SECTION 15120

PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Scope
   1. Provide specialties with materials of construction and methods of fabrication, assembly, erection, testing and interim operation in compliance with the requirements specified herein and requirements of applicable codes and authorities having jurisdiction.

B. Description Of Systems
   1. Refer to Division 15 Section “Aboveground Piping Systems” for description of systems and associated valves.

C. Related Work Specified Under Other Sections
   1. Division 15 Section “General Mechanical Requirements.”
   2. Division 15 Section “Aboveground Piping Systems.”
   3. Division 13 Sections for Instrumentation and Control Work.
   4. Division 16 Sections for Electrical Work.

1.2 QUALITY ASSURANCE

A. Refer to Division 15 Section “General Mechanical Requirements.” for applicable requirements.

1.3 SUBMITTALS

A. Refer to Division 15 Section “General Mechanical Requirements.” for applicable requirements.

B. Include piping system layout drawings, piping sizes, calculations and coefficients used, materials and equipment classification and identification, component pressure/temperature rating, piping and equipment supports and restraints, special installation requirements, catalogue data and other data necessary to verify compliance with CONTRACT DOCUMENTS.

1.4 OPERATING AND MAINTENANCE PERSONNEL TRAINING

A. Refer to Division 15 Section “General Mechanical Requirements.” for applicable requirements.

1.5 PROJECT CONDITIONS

A. Refer to Division 15 Section “General Mechanical Requirements.” for applicable requirements.

1.6 GUARANTEE/WARRANTY

A. Refer to Division 15 Section “General Mechanical Requirements.” for applicable requirements.

PART 2 PRODUCTS

2.1 PIPING SPECIALTIES

A. 4-Way Valve / Automatic Tube Brushing System (Bid Alternate No. 2)
   1. *4-Way Valve / Automatic Tube Brushing System [D,P]:* Provide an automatic chiller condenser tube brushing system consisting of nylon brushes inserted in each tube with polypropylene catch baskets attached to the end of each tube, pneumatic actuated 4-way valve installed to permit reversing the direction of water flow, and control panel.
   2. Brushes shall have an interference fit not to exceed 0.025” and shall consist of nylon bristles, titanium wire, and polypropylene tips with vanes to cause a spiraling movement through the tube.
   3. 4-Way valve shall be ASTM A 36 carbon steel body, with grooved end connections on the top ports and flanged end connections on the bottom ports, ASME UPVC Section VIII rated for 125 psig with maximum system differential of 35 psig, positive sealing plug type with all internal sealing parts of hard rubber and AISI Type 304 Stainless Steel. Valve shall have parallel flow connections to minimize field installation piping and labor. Valve shall be field adjustable for plug to seat clearance to minimize bypass. Valve shall allow for manual fail safe turning, and have a mechanical position indicator.
   4. Control panel shall include:
      a. Cycle counter
      b. Timer initiated automatic on-load cleaning cycle
      c. Manual override
      d. Power On light
      e. Diverter Position Indicator lights:
         1) Normal Flow
         2) Reverse Flow
      f. Malfunction light
      g. 4-way solenoid valve
      h. Electric Unloading Feature
      i. Flow Switch Bypass
   5. Manufacture
      a. Water Technology Of Pensacola, Inc., ATB System.
   6. Air Hose: Multiple ply nitrile rubber hose with spiral synthetic yarn reinforcement, rated to 250 psi.
      a. Hosecraft USA, Model RM1.
      b. Goodyear.
      c. B. F. Goodrich.
   7. Filter-Regulator-Lubricator Set: Manufacturer’s standard with metallic construction and polycarbonate bowls, quick bowl disconnects, manual drain cock, bronze or stainless steel

filter element to remove 15 micron and larger particles, standard relieving type regulator rated for 150 psi, pressure indicating gauge, and adjustable lubricator.
   a. Norgren.
   b. Numatics
   c. Parker.
   d. Deltech.

