

Model Specification 506 DRISCOPLEX[®] 4100 (IPS) FM and DRISCOPLEX[®] 4000 (DIPS) FM Factory Mutual Approvals Approved Polyethylene Piping

The user may choose to adopt part or all of this Model Specification; however, the user should ensure that all parts used are appropriate for the user's purpose. See notice below.

1. General Terms and Conditions

- 1.1. Scope. This specification covers requirements for DriscoPlex[®] 4100 (IPS) FM and DriscoPlex[®] 4000 (DIPS) FM Factory Mutual Approvals (FMA) approved high-density polyethylene piping for underground fire main applications. All work shall be performed in accordance with these specifications.
- 1.2. Engineered and Approved Plans. Underground fire main construction shall be performed in accordance with engineered construction plans for the work prepared under the direction of a professional engineer.
- 1.3. Referenced Standards. Where all or part of a Federal, ASTM, ANSI, AWWA, NFPA, FMA, etc., standard specification is incorporated by reference in these specifications, the reference standard shall be the latest edition and revision.
- 1.4. Licenses and Permits. A licensed and bonded contractor shall perform all underground fire main construction work. The contractor shall secure all necessary permits before commencing construction.
- 1.5. Inspections. All work shall be inspected by an authorized representative of the owner who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the project engineer or his authorized representative shall, by written notice, order further construction to cease until all deficiencies are corrected. A copy of the order shall be filed with the Contractor's license application for future review. If the deficiencies are not corrected, performance shall be required of the contractor's surety.

2. Polyethylene Pipe and Fittings

- 2.1. Qualification of Manufacturers. The manufacturer shall have manufacturing facilities and a quality assurance program that are approved by Factory Mutual Approvals and capable of producing and assuring the quality of the pipe and fittings required by these specifications. The manufacturer's production facilities shall be open for inspection by the customer or his authorized representative. The project engineer shall approve qualified manufacturers.
- 2.2. Approved Manufacturers. Manufacturers that are qualified and approved by the project engineer are listed below. Products from unapproved manufacturers are prohibited.

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- 2.3. Materials. Materials used for the manufacture of polyethylene pipe and fittings shall be PE 3408/4710 high density polyethylene meeting cell classification 445574C for black or 445574E for color stripes per ASTM D 3350; and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F.
- 2.3.1. Potable Water. When the main provides firewater and potable water service, the material shall also be listed and approved for potable water in accordance with NSF-61 or ANSI/NSF-61. The pipe must also be manufactured in accordance with AWWA C901 or C906.
- 2.4. Interchangeability of Pipe and Fittings. The Factory Mutual approved manufacturer who is qualified and approved by the project engineer shall supply polyethylene pipe and fittings. Products from non-approved manufacturers are prohibited. Pipe and fittings from different manufacturers may be used if both are FMA listed.
- 2.5. Polyethylene Pipe. Fire main pipe shall be FMA approved Class 150 or Class 200 DriscoPlex[®] 4100 FM (IPS) sized polyethylene pipe or DriscoPlex[®] 4000 FM (DIPS) sized polyethylene pipe, and shall be marked with the FM diamond logo. Each production lot of material or pipe shall be tested for melt index, density and percent carbon. Each production lot of pipe shall be tested for dimensions and ring tensile strength.
- 2.5.1. Service Identification Stripes. DriscoPlex[®] 4000 FM and DriscoPlex[®] 4100 FM are provided as black, black with red stripes or black with blue stripes. Black pipe is standard. Permanent identification of the striping shall be provided by co-extruding color stripes into the pipe outside surface. The striping material shall be the same material and cell classification as the pipe material except for color. IPS sized pipes shall have four equally spaced, longitudinal color stripes. DIPS sized pipes shall have three equally spaced pairs of longitudinal color stripes.
- 2.5.2. Potable Water and Fire Main Pipe. DriscoPlex[®] 4000 FM and DriscoPlex[®] 4100 FM shall be listed and approved for potable water in accordance with NSF-61 or ANSI/NSF-61. The pipe must also be manufactured in accordance with AWWA C901 or C906.
- 2.6. Polyethylene Fittings. Polyethylene fittings can be molded or fabricated. The manufacturer; shall be FMA approved and shall be marked with the FM diamond logo. Molded fittings shall be provided by Performance Pipe. Fabricated fittings shall be provided by a FMA approved manufacturer.
- 2.6.1. Polyethylene Flange Adapters. Flange adapters shall be FMA approved and shall be marked with the FM diamond logo. Flange adapters shall have sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasket-less sealing or restrain the gasket against blowout.
- 2.6.2. Back-up Rings & Flange Bolts. Class 150 and Class 200 flange adapters shall be fitted with FMA approved back-up rings. Flange bolts and nuts shall be Grade 3 or higher.

