UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 63 14

EXTERIOR BURIED PUMPED CONDENSATE RETURN

04/06

PART 1 GENERAL

1.1 REFERENCES
1.2 SYSTEM DESCRIPTION
1.3 SUBMITTALS
1.4 QUALITY ASSURANCE
1.4.1 Certification of Welder's Qualifications

PART 2 PRODUCTS

2.1 PLASTIC CARRIER PIPING
2.1.1 Plastic Carrier Pipe and Fittings
2.1.2 Flanged Connections
2.1.3 Gaskets, Bolts, Nuts, and Washers
2.2 STEEL PIPING
2.2.1 Steam Pipe
2.2.2 Condensate Pipe
2.2.3 Buried Steel Piping to Cooling Well or Drain
2.2.4 Threaded Fittings
2.2.5 Socket Welding Fittings
2.2.6 Buttwelding Fittings
2.2.7 Eccentric Reducing Fittings
2.2.8 Flanges and Unions
2.2.8.1 Flanges
2.2.8.2 Unions
2.2.9 Gaskets, Bolts, Nuts, and Washers
2.3 VALVES
2.3.1 Valves for Condensate Service
2.3.1.1 Gate Valves
2.3.1.2 Globe and Angle Valves
2.3.1.3 Check Valves
2.3.2 Valves for Steam Service
2.3.2.1 Gate, Globe, and Angle Valves
2.3.2.2 Check Valves
2.4 PIPING ACCESSORIES
2.4.1 Pipe Hangers and Supports

2.4.2 Strainers
2.4.3 Traps
2.4.4 Pipe Sleeves
2.4.5 Escutcheon Plates
2.4.6 Cooling Tanks
2.4.7 Couplings
2.5 BURIED PIPING SYSTEM
2.5.1 System Design
2.5.2 System Requirements
2.5.3 Buried Warning and Identification Tape

PART 3 EXECUTION

3.1 INSTALLATION
3.1.1 Cleaning of Piping
3.1.2 Demolition
3.2 PLASTIC CARRIER PIPING
3.2.1 Connections to Metal Pipe
3.2.2 Field Joints
3.2.2.1 Plastic Carrier Piping Joints Without Concrete Anchor
3.2.2.2 Plastic Carrier Piping Joints With Concrete Anchor
3.2.3 Concrete Thrust Blocks
3.3 STEEL PIPING
3.3.1 Fittings and End Connections
3.3.2 Welding
3.3.3 Pipe Hangers and Supports
3.4 NAMEPLATES
3.5 FIELD QUALITY CONTROL
3.5.1 Field Inspections
3.5.2 Field Tests of Carrier Piping
3.5.3 Field Repairs of Plastic Carrier Pipe and Joints
3.6 FIELD PAINTING
3.7 CONNECTIONS TO EXISTING SYSTEMS

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA	**UFGS-33 63 14 (April 2006)**

Preparing Activity: NAVFAC	**Replacing without change UFGS-02556 (August 2004)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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SECTION 33 63 14

EXTERIOR BURIED PUMPED CONDENSATE RETURN
04/06

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NOTE: This guide specification covers the requirements for Contractor designing and providing buried factory-prefabricated preinsulated pumped condensate piping systems for server ground water conditions.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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NOTE: This guide specification includes requirements for concrete pipe anchors exterior of manholes, interface with each manhole, and the watershed to aboveground piping. The plastic carrier piping should be used for sizes 50, 80, 100, 150, 200, and 250 mm 2, 3, 4, 6, 8, and 10 inches. Therefore, the connecting system piping should be of equal size or increased to the next size of the plastic carrier piping. System design must conform to UFC 3-430-09, "Exterior Mechanical Utility Distribution".

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NOTE: The following information shall be shown on the project drawings:

1. Only drawings (not specifications) shall indicate capacity, efficiency, dimensions, details, sections, elevations, and location of equipment; space required for equipment maintenance.

