SECTION 33 71 19

ELECTRICAL UNDERGROUND DUCTS AND MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rigid steel conduit.
2. Plastic conduit.
3. Plastic duct.
4. Reinforced resin conduit.
5. Precast concrete manholes.
6. Handholes.
7. Underground duct markers.
8. Cast-in-place manhole accessories.

B. Related Sections:

1. Division 03 - Concrete Forming and Accessories: Product and execution requirements for forms for cast-in-place manholes.
2. Division 03 - Concrete Reinforcing: Product and execution requirements for reinforcement for cast-in-place manholes.
3. Division 03 - Cast-In-Place Concrete: Product and execution requirements for concrete for cast-in-place manholes.
4. Division 07 – Damp proofing: Product and execution requirements for damp proofing of manhole exteriors.
5. Division 31 - Excavation: Product and execution requirements for excavation and backfill required by this section.
6. Division 31 - Trenching: Execution requirements for trenching required by this section.
7. Division 31 - Fill: Requirements for backfill to be placed by this section.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ASTM International:

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
4. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
5. ASTM C1037 - Standard Practice for Inspection of Underground Precast Concrete Utility Structures.

C. Institute of Electrical and Electronics Engineers:

1. IEEE C2 - National Electrical Safety Code.

D. National Electrical Manufacturers Association:

1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
2. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
3. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
4. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.
5. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.
6. NEMA TC 10 - PVC and ABS Plastic Communications Duct for Underground Installation.
7. NEMA TC 14 - Filament Wound Reinforced Thermosetting Resin Conduit and Fittings.

E. Underwriters Laboratories Inc.:

1. UL 651A - Type EB and A Rigid PVC Conduit and HDPE Conduit.

1.03 SYSTEM DESCRIPTION

A. Interconnected system of encased conduits, ducts, and manholes and handholes to distribute medium-voltage power, low-voltage power, telephone, data communications, and fire alarm.

B. Conduit routing, manhole and handhole locations are shown in approximate locations unless dimensions are indicated. Route and locate to complete duct bank system.

C. Medium-voltage: Use rigid plastic (PVC Schedule 40) conduit encased in concrete.

D. Low-voltage: Use rigid plastic (PVC Schedule 40) conduit encased in concrete.

E. Telephone: Use rigid plastic (PVC Schedule 40) conduit.

F. Data communication: Use rigid plastic (PVC Schedule 40) conduit.

1.04 SUBMITTALS

A. Division 01 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

C. Product Data: Submit for metallic conduit, nonmetallic conduit, ducts, manhole accessories, handholes, and fittings.

D. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

E. Acceptance or no exceptions taken by the County's Representative on any substitution proposed by the Developer Design/Builder shall not be construed as relieving the Developer Design/Builder from compliance with the project's specifications and performance requirements nor departure there from. The Developer Design/Builder remains responsible for details and accuracy for confirming and correlating quantities and dimensions and for the selection of fabrication processes, techniques and assembly, coordination of his work with that of all other trades and making any needed modifications consequent to the substitution at his own cost and for performing the work in a safe manner.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes and handholes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.07 COORDINATION

A. Division 01 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work with existing underground utilities and structures.

PART 2 PRODUCTS

2.01 RIGID STEEL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings: NEMA FB 1, steel.

2.02 PLASTIC CONDUIT

A. Rigid Plastic Conduit: NEMA TC 2, Schedule 40 PVC, with fittings and conduit bodies to NEMA TC 3.

2.03 PRECAST CONCRETE MANHOLES

A. Product Description: Precast manhole designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16 for areas with vehicle traffic and A-0.3 for walkways.

C. Shape: Rectangular with truncated corners.

D. Riser Casting: 12 inch, with manhole step cast into frame.

E. Frames and Covers: ASTM A48; Class 30B gray cast iron, 30 inch size, machine finished with flat bearing surfaces. Furnish cover marked ELECTRIC or TELEPHONE to indicate utility.

F. Duct Entry Provisions: Window knockouts.

G. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Furnish watertight seal.

H. Cable Rack Inserts: Minimum load rating of 800 pounds.

I. Cable Rack Mounting Channel: 1-1/2 x 3/4 inch steel channel, 48 inch length. Furnish cable rack arm mounting slots on 1-1/2 inch centers.

J. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

K. Cable Supports: Porcelain clamps and saddles.

L. Manhole Steps: Polypropylene plastic manhole step with 1/2 inch steel reinforcement Cast steps at 12 inches on center vertically.

M. Sump Covers: ASTM A48, Class 30B gray cast iron.

N. Source Quality Control: Inspect manholes in accordance with ASTM C1037.

2.04 HANDHOLES

A. Description: Molded composite handhole comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16 for areas with vehicle traffic and A-0.3 for walkways.

