

## **SECTION 26 05 43.13**

### **UNDERGROUND DUCT BANKS FOR ELECTRICAL SYSTEMS**

#### **PART 1 – GENERAL**

##### **1.1 DESCRIPTION**

- A. Scope:
  - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install underground duct banks.
- B. Coordination:
  - 1. Duct bank routing on the Drawings is diagrammatic. Coordinate installation with piping and other Underground Facilities and locate duct banks clear of interferences.
  - 2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before underground duct bank Work.
- C. Related Sections:
  - 1. Section 31 23 05, Excavation and Fill.
  - 2. Section 03 20 00, Concrete Reinforcing.
  - 3. Section 03 30 00, Cast-in-Place Concrete.
  - 4. Section 26 05 26, Grounding and Bonding for Electrical Systems.
  - 5. Section 26 05 53, Identification for Electrical Systems.
  - 6. Section 26 05 33.13, Rigid Conduits.
  - 7. Section 26 05 33.26, Expansion/Deflection Fittings.

##### **1.2 SUBMITTALS**

- A. Action Submittals: Submit the following:
  - 1. Shop Drawings:
    - a. Layouts showing proposed routing of duct banks and locations of manholes, handholes, and areas of reinforcement.
    - b. Profiles of duct banks showing crossings with piping and other Underground Facilities.
    - c. Typical cross sections for each duct bank.
- B. Informational Submittals: Submit the following:
  - 1. Special Procedure Submittals:
    - a. Installation procedures.
  - 2. Field Quality Control Submittals:
    - a. Field test report.

- C. Closeout Submittals: Submit the following:
  - 1. Record Drawings:
    - a. Include actual routing of underground duct bank runs on record documents in accordance with Section 01 78 39, Project Record Documents.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Duct: Provide conduit and fittings in accordance with Section 26 05 33.13, Rigid Conduits. Conduit types shall be as follows:
  - 1. Schedule 40 PVC conduits for power circuits and fiber-optic cable.
  - 2. PVC coated, galvanized rigid steel conduits for the following types of circuits: low voltage status, analog, and communication.
- B. Backfill: Provide backfill, including select backfill, in accordance with Section 31 23 05, Excavation and Fill.
- C. Reinforcing: Provide Duct bank reinforcing in accordance with Section 03 20 00, Concrete Reinforcing.
- D. Concrete: Provide duct bank concrete in accordance with Section 03 30 00, Cast-in-Place Concrete.
- E. Grounding: Provide ground cable in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.
- F. Conduit Spacers: Conduit spacers shall be nonmetallic, interlocking type to maintain spacing between conduits. Provide spacers suitable for all conduit types used in multiple sizes.
- G. Duct Sealing Compound:
  - 1. Products and Manufacturers: Provide one of the following:
    - a. 0-Z/Gedney, Type DUX.
    - b. Approved equivalent.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

A. Excavation and Backfilling:

1. Provide excavation and backfilling for ductbank installation in accordance with Section 31 23 05, Excavation and Fill.
2. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material, or other materials that can damage or contribute to corrosion of ducts or cables, or prevent adequate compaction of backfill.

B. Duct Bank Layout:

1. Top of duct bank concrete shall be a minimum of 2.5 feet below grade, unless shown or indicated otherwise on the Drawings.
2. Slope duct bank runs for drainage toward manholes and away from buildings with slope of approximately three inches vertical per 100 feet of run.

C. Ductbank Assembly:

1. Assemble duct banks using non-magnetic saddles, spacers, and separators. Position separators to provide minimum three-inch concrete separation between outer surfaces of each conduit. Provide side forms for each duct bank.
2. Make bends with sweeps of not less than four-foot radius or five-degree angle couplings.

D. Concrete Placing:

1. Provide minimum four-inch concrete covering on each side, top, and bottom of concrete envelopes around conduits. Concrete covering shall be as shown or indicated on the Drawings.
2. Provide red dye in concrete for easy identification during subsequent excavation; all concrete in entire duct bank, including top and bottom, shall be dyed.
3. Firmly fix conduits in place during concrete placing. Carefully place and vibrate concrete to fill spaces between conduits.

E. Conduit Transitions:

1. Conduit installations shall be watertight throughout entire length of duct bank.
2. Transition from non-metallic to galvanized rigid steel conduit where duct banks enter structure walls and slabs.
3. Terminate conduits in insulated grounding bushings.
4. Continue conduits inside buildings in accordance with Section 26 05 33.13, Rigid Conduits, and as shown or indicated in the Contract Documents.
5. If ducts are not concrete-encased, provide expansion and deflection fittings in accordance with Section 26 05 33.26, Expansion/Deflection Fittings.
6. Plug and seal empty spare conduits entering structures. Conduits in use entering structures shall be sealed watertight with duct sealing compound.

F. Duct Bank Reinforcing:

1. Provide reinforcing for all duct banks:

2. Install duct bank reinforcement as shown or indicated on the Drawings.
  3. Provide maximum clearance of 1.5 inches from bars to edge of concrete encasement.
- G. Connections to Structures:
1. Firmly anchor duct banks to structure walls or slabs. Epoxy-grout duct bank rebar into structure concrete to eliminate sheer forces between duct bank and structure wall concrete.
  2. Duct bank penetrations through structure walls shall be watertight.
- H. Grounding:
1. Provide bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout entire duct bank system.
  2. Connect ground cable to building and station ground grid or to equipment ground buses. Also, connect ground cable to steel conduit extensions of underground duct bank system.
  3. Provide ground clamp and bonding of each steel conduit extension to maintain continuity of ground system.
  4. Terminate ground cable at last manhole or handhole for outlying structures.
- I. Detectable Underground Warning Tape:
1. Provide detectable underground warning tapes complying with Section 26 05 53, Identification for Electrical Systems, over the full length of each underground duct bank.
  2. Install warning tapes approximately 12 inches below grade.
  3. Provide multiple tapes across the width of each duct bank. Locate center of a warning tape above each edge of duct bank, and at intervals across top width of duct bank so that clear space between tapes does not exceed six inches.
- J. Reused Existing Ducts:
1. Pull rag swab through duct to remove water and to clean conduits prior to installing new cable.
  2. Repeat swabbing until all foreign material is removed.
  3. Pull mandrel through duct, if necessary, to remove obstructions.

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