
USACE / NAVFAC / AFCEA / NASA UFGS-33 51 15 (November 2008)

Preparing Activity: USACE Superseding
UFGS 33 51 00.00 20 (April 2006)
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2011

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SECTION 33 51 15

NATURAL-GAS / LIQUID PETROLEUM GAS DISTRIBUTION 11/08

NOTE: This guide specification covers the requirements for natural or manufactured gas distribution systems designed in accordance with ASME B31.8, or Liquefied Petroleum Gas (LPG) Distribution systems designed in accordance with NFPA 58.

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 items(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).

PART 1 GENERAL

NOTE: This guide specification may be used for specifying liquefied petroleum gas (LPG) if the following modifications are made:

a. Delete all references to fiberglass and add the following to paragraph "Polyethylene Pipe, Tubing, Fittings and Joints" in PART 2: Polyethylene pipe, tubing, and fittings are recommended by the manufacturer for use with LPG.

b. Require, where applicable, the LPG distribution

system to be in accordance with NFPA 58, Storage and Handling of Liquefied Petroleum Gases, instead of ASME B31.8.

1.1 REFERENCES

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 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.

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 GAS ASSOCIATION (AGA)

AGA ANSI B109.2	(2000) Diaphragm-Type Gas Displacement Meters (500 cubic ft./hour Capacity and Over)
AGA XR0603	(2006; 8th Ed) AGA Plastic Pipe Manual for Gas Service

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5L	(2007; Errata 2009; Addenda 1 2009; Addenda 2 2010; 44th Ed) Specification for Line Pipe
API Spec 6D	(2008; Errata 2008; Errata 2008; Errata 2009; Addendum 2009; Errata 2010) Specification for Pipeline Valves
API Std 1104	(2005; Errata/Addenda 2007; Errata 2008; R 2010) Welding of Pipeline and Related Facilities

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 25-06	(2008) Earthquake-Activated Automatic Gas Shutoff Devices
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
- AWWA C213 (2007) Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines

ASME INTERNATIONAL (ASME)

- ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)
- ASME B1.20.2M (2006) Pipe Threads, 60 Deg. General Purpose (Metric)
- ASME B16.11 (2009) Forged Fittings, Socket-Welding and Threaded
- ASME B16.21 (2011) Nonmetallic Flat Gaskets for Pipe Flanges
- ASME B16.34 (2009; Supp 2010) Valves - Flanged, Threaded and Welding End
- ASME B16.40 (2008) Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
- ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
- ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
- ASME B31.8 (2010; Supplement 2010) Gas Transmission and Distribution Piping Systems
- ASME BPVC SEC VIII D1 (2007; Addenda 2008; Addenda 2009) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1
- ASME PTC 25 (2008) Pressure Relief Devices

ASTM INTERNATIONAL (ASTM)

- ASTM A135/A135M (2009) Standard Specification for Electric-Resistance-Welded Steel Pipe
- ASTM A139/A139M (2004; R 2010) Standard Specification for Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and over)
- ASTM A181/A181M (2006) Standard Specification for Carbon Steel Forgings, for General-Purpose Piping

ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM D 1598	(2002; R 2009) Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
ASTM D 1599	(1999; R 2005) Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
ASTM D 2513	(2011) Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D 2517	(2006) Reinforced Epoxy Resin Gas Pressure Pipe and Fittings
ASTM D 2683	(2010) Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D 2774	(2008) Underground Installation of Thermoplastic Pressure Piping
ASTM D 3261	(2010a) Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3308	(2006) PTFE Resin Skived Tape
ASTM D 3350	(2010a) Polyethylene Plastics Pipe and Fittings Materials
ASTM D 3839	(2008) Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

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

MSS SP-110	(2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
MSS SP-25	(2008) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-72	(2010) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-78	(2005a) Cast Iron Plug Valves, Flanged and Threaded Ends

MASTER PAINTERS INSTITUTE (MPI)

MPI 10	(Oct 2009) Exterior Latex, Flat, MPI Gloss Level 1
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MPI 11 (Oct 2009) Exterior Latex, Semi-Gloss, MPI Gloss Level 5

MPI 119 (Oct 2009) Exterior Latex, Gloss

MPI 9 (Oct 2009) Exterior Alkyd, Gloss, MPI Gloss Level 6

NACE INTERNATIONAL (NACE)

