



SECTION 02580
UNDERGROUND DUCT BANK

PART 1 GENERAL

1.1 SECTION INCLUDES

All material, equipment, fabrication, and installation as required for the following:

1. Underground Conduit and Duct System (CONTRACTOR Furnished)
2. Underground Conduit Accessories (CONTRACTOR Furnished)

1.2 RELATED SECTIONS

- A. All sitework sections as applicable
- B. Precast Electric Manholes And Handholes, Section 02585
- C. Concrete For Utility Lines, Section 03303
- D. General Information (Electrical), Section 16050
- E. Electrical Distribution Underground, Section 16375

1.3 SUBMITTALS

- A. **Manufacturer's Catalog Data:** Provide catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the Product requirements for underground conduit and accessories as listed herein. Specifically provide information on prefabricated, interlocking, plastic duct spacers and caps.
- B. **As-built Drawings:** The as-built drawings shall be a record of the Work as it is actually field installed by CONTRACTOR. The drawings shall include all the information as shown on the Project Drawings as well as any deviations, modifications, and changes to the Project Drawings, however minor. Drawings shall define routing of ductlines and provide references to fixed landmarks as required. As-builts shall indicate the stacking configuration of the individual conduit along each particular section of ductline as installed between manholes. CONTRACTOR shall submit one full sized set of marked up prints fully detailing the as-built conditions.



PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacturing of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening date. Items of the same classification shall be identical in detail and composition.

2.2 CONDUIT AND DUCTLINES

- A. Metallic Conduit: Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings shall comply with UL 514A and NEMA FB1.
- B. Concrete Encased Conduits: Concrete encased conduit shall be Schedule 40 PVC and comply with UL 651 Schedule 40. The conduit size and quantity shall be as indicated on the Drawings. Conduit shall be straight and true and shall be furnished in a minimum length of 10 feet. A cross section taken at any point perpendicular to the conduit shall not vary more than 1/8 inch from a true circle.
- C. Conduit couplings, adapters, bends, caps, etc., shall be products of the conduit manufacturer and shall be secured to the conduit with an adhesive approved by the conduit manufacturer and applied in strict accordance with the conduit manufacturer's recommendations. Solvent cement and fittings for PVC shall be furnished by the same manufacturer.

2.3 ACCESSORIES

- A. End Bells: Provide plastic end bells as required to provide a smooth and rounded surface at cut edges of the conduit to prevent damage to the cable during installation and normal movement. End bells shall also be provided where conduit enters handholes. End bells shall be compatible with the type conduit and as recommended by the conduit manufacturer.
- B. Duct Spacers: Provide non-metallic, prefabricated, interlocking, plastic duct spacers as manufactured by S-P Products, Underground Devices, or equal.
- C. Conduit Sealing Compound: Compounds for sealing conduit shall be compatible with the insulation of the cable as recommended by the cable manufacturer. The compound shall adhere to plastic conduit, metallic conduit, concrete, masonry, cable sheaths, jackets, covers, etc. Compounds shall provide a moisture resistant seal.



2.4 CONCRETE

All concrete used for conduit encasement shall meet the requirements of Section 03303 and shall be consolidated in accordance with ACI 309R-87 or latest revision thereof.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS: Equipment, material, and devices shall be installed in accordance with the manufacturer's published instruction and the requirements of the Contract Documents. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02321.

- A. Conformance to Codes: The installation shall comply with the requirements of NFPA 70- National Electric Code, ANSI C2, and IEEE Standards, as applicable.
- B. Verification of Dimensions: CONTRACTOR shall become familiar with the details of the Work, shall verify dimensions in the field, and shall advise OWNER of any discrepancy before performing the Work. Verify that required trenching has been completed and trenches are clear of obstacles and ready for duct installation.

3.2 CONDUIT DUCT LINES

- A. Requirements: Number and size of conduit in ductlines shall be as indicated. Ductlines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Pockets or traps where moisture may accumulate shall be avoided. **Short-radius manufactured 90-degree conduit elbows must be rigid metal conduit and may only be used for pole or equipment risers, unless specifically indicated as acceptable or otherwise approved by OWNER.** The minimum manufactured bend radius shall be 24 inches for conduit of less than 3 inches in diameter, and 36 inches for conduit 3 inches or greater in diameter. Otherwise, long-sweep bends having a minimum radius of curvature of 60 inches shall be used for a change of direction of more than 10 degrees either horizontally or vertically. Both curved sections and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Natural bending of conduits during installation is permitted; however, heat assisted bending is not authorized unless specifically approved by OWNER. Ducts shall be provided with end bells whenever ductlines terminate in handholes.
- B. Spare Conduit: The CONTRACTOR shall provide and install pull lines in all spare conduit. The polyethylene pull string "poly-line" shall have a minimum 200 lb. breaking strength. Spare conduit shall have the pull strings secured and the ends sealed with a non-permanent and removable sealing compound and end cap.