B. Air Vents (MAV) (AAV) (HCAAV)(AVS)
   1. *Manual air vents [D,P]:* See System Description and DRAWINGS.
   2. *TYPE AAV Automatic Air Vent [D,P]:* For nonpotable water service: Capacity shall be (1) SCFM at 16 PSID with, vent inlet not less than 3/4 inch IPS and outlet not less than 1/8 inch IPS. AISI 300 Series stainless steel trim. Fit with soldered hard copper discharge to point of approved disposal. Contractor shall provide shut-off valve. See detail on Drawings.
      a. Bell & Gossett, No. 87.
   3. *TYPE HCAAV High Capacity Automatic Air Vent [D,P]:* For nonpotable water service: Capacity shall be (1) SCFM at 16 PSID with, vent inlet not less than 3/4 inch IPS and outlet not less than 1/8 inch IPS. Cast iron body and bonnet, AISI 300 Series stainless steel trim. Fit with soldered hard copper discharge to point of approved disposal. Contractor shall provide shut-off valve. See detail on Drawings.
      a. Bell & Gossett, No. 107A.
   4. *TYPE AVS Automatic Air Vent [D,P]:* For steam service, balanced pressure thermostatic type rated for service temperature and pressure. Bellows shall be non-ferrous. Heads and seats shall be stainless steel.
      a. Armstrong “TTF”.
      b. Sarco.

C. Backflow Preventer (BFP)
   1. *Backflow Preventer [D]:* Reduced-pressure backflow prevention device per AWWA C-506 or ASSE requirements, consisting of two tight-closing check valves, two shut-off valves, anti-syphon mechanism, and test ports. Wetted components; bronze or stainless steel selected for service.
      a. Cla-Val “R.P. Series”.
      b. Watts Regulator.
      c. Hersey-Sparling.
      d. Conbraco.
      e. Febco.

D. Dielectric Isolators, Type (DEI)
   1. *Dielectric Isolators [P]:* Unions and/or flanges flange kits rated for service fluid exposure, pressure, and temperature conditions, with metal connections on ends to match joints and metallurgy of connecting piping.
      a. Capital Manufacturing & Supply, Columbus, Ohio.
      b. Central Plastics Co., 405-275-6302.
      c. Epco Sales Inc., Cleveland, Ohio.
      d. Maloney.

e. Pipeline Development Co., Cleveland, Ohio.

E. Escutcheons
1. Escutcheons: Nonferrous one-piece or split pattern type shall maintain a fixed position against a surface by internal spring tension or set screws.

F. Flanges, Spectacle
1. (Carbon) (Stainless) Steel for ANSI Class (150) (300) flanges, 1/4 inch thick for sizes thru 4 inch, 3/8 inch thick for sizes 5 thru 6 inch, 1/2 inch thick for 8 inch, 5/8 inch thick for 10 inch, 7/8 inch thick for 12 inch, 1 inch thick for 14 thru 18 inch and 1-1/8 inch thick for 20 inch with ANSI B16.5 standard micro-inch joint surface finish.
   a. RP&C Valve (814-479-1551)
   b. Secondaries Inc. (800-243-2678)
   c. Winston Manufacturing Corp. (214-757-7341)
   d. CONTRACTOR