NACE RP0274 (1974; R 2004) High Voltage Electrical Inspection of Pipeline Coatings

NACE SP0185 (2007) Extruded Polyolefin Resin Coating Systems with Soft Adhesives for Underground or Submerged Pipe

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 58 (2011; TIA 11-1; Errata 11-1) Liquefied Petroleum Gas Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25 (1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

SSPC SP 1 (1982; E 2004) Solvent Cleaning

SSPC SP 3 (1982; E 2004) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

SSPC SP 7/NACE No.4 (2007) Brush-Off Blast Cleaning

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

49 CFR 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards

UNDERWRITERS LABORATORIES (UL)

UL Gas&Oil Dir (2009) Flammable and Combustible Liquids and Gases Equipment Directory

1.2 SYSTEM DESCRIPTION

The gas distribution system includes natural gas piping and appurtenances from point of connection with existing system, as indicated, to a point approximately [1500] [] mm [5] [] feet from the [facility] [facilities]. Section 31 10 00 CLEARING FOR CIVIL WORKS, applies to this section unless otherwise specified. Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, in three separate packages.

1.2.1 Gas Distribution System and Equipment Operation

Include maps showing piping layout, locations of system valves, gas line markers and cathodic protection system test stations; step-by-step procedures for system start up, operation and shutdown (index system components and equipment to the system maps); isolation procedures including valve operation to shutdown or isolate each section of the system (index valves to the system maps and provide separate procedures for normal operation and emergency shutdown if required to be different). Submit Data Package No. 4.

1.2.2 Gas Distribution System Maintenance

Include maintenance procedures and frequency for system and equipment; identification of pipe materials and manufacturer by locations, pipe repair procedures, and jointing procedures at transitions to other piping material or material from a different manufacturer. Submit Data Package No. 4.

1.2.3 Gas Distribution Equipment Maintenance

Include identification of valves and other equipment by materials, manufacturer, vendor identification and location; maintenance procedures and recommended tool kits for valves and equipment; recommended repair methods (i.e., field repair, factory repair, or replacement) for each valve and piece of equipment; and preventive maintenance procedures, possible failure modes and troubleshooting guide. Submit Data Package No. 3.

1.3 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

Choose the first bracketed item for Navy, Air Force

and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation 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

Pipe, Fittings, and Associated Materials

SD-03 Product Data

Materials and Equipment[; G][; G, [____]]
Spare Parts[; G][; G, [____]]
Pipe and Accessory Coatings[; G][; G, [____]]

SD-05 Design Data

Connections to Existing Lines[; G][; G, [____]]
Connection and Abandonment Plan[; G][; G, [____]]
Jointing of Polyethylene and Fiberglass Piping[; G][; G, [____]]

SD-06 Test Reports

Pressure and Leak Tests[; G][; G, [____]]

Data in booklet form from all pressure tests of the distribution system.

SD-07 Certificates

Welder's training, qualifications and procedures[; G][; G, [____]]
Utility Work

Certification from the Operating Agency/Utility Company that work for which the Utility is responsible has been completed.

SD-10 Operation and Maintenance Data

Gas distribution system and equipment operation[; G][; G, [____]]
Gas distribution system maintenance[; G][; G, [____]]
Gas distribution equipment maintenance[; G][; G, [____]]

Data packages, as specified.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Welding General

a. Submit a certificate of Welder's training, qualifications and procedures, in conformance with API Std 1104, for metal along with a list of names and identification symbols of performance qualified

welders and welding operators.

b. Welding and nondestructive testing procedures for pressure piping are specified in Section 40 05 13.96 WELDING PROCESS PIPING.

c. Weld structural members in accordance with Section 05 05 23 WELDING, STRUCTURAL.

1.4.1.2 Jointing of Polyethylene and Fiberglass Piping

a. Join piping by performance qualified PE joiners, qualified by a person who has been trained and certified by the manufacturer of the pipe, using manufacturer's pre-qualified joining procedures in accordance with AGA XR0603. Inspect joints by an inspector qualified in the joining procedures being used and in accordance with AGA XR0603. Welders training, qualifications and procedures, (metal and PE) includes use of equipment, explanation of the procedure, and successfully making joints which pass tests specified in AGA XR0603.

b. Submit a certificate of qualified jointing procedures, training procedures, qualifications of trainer, and training test results for joiners and inspectors. Notify the Contracting Officer at least [24] [_____] hours in advance of the date to qualify joiners and inspectors.