- C. Preparation: Conduit shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. The cut end of each conduit shall be reamed smooth. Field-cut conduit shall be joined with double-ended couplings designed for that purpose. A coupling recommended by the conduit manufacturer shall be used whenever an existing conduit is connected to a duct of different material or shape. Conduit shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of water or any foreign substance. Conduit shall be inspected for cleanliness prior to being laid in the trench. Conduit shall be free of cracks and chipped ends. Plastic conduit shall be stored on a flat surface and shall be protected from direct sunlight.
- D. Configuration Adjustment: When changes in configuration and formation of conduit within a ductline are necessary, the transition shall be accomplished in as straight an alignment as possible, maintaining continuous support under the conduits.
- E. Non-encased Direct-Burial Ductlines (**Only used if approved by OWNER**): Top of ductline shall be not less than 42 inches below surface of the ground and shall be installed with a minimum of 3 inches of suitable $\frac{3}{4}$ inch gravel fill around each conduit, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottom of trench shall be graded toward manhole or handhole and shall be smooth and free of stones, soft spots, and sharp objects. Where bottom of trench comprises material other than sand, a 3-inch layer of sand shall be laid first. Joints in adjacent tiers of conduit shall be vertically staggered at least 6 inches. The first 15-inch layer of backfill cover shall be $\frac{3}{4}$ inch clean gravel compacted as previously specified. The rest of the excavation shall be backfilled in accordance with Section 02321 and compacted in lifts in accordance with such Section.
- F. Concrete Encased Ductline: Top of ductline concrete shall be not less than 30 inches below surface of the ground. **If 30 inches of cover is not possible because of existing underground facilities, continuous rock formations, or other barriers then the concrete encased ductline may be installed at the minimum burial depth allowed by the National Electric Code if approved by the OWNER but in no case shall the cover on top of the concrete be less than 18 inches.** All conduit shall be encased and shall have all openings sealed, plugged, or capped before the concrete is poured. Each single conduit requiring concrete encasement shall be completely encased in concrete with a minimum of 3 inches of concrete on all sides. Ductline encasements shall be steel-reinforced monolithic pours. The walls of the trench may be used to form the sidewalls of the pour provided the soil is stable. Where a pour is made adjacent to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. At any point along the route the tops and sides of the

concrete encasement shall be not less than 6 inches of concrete and the minimum cover shall be not less than that indicated on the Project Drawings, but in no case less than that which is required by NFPA 70. Spacers of the size and quantity as recommended by the duct manufacturer shall be placed no less than 6 feet on centers. Conduit shall be securely anchored at a minimum of 5 foot intervals to prevent movement during placement of concrete and joints and spacers shall be staggered a minimum of 6 inches vertically. **All ductlines shall be reinforced with continuous #6 reinforcing bars running longitudinally along the trench and secured at each corner of the ductline.** Do not install reinforcing steel or other ferrous metal between individual conduit. Do not place concrete encasement prior to inspection and approval of duct installation by the Resident Project Representative or OWNER.

- G. Joining of Plastic Conduit: Joints in each type of conduit shall be made up in accordance with the conduit manufacturer's recommendations for the particular type of conduit and coupling being utilized. An adhesive approved by the conduit manufacturer shall be applied in accordance with the manufacturer's recommended joining procedure. Joints shall be staggered a minimum of 6 inches.
- H. Dig-in Warning Tape: CONTRACTOR shall install OWNER-furnished warning tape bedded in backfill material approximately 18 inches above the top of the ductline and running continuously along the route of the underground distribution system.
- I. Conduit Cleaning: Conduit shall be cleaned with an assembly that consists of a flexible mandrel that is ¼ inch less than the size of the conduit, two wire brushes, and a rag. The cleaning assembly shall be pulled through the conduit a minimum of two times (once in each direction) or until all dirt and debris is sufficiently removed. Once cleaning is complete the CONTRACTOR shall pull mandrel, 1/2" smaller than the size of the conduit through each individual conduit. The Resident Project Representative shall be present for this test. Any obstructed or damaged conduit shall be cut out and replaced.

END OF SECTION