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## 260543 - Manholes (Underground Ducts & Raceways for Electric Systems)

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260543 - Manholes (Underground Ducts & Raceways for Electric Systems)

**SECTION 26 0543 - MANHOLES (UNDERGROUND DUCTS & RACEWAYS FOR ELECTRICAL SYSTEMS)**

1.1 SUMMARY

A. Section Includes:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and pull boxes.
3. Manholes.
4. Tracer Wire: Refer to Chapter 5, Division 01, Section 011000 1.3 N. 1 'General Requirements.'

- B. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

1.2 QUALITY ASSURANCE

- A. Comply with IEEE C2.

- B. Comply with NFPA 70.

1.3 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

- B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

1.4 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers:

1. AFC Cable Systems.
2. ARNCO Corporation.
3. Beck Manufacturing.
4. Cantex, Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. DCX-CHOL Enterprises, Inc.; ELECSYS Division.
8. Electri-Flex Company.
9. IPEX Inc.
10. Lamson & Sessions; Carlon Electrical Products.

11. Manhattan Wire Products; a Belden company.
- B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- C. Duct Accessories:
  1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and retained to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
  2. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.
    - a. Color: Red dye added to concrete during batching.
    - b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

## 1.5 HANDHOLES AND PULL BOXES

- A. Description: Comply with SCTE 77.
  1. Color: Gray or Green.
  2. Configuration: Units shall be designed for flush burial and have open, closed, or integral closed bottom unless otherwise indicated.
  3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  5. Cover Legend: Molded lettering.
  6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.
- B. Fiberglass Handholes and Pull Boxes with Polymer Concrete Frame and Cover: Complying with SCTE 77 Tier 5, Tier 8, or Tier 15 loading. Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
  1. Manufacturers:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. Christy Concrete Products.
    - d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

## 1.6 PRECAST MANHOLES

- A. Manufacturers:

1. Christy Concrete Products.
  2. Cretex Concrete Products West, Inc.; Riverton Division.
  3. Elmhurst-Chicago Stone Co.
  4. Oldcastle Precast Group.
  5. Oldcastle Precast Inc.; Utility Vault Division.
  6. Utility Concrete Products, LLC.
  7. Wausau Tile Inc.
8. Manhole Structure Manholes shall have a minimum internal dimension of 12'-0" by 6'-0' with minimum headroom of 7-feet.
- a. Shall be for heavy duty precast reinforced concrete manholes for electric installation. The concrete minimum compressive strength: 5000 psi at 28 days in accordance with ASTM, reinforced in accordance with H-20 Loading.
  - b. Precast units shall not have more than two (2) sections
  - c. Provide Precase extension with mortared joints with full bearing.
  - d. Joints between sections shall have self-aligning V-grooves and asphaltic butyl compound joint sealant.
  - e. All conduits shall be terminated in termaduct fittings precast into the manhole walls.
  - f. All concrete ducts shall be doweled to the manhole walls and building foundation walls with rebar.
  - g. Frames and covers shall be cast iron, heavy-duty type, suitable for H-20 street loading and have machined bearing surfaces. Electrical manholes shall have a minimum clear opening of 32" in diameter. The word "Electrical" shall be cast on the upper side of each cover.
9. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
- a. Type and size shall match fittings to duct or conduit to be terminated.
  - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.
- B. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.
- C. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
- D. Manhole exterior walls, roofs, bottom and the first 10' porting of ductbank entering and leaving the manhole shall be waterproof coated with coal tar epoxy bitumastic.

## 1.7 UTILITY STRUCTURE ACCESSORIES

### A. Manufacturers:

1. Bilco Company (The).

2. Campbell Foundry Company.
  3. Christy Concrete Products.
  4. Cretex Concrete Products West, Inc.; Riverton Division.
  5. East Jordan Iron Works.
  6. Elmhurst-Chicago Stone Co.
  7. Hubbell Power Systems; Lenoir City Division.
  8. McKinley Iron Works.
  9. Neenah Foundry Company.
  10. NewBasis.
  11. Oldcastle Precast Group.
  12. Oldcastle Precast Inc.; Utility Vault Division.
  13. Osburn Associates, Inc.
  14. Pennsylvania Insert Corporation.
  15. Underground Devices, Inc.
  16. Utility Concrete Products, LLC.
  17. Wausau Tile Inc.
- B. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 (ASTM A 153M) and ASTM A 123 (ASTM A 123M).
- C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B or cast aluminum with milled cover-to-frame bearing surfaces; diameter, 32'
    - a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
    - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
  2. Cover Legend: Cast in. Retained to suit system.
    - a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
    - b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
    - c. Legend: "SIGNAL" for communications, data, and telephone duct systems.
  3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
    - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387/C 387M, Type M, may be used.
- D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- (50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.

1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.
- E. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- (32-mm-) diameter eye, rated 2500-lbf (11-kN) minimum tension.
- F. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.
- G. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to 1-1/4 inches (32 mm) minimum at base.
1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.
- H. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.
- I. Cable Rack Assembly: Steel, hot-rolled or hot-dip galvanized except insulators.
1. Stanchions: T-section or channel; 2-1/4-inch (57-mm) nominal size; punched with 14 holes on 1-1/2-inch (38-mm) centers for cable-arm attachment.
  2. Arms: 1-1/2 inches (38 mm) wide, lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 18 inches (460 mm) with 250-lb (114-kg) minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
  3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- J. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- K. Grounding: Provide a complete ground grid around each manhole consisting of (4) 5/8-inch by 8'-0" long ground rods located at each corner of the manhole. Interconnect ground rods with #4/0 AWG Bare Stranded Copper Wire looped around the exterior of the manhole. All connections below grade shall be exothermic welded type. A #4/0 AWG Bare Stranded Copper Wire lead shall be brought into the manhole and connected to a #4/0 AWG Bare Stranded Copper Wire looped around the interior perimeter of the manhole and securely attached at 2-foot intervals to the wall of the manhole at an elevation of 5-foot. Connections on the interior of the manhole shall be

made by properly sized/rated split bolt connectors or properly sized/rated one bolt connectors.

END OF SECTION 26 0543