2. Configuration, slope, and sizes for each piping system

3. Locations, sizes, and type of each valve and each trap

4. Details of manholes, piping within manholes, piping aboveground, and piping not in approved factory-prefabricated insulated conduit systems

5. Locations and details of thrust blocks, anchors, and connections between metal piping and plastic carrier piping

6. Trench cross section, sand bedding, and depth of bury

7. Details, sections, and elevations of piping through manholes, walls, floors, and entrance to buildings

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NOTE: Exterior buried factory-prefabricated insulated piping system including concrete pipe anchors exterior of manholes, interface with each manhole, and the watershed to aboveground piping shall be designed by the Contractor. Manholes, piping within manholes, piping aboveground, and piping not in approved conduit systems shall be designed on the project drawings.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically

be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.3	(2016) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.5	(2017) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2018) Factory-Made Wrought Buttwelding Fittings
ASME B16.11	(2016) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2016) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.34	(2017) Valves - Flanged, Threaded and Welding End
ASME B16.39	(2020) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B31.1	(2020) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A106/A106M	(2019a) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A193/A193M	(2020) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A194/A194M	(2020a) Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM D1330	(2004; R 2010) Rubber Sheet Gaskets

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved American National Standard)
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-80	(2019) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

1.2 SYSTEM DESCRIPTION

Design and provide [new and modify existing] exterior buried factory-prefabricated preinsulated pumped condensate (hot water) return piping system complete and ready for operation. Provide identical buried factory- prefabricated insulated piping material up to the first flanged connection in manholes and aboveground. Design pressure and temperature ratings of system components shall be for working pressure of 862 kPa (gage) 125 psig condensate at 121 degrees C 250 degrees F.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes

following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cooling tanks

Manholes

Federal Agency buried piping system

Show design and layout of piping system. Drawings shall have Professional Engineer Seal.

SD-03 Product Data

Pipe and fittings

Valves

Strainers

Pipe hangers and supports

Traps

Gages

Federal Agency Approved Brochure for plastic carrier piping

Thermometers

SD-05 Design Data

Federal Agency buried piping system

Submit calculations of system design. Calculations must have Professional Engineer Seal.

SD-07 Certificates

Certification of welder's qualifications

1.4 QUALITY ASSURANCE

1.4.1 Certification of Welder's Qualifications

Submit prior to site welding. Certifications shall not be more than one year old.

PART 2 PRODUCTS

2.1 PLASTIC CARRIER PIPING

2.1.1 Plastic Carrier Pipe and Fittings

Provide plastic carrier piping conforming to the Federal Agency Approved Brochure. Pipe, fittings, and adhesive shall be supplied by the same manufacturer. Pipe, fittings, flanges, and couplings shall have end connections of the adhesive bell and spigot type. Threaded piping, including pipe, fittings, flanges, and couplings, will not be permitted.

2.1.2 Flanged Connections

Provide flat face type flanged connections between plastic piping and metal piping. Plastic flanges shall be for connecting to ASME B16.5, Class 150 flanges.

2.1.3 Gaskets, Bolts, Nuts, and Washers

a. Gaskets: ASTM D1330, except the Shore A durometer hardness shall be 55 to 65, 3.20 mm 0.125 inch thick ethylene propylene, full face of flange. Provide one piece factory cut gaskets.

b. Bolts: ASTM A193/A193M, Grade B7. Extend a minimum of two full threads beyond the nut with the bolts tightened to the torque recommended by plastic pipe manufacturer.

c. Nuts: ASTM A194/A194M, Grade 7, with Teflon coated threads.

d. Washers: Provide steel flat circular washers under bolt heads and nuts.

2.2 STEEL PIPING

Provide steel piping in manholes and aboveground. Steam piping includes piping upstream of steam traps. Condensate piping includes piping downstream of steam traps.