2.6.3. MJ Adapters. MJ Adapters shall be FMA approved, shall be marked with the FM diamond logo.

2.7. Compliance Tests. In case of conflict with manufacturer's certifications, the contractor, project engineer or customer may request retesting by the manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense and shall be performed in accordance with these specifications.

3. Joining

3.1. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt fusion using only procedures that are recommended by the pipe and fitting manufacturer. The contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure. The contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months prior to construction. External and internal beads shall not be removed.

3.2. Heat Fusion Training Assistance. Upon request and at the requestor's expense, training personnel from the manufacturer or his representative shall be made available.

3.2.1. Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends or pipe ends and fitting outlets having the same outside diameter and class. Butt fusion joining between Class 150 and Class 200 is permitted; however, the system pressure rating retains the Class 150 rating. Transitions between Class 150 and Class 200 shall be made with approved flange connections.

3.3. Mechanical Joining. Polyethylene pipe and fittings may be joined together or to other materials by means of FMA approved flange adapters and back-up rings or FMA approved MJ Adapters. Where FMA approved pipe or fittings are connected to the socket of mechanical joint pipe, fittings or appurtenances, an FMA approved MJ Adapter shall be used. Plain end pipe with or without an ID stiffener shall not be installed into the hub of a mechanical joint component. Mechanical couplings and external joint restraints shall not be used to connect FMA approved polyethylene pipe or fittings.

3.4. Flange Installation. Mechanical joint and flange connections shall be installed in accordance with the manufacturer's recommended procedure. MJ Adapters and flanges shall be centered and aligned to the mating components before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the manufacturer.

4. Installation

- 4.1. General. When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer within 7 days. Installation shall be in accordance with ASTM D 2774, manufacturer's recommendations and this specification. All precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
- 4.2. Excavation. Trench excavations shall conform to the plans and drawings, as otherwise authorized in writing by the project engineer or his approved representative and in accordance with all applicable codes. Where necessary, trench walls shall be shored or reinforced and all precautions shall be taken to ensure a safe working environment.
- 4.3. Large Diameter Fabricated Fittings. A maximum of one leg of a fabricated directional fitting 16" IPS and larger shall be butt fused to the end of a pipe string. The remaining fitting connections shall be made in the trench using butt fusion, flange or other connection means in accordance with 3.3 (Mechanical Joining). Flange and MJ Adapter connections shall be assembled and tightened in accordance with the connection manufacturer's instructions and 4.4 (Foundation and Bedding). Handling, lifting, moving or lowering a 16" IPS or larger fabricated fitting that is connected to more than one pipe length is prohibited. If multiple legs of large diameter fittings are fused to long pipe strings, damage to the fitting may occur. The contractor at his expense shall correct fitting damage caused by such improper handling.
- 4.4. Foundation and Bedding. Pipe shall be laid on grade and on a stable foundation. Unstable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted Class I material shall be installed to pipe bottom grade. Excess groundwater shall be removed from the trench before laying the foundation or bedding for the pipe. A trench cut in rock or stony soil shall be excavated to 6" below pipe bottom grade, and brought back to grade with compacted Class I bedding. All ledge rock, boulders and large stones shall be removed.
- 4.5. Pipe Handling. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move or lower pipe and fittings. Wire rope and chain are prohibited.
- 4.6. Backfilling. Embedment material soil type and particle size shall be in accordance with ASTM D 2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe spring line are completely filled and free of voids.
- 4.7. Protection Against Shear and Bending Loads. In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

- 4.8. Final Backfilling. Final backfill shall be placed and compacted to finished grade. Native soils may be used provided they are free from debris, stones, boulders, clumps, frozen clods or the like larger than 8" in their largest dimension.

5 Testing

- 5.1 Fusion Quality. The contractor shall ensure the field set-up and operation of the fusion equipment and the fusion procedure used by the contractor's fusion operator while on site. Upon request by the owner, the contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure and shall re-make the rejected fusions.
- 5.2 Leak Testing. Hydrostatic leak testing shall be conducted in accordance with Performance Pipe Technical Note 802 '*Leak Testing*'. Pneumatic pressure testing is prohibited

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