

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. ISCO Industries, Inc. or another approved manufacturer with an ISO 9001 Quality management system shall fabricate manholes and structures.

2. SUBMITTALS AND QUALITY ASSURANCE REQUIREMENTS

2.1. DOCUMENTATION-

- 2.1.1. The fabricator of the manholes/structures shall submit shop drawings for approval as part of the submittal data showing overall configuration including details such as the position of the inlets, outlets and the overall dimensions along with any other special features such as manways, ladders, internal piping, valves, etc.
- 2.1.2. The fabricator shall submit documentation for review by the project engineer, or owner, indicating that the vertically installed manholes and structures are consistent with the guidance of ASTM F1759, "Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications".
 - 2.1.2.1. The documentation shall contain information related to ring compressive strain, combined ring compressive and ring bending strain, ring buckling, axial strain, axial buckling, and the thickness of the bottom based on acceptable stress and deflection limits. Bottom or top plates may have additional support ribs, gussets or and bracing as methods to reduce stress and deflection to acceptable levels.
 - 2.1.2.2. The Engineer of record (or owner) shall provide the depth and groundwater elevation, and verify all site conditions and soil properties are accurate.
 - 2.1.2.2.1. Design service conditions, including installation environment and operating parameters, will determine the wall thickness, Pipe DR, and/or RSC of pipe. The project engineer or the owner shall be specify or verify the service conditions.
- 2.1.3. The project engineer will review and approve the documentation supplied as part of the submittal package. The project engineer will review documentation 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 Quality management system certificate for the manufacturing facility and/or the written Quality management system manual.
- 2.1.5. When required, test the manholes, structures, and pipe in accordance with section 4.8 of this specification and, if requested, test documentation shall be provided.
- 2.1.6. When requested, attach an identification plate indicating, the job number, testing data, and build date and fabrication organization, to the manhole/structure.

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 or structure will meet installation and service requirements.
- 2.2.2. Engineer of record (or owner) reserves the right to require changes to the proposed product to meet intended installation and service conditions. In the event such changes affect costs or timing, adjustment to the purchase contract will reflect those changes.

3. HDPE PRODUCT REQUIREMENTS

- 3.1. The products used in the fabrication of the manholes and structures shall conform to the following requirements:
 - 3.1.1. HDPE extruded solid wall pipe requirements – Solid wall pipe supplied under this specification shall be a minimum grade of PE 4710 with a minimum cell classification value of 445474C per ASTM D3350. Pipe sizes 3” and larger shall have a manufacturing standard of ASTM F714, while pipe smaller than 3” shall be manufactured to the dimensional requirements listed in ASTM D3035. Dimension Ratio (DR) and Outside Diameter (IPS/DIPS) shall be as specified on plans.
 - 3.1.2. HDPE profile wall pipe requirements – 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 per ASTM D3350.
 - 3.1.3. HDPE sheet material Requirements- HDPE sheet or plate shall be pipe grade material with a minimum equivalent designation of PE 3608 or a minimum cell classification value of 345464C per ASTM D3350.
 - 3.1.4. HDPE fitting requirements – HDPE fittings shall be a minimum grade of PE 4710 with a minimum cell classification value of 445474C per ASTM D3350 and conform to either ASTM D3261 for molded or machined fittings or F2206 for fabricated fittings.

4. HDPE FABRICATION REQUIREMENTS

- 4.1. The fabricator shall construct the HDPE manholes and structures based on project engineer or owner approved drawings.
- 4.2. The inlets and outlets shall be extrusion welded on the inside and outside of the structure, where access is available. Two gussets shall be provided for 2”-8” extrusion welded inlets and outlets and four gussets shall be provided for 10” and larger extrusion welded inlets and outlets unless impractical.
- 4.3. Join all manhole/structure connections larger than 4” nominal OD pipe by butt fusion, electrofusion, or flanged connections using an HDPE flange adapter and metallic backup ring with a bolt pattern per ASME B16.5 or B16.47 Series A. For 4” OD pipe and smaller, threaded transition fittings can also be used as well as the connections for 4” and larger. Employing mechanical couplings or similar connections requires approval by the project engineer.
- 4.4. Make all butt fusion welds as described in ASTM F2620 and all butt fusion welds performed with hydraulically operated butt fusion equipment shall be recorded using a data acquisition device. The fabricator shall maintain records of the temperature, pressure, and graph of the fusion cycle for a minimum of 3 years.
- 4.5. Except when impractical, lifting eyes are integral to the manhole/structure body and located on shop drawings.