G. Flexible Connectors (Type FC Series)
1. *TYPE FC-1 Spherical Elastomer Connector [D,P]:* Steel van-stone flanged expansion-vibration joints to absorb movement of the pipe sections with no detrimental effect on joint. Provide control rod or cable assemblies to restrict joint movement under service pressure (positive or negative) application. Provide spherical steel washers at control rods. rubber washers are not acceptable. Provide joints for continuous duty working temperature of not less than 240 degF and pressures to 225 PSI. Factory tag joints with manufacturer's maximum recommended limits for elongation or compression or lateral displacement and do not remove prior to acceptance inspection.
   a. Metraflex Co. "Metra-Sphere/Cablesphere".
   b. Garlock EZF-200.
   c. General Rubber Corp. "Maxi-Sphere" Style 1010.
2. *TYPE FC-2 Braided/Convoluted Metal Hose [P]:* AISI 304 or 316 Series stainless steel externally shielded with wire braid of same or similar alloy, with ANSI Class 150 flat faced flanges, rated for not less than 150 PSI at operating temperature with safety factor of 4 for all sizes.
   a. Minimum live length shall be (per manufacturer's calculations) (as indicated) (for indicated applications).
   b. Maximum permanent offset shall be 1inch or as scheduled.
   c. Maximum offset shall be 1 inch ± greater than maximum permanent offset with zero allowance for misalignment.
   d. (For Gasoline Service, hose shall be UL Listed.)
   e. Manufacturers:
      1) Anaconda.
      2) Boa.
      3) Metraflex Hose and Braid.

H. Gauge Piping
1. Gauge Piping: Annealed, pressure-rated copper tubing or stainless steel to suit media and nonferrous fittings to suit media on remote pressure gauge connections. Provide shut-off

valves, pulsation dampeners and Schedule 40 syphon connections as required by the service.

I. Unions Orifice
   1. *Orifice Unions [D]:* Threaded or socket weld female ends, forged steel rated 3000 PSI WOG minimum, fitted for but furnished without orifices for field drilling.
      a. Clayton-Mark.
      b. Other approved.

J. Pressure/Temperature Test Plug
   1. Brass body, ¼" NPTM, with Neoprene or Nordel probe insertion valve core, brass cap and cap retaining strap. Maximum operating pressure 400 PSIG, operating temperature range 45 – 200 degrees F.
      a. Peterson Equipment Company, Pete's Plug Model 100.
      b. Other Approved.

K. Pressure Indicating (PI) Gauges
   1. Bourdon tube type: With minimum 4-1/2-inch dial. Case shall be of drawn steel with friction fit stainless steel ring. Bourdon tube and socket material shall be as required for the service media. Pointer shall be precision needle type. Range shall be twice design pressure, except where otherwise indicated, and normal operation and accuracy shall be within 1 percent over the middle third of the range. Where not indicated otherwise, provide range such that process readout is nominally at mid-point of middle-third of range. Dial shall indicate in Kg/Cm^2 and PSI.
   2. Furnish gauge complete with manufacturers standard needle type isolation valve and integral-to-stem snubber screw.
   3. Provide compound gauges at pump suction and at vertical locations where pressure/vacuum occurs. Provide/retrofit glycerine filled type gauges at interior to building pumps, air compressors, and wherever pulsation occurs.
   4. Where indicated, furnish gauges complete with 60 inch stem.
   5. Manufacturers:
      a. Trerice.
      b. Marsh Instruments.
      c. U.S. Gauge.
      d. Ashcroft.
      e. Weksler.
      f. Palmer.

L. Differential Pressure Gauges
   1. Rolling diaphragm type: With 6 inch dial, case shall be of drawn stainless steel with friction fit stainless steel ring. Diaphragm shall be Buna. Pointer shall be precision needle type. Range shall be 0-50 psid and accuracy shall be within ±2% ascending.
   2. Furnish gauge complete with manufacturers standard needle type isolation valves and integral-to-stem snubber screws.
   3. Manufacturers:
      a. Ashcroft, Model 1131.

b. Trerice.
c. Marsh Instruments.
d. U.S. Gauge.
e. Weksler.
f. Palmer.

