Model Specification PP 534

HDPE Pipe and Tubing for High Temperature Applications (PE-RT)

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 high-density polyethylene piping and tubing for high temperature applications. All work shall be performed in accordance with these specifications.

1.2 Engineered and Approved Plans. Pipeline construction shall be performed in accordance with engineered plans and drawings 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, NSF 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 pipeline 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 its 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.

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2 Polyethylene Pipe and Fittings

2.1 Qualification of Manufacturers. The manufacturer shall have manufacturing and quality control facilities that are 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 its authorized representative. The pipe and fitting manufacturer shall be ISO Certified in accordance with the current edition of ISO 9001 and a documented quality management system that defines product specifications and manufacturing and quality assurance procedures that assure conformance with customer and applicable regulatory requirements. Upon request, the manufacturer shall provide a current Certificate of Compliance form and independent ISO 9000 Registrar.

2.2 Approved Manufacturer.

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2.3 Materials. PE-RT material used for the manufacture of polyethylene pipe, tube and fittings shall be PE 4710 high density polyethylene meeting ASTM D3350 cell classification of 445574C 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 and 800 psi at 180°F per ASTM D2837. The material shall contain a stabilizer system for high oxidative environments with a CC3 rating per ASTM D3350.

2.4 Polyethylene Pipe. Polyethylene pipe shall be manufactured in accordance with ASTM F2619, API 15LE and ASTM F714. The pipe shall be protected against UV degradation with 2-3% carbon black.

Approved Pipe: PlatinumStripe® 1800 Series PE-RT Pipe

2.5 Identification Stripes. IPS pipes shall have four, equally spaced, platinum color stripes co-extruded into the pipe outside surface. Stripes printed or painted on the pipe outside surface shall not be acceptable.

2.6 Marking. Pipe shall be marked in accordance with ASTM F2619, API 15LE, and ASTM F714.

2.7 Polyethylene Fittings & Custom Fabrications. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.

Polyethylene fittings and custom fabrications shall be supplied by: Performance Pipe, a division of Chevron Phillips Chemical Company LP

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2.8 Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and D2513 and shall be so marked.

2.9 X-Ray Inspection. The manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.

2.10 Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.

2.11 Polyethylene Flange Adapters. Flange adapters shall be made with 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).

2.12 Back-up Rings & Flange Bolts. Flange adapters shall be fitted with back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts shall be SAE J429 Grade 2, or Grade 5 and used with corresponding heavy-hex nuts.

2.13 MJ Adapters. MJ Adapters 4” thru 16” may be provided with optional Stainless Steel Stiffener upon request. MJ Adapters 14” and above shall be provided with Heavy Duty Back-up Ring Kits. All MJ adapters 18” and above must be provided with Stainless Steel stiffeners.

2.14 Compliance Tests. In case of conflict with manufacturer's certifications, the contractor, project engineer, or owner 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. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are in accordance with ASTM F2620 and 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 before commencing construction. External and internal beads shall not be removed.

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3.1.1 Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR 17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDR's for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26, 32.5 and 41.

3.1.2 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 Joining by Other Means. Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

3.2.1 ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

3.3 Branch Connections. Branch connections to the main shall be made with saddle fittings, electrofusion fittings, or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe per 3.1.

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 necessary 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 authorized in writing by the project engineer or its approved representative and in accordance with all applicable codes. The Contractor shall remove excess groundwater. Where necessary, trench walls shall be shored or reinforced, and all necessary precautions shall be taken to ensure a safe working environment.

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4.3 Large Diameter Fabricated Fittings. Not more than one plain-end connection of 16" IPS and larger fabricated directional fittings (elbows, tees, etc.) shall be butt fused to the end of a pipe length before placing the assembly into the trench. The remaining fitting connections shall be made in the trench using butt fusion, flange or other connection means in accordance with 3.2. Flange and other mechanical connections shall be assembled, and tightened in accordance with the connection manufacturer's instructions. Handling, lifting, moving or lowering a 16" IPS or larger fabricated fitting that is connected to more than one pipe length is prohibited. The installing contractor at his expense shall correct fitting damage caused by such improper handling.

4.4 Mechanical Joint & 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 component before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads and the nut 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. Four hours after initial assembly, flange connections shall be re-tightened to the target torque value following the tightening pattern and torque step recommendations of the manufacturer. For pipes of diameters 14" and larger, for environmentally sensitive, or for critical pipelines, a second re-torque is performed after an additional 4 to 24 hours.

4.5 Foundation & Bedding. Pipe shall be laid on grade and on a stable foundation. Excess groundwater shall be removed from the trench. The trench bottom may undulate but significant irregularities must be leveled off and/or filled with compacted embedment backfill. If the trench bottom is uniform and the soil is stable, foundation or bedding may not be required at the discretion of the project engineer. Unstable and unsuitable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted Class I material shall be installed to pipe bottom grade.

4.6 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. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used

4.7 Pipe Embedment. For shallow, non-traffic applications and at the discretion of the project engineer, compactable native backfill material from trench may be used. The embedment should be placed in lifts not exceeding 6 inches thick and compacted to at least 85% Standard Proctor Density as defined in ASTM D698.

When an engineering embedment is required to provide soil support to enable the pipe to withstand external loads, embedment soil specifications and installation should be performed in accordance with the specifying engineer's requirements. Engineered 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

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and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.

4.8 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.

4.9 Final Backfilling. Final backfill shall be placed and compacted to finished grade. Native soils may be used provided the soil is free of 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. . QA/QC controls for fusion joint quality include 1) operator training in identifying a properly made fusion; 2) if applicable, using equipment to record and document key parameters of the fusion process to determine whether the procedure performed adheres with recommended guidelines; 3) field testing of trial joints; 4) hydrostatic testing. The contractor at its expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

5.2 Trial Fusions. 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 before conducting a Bend Back test per ASTM F2620 or a Guided Side Bend test per ASTM F3183. A Bend Back test shall be used for pipe with wall thicknesses of less than 1", while a Guided Side Bend test shall be used for pipe with wall thicknesses of 1" and larger. If the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected.

5.3 Leak Testing. Hydrostatic leak testing shall be conducted in accordance with Performance Pipe Technical Note 802 *Leak Testing* and ASTM F2164. Pneumatic pressure testing is prohibited.

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