2.2.1 Steam Pipe

a. ASTM A53/A53M: Type E (electric-resistance welded, Grade A or B) or Type S (seamless, Grade A or B), black steel. Provide Weight Class STD (Standard) for welding end connections. Provide Weight Class XS (Extra Strong) for threaded end connections.

b. ASTM A106/A106M: Grade A or B, black steel, Schedule No. 40 for pipe sizes through 250 mm 10 inches, and minimum pipe wall thickness of 9.50 mm 0.375 inch for pipe sizes 300 mm 12 inches and larger for welding end connections. Provide Schedule 80 for threaded end

connections.

2.2.2 Condensate Pipe

Provide steel piping for other than exterior buried factory-prefabricated insulated pumped condensate return piping.

a. ASTM A53/A53M: Type E (electric-resistance welded, Grade A or B) or Type S (seamless, Grade A or B); black steel, Weight Class XS (Extra Strong).

b. ASTM A106/A106M: Grade A or B, black steel, Schedule No. 80.

2.2.3 Buried Steel Piping to Cooling Well or Drain

Provide direct buried steel condensate pipe and fittings with exterior coal tar epoxy painting system.

2.2.4 Threaded Fittings

ASME B16.11, or ASME B16.3, Class 150 for steam, Class 300 for condensate.

2.2.5 Socket Welding Fittings

ASME B16.11.

2.2.6 Buttwelding Fittings

ASME B16.9. Provide the same material and weight as the piping in which fittings are installed. Provide backing rings conforming to ASME B31.1 and be compatible with materials being welded.

2.2.7 Eccentric Reducing Fittings

ASME B16.9. Provide the same material and weight as the piping in which fittings are installed. Provide for changes in horizontal steam piping sizes.

2.2.8 Flanges and Unions

Provide flanges at connections to plastic piping.

2.2.8.1 Flanges

ASME B16.5, Class 150. Provide flat face flanged connections between plastic piping and metal piping.

2.2.8.2 Unions

ASME B16.39, Class 150 for steam, Class 250 for condensate.

2.2.9 Gaskets, Bolts, Nuts, and Washers

a. Gaskets: Provide ASME B16.21, composition ring 1.60 mm 0.0625 inch thick for steam and gravity condensate (steam) piping. Provide ASTM D1330, except the Shore A durometer hardness shall be 55 to 65, 3.20 mm 0.125 inch thick, full face of flange for pumped condensate (hot water) piping. Provide one piece factory cut gaskets.

b. Bolts: ASTM A193/A193M, Grade B7. Extend a minimum of two full threads beyond the nut with the bolts tightened to the required torque.

c. Nuts: ASTM A194/A194M, Grade 7, with Teflon coated threads.

d. Washers: Provide steel flat circular washers under bolt heads and nuts.

2.3 VALVES

Provide with stems in the horizontal position or not greater than 45 degrees above the horizontal position. Valves shall have flanged end connections, except sizes smaller than 65 mm 2.5 inches in steel piping may have union end connections, or threaded end connections with a union on one side of the valve.

2.3.1 Valves for Condensate Service

Valves downstream of steam traps shall be for minimum working pressures of ASME Class 125.

2.3.1.1 Gate Valves

MSS SP-80, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-70.

2.3.1.2 Globe and Angle Valves

MSS SP-80, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-85.

2.3.1.3 Check Valves

MSS SP-80, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-71. Provide swing check valves.

2.3.2 Valves for Steam Service

Valves upstream of steam traps shall be steel body for minimum working pressures of ASME Class 150.

2.3.2.1 Gate, Globe, and Angle Valves

ASME B16.34.

2.3.2.2 Check Valves

ASME B16.34, swing check.

2.4 PIPING ACCESSORIES

2.4.1 Pipe Hangers and Supports

Provide MSS SP-58 and MSS SP-69, of the adjustable type, except as specified or indicated otherwise. Tack-weld Type 39 pipe covering protection saddles to steel pipe for insulated piping. Provide steel support rods. The finish of rods, nuts, bolts, washers, hangers, and supports shall be hot-dip galvanized after fabrication. Rollers, bases, and saddles may be painted with two coats of aluminum or light gray paint

rated for use on hot metal surfaces up to 232 degrees C 450 degrees F in lieu of hot-dip galvanized. Provide stainless steel axles for rollers. Miscellaneous metal shall conform to ASTM A36/A36M, hot-dip galvanized after fabrication.