M. Sight Flow Devices
1. Sight flow devices: Cast iron or bronze body, screwed ends in sizes 2 inches and smaller and ANSI B16.1 flanged for 2-1/2 inches and larger. Moving Teflon wheel or moving stainless steel pinned flapper, borosilicate glass, assembly rated at not less than 100 PSI at 240 degF with 1.5 PSI max. pressure drop.
   a. Eugene Ernst Co. — EEP 300-S. through 2 inch, wheel; EEP 960f. through 4 inch, wheel.
   b. Dover Corp./OPW Div. — Vis-Flo. through 4 inch, wheel

N. Strainers
1. *TYPE STR-Y, LINE Y-BODY [D,P]*:
   a. ANSI Class 125 pressure/temperature rating and body materials shall match fluid system in which installed, unless otherwise specified. Strainer screen/back-up to pipe area ratio shall be not less than 3:1 and pressure drop, 25% dirty, shall not exceed 2 PSI at fluid rated flow.
   b. Strainer screen perforated sheet back-up shall be AISI TYPE 304/316 stainless steel or Monel. Start-up screens. Liquids No. 20 mesh; gases/vapors No. 100 mesh. Revise to approved particle separation where mandated by fluid characteristics/ pressure drop.
   c. Cast iron body, screwed ends thru 2 inch, unless otherwise specified; flanged ends in sizes 2-1/2 inches and larger with off-set blow-off connection. Fit with system rated ball blow-down valve with capped outlet, unless otherwise indicated, differential pressure gauge tapped connection parts.
      1) Armstrong
      2) Keckley
      3) Leslie
      4) Mueller Steam Specialty
      5) Metroflex.
2. *TYPE STR-ST SIMPLEX, BASKET [D,P]*:
   a. ANSI Class 125, pressure/temperature rating: wetted metallic and non-metallic materials shall be suitable for fluid contained in system in which installed. Strainer screen/back-up to pipe area ratio shall be not less than 3:1 and pressure drop, 25% dirty, shall not exceed 2 PSI at fluid rated flow.
   b. Strainer screen back-up shall be AISI TYPE 304/316 stainless steel. Start-up screens No. 20 mesh. Revise to approved particle separation where mandated by fluid characteristics pressure drop.
   c. Cast carbon steel body, flanged ends. Body drain in bottom, fitted with ball blowdown valve with capped outlet, unless otherwise indicated. Bolted cover suitable for pressure temperature rating, fitted with two eye bolts suitable for lifting, fitted

with rated pressure vent valve. Provide differential pressure gauge tapped connection ports.

d. Manufacture:
   1) Andale
   2) Elliot
   3) Keckley
   4) Mueller Steam Specialty
   5) S.P. Kinney
   6) Kraissl Co.
   7) Leslie
   8) Metroflex

O. Temperature Indicators And Thermowells
   1. GENERAL SERVICE DIAL TYPE (TI):
      a. Bi-metallic or vapor actuated, hermetically sealed, AISI 18-8 cased, 5 inch minimum dial. Fixed stem when located within 6 feet of reading level. Otherwise. Remote Service Type. Furnish with Thermowells. Range as required by service conditions to read at mid-point. Dual scale readout, degC/degF.
         1) Ashcroft.
         2) Marsh Instruments.
         3) Rochester.
         4) Trerice.
         5) Weksler.
         6) Palmer.
   2. REMOTE SERVICE DIAL TYPE (TI-RS):
      a. Liquid or vapor actuated, remote element type with armored capillary, hermetically sealed AISI 18-8 cased, 3-1/2 inch minimum dial. Furnish with Thermowells. Range as required by service conditions to read at mid-point. Dual scale readout, degC/degF.
         1) Ashcroft.
         2) Marsh Instruments.
         3) Rochester.
         4) Trerice No. 8000 Series.
         5) Weksler.
         6) Palmer.
   3. INDUSTRIAL PATTERN (TI-S):
      a. Non-mercury filled, liquid-in-glass, 9 inch dual scale degC/degF readout, aluminum cased, adjustable stem. Range as required by service conditions to read at midpoint. Furnish with separable thermowells.
         1) Ashcroft.
         2) Marsh Instruments.
         3) Trerice.
         4) Weksler.
         5) Palmer.
   4. THERMOWELLS (TW):
      a. Metallurgy to match system wetted valve trim.

b. Brass where suited for neutral pH service media and at less than 200 degF. Otherwise, AISI Type 304 or 316 stainless steel to suit service conditions. Provide extension neck type to accommodate insulated surfaces installations.

