**SECTION 26 05 44**

**MANHOLES**

**BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/23**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

**PART 1 - GENERAL**

**SCOPE**

The work under this section includes prefabricated and cast-in-place manholes, and manhole accessories for electrical power and signal system distribution. The term “signal” is used thorough this specification as a generic term to include communications, control, security and other low voltage systems. Included are the following topics:

PART 1 - GENERAL

 Scope

 Related Work

 Quality Assurance

 Submittals

 Project Record Documents

 Coordination

PART 2 - PRODUCTS

 General

 Precast Concrete Manholes

 Cast-In-Place Concrete Manholes

 Manhole Accessories

PART 3 - EXECUTION

 Excavation

 Preparation

 General

 Installation - Precast Concrete Manholes

 Installation - Cast-In-Place Concrete Manholes

 Installation - Manhole Accessories

 Existing Manhole Refurbishing

**RELATED WORK**

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 43 - Underground Ducts and Raceways for Electrical Systems.

Section 26 05 26 - Grounding and Bonding for Electrical Systems.

Section 01 91 01 or 01 91 02 – Commissioning Process

**QUALITY ASSURANCE**

Manufacturer: Company specializing in precast or cast-in-place concrete structures with three years documented experience.

**SUBMITTALS**

Indicate material specifications, and provide product data for manhole accessories.

**PROJECT RECORD DOCUMENTS**

Accurately record actual locations and depths of each manhole.

**COORDINATION**

Obtain all available information on underground utilities before starting excavation. If underground utilities interfere with shown location of manholes, bring this to the attention of the DFD Field Representative as soon as possible. The manhole shall be revised or relocated only with the approval of the Engineer.

**PART 2 - PRODUCTS**

**GENERAL**

Portland Cement: Shall meet ASTM C-150, Type 1 specifications.

Aggregate: Fine aggregate shall be sand, ASTM C-33. Coarse aggregate shall be well proportioned mixture conforming to size #4 and size #67, Table II, ASTM C-33.

Water: Water shall be suitable for drinking.

Mixture:

Minimum cement content shall be 5.75 sacks per cubic yard. Maximum water shall be 6 gallons per sack. Ready-mix concrete shall meet ASTM C-94 specifications.

Concrete shall have a minimum compressive strength of 4000# per square inch in 28 days.

Allowable slump shall not exceed 4 inches.

Written approval from the DFD's Construction Representative is required for job mixed concrete.

Concrete shall be of suitable consistency to completely fill forms and surround steel. Mechanical vibrations shall be used.

Reinforcing Steel: ASTM A-615, Grade 50, steel reinforcing bars.

The indicated dimensions for Power and Signal Manholes for new installations in un obstructed areas. Minimum size shall be 8 x 8 x 8D with larger sizes as desired based on size of duct packages entering and exiting manholes. New manholes can be reduced to a minimum of 6 x 6 x 6.5D if existing conditions limit installation of larger units. Coordinate with DFD electrical reviewer prior to reducing specified dimensions.

Inside Dimensions:

Power Manholes: [Eight ft. (2.4 m) length; Eight ft. (2.4 m) width; Eight ft. (2.4 m) deep, minimum.] [As indicated on drawing.]

Signal Manholes: [Eight ft. (2.4 m) length; Eight ft. (2.4 m) width; Eight ft. (2.4m) deep, minimum.] [As indicated on drawing.]

Include opening in top section the same size as required for the necking and shaft openings listed below.

Necking and Shaft Sections:

Power Manholes: 40 inch (900 mm) diameter clear opening

Signal Manholes: 34 inch (760 mm) diameter clear opening.

Include 18 inch sump pit and 3/4 inch ground rod in base section.

Windows for Duct Entry: As shown on drawings.

Waterproofing: Provide complete waterproofing top, bottom, and sides. Waterproofing to be Tremco "Tremproof 60" system or equal applied per manufacturer's recommendations.

**PRECAST CONCRETE MANHOLES**

Construction: Monolithic or in modular sections with gasketed tongue and groove joints.

Wall Thickness: [\_\_\_\_\_] inches ([\_\_\_\_\_] mm).

Provide a continuous water stop gasket at all section and slab joints.

**CAST‑IN‑PLACE MANHOLES**

See drawings for construction details.

