SECTION 02605

MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. This section addresses storm sewer manholes, and includes the acceptable products, materials, and construction practices that are to be used in the construction and installation of manholes.

B. Manholes shall be furnished with all accessories, including steps, base, cone section and ring & cover.
   1. Reference Standard Drawing SW-6A and SW-6B for standard manholes.
   2. Reference Standard Drawing SW-6B for drop manhole with invert protection.

C. Install manholes wherever there is a change in size, direction, slope, at junctions, and at intervals of not more than four hundred (400) feet for 18-inch to 36-inch and five hundred (500) feet for 42-inch and larger.

D. Measurement and Payment Procedures
   1. For public funded capital improvement projects, measurement and payment procedures will be determined on a project by project basis.
   2. For privately funded development projects, Owner will determine measurement and payment requirements.

1.02 RELATED SECTIONS

A. Section 02221 - Trenching, Backfilling and Compacting.

B. Section 03300 - Cast-In-Place Concrete.

C. Section 03400 - Precast Concrete.

D. Section 05500 – Metal Castings and Fabrications.

1.03 REFERENCES

A. American Society for testing and Materials (ASTM)
   1. ASTM A185 – Specification for steel welded wire fabric, plain for concrete reinforcement.
   2. ASTM A615 – Specification for deformed and plain billet-steel bars for concrete reinforcement.
   3. ASTM A696 Specification for the steel bars, carbon, hot-wrought or cold-finished, special quality for pressure pipe components.
   4. ASTM C33 Standard specification for concrete aggregates
   5. ASTM C144 Specification for aggregate for masonry mortar.
   6. ASTM C150 Standard specification for Portland cement
   7. ASTM C207 Specification for hydrated lime for masonry purposes.
   8. ASTM C478 Specification for precast reinforced concrete manhole sections.
   9. ASTM C497 Test methods for concrete pipe, manhole sections, or tile.
   10. ASTM C891 Installation of underground precast concrete utility structures.

11. ASTM D3575 and D4819-13: Grade Adjustment Rings.
12. ASTM C-290, Type S Grade NS, Class 25, Uses NT, T, M, G, A and O Adhesive/Sealant

B. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO M198 Joints for circular concrete sewer and culvert pipe using flexible watertight gaskets.

C. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).
1. OSHA 1910.23 guarding floor and wall openings and holes.
2. OSHA 1910.27 fixed ladders.

D. Where reference is made to one of the above standards, the latest revision shall apply.

1.04 SUBMITTALS

A. Submit to Inspector, the name of the manhole section and fitting suppliers and a list of materials to be furnished.

B. Submit to Inspector, shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of manhole sections.

C. Prior to each shipment of each manhole section, submit to Inspector certified test reports that section was manufactured and tested in accordance with the ASTM Standards specified herein.

D. Complete specifications and data covering the materials to be furnished and detailed drawings covering the installation shall be submitted.

1.05 QUALITY ASSURANCE

A. See Section 01010-1.08.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Manholes shall be handled, stored, and protected in such a manner as to prevent damage to materials.

B. All joint surfaces shall be free from dirt, oil, and grease at the time of installation.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

A. Precast manhole bases, risers, and cone sections shall be manufactured in accordance with ASTM C478, and shall be made with Type I or II cement.
1. All cone sections shall be the eccentric type.

B. Concrete and Reinforcing Materials.
1. All reinforcing materials shall conform to ASTM A615, ASTM A617, or ASTM A185.
2. Reference Section 03400.

2.02 CAST-IN-PLACE MANHOLES

A. Cement used in cast-in-place manholes shall conform to ASTM C150, Type I or II.

B. All fine and course aggregate shall conform to ASTM C33.

C. All deformed reinforcing bars shall conform to ASTM A615 or ASTM A617. Smooth formed bars or wire are not acceptable.
   1. All bars shall be Grade 60.

D. Concrete used in cast-in-place manholes shall have a minimum of six (6) sacks of cement per cubic yard, and shall develop a minimum compressive strength of 4000 psi after 28 days.
   1. Concrete shall have a maximum allowable water/cement ratio of 0.44 by weight.

E. Air-entrainment in accordance with Section 03300 – 2.4 A.

F. Reference Section 03300.

2.03 MORTAR

A. Mortar shall be Sand-Cement grout, using the following ratio of ingredients:
   1. One part Portland cement; conforming to ASTM C150, Type I or II or V.
   2. Two parts sand; conforming to ASTM C144.
   3. 1/2 part hydrated lime; conforming to ASTM C207, Type S.