P. Vacuum Breakers
1. Rate for the temperatures, pressures and service to be encountered. Provide with isolating valve on inlet side.
a. Crane.
b. Johnson.
c. Hoffman.

Q. Water Hammer Arrestors
1. *Water Hammer Arrestors [D]:* Commercially manufactured with AISI TYPE 18-8 stainless steel bellows arranged to absorb the energy of pressure waves generated by valve closure in a line in which liquid is flowing. Arrestors with inlets sized 1 inch and smaller, per Plumbing and Drainage Institute Standard PDI-WH201. Arrestors for larger system requirements, engineered for the service by the manufacturer.
a. Metraflex “Surge Master”.
b. J. R. Smith.
c. Josam.
d. Souix Chief.

2.2 ELECTRIC HEAT TRACING

A. General
1. Provide electric heat tracing system as a CONTRACTOR/manufacturer turnkey design, engineering, manufacturing, installation, start-up, testing responsibility to automatically protect specified/indicated systems from freezing. Provide system in accordance with IEEE Heat Tracing Design Recommended Practice, NFPA-70, UL, and the DRAWINGS.
2. Only one 30 amp, 480 Volt, 3-phase 60 Hertz power supply will be provided to Heat Trace System Control Panel HTCP-2 as part of WORK under Division 16 Series SECTIONS. All other electrical work shall be provided as part of electric heat tracing work, in accordance with specified standards/codes and Division 16 Series SECTIONS, including Ground Leak Circuit Breaker protection with 30 milliamp trip.

B. Description Of Systems
1. Refer to DRAWINGS and SCHEDULE.
a. Heat trace the following surfaces in an Ordinary Hazard Area:
1) Cooling Tower Water Piping, as shown on the DRAWINGS, with each pipe as separate circuits.
b. It shall be the CONTRACTOR’S responsibility to coordinate and ensure that properly insulated piping is provided.

C. Design Conditions
1. System shall energize automatically on sensing of low ambient conditions by duplex sensors. System shall prevent freeze-up by maintaining minimum 40 degF surface

temperature in an ambient of minus 20 degF and 20 MPH wind based on, for design purposes, of one-inch of phenolic foam insulation. Provide 15% design safety factor for aboveground piping and 25% safety factor for underground portion. Surface temperature of heat tracing element shall be limited by maximum allowable temperature of insulation materials.

D. Submittals
   1. *Shop drawing submittals for Heat Tracing Work [D,P]* shall be complete and shall clearly indicate that aboveground work has been completely coordinated with underground work.

E. Materials
   1. General: Power connections, end-seals, splices, ties, etc., made in the field shall be made with heater cable manufacturer's products.
   2. Heater Cable: Shall be self-limiting/regulating type with synthetic resin jacket and tinned copper metallic braid outer shield. Underground service jacket shall be fluoropolymer.
   3. Thermostats: Energize and control heat circuits, as stated, with adjustable set-point.

F. Heat Trace Control Panel (HTCP-2)
   1. Enclosure shall be NEMA 4X for exterior to building mounting.
   2. Panel shall be fitted with main circuit breaker, transformer, and one or two-pole terminal trip ground leak circuit breaker (GLCB) for each heater trace circuit. Provide not less than (two) spare circuits, of nominal ampacity, completely prewired to terminal blocks with corresponding panel face circuit "spare" indication provisions. Minimum short circuit interrupting capacity shall be 10,000 RMS symmetrical amperes at 120/240 VAC.
   3. In addition to white "power on" light, each circuit shall have push-to-test indicating light to visually/audibly alarm any of the following conditions:
      a. GLCB trip on over current.
      b. Loss of power to heat trace circuit.
      c. Loss of heater continuity.
   4. Fit panel with local common alarm with adjustable frequency 105 dbA/10-feet industrial duty horn and Edwards 52 RNS flashing/rotating red beacon, push-to-silence, push-to-test, and "light-on until rectified" feature.