Wall Thickness: [\_\_\_\_\_] inches ([\_\_\_\_\_] mm).

Waterstops: Provide a continuous water stop in the floors of the pits extending into the bottom of the pit walls as shown on the drawings. Water stops shall be 6" wide PVC plastic, Sealtight No. 6316 "Durajoint", Type 4 or equal. Butt weld joints with hot iron.

**MANHOLE ACCESSORIES**

Manhole Frames and Covers: ASTM A48; Class 30B; gray cast iron; machine finished with flat bearing surfaces.

ALL applications - heavy duty frames and covers:

Power Manholes (chimney-type installation): Neenah Foundry Catalog No. R-1792-JL, 40 inch lid

Power Manholes (slab-type installation): Neenah Foundry Catalog No. R-5900-J, 40 inch lid

Signal Manholes (chimney-type installation): Neenah Foundry Catalog No. R-1792-HL, 34 inch lid

Signal Manholes (slab-type installation): Neenah Foundry Catalog No. R-5900-H, 34 inch lid

Manhole lid lettering:

Power manholes: "UW Primary" at all UW System campuses, “Primary” at all other locations.

Signal Manholes: "UW Signal" at all UW System campuses, “Signal” at all other locations.

Pulling Irons:

PI-1 Hytrel pulling iron, pulling iron pocket and lid by Pennsylvania Insert Corporation, 7/8 inch diameter galvanized pulling-in iron by Hubbell/Chance (cat. # 8119), or 3/4 inch diameter galvanized steel round bar forming a triangle of 9 inches per side with 12 inch minimum tails set in the wall.

Concrete Insert Channel and Associated Hardware:

Continuous slot stainless steel insert channel with minimum load rating of 2000 pounds (910 kg), 48 inch (1.2 m) length minimum with rigid plastic closure strip or Styrofoam filler. All hardware shall be stainless steel.

Cable Supports:

Split-type insulators with channel clamp, size as needed to match cable size. Or heavy duty multi-mount cable support arm as manufactured by Underground Devices, Inc., arm length as needed.

Ground Rod:

Provide one ¾” x 10’ ground rod per manhole. See Section 26 05 26 – Grounding and Bonding for Electrical Systems.

Ground Wire:

 Provide a #4/0 stranded bare copper wire completely around interior of each power manhole. Connect to ground rod and wall strut channel. See Section 26 05 26 - Grounding and Bonding.

Coordinate with DFD Electrical reviewer and agency site personnel, installation of manholes with three options: Manhole with sealed Sump pit and sump pump with all associated electrical and plumbing included, Manhole with sealed sump pit for portable drop in sump pump by agency, or Manhole with open sump pit and drainage fill installed below manhole for French Drain. All Sump Pump requirements including electrical and mechanical shall be included on site drawings. If multiple options are desired within same project, denote requirements for each manhole. Develop manhole schedule.

Sump Pit:

 1' 6" diameter X 1' 6" deep concrete sump pit with sealed [open] concrete bottom.

Sump Pit Grate:

 ASTM A48; Class 30B, gray cast iron; light duty sized to fit concrete sump pit above.

Sump Pump:

 See drawings [Schedules] for electrical and mechanical requirements for installation of sump pump.

**PART 3 - EXECUTION**

**EXCAVATION**

The Contractor is responsible for all demolition, excavation and backfilling required to install manholes.

After completion of manhole installation, return all ground and pavement surfaces to original condition or to condition as indicated on the drawings. This includes all sidewalks, curbs, streets, parking areas, lawns, shrubs, etc.

**PREPARATION**

Excavate, install base material, and compact base material.

**GENERAL**

Forms:

Mortar-tight, rigid, smooth surface, sufficiently braced.

Wet thoroughly (except in freezing weather) or oil.

Reinforcement:

Clean off foreign matter before placing.

Reinforcement Bending:

Bars to be bent around pins having diameters in accordance with ACI Manual 318-56.

Bend cold.

Reinforcement Placing:

In accordance with plans. Unless otherwise shown, the following depth of clear cover shall be maintained:

1. Where concrete is poured against ground 3"
2. Where poured in forms but exposed to ground or weather 2"
3. In slabs and walls 3/4"
4. In beams and columns 1 1/2"
5. Standard hooks, bends, and laps shall be used.

Secure in concrete, metal chairs, or spaces.