1.4.2 Pre-Installation Conference

1.4.2.1 Shop Drawings

Submit shop drawings, within [30] [_____]days of contract award, containing complete schematic and piping diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Show on the drawings proposed layout and anchorage of the system and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

1.4.2.2 Connecting and Abandonment Plan

Submit written notification of the method and schedule for making connections to existing gas lines, to the Contracting Officer at least 10 days in advance. Include gas line tie in, hot taps, abandonment/removal or demolition, purging, and plugging as applicable in conformance with ASME B31.8 Include in submittal [connections to existing lines] [connection and abandonment plan].

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

Inspect materials delivered to the site for damage, and store with a minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.2 Handling

Handle pipe and components carefully to ensure a sound, undamaged condition. Take particular care not to damage pipe coating. Repair damaged coatings to original finish. Do not place pipe or material of any

kind inside another pipe or fitting after the coating has been applied, except as specified in paragraph INSTALLATION. Handle steel piping with coal-tar enamel coating in accordance with [AWWA C203](#), and fusion-bonded epoxy coatings per [AWWA C213](#). Handle plastic pipe in conformance with [AGA XR0603](#).

1.6 EXTRA MATERIALS

Submit [spare parts](#) data for each different item of equipment and material specified, after approval of the detail shop drawings and not later than [_____] months prior to the date of beneficial occupancy. Include in the data a complete list of parts and supplies, with current unit prices and source of supply.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND ASSOCIATED MATERIALS

Provide [materials and equipment](#) which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos are not allowed. Provide written verification and point of contact for a supporting service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Mark all valves, flanges, and fittings in accordance with [MSS SP-25](#). Submit a complete list of materials and equipment, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions, including, but not limited to the following:

- a. Dielectric Waterways and Flange Kits.
- b. Emergency Gas Supply Connection.
- c. Fittings
- d. Piping
- e. [Pipe and Accessory coatings](#)
- f. Pressure Reducing Valves.
- g. Meters
- h. Regulators.
- i. Shut-off Valves
- j. [_____] Earthquake Actuated Automatic Gas Shut-off System conforming to [ASCE 25-06](#).

2.1.1 Steel Pipe

NOTE: Delete all words in brackets when steel pipe is expected to be subjected to unusually severe conditions (including handling) such as impact stresses, seismic forces, burial beneath vehicle or railroad crossings, significant differential settlement, or underneath piers.

[API Spec 5L](#), Grade [A,] B, or X42, [[ASTM A53/A53M](#), Grade A or B, [ASTM A135/A135M](#), or [ASTM A139/A139M](#), Grade A or B], Schedule 40. Do not coat pipe and fittings for aboveground lines. Provide butt weld wrought steel fittings, conforming to [ASME B16.9](#), Schedule 40. Provide forged steel socket weld and threaded fittings, conforming to [ASME B16.11](#). Verify that pipe wall thickness conforms to ASME B31.8 for larger sizes and

high pressures.

2.1.2 Small Fittings

For sizes 40 mm 1-1/2 inches and smaller, provide fittings conforming to ASME B16.11.

2.1.3 Fittings, 50 mm 2 inches and Larger

Provide pipe flanges and flanged fittings, including bolts, nuts, and bolt patterns in accordance with ASME B16.5, Class [_____]. Provide butt weld fittings in accordance with ASME B16.9. Use weld neck flanges.

2.1.4 Steel Forged Branch Connections

Provide steel forged branch connections conforming to ASTM A181/A181M, Class 60, carbon steel.

2.1.5 Flange Gaskets

Provide non-asbestos compressed material gaskets in accordance with ASME B16.21, 1.6 mm 1/16 inch minimum thickness, full face or self-centering flat ring type, containing aramid fibers bonded with nitrile butadiene rubber (NBR), or glass fibers bonded with polytetrafluoroethylene, suitable for maximum 315 degrees C 600 degrees F service and meeting applicable requirements of ASME B31.8.

2.1.6 Pipe Threads

Provide threaded pipe conforming to ASME B1.20.2/ASME B1.20.1.

[2.1.7 Polyethylene Pipe, Tubing, Fittings and Joints

NOTE: Before selecting polyethylene or fiberglass pipe material, contact the gas supplier for a gas analysis to determine the types of chemicals which will be in the gas to be supplied. Select suitable polyethylene or fiberglass pipe material based on the gas analysis.