- 4.6. Manhole/structure and outlets are not for use as anchor points against excessive axial loads or movement. When expecting large changes in temperature, design restraints to isolate the structure and prevent strain at the inlets or outlets. Restraints shall be cast into a concrete block or collar around the pipe. If required as an integral part of the manhole/structure, the fabricator/manufacturer shall provide anti-flotation and/or anti-settling measures such as anchor lugs, rings, or collars.
- 4.7. Reinforced concrete pads at surface level spanning the HDPE manhole/structure footprint are required when used in traffic areas. The pad shall transfer live loads to the surrounding fill and remove direct loading to the manhole/structure 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/structure will be coordinated with the manufacturer.
- 4.8. When practical and required, manholes/structures shall be factory tested with water or with air. Testing requirements shall be provided prior to fabrication. The owner or a representative of the owner may request to observe the test.
 - 4.8.1. Pressure rated vessels may be tested with a hydrostatic pressure test. Minimum test duration will be one hour. Maximum test duration will be three hours.
 - 4.8.2. When approved, conduct a water fill test by filling the structure and checking for leaks. Approval drawings and testing documents will specify the level of water and test duration. Minimum test duration will be one hour.
 - 4.8.3. A low-pressure air test may be used instead of testing with water. In this case, use a minimum of 1-PSI test pressure for 15 minutes. It is possible to test structures with a 60" inside diameter or smaller up to 4 PSI with approval of the fabricator.

5. SITE HANDLING AND CONNECTIONS

- 5.1. Handling of Manholes/Structures. Take care during loading, transportation, and unloading to prevent damage to the pipe. HDPE manholes/structures shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. Handling HDPE manholes/structures in such a manner to minimize damage, such as the use of nylon slings. The PPI Handbook of Polyethylene Pipe Chapter 2 offers guidance on handling of HDPE pipe/fittings and is appropriate to consider for HDPE manholes and structures.
- 5.2. Pipe Joining. Perform HDPE joining by butt fusion as described in ASTM F2620 or by electrofusion.
 - 5.2.1. All connections to the structure made by butt fusion and hydraulically operated butt fusion equipment shall be recorded using a data acquisition device. The contractor shall maintain records of the temperature, pressure, and graph of the fusion cycle for all butt fusions to the structure at the jobsite.
- 5.3. Handling of Fused Pipe- The handling of the pipeline should be in such a manner to minimize damage to the pipe. 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.
 - 5.3.1. Remove or repair sections of the pipe with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections with a procedure approved by the engineer or owner.
 - 5.3.2. Limit bending of the pipe welded to fittings or manholes/structure.
- 5.4. Flanged Connections- Flanged connections to the structure should use a connection with a 150# bolt pattern per ASME B16.5 or B16.47 Series A

- 5.4.1. Bolted connections should follow recommendations from the Plastic Pipe Institute (www.plasticpipe.org) TN-38, Bolt Torques For Polyethylene Flanged Joints, including the following recommendations:
 - 5.4.1.1. Tighten bolts in a “star pattern” to recommended torque values.
 - 5.4.1.2. Bolts should be tightened a second time after 8-24 hours to ensure a positive seal.
 - 5.4.1.3. Gaskets are not required between HDPE to HDPE flanged connections.
- 5.5. Equipment Mounting- Special provisions should be considered when mounting pumps in an HDPE manhole or structure. Bolting directly to the wall of the HDPE structure is not recommended.

6. DIRECT BURIAL INSTALLATION

- 6.1. Trench Construction- Construct the trench and trench bottom in accordance with ASTM D2321. The HDPE manhole or structure shall be installed on a stable base consisting of 12” of Class I materials compacted to 95% proctor density per ASTM F1759. All required safety precautions for manhole/structure installation are the responsibility of the installation contractor.
- 6.2. Embedment materials- Embedment materials shall be Class I or Class II materials as defined by ASTM D2321. Class I or flowable fill (controlled low strength material /CLSM) materials are preferred. Backfill and bedding materials shall be free of debris.
- 6.3. Bed and compact beneath the manhole or structure in accordance with ASTM D2321.
- 6.4. Backfilling shall be done to conform to the ASTM F1759. Backfill should extend at least 3.5 feet beyond the edge of the manhole/structure for the full height of the manhole/structure 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 4.7 applies to the project and using HDPE manholes or structures in traffic areas, reinforced concrete pads with a traffic rated frame and cover shall be required. The contractor must submit a drawing showing the dimensions of the pad, including thickness of the pad and the placement of rebar, and the location in relation to the HDPE manhole/structure to the engineer.

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, manhole, or structure 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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