Nails shall not be driven into forms to support reinforcement.

Do not pour concrete under water.

Vibrate by an approved mechanical vibrator.

Trowel slabs to a smooth finish.

Pulling Irons:

Install cable pulling irons opposite each duct entry window.

Pulling irons must be fastened to the manhole wall reinforcement steel before concrete is poured. Provide additional reinforcement bars to support pulling irons.

Finishing: Patch all defects and tie rod holes immediately after form removal.

Curing:

Minimum of 5 days.

Keep in a moist condition or coat with approved curing compound.

Protect from rain and weather conditions when necessary

Cold Weather Requirements:

Provide adequate equipment for heating materials and protecting concrete during freezing or near freezing weather.

All materials, forms and ground with which concrete will come in contact are to be free from frost.

No calcium chloride or other anti-freezing solution nor any chemical accelerator shall be used in any concrete.

Cleanup and water:

This Contractor shall remove all mud and debris from manholes after completion. All water shall be removed from manholes. If manholes continue to fill up with water, this Contractor shall pump them regularly until the source of water has been detected and corrected or until the manhole has been accepted by the DFD.

It is the intent of these specifications that the underground raceway system and manholes shall be waterproof with the exception of the manhole covers.

**INSTALLATION ‑ PRECAST CONCRETE MANHOLES**

Install and seal precast sections in accordance with manufacturer's instructions.

Use gasketed precast neck and shaft sections to bring manhole entrance to proper elevation.

Install manholes plumb.

Set the top of each manhole to finished elevation.

**INSTALLATION ‑ CAST‑IN‑PLACE CONCRETE MANHOLES**

Completely form manholes, inside and outside surfaces.

**INSTALLATION ‑ MANHOLE ACCESSORIES**

Coordinate with DFD Electrical reviewer and agency site personnel, installation of manholes with three options: Manhole with sealed Sump pit and sump pump with all associated electrical and plumbing included, Manhole with sealed sump pit for portable drop in sump pump by agency, or Manhole with open sump pit and drainage fill installed below manhole for French Drain. All Sump Pump requirements including electrical and mechanical shall be included on site drawings. If multiple options are desired within same project, denote requirements for each manhole. Develop manhole schedule.

Insert and seal sump pit into manhole floor. Put one sump pit in each manhole except, where a primary and a signal manhole are side-by-side, place one sump pit in the signal manhole and core a 4" hole at the floor line from the primary manhole to the signal manhole.

Insert open (French Drain) sump pit into manhole floor. Drainage material to be installed below sump pit. Put one sump pit in each manhole except, where a primary and a signal manhole are side-by-side, place one sump pit in the signal manhole and core a 4" hole at the floor line from the primary manhole to the signal manhole.

Grounding:

Install ground rod with top protruding 6 inches above manhole floor.

Ground Wire:

Install the ground wire around the inside perimeter of the power manholes and connect them to all strut channels using a copper alloy grounding post similar to Burndy KC28B1, T&B Blackburn SP8SL, or NSi SPM-9L. A stainless steel strut nut must be used with the grounding post.

Connect the ground wire to the ground rod by exothermic welding process to form a solid metal joint.

Bond the wire to any splice shield wires, ground wires, cable racks and other metal items in the manholes.

All separate ground wires accompanying circuits shall be grounded in each manhole passed through.

Cable Support System:

In each manhole, after installation is complete, install insulated cable clamps or heavy duty nonmetallic cable support arms on all of the walls for not less than one set of cables, and as many additional supports as required for the cables which are being installed for this contract.

Cable support intervals shall be approximately 4 feet (1.2 m).

Provide adequate slack in the cables.

Strap cable to supports with heavy duty plastic tie wraps.

All phase and ground cables in each circuit shall be kept together and contained on/in the cable supports. No phase cable shall be run separate from the other two phases and ground.

Waterproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 5 days.

***The consultant shall investigate each manhole, determine the extent of the refurbishing, and include in this specification, and on the drawings.***

**EXISTING MANHOLE REFURBISHING**

Clean out existing manholes being worked in on this project. Remove dirt, debris, etc. from the bottom of the manhole.

Inspect existing cable supports and grounding. Report any deficiencies to the DFD Construction Representative as soon as deficiencies are identified.

END OF SECTION