

SECTION 16117
CONCRETE MANHOLES, HANDHOLES AND PULL BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMMARY

- A. This Sections includes the following:
1. Concrete manholes and manhole accessories.
 2. Concrete handholes and handhole accessories.
 3. Concrete pullboxes and pullbox accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 02, Site Work: Excavation and Backfilling.
 2. Division 03, Concrete: Reinforcement, and Cast-in-Place.
 3. Division 07, Thermal and Moisture Protection: Bituminous Waterproofing.
 4. Division 15, Mechanical: Plumbing Specialties.
 5. Section 16118, Conduit: Underground Conduit Duct Bank.
 6. Section 16450, Grounding.

1.3 REFERENCES

- A. American Association of State and Highway Officials:
1. AASHTO H20-92, Standard Specifications for Highway Bridges, Fifteenth Edition.
- B. American Standards for Testing and Materials:
1. ASTM A48-94, Gray Iron Castings.
 2. ASTM A153-82, Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 3. ASTM A569-91, Steel, Sheet and Strip, Carbon (0.15% max), Hot-Rolled, Commercial Quality.
 4. ASTM C858-1983 Standard Specification for Underground Precast Concrete Utility Structures.
- C. American National Standards Institute (ANSI):
1. ANSI-C2-1997, National Electrical Safety Code.
- D. National Fire Protection Association (NFPA):
1. NFPA-70-99, National Electrical Code.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the conditions stated in General and Supplementary Conditions.
- B. Products furnished from listed manufacturers are pre-approved but still require submittal.
- C. Submit proposed substitutions for approval in accordance with General and Supplementary Conditions.
- D. Product Data for equipment specified, including the following:

1. Certified technical data sheets shall include load capacities for manhole, handhole, and pull box covers.
- E. Shop Drawings: Show fabrication and installation details for underground utility structures and include the following:
 1. For manholes and handholes:
 - a. Duct sizes and locations of duct entries.
 - b. Reinforcement details.
 - c. Manhole cover design.
 - d. Step details.
 - e. Dimensioned locations of cable rack inserts, pulling-in irons, and sumps.
 2. For precast manholes, handholes and pull boxes: Shop Drawings shall be signed and sealed by a qualified professional engineer, and shall show the following:
 - a. Construction of individual segments.
 - b. Joint details.
 - c. Design calculations.
- F. Coordination Drawings, including plans and sections drawn to scale. Submit with Shop Drawings. Show layout and relationships between components and adjacent structural and mechanical elements. Show support sub-base criteria, type of support, and weight on each support. Indicate and certify field measurements.
- G. Product Certificates: For concrete and steel used in manholes, handholes, and pull boxes according to ASTM C858.

1.5 QUALITY ASSURANCE

- A. Drawing Compliance: Manholes, handholes, pull boxes, and accessories shall be designed, fabricated, and installed in compliance with the Drawings.
- B. AAHSTO Compliance: Provide manhole covers that are listed and labeled by AAHSTO for loadings specified.
- C. Coordination: Coordinate layout and installation of manholes, handholes, and pull boxes with other installations.
- D. Comply with ANSI C2.
- E. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment as factory-fabricated modules with protective crating and covering.
- B. Lift and support components with manufacturer's designated lifting or supporting points.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate size and location of sub-base materials and compaction with other sections of the specification.

1.8 COORDINATION

- A. Coordinate layout and installation of manholes, handholes, and pullboxes with final arrangements of other utilities and site grading, as determined in the field.

