excavating, furnishing and placing backfill, replacing pavement structure, sod, riprap, curbs or other surfaces; for marking location of conduit (when required); for furnishing and installing all fittings, junction boxes, special radius sweeps, and expansion joints, conduit straps; and for all labor, tools, equipment and incidentals necessary to complete the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Electrical PVC Conduit - The use of Electrical PVC conduit will be allowed as long as all guidelines set forth in the NEC (National Electrical Code) book are followed. Schedule 80 Electrical PVC will only be used in pertinent applications. In locations above the ground, rigid metal conduit will be used. All grounding procedures set forth in the NEC shall be followed.

PVC conduit shall be joined by solvent-weld method in accordance with the conduit manufacturers recommendation. No reducer couplings shall be used unless specifically indicated on the drawings.

B. Rigid Steel, Hot-Dipped, Galvanized Conduit

- 1) All conduit shall be of mild steel piping, galvanized inside and outside, and shall conform in all respects to the Federal Specification WW-C-581c, American Standard Rigid Steel Conduit Specification C80.1, latest revision, and Underwriters' Laboratories Specifications.
- 2) Trade Names - Conduit manufactured by Clifton, Pittsburg-Standard, Triangle or Youngstown conforms to the provisions of this specification. Other brands of rigid steel, hot dipped, galvanized electrical conduit may be approved by the engineer provided samples and engineering data submitted by the bidder equal the provisions of this specification.
- 3) Protective Coating - The galvanized coat of zinc shall be of uniform thickness, not less than 0.0008 inch, applied by the hot-dipped process to not only the inside and outside surfaces of the conduit, but also to the threads of the conduit.
- 4) Threading and Reaming - Each piece of conduit shall be straight, free from blisters and other defects, cut square and taper reamed, and furnished with coupling in 10 ft. lengths threaded each end. The interior threaded surface of each coupling shall be galvanized to insure 100% galvanic protection when coupled together with lengths of hot-dipped rigid conduit with hot-dipped galvanized threads.
- 5) Rigid Elbows - Rigid standard and special radius elbows shall be made from the same grade of mild steel piping as rigid steel conduit. They shall be galvanized so that not only the exterior and interior surfaces shall have

- a galvanized coating but also the threaded area, thereby insuring 100% galvanic protection on all surfaces.
- 6) Chemical Test for Coating - The hot galvanized coating shall be of such quality and uniformity that a sample of hot-galvanized conduit will not show a fixed deposit of copper after four (4) immersions or dips in a standard copper sulfate solution.
 - 7) Bending Test - The hot-galvanized coating on the inside and outside surfaces shall be sufficiently elastic to prevent cracking or flaking when a sample of finished conduit is bent 90 degrees, at a minimum bend of 60 degrees inner edge of the bend of six (6) times the inside diameter of the conduit. For conduits two (2) inches in diameter, or smaller, special eighteen (18) inch minimum radius sweeps shall be furnished and installed by the contractor.

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

- A. General - The contractor shall familiarize himself with the provisions of the General and Special Conditions in regard to permits, codes, laws and ordinances, and these provisions shall be controlling factors, except as specifically noted otherwise or supplemented herein.

All work shall be done in accordance with the latest rules and regulations of the National Board of Fire Underwriters, the National Electrical Safety Code and all local ordinances.

- B. Coordination - The work shall be carefully coordinated with work of other trades. Wherever work covered under this item, the order of work shall be carefully scheduled and coordinated to secure the completion of the various portions in the best possible manner. The rights of the various interests and the sequence when in dispute, shall be established by the Engineer and his instructions as to priority and scheduling shall be final and binding.
- C. Placement - All joints in conduit shall be cut square, reamed smooth and drawn up tight. Concealed conduit shall run in as direct a manner as practicable, with maximum radius bends. All bends shall be free from dents or flattening. Not more than the equivalent of three quarter bends (two hundred seventy degrees) shall be used in any run between terminals, outlets and junction or pull boxes. Conduit joints shall be made with approved couplings and unions; where conduit

cross expansion joints, expansion fittings shall be installed. Conduit runs underground shall be installed a minimum of 24 inches below finished grade, except where it is impossible or impractical. The Engineer or approved designer shall be the sole judge of the permissible depth of conduit installation. The conduit shall be installed as shown on the plans or as directed by the Engineer. Each conduit run shall be swabbed after installation, and a No. 9 galvanized steel pull wire shall be inserted in each conduit and folded in a manner making it easy to retrieve from each end. The conduit ends shall be capped or plugged until cabling and wiring operations commence.

Upon request of the Engineer, the contractor shall draw a full-time metal brush, attached by swivel joint to a pull tape through "metal conduit" and a special template having a diameter not less than 75 percent of the inside diameter through PVC conduits to insure that the conduit is clean and free from obstructions. A nylon or non-metal pull tape shall be used in pulling cable and conductors through PVC conduit. Metal tapes will not be permitted in PVC conduit. The conduits shall be placed as shown on the drawings or as directed by the Engineer.

Conduit placed for concrete encasement shall be secured and supported in such a manner that the alignment will not be disturbed during placement of the concrete. No concrete shall be placed until all of the conduit ends have been capped and all box openings closed.

PVC conduit which is placed under existing pavement, sidewalks, and driveways shall be placed by first providing a void through which the PVC conduit shall be inserted. Boring is required for placing conduit under pavements. Metal conduit which is to be placed under existing pavement, sidewalks, and driveways shall be placed by boring.

Existing conduit which has been placed in position on the job site by others for this installation shall be checked to see that there are no obstructions in the conduit prior to threading the wire through. Any such obstructions shall be cleared without damage to the conduit, prior to installing cable.

Conduit runs shall be installed in such a manner as to minimize the accumulation of moisture at low points and pockets.

The components parts of conduits systems shall, in general, be of like material. Where dissimilar metals are used together, suitable provisions shall be made to prevent galvanic action.

The ends of all conduit runs shall be closed immediately after installation to prevent the accumulation of water, dirt and other foreign material. Conduit shall be swabbed out where necessary before conductors are pulled in. Bends may be either factory or field made. All 2 inch conduits shall be placed with special radius sweeps with a minimum radius of 18 inches. Standard bends shall not be allowed with 2 inch conduits.

D. Bonding

A No. 8 solid soft bare copper bond wire shall be installed in each conduit. This bond wire shall be firmly attached to the grounding rod installed in each pull box and cabinet. The bond wire shall create a continuous grounding system for the entire conduit system. All conduits, including rigid metal, shall be bonded together with a No. 8 solid bare copper wire and have continuity to every ground rod installed at each signal installation.

E. Pull Rope

A 5/16 inch nylon pull rope shall be installed in each conduit installed. A minimum of three feet of pull rope shall be coiled in each pullbox and cabinet.

F. Sealing

After installation of cables and wires the conduits shall be sealed with a suitable compound so as to prevent the entrance of moisture or gases.

END OF SECTION