SECTION 260543
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide an underground duct system for power, telephone, data and miscellaneous signal/communication services as indicated and specified.
2. Provide work items required to accomplish a complete system, such as duct runs, concrete encasement, excavating and backfilling.
3. Electrical site drawings indicate approximate ductbank arrangement and are intended to primarily indicate conduit and duct sizes, cable routing, and ductbank cross-sections.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A48 - Specification for Gray Iron Castings.
2. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

1.3 SUBMITTALS

A. Product Data

1. Submit manufacturer's technical product data for underground duct system components.

B. Shop Drawings

1. Submit dimensioned drawings of underground duct system, showing layout of ducts, spatial relationships to adjoining underground utility lines and connections to building electrical equipment and other structures.

C. Quality Control Submittals

1. Submit results of field tests.

PART 2 - PRODUCTS

2.1 CONDUIT AND DUCT

A. Material

1. Rigid non-metallic conduit.

2.2 CONDUIT AND DUCT ACCESSORIES

A. Material

1. Provide fittings, bushings, and other accessories designed to match and mate with the size and type of conduit and duct provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation and Backfilling

1. Provide excavation and backfilling as required.

B. Concrete Encasement of Conduit and Ducts

1. Provide concrete encasement of conduit and ducts per Section 03300, "Cast-In-Place Concrete", using calcium-chloride-free, 3000 psi, normal weight concrete.
2. Encase ducts and conduit in concrete with minimum three-inch coverage of outside conduits and between conduits.
3. When pouring concrete, avoid having a heavy mass of concrete fall directly on the conduit. Direct the flow down the sides of the bank to the bottom so it rises up the middle, filling all spaces uniformly. Work a long flat bar up and down between the vertical rows of conduits.
4. Brace the duct bank to prevent the conduit from floating by driving reinforcing rods into the earth and tying them to the duct.
5. The concrete encasement is to be monolithic, insofar as possible. If joints are necessary, treat the surface of the joint to insure a good bond before the next section is poured.
6. Provide reinforcement for conduit and duct runs beneath roadways and for ten feet beyond each side of roadway.

C. Conduit and Duct Installation

1. Provide duct bank structure so that top is minimum 24 inches below finished grade (36 inches for 13.2 Kv) and minimum 6 inches below bottom of floor slabs, unless otherwise indicated.
2. Install duct structure a minimum of 12 inches away from gas, water, steam, and other piping,
3. Provide rigid non-metallic conduit unless otherwise specified or indicated.
4. Provide galvanized rigid steel conduit for ducts installed under floors, roadways, walks, and through building walls. Extend steel conduit 10 feet on each side of roadways and five feet beyond walls.
5. Provide galvanized rigid steel conduit for duct changes from horizontal to vertical and for vertical extension.
6. Provide galvanized rigid steel conduit elbows for horizontal changes in duct direction.
7. Do not lay steel conduit in cinders, ground containing cinder, and in concrete with calcium chloride content.
8. Provide a 6-inch-wide yellow polyethylene tape above each electric ductbank and telephone conduit run. Install tape continuously with overlap where splices are needed. Provide tape which reads: "Caution - Buried Electrical Line" or “Caution - Buried Telephone Line” as appropriate. Install no deeper than 18 inches below finished grade.

D. Joints and Terminations

1. Provide watertight and electrically continuous galvanized rigid steel conduit joints.
2. Provide solvent weld type joints for plastic utilities duct.
3. Provide end bell for conduits and ducts entering manhole.

4. Provide suitable adapter for plastic utilities duct to galvanized rigid steel conduit joints.
5. Stagger joints a minimum of 6 inches both horizontally and vertically.

E. Spacing, Alignment, and Drainage

1. Provide uniform spacing and alignment with comb-type precast or interlocking plastic separators.
2. Provide radius of conduit and duct bends which conform to NEMA requirements and cable requirements.
3. Provide a positive uniform pitch for duct drainage of not less than 3 inches per 100 feet. Drain ducts toward manhole.

F. Spare Conduits and Ducts

1. Provide conduit, and ducts indicated as spare with a 1/8-inch polypropylene pulling line for the entire conduit, and duct length with 24-inch slack at the ends.
2. Provide suitable cap for ends of spare conduits and ducts.

G. Cleaning Conduits and Ducts

1. Clean conduits, and ducts of foreign material and obstruction after installation and prior to installation of pull lines and cables.
2. With factory-made products, plug or cap ends of conduits and ducts after installation to prevent entry of foreign material.

H. Grounding

1. Provide continuous ground wire in duct encasement.

3.2 FIELD QUALITY CONTROL

A. Field Tests

1. Upon completion of the duct bank, test each conduit for clearance by pulling a mandrel through the conduit. For straight runs, use a mandrel diameter of 1/4 inch less than the nominal diameter of the conduit. For curved runs use a tapered mandrel having a length of 6 inches and end diameters of 6 and 1/4 and 1/2 inch less than the conduit diameter. After the mandrel test, clean the ducts by pulling a wire brush through.

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