2.4.2 Strainers

Steel body in accordance with ASME B16.5 for minimum of ASME Class 150. Provide stainless steel strainer element with minimum diameter perforations of 0.40 mm 0.016 inch for steam, 0.80 mm 0.031 inch for steam mixed with condensate, and 1.20 mm 0.047 inch for condensate (hot water). Provide blow-off outlet with pipe nipple, gate valve, and discharge pipe nipple.

2.4.3 Traps

Steel body, internals of stainless steel, minimum of ASME Class 150, and of the types indicated.

2.4.4 Pipe Sleeves

Provide where piping passes entirely through walls and floors. Provide sleeves of sufficient length to pass through entire thickness of walls and floors. Provide 25 mm one inch minimum clearance between exterior of piping or pipe insulation or conduit and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

a. Sleeves in Masonry and Concrete Walls and Floors: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of sleeves when cavities in the core-drilled hole are grouted smooth.

b. Sleeves in Other Than Masonry and Concrete Walls and Floors: Provide 26 gage galvanized steel sheet.

2.4.5 Escutcheon Plates

Provide split hinge type metal plates for piping entering walls and floors in exposed spaces. Provide polished stainless steel plates or chromium-plated copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.4.6 Cooling Tanks

Construct of steel for minimum working pressure of ASME Class 150.

a. Thermometers: Provide bimetal dial-type thermometers with stainless steel case, stem, and fixed thread connection; 125 mm 5 inch diameter dial with glass face gasketed within the case; accuracy within one percent of scale range. Provide scale range for the intended service.

b. Gages: Provide single style pressure gage for steam with 115 mm 4.5 inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubbers, and syphon. Provide scale range for the intended service.

c. Self-Powered Cooling Valve: Provide Spirax Sarco T-44 or Ogontz 3\4-AFR-255-CRB self-powered cooling valve with special factory setting to automatically open at 121 degrees C 250 degrees F. Notwithstanding any other provision of this contract, no other product will be acceptable.

2.4.7 Couplings

Provide special couplings for joining plastic condensate return pipe to ASTM A106/A106M steel pipe. Couplings shall be for working pressure of 862 kPa (gage) 125 psig hot water at 121 degrees C 250 degrees F. Couplings shall include carbon steel sleeve flared at each end, two Viton gaskets, two steel follower rings, and set of steel track bolts to properly compress the gaskets. Tighten bolts to torque recommended by coupling manufacturer. Provide 178 mm 7 inch long carbon steel sleeves for use with each nominal pipe size with minimum wall thickness as follows:

MINIMUM WALL THICKNESS (mm)						
Nominal Pipe Sizes (mm)	50	80	100	150	200	250
Wall Thickness	3.80	5.10	5.10	6.40	6.40	6.40
NOTE: Rockwell 411 couplings for steel pipe with Viton gaskets and Dresser 38 couplings for steel pipe with Viton gaskets will meet this specification.						

MINIMUM WALL THICKNESS (inches)						
Nominal Pipe Sizes (inches)	2	3	4	6	8	10
Wall Thickness	0.15	0.20	0.20	0.25	0.25	0.25
NOTE: Rockwell 411 couplings for steel pipe with Viton gaskets and Dresser 38 couplings for steel pipe with Viton gaskets will meet this specification.						

2.5 BURIED PIPING SYSTEM

Design and provide exterior buried factory-prefabricated preinsulated pumped condensate return piping in a conduit for which a Federal Agency Approved Brochure has been issued. In case of differences between the Approved Brochure and the project specification and drawings, the project specifications and drawings shall govern. Design, equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, testing, and repair requirements shall be in accordance with the Approved Brochure.

