

Specifications for High Density Polyethylene Manholes and Structures

1. SCOPE OF WORK

This specification covers the material, fabricators, joining methods, and general installation practice for high density polyethylene pipe (HDPE) manholes and structures. Manholes shall be fabricated by ISCO Industries, Inc. or other approved manufacturer holding an ISO 9001 quality system certificate.

2. SUBMITTALS AND QUALITY ASSURANCE

2.1. DOCUMENTATION-

- 2.1.1. The manhole fabricator shall submit certification that the HDPE material meets the specifications.
- 2.1.2. The fabricator of the manholes shall submit shop drawings for approval as part of the submittal data showing the position of the inlets, outlets and the overall dimensions along with any other special features such as manways, ladders, internal piping, valves, etc.
- 2.1.3. The fabricator shall submit calculations for review by the project engineer, or owner, indicating that the vertically installed manholes have been analyzed using the guidance of ASTM F1759, "Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications". The data shall contain information related to the following areas: Ring Compressive Strain, Combined Ring Compressive and Ring Bending Strain, Ring Buckling, Axial Strain, Axial Buckling, and the thickness of the bottom based on depth and groundwater. Thickness should be based on acceptable stress and deflection limits. Data and calculations are supplied for informational purposes and will be part of the submittal package that are reviewed and approved by the project engineer. The project engineer will review any data/calculations submitted for accuracy, including any site specific variables, and confirm the structure is suitable for the intended service including installation and operating conditions.
- 2.1.4. When requested, the fabricator shall submit the ISO 9001:2008 Certificate of Registration for the manufacturing facility and/or the written quality assurance program used during fabrication of the manholes, including documentation that personnel responsible for fabrication have been trained and qualified. The fabricator may be required to submit their QA/QC program for fabricating thermoplastic structures prior to beginning work and the qualifications of the fabrication technician upon beginning of work on the structure.
- 2.1.5. When required, the manholes and pipe shall be tested in accordance with section 4.11 of this specification. A written certification shall be sent as an addendum to original submittal package, certifying the manholes are leak free. The test results shall become part of the submittals. When requested, an identification plate indicating, the job number, testing data, and when built and by whom, shall be attached to the manhole.

2.2. Approval or Rejection

- 2.2.1. Engineer of record (or owner) will review submittal information and provide written approval or rejection of submittal data, shop drawings, and verify proposed manhole will meet installation and service requirements.
- 2.2.2. ENGINEER reserves the right to require changes to the proposed product so as to meet intended installation and service conditions.
- 2.2.3. In the event such changes impact price or timing, the purchase contract will be adjusted to reflect those changes.

3. HDPE MATERIALS

The material for the manholes shall be made from HDPE resins meeting the following requirements:

- 3.1. HDPE Extruded Solid Wall Pipe Material – Solid wall pipe under this specification shall be a minimum grade of PE 3608 with a minimum cell classification value of 345464C as defined in ASTM D3350. Pipe sizes 3” and larger shall have a manufacturing standard of ASTM F 714, while pipe smaller than 3” shall be manufactured to the dimensional requirements listed in ASTM D 3035. Dimension Ratio (DR) and Outside Diameter (IPS/DIPS) shall be as specified on plans.
- 3.2. HDPE Profile Wall Pipe Material – Profile wall pipe supplied under this specification shall be manufactured to the dimensions and material requirements of ASTM F894 with a minimum cell classification value of 334433C as defined in ASTM D3350.
- 3.3. HDPE sheet and fittings material- Sheet, plate and other HDPE materials under this specification shall be pipe grade material with a minimum designation of PE 3608 along with a minimum cell classification value of 345464C as defined in ASTM D3350.

4. HDPE MANHOLE FABRICATION

- 4.1. The HDPE manholes shall be constructed of cylinder with a nominal OD of _____ (or nominal ID of _____) and a wall thickness (or DR/RSC) of _____. Design service conditions, including installation environment and operating parameters, will determine the wall thickness, Pipe DR, and/or RSC of pipe and shall be specified or verified by the project engineer or the owner.
- 4.2. The bottom thickness of the manholes will meet the required limits for stress and deflection as required in ASTM F1759. Bottom or top plates may have additional support ribs, gussets or and bracing as methods to reduce stress and deflection to acceptable levels.
- 4.3. The inlets and outlets shall be extrusion welded on the inside and outside of the structure, where access is available. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets unless impractical.
- 4.4. All manhole connections larger than 4” nominal OD pipe shall be butt fusion welded, electrofusion welded, or flanged connections. For 4” OD pipe and smaller threaded transition fittings can also be used as well as the acceptable connections listed. Mechanical connections may be employed when approved by the project engineer.
- 4.5. All butt fusion welds shall be made as described in ASTM F2620 and all butt fusion welds performed with hydraulically operated butt fusion equipment shall be recorded using a McElroy Manufacturing DataLogger. The fabricator shall maintain records of the temperature, pressure, and graph of the fusion cycle for a minimum of 3 years.
- 4.6. The ladders in the manholes, if specified, shall conform to OSHA requirements. Ladders will be of fiberglass material with stainless steel hardware, and will be mechanically affixed to HDPE braces welded to the manhole body.
- 4.7. Except for when impractical, lifting eyes will be integral to the manhole body and located on shop drawings.
- 4.8. Manhole structures and outlets should not be used as anchor points when axial loads or movement is anticipated. Where large changes in temperature are expected, restraints shall be designed to isolate the structure and prevent strain at the inlets or outlets. These restraints shall be cast into a concrete block or collar around the pipe. Anti-flotation and/or anti-settling measures such as anchor lugs, rings, or collars, if required, shall be provided as an integral part of the manhole by the fabricator/manufacturer of the manhole.
- 4.9. The top of the structure and/or manway of the manhole shall be built to the meet the requirements of contract drawings. If testing is required, flanged tops or manways may be required, and additional bolts may be needed to withstand test conditions.
- 4.10. Reinforced concrete pads at surface level spanning the HDPE manhole footprint will be required when HDPE manholes are used in traffic areas. The pad shall transfer live loads to the surrounding fill and remove direct loading to the manhole riser or manway. A traffic rated frame and cover will be