G. Signs/Tags
   1. Provide "Electric Heat Tracing Caution" signs/tags per NEC Section 427-13.
   2. Identify each circuit with data tag.

H. Installation
   1. Install per referenced codes/standards and CONTRACT DOCUMENTS additional requirements to provide a complete functioning system.
   2. Coordinate all work with insulation applicator in a joint meeting.

I. Testing
   1. Perform all pre-post operational testing required to prove system performance and compliance with CONTRACT DOCUMENTS.

J. Follow-Up
   1. After installation/acceptance and when weather first requires system operation, system start-up engineer shall visit site to observe system operation, make any adjustment.

K. Training
   1. Provide training for OWNER'S operating and maintenance personnel.

L. Heat Trace System Source
   1. Raychem.
   2. Thermon.
   3. Nelson Electric.

2.3 MISCELLANEOUS MATERIALS

A. Bolting
   1. General Requirements: Bolting shall be certified "made in USA" and furnished with visually identifiable manufacturing source/quality.
   2. *General Service [S]:* Heavy hex head or stud per ASTM A 307, Grade B and hex nuts per ANSI B18.2.2. Square head bolts and nuts are not acceptable.
   3. *High Strength [S]:* For all ANSI Class 150 or 300 flanged joints per ANSI B31.1 Table 108.52, except where Class 125 and special case Class 250 cast iron flanges occur. Heavy hex head or stud alloy steel per ASTM A 193, Grade B7 and semi-finished heavy hex nuts per ASTM A 194, Grade 2H. Square head bolts and nuts are not acceptable. Color code to be visually identifiable in field.
   4. *Corrosion Resistant [S]:* Stainless steel, Type 304, semifinished regular hex head bolts, ASTM A 193, Grade B8, NC thread with stainless steel, Type 303, semifinished regular hex head nuts, ASTM A 194, Grade 8F, NC thread. Square head bolts and nuts are not acceptable. Certified made in USA, and visually identifiable in field.
   5. High Strength *High Temperature, Bolting High Nickel[C,P,S]*: High nickel (26% Ni/15% Cr) nominal steel, working range to 800 degF, UNC-2A thread full thread studs, ASTM A 453, Grade B660 Class B with, UNC-2B thread, heavy hex head nuts, ASTM A 453, Grade B660 Class B NOTE: This material has a coefficient of expansion similar to that of austinitic stainless steel.
   6. *High Strength High Temperature Bolting, Ferritic [C,P,S]*: Ferritic stainless steel, working range -0 to 900 degF, Type 410, UNC-2A thread full thread studs, ASTM A 193, Grade B6 with ferritic stainless steel, UNC-2B thread, heavy hex head nuts, ASTM A 194, Grade 6.

B. Caulk
   1. TYPE PTR, POLYSULFIDE: Two-part, non-sag polysulfide, with primer for unprimed surfaces.
      a. Pecora Corp. (215-723-6051) "SYNTHACALK" GC-2 and primer.
   2. TYPE RTV, Silicone: Room temperature vulcanizing, with product formulation recommended by manufacturer as suitable for service/application.
      a. Dow-Corning
      b. General Electric

c. Union Carbide Chemical and Plastics
d. Uniroyal
e. TYPE UR, Polyurethane: Single component, marine grade.
f. 3M “5200”

C. Flashing - Counterflashing
1. Sheet copper: Per ASTM B 370, not less than 16 ounces per square foot.

D. Grout
1. TYPE NS Non-Shrink Grout: Premixed, nonshrink grout, consisting of aggregate base, portland cement and sand, with all necessary plasticizers, densifiers and other control ingredients;
a. Nonmetallic:
1) Euclid Chemical Co. “Euco N-S Grout”.
2) L & M Construction Chemicals “Crystex”.
3) Master Builders “Masterflow 713”
4) W. R. Meadows, Inc. “588 Grout”.
5) U. S. Grout Corp. “Five Star Grout”.
2. TYPE EP Chemical/Oil Resistant Epoxy Grout: Premixed, nonshrink grout, consisting of plastic resins base, with appropriate modifiers:
a. The Ceilcote Co. “648 Grout”.
b. L & M Construction Chemicals “Epo Grout”.
c. U.S. Grout Corp. “Five Star Epoxy Grout”.