C. Shape: Rectangular.

D. Nominal Inside Dimensions: 24” x 36”, minimum or as indicated.

E. Inside Depth: 24 inches or as indicated.

F. Covers: Molded composite with tamperproof fasteners. Furnish cover marked ELECTRIC.

G. Duct Entry Provisions: Window knockouts.

2.05 UNDERGROUND DUCT MARKERS FOR MEDIUM VOLTAGE LINE

A. Underground Warning Tape: 4 inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Electric Service” in large letters.

2.06 CAST-IN-PLACE MANHOLE ACCESSORIES

A. Frames and Covers: ASTM A48 Class 30B gray cast iron, 30 inch size, machine-finished with flat bearing surfaces. Furnish cover marked ELECTRIC or TELEPHONE to indicate utility.

B. Cable Pulling Irons: Use galvanized rod and hardware.

C. Cable Rack Inserts: Minimum load rating of 800 pounds.

D. Cable Rack Mounting Channel: 1-1/2 x 3/4 inch steel channel, 48 inch length. Furnish cable rack arm mounting slots on 1-1/2 inch centers.

E. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

F. Cable Supports: Porcelain clamps and saddles.

G. Manhole Steps: Polypropylene plastic manhole step with 1/2 inch steel reinforcement.

H. Sump Covers: ASTM A48; Class 30B gray cast iron.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify routing and termination locations of duct bank prior to excavation for rough-in.

C. Verify locations of manholes prior to excavating for installation.

3.02 INSTALLATION - DUCT BANK

A. Install 12 KV power conduit at a minimum of 36 inches below finished grade.

B. Install 480 volt, 120 volt and low voltage conduit at 24 inches below finished grade.

C. Install conduit and duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope conduit and duct toward manholes and away from building entrances.

D. Cut conduit and duct square using saw or pipe cutter; de-burr cut ends.

E. Insert conduit and duct to shoulder of fittings; fasten securely.

F. Join nonmetallic conduit and duct using adhesive as recommended by manufacturer.

G. Wipe nonmetallic conduit and duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

H. Install no more than equivalent of three 90-degree bends between pull points.

I. Install fittings to accommodate expansion and deflection.

J. Terminate conduit and duct at manhole entries using end bell.

K. Stagger conduit and duct joints vertically in concrete encasement 6 inches minimum.

L. Use suitable separators and chairs installed not greater than 4 feet on centers. Secure separators and chairs to trench bottom prior to concrete pour.

M. Band conduits and ducts together before backfilling or placing concrete.

N. Securely anchor conduit and duct to prevent movement during concrete placement.

O. Place concrete in accordance with Division 03.

P. Use mineral pigment to color concrete red.

Q. Install ducts with minimum 3 inch concrete cover at bottom, top, and sides.

R. Install two No. 4 steel reinforcing bars in top of bank under paved areas.

S. Connect to existing concrete encasement using dowels.

T. Connect to manhole wall using dowels.

U. Provide suitable pull string in each empty duct except sleeves and nipples.

V. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

W. Backfill trenches in accordance with Division 31.

X. Interface installation of underground duct markers with backfilling specified in Division 31. Install 6 inches below finished surface.

3.03 INSTALLATION - PRE-CAST MANHOLE

A. Excavate for manhole installation in accordance with Division 31.

B. Install and seal precast sections in accordance with ASTM C891.

C. Install manholes plumb.

D. Use precast neck and shaft sections to bring manhole cover to finished elevation.

E. Attach cable racks to inserts after manhole installation is complete.

F. Install drains in manholes and connect to site drainage system.

G. Damp proof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days, in accordance with Division 07.

H. Backfill manhole excavation in accordance with Division 31.

3.04 INSTALLATION - PRE-CAST HANDHOLE

A. Excavate for handhole installation in accordance with Division 31.

B. Install and seal precast sections in accordance with ASTM C891.

C. Install handholes plumb.

D. Backfill handhole excavation in accordance with Division 31.

3.05 INSTALLATION-CAST-IN-PLACE MANHOLE

A. Excavate for manhole installation in accordance with Division 31.

B. Formwork: Form inside and outside manhole surfaces in accordance with Division 03.

C. Reinforcing: Install reinforcing in accordance with Division 03.

D. Concrete: Install air entrained 2000 psi compressive strength at 28 days in accordance with Division 03.

E. Shape: Rectangular.

F. Duct Entry: Cast duct openings in walls as required.

G. Cable Pulling Irons: Locate opposite each duct entry.

H. Manhole Steps: Cast steps at 12 inches on center vertically.

I. Attach cable racks to inserts after manhole construction is complete.

J. Install drains in manholes and connect to site drainage system or 4 inch pipe terminating in 1/3 cu yd crushed gravel bed in accordance with Division 33.

K. Damp proof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days, in accordance with Division 07.

L. Backfill manhole excavation in accordance with Division 31.

END OF SECTION