- B. Coordinate elevations of ducts and duct-bank entrances into manholes and handholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and to ensure duct runs drain to manholes and handholes, and as approved by Construction Manager.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Underground Precast Concrete Utility Structures:
 - a. Carder Concrete Products.
 - b. Christy Concrete Products, Inc.
 - c. Elmhurst-Chicago Stone Co.
 - d. Riverton Concrete Products.
 - e. Rotondo Precast/Old Castle.
 - f. Utility Vault Co.
 - g. Wasau Concrete Co.
 - h. Hartford Concrete Products, Inc.
 - i. Heritage Concrete Pipe Co.
- 2. Frames, Covers, and Accessories:
 - a. Campbell Foundry Co.
 - b. East Jordan Iron Works, Inc.
 - c. McKinley Iron Works, Inc.
 - d. Neenah Foundry Co.
 - e. Flockhardt Foundry Co.
 - f. A.B. Chance Co.

2.2 PRECAST CONCRETE MANHOLES

- A. Precast Concrete: Air-entrained, 3,000 psi (25 mPa) compressive strength at 28 days.
- B. Reinforcing: AASHTO H20; bridge loading.
- C. Construction: In modular sections with tongue and groove joints.
- D. Manhole Shape: As indicated, and in accordance with ORNL standard ES-1.1-17 Type A standard electrical manhole.
- E. Inside Dimensions: As indicated.
- F. Wall Thickness: 12 in.
- G. Include 36-in. diameter grooved opening in top section.
- H. Necking and Shaft Sections: 30-in.-diam clear opening.
- I. Include 12-in. drain opening and two 1-inch ground rod openings in base section.
- J. Window for Duct Entry: As indicated.
- K. Include cable pulling irons opposite each duct entry window.
- L. Include inserts for cable racks at 2 ft on center.

- M. Include precast manhole steps at 16 in. on center in neck and hot dip galvanized ladder inside manhole.

2.3 CAST-IN-PLACE MANHOLES

- A. Concrete: 3,000-psi compressive strength at 28 days in conformance with requirements of Division 3, with steel bar reinforcing per ORNL standard ES-1.1-17.
- B. Provide reinforcing under the provisions of Division 3.
- C. Provide two 1 inch ground rod openings in base.

2.4 MANHOLE ACCESSORIES

- A. Manhole Frames and Covers: ASTM A48; Class 30B gray cast iron, machine finished with flat bearing surfaces. Cover shall have custom design cast into exposed face similar to SNS logo with either the word "ELECTRIC" for power manholes or "COMMUNICATIONS" for communications manholes.
- B. Sump Covers: ASTM A48; Class 30B gray cast iron.
- C. Pulling Irons: 7/8-in.-diam steel bar forming a triangle of 9 in. per side when set. Galvanize to ASTM A153 for irregular shaped articles.
- D. Cable Rack Inserts: Galvanized Steel channel insert with minimum load rating of 800 lb, length to match cable rack channel.
- E. Cable Rack Channel: 2 1/4-in. X 2 1/4-in. X 1/4-in. galvanized steel channel wall bracket, 27 1/2 in. length, with 14 cable rack arm mounting holes on 1 1/2-in. centers.
- F. Cable Racks: ASTM A569; steel channel, 2 1/2 in. X 10 1/2 in. with high-glazed, wet-process porcelain insulators.
- G. Manhole Steps: Cast iron, suitable for manhole shape and construction.

2.5 PRECAST CONCRETE HANDHOLES

- A. Precast Concrete: Air-entrained, 3,000 psi (35 mPa) compressive strength at 28 days.
- B. Reinforcing: AASHTO H20; bridge loading.
- C. Construction: In modular sections with tongue and groove joints.
- D. Dimensions: Minimum inside dimensions of 48 in. width X 66 in length X 54 in. depth.
- E. Wall Thickness: 5 in.
- F. Include 12-in. sump in base section.
- G. Windows for Duct Entry: 4 duct terminators in each end and 2 duct terminators in each side, located as shown on Drawings.
- H. Knockouts: 1-10 in. X 26 in. knockout in each end, and 1-6 in. X 24 in. knockout in each side, located as shown on Drawings.

- I. Include cable pulling irons opposite each duct entry window.