E. Pipe Thread Compounds
1. Compounds: For potable water service and similar applications utilize compounds acceptable to U.S. Department of Agriculture (USDA) or Food and Drug Administration (FDA). Compounds containing lead are prohibited.
2. Inorganic zinc-rich coatings: Or corrosion inhibited proprietary compounds for GALVANIZED CARBON STEEL SYSTEMS to coat oil-free raw carbon steel surfaces, in lieu of subsequent painting.
a. Ameron “EZ”
b. Carboline “Carbo-Zinc 12”.
c. ZRC.
3. Type GRAF: Proprietary corrosion inhibited and conductive graphite compounds suitable for gasoline/solvent/alcohol/fuel oils/LPG and specified (including hydro-test and flushing) fluid systems, where electrical continuity for anti-static discharge is required.
a. Flow Control Div./Copper Industries/WKM Products (713-499-8511). “Key Graphite Paste” (non-aqueous service only).
b. Union Carbide Chemicals & Plastics (800-822-4322) Grafoil GTS (petroleum base).
4. TYPE TFE: Use tetrafluoroethylene (Teflon) tape or sealant compound for other systems. For FRP/PVC/CPVC joints, (use correct thickness tape.)
a. Cadillac Plastic Tape.
b. Cajon Co. “SWAK” Part No. MS-PTS-50 Anaerobic/TFE Sealant.
c. Jomar Seal “Heavyweight” Sealant.
d. Permacel Tape.

e. Permatex.

F. Sleeves Wall And Floor Fireproof
1. Refer to DIVISION 15 SECTION "GENERAL MECHANICAL REQUIREMENTS."
2. *Pre-fabricated [P]:* Fit insulated piping penetrating fire rated walls or floors with slip-fit Type 360 degree shield/jacket. Up to and through 2 hour rated barrier shall be 24 gage; 3 and 4 hour rated barrier shall be 16 gauge. Jacket shall be flush on both sides of wall and underside of floor and project 2 inches above floor. Insulation shall consist of 360 degree calcium silicate insert 1 inch longer than the shield/jacket for vapor barrier lines with the thickness matching adjacent insulation.
   a. Pipe Shields, Inc. Series F1000, F500, or F8000 as appropriate.
   b. Elcen "Iso-Shield" Type 3, 360 degree insert, fire-rated.
3. *Field Fabricated System [P]:* Consisting of sleeve, packing and calking on both ends:
   a. Standard weight black carbon steel pipe sleeve with anchor lugs where required.
   b. Packing: Refractory fiber or ceramic fiber:
      1) Corborundum "Fiberfrax".
      2) Eagle Picher "Epitherm 1200".
      3) Babcock and Wilcox "Kaowool".
      4) Manville "Cerafelt".
      5) Multi-part polyurethane calk:
      6) Pecora "Dynatrol II".
      7) PRC Rubber Calk "210 and 270 Sealants".
      8) Tremco "Dymeric".
      9) Mameco "Vulkem 227".
   c. As an alternate to packing specified above, and subject to approval, a fire-rated surface silicone foam, not exceeding the foam fire rating, may be proposed.
      1) Dow Corning "3-6548 RTV Foam".
      2) Semco Div. Products Research and Chemical Corp. "PR-855".
      3) Chase Technology Corp. "CTC PR-855".
      4) Intumescent Caulk:
      5) Johns-Manville.
      6) 3M.
      7) Nelson Electric.
      8) Trimco.
4. Three-Hour Rated [P]: Provide wall sleeve and modular floor and wall seal to assure protection against the penetration of flame, smoke, gases, and water for three hours.
   a. Sleeve shall be manufactured from heavy wall welded or seamless steel pipe with full circle, continuously welded water stop plate, to assure positive water sealing on the O.D. of the sleeve and no thrust movement. Sleeve shall be finished with enriched red primer to assure metal surface protection.
      1) Thunderline "Link-Seal, Wall Sleeves".
   b. Modular floor and wall seal shall be constructed of inorganic materials to provide protection against the penetration of flames, smoke, gases, water and temperatures in excess of 1900 degF for three hours. Sealing elements shall be fire resistant silicone rubber with steel pressure plates and shall meet ASTM Standard E-119-76.
      1) Thunderline "Link-Seal, Pyro-Pac".

