

ITEM 662.74125325 - HDPE INNERDUCT 1 ¼ in. ID

1. DESCRIPTION:

- 1.01 This work shall consist of furnishing all labor, tools, and equipment necessary for installing high density polyethylene (HDPE) innerduct as indicated on the plans or as directed by the Engineer. The innerduct is to be used for fiber optic cable facilities and will be placed as direct burial, drilled, or in sleeves as shown in the plans.
- 1.02 The innerduct shall include the following work items:
- A. Innerduct
 - B. Splicing
 - C. Trace Wire
 - D. Warning Tape
 - E. Path Markers
 - F. Plugs and Lashing Ties
 - G. Documentation

Conduit excavation, backfill, sleeves, and directional drilling or jacking are paid for under separate items as shown in the plans.

2. MATERIALS:

2.01 Innerduct:

- A. The innerduct shall be smooth-walled, inside and outside, High Density Polyethylene (HDPE) plastic Type SDR9 deliverable to the site on reels. All innerduct shall be the same inner and outer diameter and shall be acquired from the same vendor.
- B. The innerduct shall be extruded from high-density polyethylene (HDPE) resin and conforming to the minimum standards for polyethylene PE345430B as defined in ASTM D3350.
- C. Each innerduct shall be solid color coded as shown on the plans.
- D. The innerduct shall be suitable for heat fusion welding using a fusion duct splicer.
- E. Innerducts shall be pre-lubricated during the manufacturing process such that the lubricant becomes permanently impregnated in the inner walls of the innerducts. The process shall provide a dynamic co-efficient of friction of .06 to .09 in accordance with Bellcore Standard GR-TSY-356-CORE, Oct. 1995, Section 4.1.5.
- F. The lubricant shall be compatible with the proposed fiber optic cable jacket.

2.02 **Trace Wire:** The Contractor shall select a suitable trace wire for the installation and provide a demonstration to the Engineer. The trace wire shall be detectable at depths of up to 15 feet below grade.

2.03 **Underground Warning Tape:** Underground Warning Tape shall be a heavy-duty polyethylene material that is compounded for direct burial service and which will resist acids, alkalis and other soil substances. The tape shall be orange with a continuous legend "CAUTION BURIED FIBER OPTIC CABLE" print in black. The underground warning tape shall be six (6) inches wide and have a minimum thickness of 4 mils.

ITEM 662.74125325 - HDPE INNERDUCT 1 ¼ in. ID

2. MATERIALS: (cont'd)

- 2.04 **Path Markers:** The Contractor shall provide above-grade markers to identify the path of the buried duct. The markers shall be orange and shall bear the permanent factory-printed text as shown on the plans. The markers shall be 12 inches tall by four (4) inches wide by 1/8 inch thick and constructed of polyethylene rated for a minimum of 10 year outdoor durability. The markers shall be resistant to UV rays, scratches, fading, and cracking. Galvanized steel posts shall be provided as necessary to mount the markers in areas as indicated in the plans. Attachment hardware shall be galvanized steel, stainless steel, or other non-corrosive materials approved by the Engineer.
- 2.05 **Innerduct Plugs:** Innerduct plugs and terminating plugs shall be corrosion proof, chemical resistant, removable, reusable and provide a light, air and gas tight seal to seal the Innerduct. The terminating plug shall have an individual entry port for each installed cable.
- 2.06 **Lashing Ties:** Lashing ties shall be weather resistant nylon, non-releasable with a minimum loop tensile strength of 1.1 kN □ 250 pound force.

3. CONSTRUCTION DETAILS:

3.01 Innerducts:

- A. The innerducts shall be placed as direct burial or in sleeves where shown on the plans.
- B. Innerduct shall be installed in accordance with industry standards, manufacture's written instructions, as shown on the Plans or as ordered by the Engineer. Guide wheels, bending shoes or quadrant guides shall be used to achieve a smooth transition from road grade to conduit depth. All bends in the Innerduct shall be made without kinking, flattening or appreciably reducing the internal diameter of the Innerduct and as recommended by the manufacturer.
- C. The configuration of the color-coded innerducts shall be as shown on the plans. The innerducts shall be bundled together using lashing tape every six (6) feet to prevent duct separation and entanglement.
- D. If existing pull boxes require resetting or other modifications, this work shall be completed prior to the installation of innerduct into the subject pull box.
- E. Innerduct shall be installed in continuous lengths to the extent possible. Splicing of innerduct will be permitted as required to facilitate the installation. Innerduct shall be butt-fused together using a heat fusion welder. Heat fusion welding shall be conducted using a machine specifically designed for the application and materials being used and shall have been widely used in the industry for a minimum of 5 years. The fused innerduct shall have been tested and demonstrated to provide an impermeable seal with a tensile strength equal to or greater than the duct without splices.
- F. All Innerducts shall be sealed during installation and when being stored to prevent contaminants from entering the innerduct. All Innerducts terminating in pull boxes with installed wires or cables shall have a terminating plug installed in accordance with the manufacturer's instructions. Unused innerduct shall pass through the pull boxes uncut.
- G. Where the innerducts terminate at pull boxes, the Contractor shall break into the pull box and seal the opening between the innerduct and pull box with a watertight sealer approved by the

ITEM 662.74125325 - HDPE INNERDUCT 1 ¼ in. ID

Engineer.

3. CONSTRUCTION DETAILS: (cont'd)

3.01 Innerducts: (cont'd)

- H. Warning tape, trace wire and path markers shall be installed along the entire innerduct path as shown in the plans and as directed by the Engineer. Wherever possible, the markers shall be affixed to permanent roadside features within 30 feet of the conduit path. The Contractor shall submit a list of intended mounting locations for the Engineer's approval.
- I. After installation each innerduct shall be tested for continuity using a nominal 1 ¼ inch diameter non-collapsible mandrel. The testing equipment shall be approved by the Engineer. Notification of all tests shall be made at least 48 hours prior to testing. All testing shall be witnessed by the Engineer and a third party (if involved).
- J. The minimum bend radius shall be as indicated on the plans, or as recommended by the manufacturer, whichever is greater.

3.02 Documentation:

- A. Complete and accurate as-built diagrams showing the entire innerduct plant shall be included as part of the overall final documentation for the cable plant. The Contractor shall incorporate as-built documentation from other innerduct installation operations (such as for structure-mounted multi-duct and plan/profile data from the directional driller) if applicable.
- B. Documentation shall also include documentation on the methods and equipment required to locate the fiber path using the trace wire.

4. METHOD OF MEASUREMENT:

- 4.01 The innerducts shall be measured by feet along the axis of the innerduct, of the size and type specified, installed according to the plans, Proposal, or as directed by the Engineer. Measurement shall include all couplings and bends.

5. BASIS OF PAYMENT:

- 5.01 The unit price bid per foot shall include the innerduct and all labor and materials necessary to complete the work, including splicing, testing and connection to pull boxes.
- 5.02 Progress payments will be made in the following percentages:

<u>Payment Milestone</u>	<u>Description</u>	<u>Percentage</u>
1	Duct Installed and Plugged	50%
2	Completion of Testing	40%
3	Markers and Documentation	10%