required. A professional engineer shall approve the design of the concrete pad. Integration of the pad with the manhole will be coordinated with the HDPE manhole manufacturer.

- 4.11. When practical and required, manholes shall be factory tested with water or with air. The hydrostatic test shall be conducted by filling the structure with water and checking for leaks. Minimum test duration will be one hour. If air is used, a minimum of 1 PSI shall be used for 30 minutes. Structures with a 72" inside diameter or smaller may be tested to 2 PSI. Data showing the structure to be leak-free will be supplied, when testing requirements are agreed to prior to fabrication. The owner or his representative may request to observe the test.

5. SITE HANDLING AND CONNECTIONS

- 5.1. Handling of Manholes. During loading, transportation, and unloading, every precaution should be taken to prevent damage to the pipe. HDPE manholes shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE manholes shall be done in such a manner that there is no damage. Nylon slings are often used. PPI Handbook of Polyethylene Pipe (2nd Edition), Chapter 2 offers guidance on handling of HDPE pipe/fittings and is appropriate to consider for HDPE manholes and structures.
- 5.2. Pipe Joining. HDPE pipe shall be joined using butt fusion. All butt fusion welds shall be made as described in ASTM F 2620. Electrofusion welding can be used for making pipe welds. All connections to the structure made butt fusion welds using hydraulically operated butt fusion equipment shall be recorded using a McElroy Manufacturing DataLogger. The contractor shall maintain records of the temperature, pressure, and graph of the fusion cycle for all welds joining the pipe to the structure at the jobsite.
- 5.3. Handling of Fused Pipe- The handling of the pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined. Limit bending of the pipe welded to fittings or manholes. Nylon slings are preferred. Refer to the PPI Material Handling Guide for HDPE Pipe and Fittings for recommendations, guidelines and instructions regarding the handling, lifting, loading, storing and installing polyethylene pipe and fittings
- 5.4. Flanged Connections. Flange adapters (where shown in the drawings) shall be attached to HDPE manhole inlets and outlet stubs during fabrication by butt fusion welding per ASTM F2620. A metal back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern. Check the drawings for materials required for corrosive conditions such as SS rings or bolts. Bolted connections should follow recommendations for Plastic Pipe Institute (www.plasticpipe.org) TN-38, Bolt Torques For Polyethylene Flanged Joints, including the following recommendations:
 - 5.4.1. Bolts shall be tightened in a "star pattern" to recommended torque values.
 - 5.4.2. Bolts should be tightened a second time after 8-24 hours to insure a positive seal.
 - 5.4.3. Gaskets may not be required between HDPE to HDPE flanged connections.
- 5.5. Equipment Mounting- Special provisions must be made when mounting pumps in an HDPE manhole. Bolting directly to the wall of the HDPE structure is not recommended.

6. DIRECT BURIAL INSTALLATION

- 6.1. Trench Construction- The trench and trench bottom shall be constructed in accordance with ASTM D 2321- Section 6, Trench Excavation, and Section 7, Installation. The HDPE manhole shall be installed on a stable base consisting of 12" of Class I materials compacted to 95% proctor density per ASTM F 1759, Section 4.2. All required safety precautions for manhole installation are the responsibility of the contractor.
- 6.2. Embedment materials- Embedment materials shall be Class I or Class II materials as defined by ASTM D 2321- Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.
- 6.3. Bedding of the manhole shall be performed in accordance with ASTM D 2321- Section 7.2. Compaction shall conform to Section 7.5 and 7.51.
- 6.4. Backfilling shall be done to conform to the ASTM F1759, Section 4.2, "Design Assumptions". This Specification indicates that backfill shall extend at least 3.5 feet beyond the edge of the manhole for the full height of the manhole and extend laterally to undisturbed soils. Compaction shall be minimum 90% proctor density with a minimum fill modulus of 1000 psi.

6.5. H-20 Highway Loads- When section 4.10 applies to the project and HDPE manholes are used in traffic areas, reinforced concrete pads with a traffic rated frame and cover shall be required. A drawing showing the pad, including thickness, and the location in relation to the HDPE manhole must be submitted to the engineer by the contractor.

ISCO Industries, Inc. has taken every effort to check the accuracy and standards used in the preparation of these sample specifications, ISCO does not guarantee or warranty piping or manhole installations, nor their final design. Sample specifications are to be used as a guide to assist engineers and owners of piping systems containing HDPE manholes or structures. Sample specifications do not cover all situations or applications. These specifications are not intended to provide installation training or instructions. Since every job is different, a trained professional engineer should be used to determine the needs of a particular job.

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