Pre-insulated HDPE-Jacketed Steel Piping Systems *suitable for Chilled Water, Heating Water, Domestic Hot Water, Process Fluids, Low Pressure Steam (15 PSIG Max.), Condensate Return, and Cryogenic services.*

Part 1 - General

1.1 Pre-insulated Piping - Furnish a complete HDPE jacketed system of factory pre-insulated steel piping for the specified service. The jacket throughout the entire system shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings, joint closures, or other points of connection. This shall create a jacket that is seamless throughout the entire system with the exception of anchors, whose water shed rings are sealed with a Raychem Dirax or Canusa GTS-65 wrap prohibiting the ingression of water. The system shall incorporate a copper wire, as specified below, to make the system leak detection ready. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the Pre-insulated Piping System manufacturer.

1.2 A complete layout of the system, showing anchors, expansion provisions, and building entrance details, shall be provided by the pre-insulated pipe manufacturer. Means for expansion must be made in pipe off-sets or loops. The system shall be pre-fabricated and pre-engineered to minimize the number of field welds.

1.3 The system shall be **FERRO-THERM** as manufactured by **Thermacor Process, L.P.**, of Fort Worth, Texas.

Part 2 - Products

2.1 Carrier pipe shall be steel ASTM A-53, Grade B., ERW (Type E) or seamless (Type S), standard weight for sizes 2" and larger, and shall be ASTM A-106/ A-53, seamless, standard weight for sizes 1-1/2" and smaller (Std. Wt. is the same as Sch. 40 through 10"). Condensate return piping shall be Extra Strong (XS is the same as Sch. 80 through 8"). When practical, piping shall be provided in 40-foot double-random lengths. All carbon steel pipe shall have ends cut square and beveled for butt-welding. Straight sections of factory insulated pipe shall have 6" of exposed pipe at each end for field joint fabrication.

2.2 Insulation shall be polyurethane foam either spray applied or high pressure injected with one shot into the annular space between carrier pipe and jacket. Insulation shall be rigid, 90%- 95% closed cell polyurethane with a 2.0 to 3.0 lbs per cubic foot density and coefficient of thermal conductivity (K-Factor) of 0.15 @ 75°F and shall conform to ASTM C-591. Maximum operating temperature shall not exceed 250°F. Insulation thickness shall be specified by calling out appropriate carrier pipe and jacket size combinations as listed on drawing FTSG 7.103.

2.3 Jacketing material shall be extruded, black, high density polyethylene (HDPE), having a minimum wall thickness of 125 mils for jacket sizes less than or equal to 12", 150 mils for jacket sizes larger than 12" to 20", and 175 mils for jacket sizes greater than 20". The jacket throughout the entire system shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings, joint closures, or other points of connection. This shall create a jacket that is seamless throughout the entire system with the exception of anchors, whose water shed rings are sealed with a Raychem Dirax or Canusa GTS-65 wrap prohibiting the ingression of water. The inner surface of the HDPE jacket shall be oxidized by means of corona treatment, flame treatment (patent pending), or other approved methods. This will ensure a secure bond between the jacket and foam insulation preventing any ingression of water at the jacket/ foam interface.

2.4 Straight run joints are insulated using polyurethane foam to the thickness specified, jacketed with a full length HDPE sleeve that incorporates electro- fusion welding at all seams to create a pressure testable joint closure, a Canusa pressure testable Supercase closure, or Raychem Rayjoint pressure testable closure. The joint will be pressure tested at 5 psi for 5 minutes while simultaneously soap tested at the joint closure's seams for possible leaks. After passing the pressure test, the field joint is insulated and a closure plug is frictionally welded (as per specified joint closure instructions) over the foam holes. All joint closures and insulation shall occur at straight sections of pipe.

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2.5 Fittings are factory pre-fabricated and pre-insulated with polyurethane foam to the thickness specified and jacketed with a one piece seamless molded HDPE fitting cover, a butt fusion welded, or an extrusion welded and mitered HDPE jacket. **NO TAPING OR HOT AIR WELDING SHALL BE ALLOWED**. All fitting jackets/ covers shall be connected to the straight lengths of pipe by electro fusion, butt fusion, or extrusion welding. Carrier pipe fittings shall be butt-welded, except sizes smaller than 2" shall be socket-welded. Fittings include expansion loops, elbows, tees, reducers, and anchors. Elbows, loops, offsets, or any other direction changes shall conform to the standards set by ASME B31.1, Code for Power Piping.

2.6 Expansion/ contraction compensation will be accomplished utilizing factory pre-fabricated and pre-insulated expansion elbows, Z-bends, expansion loops, and anchors specifically designed for the intended application. External expansion compensation utilizing flexible expansion pads (minimum one inch thickness), extending on either side, both inside and outside the radius of the fittings used, with all fittings having expansion in excess of 1/2".

2.7 The system shall be leak detection ready by means of installing a bare copper wire between the carrier pipe and the HDPE jacket. The piping system manufacturer shall install the wire in a manner that has the wire embedded in the foam insulation and incorporated into each piece of pre-insulated pipe and fittings. Contractor shall check continuity and electrical isolation of each piece of insulated pipe and fittings with a standard ohmmeter as it arrives at the jobsite. Contractor shall connect the copper wires together at each field joint with the supplied insulated jumper cable and recommended crimping tool as per manufacturer's instructions. Contractor shall then check for continuity and electrical isolation using a standard ohmmeter over the length of the installed piping system before insulating straight run joint kits. After the piping system is installed, the owner at any time may check the system for a leak by using a standard volt ohmmeter. If a leak is detected, the owner should contact the system manufacturer for a Time Domain Reflectometer (TDR) to determine the location of the leak. (At owner's option, an alarm panel may be installed, which will provide continuous leak detection monitoring.)

Part 3 - Execution

3.1 Pre-engineered systems shall be provided with all straight pipe and fittings factory pre-insulated and pre-fabricated to job dimensions.

3.2 Underground systems shall be buried in a trench not less than two feet deeper than the top of the pipe and not less than eighteen inches wider than the combined O.D. of all piping systems. A minimum thickness of 24 inches of compacted backfill placed over the top of the **pipe will meet H-20 highway loading.**

3.3 Backfilling shall be done with sand 6" below the casing and 1' above. Engineer-approved backfill may be used to fill the rest of the trench. This material should be free of rocks, roots, large clods, or anything that could cause damage to the jacket.

3.4 A hydrostatic pressure test of the carrier pipe shall be performed per the engineer's specification with a factory recommendation of one and one-half times the normal system operating pressure for not less than two hours. Care shall be taken to insure all trapped air is removed from the system prior to the test. *Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.*

3.5 Field Service is required and will be provided by a certified manufacturer's representative or company field service technician. The technician will be available at the job a minimum of one day (or more if required by job size) to check unloading, storing, and handling of pipe, pipe installation, pressure testing, field joint insulation, and backfilling techniques.