G. Thermal Joining Filler Materials
   1. TYPE LF, Soft Solder: Tin-antimony “95-5”; ASTM B 32-83 Alloy Grade Sb5, “Lead-Free, 0.2% Pbmax”.
   2. TYPE BA, Brazing Alloy: AWS A5.8, Classification B Cup-5. Use of brazing alloys containing lead or cadmium is prohibited.
   3. Welding Filler Metal: Furnish, store, apply materials per referenced codes and metallurgically compatible with materials being joined. See CONTRACTOR’S Welding Procedures.

H. Solution, Leak Detector Type
   1. Leak Detector Solution. Commercial type for pipe system testing.
      a. American Gas and Chemicals Inc. “Leak Tec”.
      b. Cole-Parmer Inst. Co. Leak Detector.
      c. Guy Speaker Co. Inc., “Squirt ‘n Bubbles”.

PART 3 EXECUTION

3.1 GENERAL

A. Execute the WORK in compliance with Division 15 Section “General Mechanical Requirements.”

B. Refer to Division 15 Section “Aboveground Piping Systems” for additional requirements.

C. Grooved Couplings And Fittings
   1. Use grooved couplings and fittings only in specified piping systems. Select manufacturer’s recommended gaskets for the service.
   2. For straight runs, provide rigid couplings and pipe guides at each end of run. At changes of direction, provide sufficient but not less than two flexible couplings to accommodate pipe movement without imposing bending moments on rigid joints. Grooved system components shall be obtained from a single manufacturing source. At pumps, provide welded piping joints, unless otherwise approved.

D. Air Vents
   1. Install air vent valves at all pressurized liquid piping systems and equipment water box high points and where indicated.
   2. Provide automatic air vent valves with isolation valves in condenser water box, water lines, except potable water lines, and drainage piping to points indicated or to points of disposal approved by the authorities having jurisdiction. Other vents shall be manual type installed in easily accessible locations.

E. Water Hammer Arresters
   1. Prevent hammer in liquid lines; size and locate water hammer arresters per the manufacturer’s published instructions. Submit shop drawings showing details of installation and location for approval.

F. Escutcheons
   1. Provide escutcheons at building surface penetrations of piping into finished areas. Size the plates to fit around insulation and conceal openings in building construction.
   2. Mount one-piece chrome-plated escutcheons on chrome plated pipe or tubing and one-piece or split pattern type elsewhere.

G. Expansion Joints And Flexible Connectors
   1. Install piping supports, anchors and guides related to expansion joints and flexible connectors per manufacturer's instructions.

H. Flashing And Counterflashing
   1. Provide flashing and counterflashing to maintain building weathertightness.

I. Where piping passes through fire rated walls and floors, or walls and floors of buildings more than two stories high, fill voids and cavities around wall and floor penetrations with firestopping and smoke sealing materials to maintain the required fire-rated condition of substrate.

3.2 FIELD QUALITY CONTROL

A. General
   1. Refer to Division 15 Section "General Mechanical Requirements" for additional requirements.

B. Testing Of Equipment
   1. Test equipment per manufacturer's published instructions, and as specified for the system.

END OF SECTION

Revision History	
Date	**Rev. No.**
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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