2.5.1 System Design

Design the underground piping system including trench bed and pipe anchors in accordance with the Approved Brochure. Pipe expansion loops will not be permitted. Expansion design having lateral movement through manholes

will not be permitted. Design shall include buried prefabricated preinsulated piping system including concrete pipe anchors exterior of manholes, interface with each manhole, and the watershed to aboveground piping. Provide manholes, piping within manholes, piping aboveground, and piping not in approved conduit systems as indicated; redesign will not be permitted. Earth horizontal resistant loading is 95.8 kPa 2000 psf.

2.5.2 System Requirements

Provide system approved for Class A [or Class B] ground water conditions. Minimum depth of burial shall be [914 mm] [36 inches] [_____] from center of carrier pipe to final ground surface. Provide insulation, completely filling the space between the carrier pipe and the conduit in accordance with the Approved Brochure.

2.5.3 Buried Warning and Identification Tape

Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 80 mm 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read CAUTION BURIED STEAM PIPING BELOW or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 300 mm 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 3 EXECUTION

3.1 INSTALLATION

Installation of exterior buried pumped condensate return piping system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.1, except as modified herein. Field assembly shall be in accordance with the Federal Agency Approved Brochure. Install piping straight and true to bear evenly on sand bedding material. Install valves with stems horizontal or above. Provide flanges and unions at valves, traps, strainers, connections to equipment, and as indicated.

3.1.1 Cleaning of Piping

Keep the interior and ends of new piping and existing piping affected by the Contractor's operations, cleaned of water and foreign matter during installation by using plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Inspect piping before placing into position.

3.1.2 Demolition

Remove materials so as not to damage materials which are to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction.

3.2 PLASTIC CARRIER PIPING

Exterior buried factory-prefabricated insulated pumped condensate (hot water) return piping system, including field joints, bedding, and initial backfill shall be in accordance with the Approved Brochure, except as modified herein.

3.2.1 Connections to Metal Pipe

Connections between plastic carrier pipe and metal pipe shall be flanged, with metal pipe anchored within 1500 mm 5 feet of the connection. Expansion and load forces of metal piping shall not be transmitted to the plastic carrier pipe or conduit. Do not bury flanged pipe connections. Provide flat circular steel washers under bolt heads and nuts on flanges; tighten bolts to the torque recommended by the plastic pipe manufacturer.

3.2.2 Field Joints

3.2.2.1 Plastic Carrier Piping Joints Without Concrete Anchor

Pressure test and approve piping joints. Provide with polyurethane or polyisocyanate insulation of the same type and thickness as the insulation on the carrier piping. Provide waterproof shrink sleeves to cover the insulation and overlap not less than 150 mm 6 inches of each end of conduit section.

3.2.2.2 Plastic Carrier Piping Joints With Concrete Anchor

Pressure test and approve piping joints. Provide concrete anchors (thrust blocks) for each elbow and tee. Provide waterproof end seals between the carrier piping and the conduit adjacent to each carrier pipe fitting. Encase the carrier pipe fitting and at least 50 mm 2 inches of each end of the conduit with a minimum of 150 mm 6 inches of concrete.

3.2.3 Concrete Thrust Blocks

Cast thrust blocks after completion of hydrostatic testing. Encase each elbow and tee of the carrier pipe in a concrete thrust block with a minimum of 0.30 square meter 3 square feet of thrust-bearing surface cast against undisturbed soil, a minimum pipe-to-bearing surface single dimension of 250 mm 10 inches perpendicular to the bearing surface, and a minimum volume of 0.25 cubic meter 9 cubic feet, except as indicated otherwise. Disturbed soil under and around thrust blocks shall be compacted. Provide concrete thrust blocks under this section as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE except the concrete shall be of 30 MPa 4000 psi minimum 28 day compressive strength, air entrained admixture (133 grams per cubic meter 3.6 ounces per cubic yard), with water-reducing admixture (814 grams per cubic meter 22 ounces per cubic yard).