2.04 GROUT

A. Grout shall be one of the following:
   1. Pre-mixed, nonmetallic grout; the acceptable types and manufacturers of which are listed below:
      a. Master Builders; “Embeco Mortar”.
      b. Sonneborn; “Ferrolith G-D.S. Redi-Mixed”.
      c. Or an approved equal.
   2. Job-mixed grout, using the following ratio of ingredients:
      a. One part Portland cement; conforming to ASTM C207, Type I, II or V.
      b. One part sand; conforming to ASTM C144.
      c. One part shrinkage correcting aggregate; the acceptable types and manufacturers of which are listed below:
         1) Master Builders: “Embeco Mortar”.
         2) Sonneborn; “Ferrolith G-D.S. Redi-Mixed”.
         3) Or an approved equal.

B. Provide minimum 28-day compressive strength of 6500 psi.

2.05 RING AND COVER

A. All rings shall be 8 inches in height.

B. Acceptable rings and cover are:
   1. East Jordan Iron Works, 2405A
   2. Neenah, R-1706.
   3. D & L A1161.
   4. ARPRO Expanded Polypropylene (EPP), black – PRO-RING by Cretex Specialty Products (Flat and Angle Grade Rings), Adhesive/Sealant (per product recommendation).
   5. Or an approved equal

C. Rings differing from 8 inches may be acceptable for street overlays or repaving, with written acceptance of the Inspector.

D. Manhole cover shall meet the requirements of City of Loveland standard detail SW-6B

2.06 STEPS

A. Conform to OSHA Standard 1910.27 and Figure D-1.

B. All steps, in manholes, shall be made of the following material:
   1. Copolymer polypropylene plastic with a metal core conforming to ASTM C478 and ASTM C497.

C. All steps shall be spaced 12 inches apart (O.C.) and have a width of 16 inches.

D. The maximum distance from the cover of the manhole to the top most step shall be 18 inches.

E. The maximum distance from the bench of the manhole to the lowest step shall be 12 inches.

2.07 PREFORMED PLASTIC GASKETS

A. All preformed plastic gaskets shall conform to AASHTO M198.

B. The diameter of a preformed plastic gasket shall be 1.5-inches for a 48-inch diameter manhole.

C. Acceptable gaskets and their manufacturers are:
   1. “Rub-R-Nek”; Henry Co.
   2. “Con Seal” – CS-202.
   3. Or an approved equal.
   4. Ram Neck is NOT acceptable.

D. Gaskets shall be pliable at the time of installation.

E. Primer shall be used for cold weather construction or when requested by City.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install precast structures in conformance with the requirement of ASTM C891.

B. Trenching, backfilling, and compaction.
   1. Reference Section 02221.

C. For installation also see Section 02722.

D. Manhole construction
   1. Standard manholes shall be installed in accordance with Standard Drawing SW-6 and SW-7.
   2. Drop manholes with invert protection shall be installed in accordance with Standard Drawing SW-7.
   3. Flattop manholes shall be installed in accordance with Standard Drawing SW-6 and SW-7.
      a. Flattop manholes are required whenever the distance between the finished road surface and a manhole barrel section does not allow room for a cone section.

b. Access holes for flattop manholes shall be offset from center
    1) If the distance from the manhole cover to the invert of the storm line main is less than 3 feet, the access hole shall be centered.

4. Manholes shall be constructed at the location and the elevation indicated on the accepted Construction Drawings, or as stated by the City to accommodate field conditions.
    a. The location of manholes shall be referenced by the Design Engineer, to minimum of two permanent surface references, and recorded on the Record Drawings.
5. The manhole shall be set plumb.
    a. Precast concrete adjustment rings shall be used to bring the ring and cover to grade.
        1) The total height from the top of the cone section to the finish street grade shall not exceed 16 inches.
        2) The adjustment rings shall be flush with the inside of the manhole and set in a bed of grout.
6. Manhole sections shall be joined to each other and to the base using a double row of preformed plastic gaskets.
    a. All joint surfaces shall be kept clean, dry, and warm during installation.
    b. The joint between the manhole section and the base shall be grouted on the inside to provide a smooth surface.
    c. Adjustment rings, and ring & cover shall be joined using mortar.
    d. Manhole sections shall be grouted to ring and covers, on the inside.
7. All lifting holes, joints, and other imperfections shall be filled with an approved non-shrink grout, to provide a smooth finish appearance.
8. If rubber gaskets are not used, then the inside and outside of the manhole penetration shall be grouted using non-shrink grout. The exterior wall shall have a concrete collar with a minimum thickness of 6-inches.
9. If the ground water is above the top of the pipe, the exterior surfaces of manholes shall have a 1/16-inch coating of asphaltic or bituminous material.
    a. The determination of the need for a coating shall be made by the City upon review of the soil report, or shall be shown on the accepted utility plans.

END OF SECTION