2.6 HANDHOLE ACCESSORIES

- A. Handhole Frames and Covers: steel angle cast-in-place frame, machine finished with flat bearing surfaces. AASHTO H20; bridge loading. Galvanized checker plate steel cover with formed galvanized steel beams, torsion springs and safety bars, cover shall have either the word "ELECTRIC" for power manholes or "COMMUNICATIONS" for communications handholes engraved in steel name plate on frame.
- B. Pulling Irons: 7/8-in.-diam steel bar forming a triangle of 9 in. per side when set. Galvanize to ASTM A153 for irregular shaped articles.

2.7 PRECAST CONCRETE PULLBOXES

- A. Precast Concrete: Air-entrained, 3,000 psi (25 mPa) compressive strength at 28 days.
- B. Reinforcing: AASHTO H20; bridge loading.
- C. Dimensions: Minimum inside dimensions of 10 1/2 in. width X 17 1/4 in length X 12 in. depth.
- D. Wall Thickness: minimum 7/8 in.
- E. Window for Duct Entry: 2 – 3" knockouts on each side and 1- 3" knockout on each end.

2.8 PULLBOX ACCESSORIES

- A. Covers: reinforced concrete, air-entrained, 3,000 psi (25 mPa) compressive strength at 28 days, AASHTO H20; bridge loading.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate, install base material, and compact base material under provisions of Division 2.

3.2 EXAMINATION

- A. Examine sitework, duct bank installation subbase placement, levelness, and compactness before placing the manhole sections, handholes, or pullboxes.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION - PRECAST CONCRETE MANHOLES

- A. Install and seal precast sections according to manufacturer's instructions.
- B. Use precast neck and shaft sections to bring manhole entrance to proper elevation.
- C. Install manholes plumb.
- D. Set top of each manhole to finished elevation indicated.

3.4 INSTALLATION - CAST-IN-PLACE CONCRETE MANHOLES

- A. Form cast-in-place manholes, inside and outside surfaces, according to provisions of Division 3.
- B. Manhole configuration, inside dimensions, wall thicknesses concrete reinforcing, and duct bank window sizes and locations: According to details.
- C. Include 12-in. drain opening and two 1-in. ground rod openings in base section.
- D. Cast cable pulling irons in place opposite each duct entry window.
- E. Cast inserts for cable racks in place at 2 ft centers.
- F. Cast manhole steps in place on 16-in. centers.

3.5 INSTALLATION - MANHOLE ACCESSORIES

- A. Install drains in manholes where shown on the drawings, and connect to daylight at the nearest location. Install ground rod with top protruding 4 in. above manhole floor.
- B. Waterproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days minimum, in accordance with provisions of Division 7.
- C. Attach cable racks to inserts after manhole installation is complete.
- D. Install manhole covers.
- E. Ground cable racks to manhole ground rod with #6 bare, solid copper conductor by exothermic weld process.
- F. Bring exterior #4/0 bare copper cable into manhole and connect to ground rod in manhole floor.
- G. Ground circuit #4/0 copper cable in 5" conduit to exterior cable in duct bank and manhole ground rod.

3.6 INSTALLATION - PRECAST CONCRETE HANDHOLES AND PULLBOXES

- A. Install and seal precast sections according to manufacturer's instructions.
- B. Install handholes and pullboxes plumb.
- C. Set top of each handhole and pullbox to finished elevation indicated.

3.7 FIELD QUALITY CONTROL

- A. Verify that installed manholes, handholes, and pullboxes are installed plumb and level and that covers will be flush with final paved surfaces.
- B. Check that accessories are installed according to specifications and drawings.
- C. Inspect drain lines to verify proper drainage.

3.8 ADJUSTING

- A. Adjust final manhole, handhole, and pullbox frame elevations to match that of final paving or grade.

3.9 CLEANING

- A. Clean inside of manholes, handholes, and pullboxes from all construction debris and verify proper operation of drains (for both precast and cast-in-place manholes).

3.10 PROTECTION

- A. Protect, handhole, and pullbox interiors from entrance of construction debris after final cleaning is complete.

END OF SECTION 16117