3.3 STEEL PIPING

Test, inspect, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for connections. Stab type connections will not be permitted. Make changes in piping sizes through tapered reducing fittings; bushings will not be permitted. Jointing compound for pipe threads shall be Teflon pipe thread paste. Pipe nipples 150 mm 6 inches long and shorter shall be Schedule 80 steel pipe. Condensate piping shall include drip, vent, relief, and gage

connecting piping.

3.3.1 Fittings and End Connections

For sizes less than 25 mm one inch provide threaded fittings and end connections. For sizes 25 to 50 mm 1 to 2 inches provide threaded or socket-welding or buttwelding fittings and end connections; provide threaded connections for threaded valves, traps, strainers, and threaded connections to equipment. For sizes 65 mm 2.5 inches and larger provide buttwelding fittings and end connections; provide flanged connections for flanged valves, traps, strainers, and flanged connections to equipment.

3.3.2 Welding

ASME B31.1, metallic arc process, including qualification of welders.

3.3.3 Pipe Hangers and Supports

Provide additional hangers and supports for concentrated loads in piping between hangers and supports, such as for valves.

3.4 NAMEPLATES

Provide laminated plastic nameplates for equipment, gages, thermometers, and valves. Nameplates shall be melamine plastic, 3.20 mm 0.125 inch thick, black with white center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 25 to 65 mm 1 by 2.5 inches. Lettering shall be minimum of 6.40 mm 0.25 inch high normal block style. Key the nameplates to a chart and schedule for each system. Frame charts and schedules under glass, and locate where directed near each system. Furnish two copies of each chart and schedule.

3.5 FIELD QUALITY CONTROL

Before final acceptance of the work, test each system to demonstrate compliance with contract requirements. Flush and clean piping before placing in operation. Flush piping at a minimum velocity of 2.40 meters per second 8 fps. Correct defects in work provided by Contractor and repeat tests until work is in compliance with contract requirements. Furnish potable water, electricity, instruments, connecting devices, and personnel for the tests.

3.5.1 Field Inspections

Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's submittals.

3.5.2 Field Tests of Carrier Piping

Do not cover the carrier piping joints with insulation or concrete anchors (thrust blocks), until the carrier piping joints have passed all field tests and testing requirements in the Approved Brochure for exterior buried factory-prefabricated insulated condensate return piping system.

3.5.3 Field Repairs of Plastic Carrier Pipe and Joints

Repair leaking and porous sections of pipe or joints by removing and replacing with new materials. Do not overwrap the fault with any type of

patch or other material. If a joint is damaged during laying operation, cut off the joint, bond a coupling to the severed end, and lay in the piping as a normal pipe. If damage occurs to a new pipe section after pipe has been laid, cut out damaged section and replace with a new pipe section in accordance with manufacturer's instructions.

3.6 FIELD PAINTING

After completion of field inspections and tests, clean and paint metal surfaces exposed to the weather and in manholes, including valves, strainers, traps, flow meters, pipe flanges, bolts, nuts, washers, pipe hangers and supports, expansion joints, and miscellaneous metal. Do not paint piping prior to the application of field-applied insulation. Do not paint stainless steel or aluminum jackets. Apply paint to clean dry surfaces. Clean surfaces to remove dust, dirt, rust, oil, and grease. Provide surfaces with two coats of enamel paint applied to a total minimum dry film thickness of 0.05 mm 2 mils. Apply the second coat of paint after the preceding coat is thoroughly dry. Color of finish coat shall be aluminum or light gray. Paint shall be rated for use on hot metal surfaces up to 232 degrees C 450 degrees F and for use on surfaces exposed to the weather.

3.7 CONNECTIONS TO EXISTING SYSTEMS

Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; receive approval before interrupting service. Provide materials required to make connections into existing systems and perform excavating, backfilling, and other incidental labor as required.

-- End of Section --