Do not use polyethylene for gas lines with design pressures above 690 kPa (100 psig) or with operating temperatures below 7 degrees C (20 degrees F) or above 60 degrees C (140 degrees F).

For thermoplastic (polyethylene) pipe in sizes from 15 mm through 150 mm (1/2 inch through 6 inches), select minimum wall thickness based on ASME B31.8, table 842.32(c); and select the standard dimension ratio (SDR) based on the long-term hydrostatic strength of S = 8.6 MPa (1,250 psi) for PE 2406 or S = 11 MPa (1,600 psi) for PE 3408 at 23 degrees C (73 degrees F) for the following pressures:

SDR	Design Pressure at 23 degrees C (73 Degrees F)			
	S = 8.62 MPa (1,250 psi)		S = 11 MPa (1,600 psi)	
11	550 kPa	(80 psig)	690 MPa	(100 psig)
13.5	415 kPa	(60 psig)	550 kPa	(80 psig)
17	345 kPa	(50 psig)	415 kPa	(60 psig)
21	275 kPa	(40 psig)	345 kPa	(50 psig)
26	207 kPa	(30 psig)	275 kPa	(40 psig)

Where the buried pipe system is expected to exceed 23 degrees C (73 degrees F) at the design pressures stated above, use alternate materials.

Provide polyethylene pipe, tubing, fittings and joints conforming to [ASTM D 3350](#) and [ASTM D 2513](#), pipe designations PE 2406 and PE 3408, rated SDR [_____] or less, as specified in [ASME B31.8](#). Mark pipe sections as required by [ASTM D 2513](#). Provide butt fittings conforming to [ASTM D 3261](#) and socket fittings conforming to [ASTM D 2683](#). Match fittings to the service rating of the pipe, with a minimum wall thickness of [_____]. [Use polyethylene pipe, tubing, and fittings as recommended by the manufacturer for use with LPG.] Perform underground installations in conformance with [ASTM D 2774](#).

] 2.1.8 Fiberglass Pipe, Fittings and Adhesive

Provide fiberglass pipe, fittings and adhesive conforming to [ASTM D 2517](#). Mark pipe sections as required by [ASTM D 2517](#), with [_____] minimum wall thickness. Perform underground installations in conformance with [ASTM D 3839](#).

] 2.1.9 Sealants for Steel Pipe Threaded Joints

2.1.9.1 Sealing Compound

Provide joint sealing compound as listed in [UL Gas&Oil Dir](#), Class 20 or less.

2.1.9.2 Tape

Provide polytetrafluoroethylene tape conforming to [ASTM D 3308](#).

2.1.10 Identification

Provide pipe flow markings and metal tags for each valve, meter, and regulator as required by the Contracting Officer.

2.1.11 Insulating Joint Materials

Provide insulating joint materials between flanged or threaded metallic pipe systems where shown to isolate galvanic or electrolytic action.

2.1.11.1 Threaded Joints

For threaded pipe joints, provide steel body nut type, dielectric waterways with insulating gaskets.

2.1.11.2 Flanged Joints

For flanged pipe joints, provide full face sandwich-type flange insulating gasket of the dielectric type, insulating sleeves for flange bolts and insulating washers for flange nuts.

2.1.11.3 Dielectric Waterways and Flanges

Provide dielectric waterways with temperature and pressure rating equal to or greater than that specified for the connecting piping, with metal connections on both ends suited to match connecting piping. Provide internally lined dielectric waterways, lined with an insulator specifically designed to prevent current flow between dissimilar metals, meeting the performance requirements described herein for dielectric waterways.

2.1.12 Gas Transition Fittings

Provide manufactured steel gas transition fittings approved for jointing steel and polyethylene or fiberglass pipe, conforming to [AGA XR0603](#) requirements for transition fittings.

2.2 VALVES

NOTE: Valves and pressure regulators are necessary at all points where design requires pressure reduction or regulation. Require a shut-off valve upstream of the regulator. A central regulating station is generally provided by the gas company and is usually located near the entrance to the installation. When valves, gas pressure regulators, and related devices are required in the contract, ensure that all necessary equipment will comply with the requirements of the gas company, and revise these paragraphs as required. Provide a detail of each regulating station and the following data for each pressure regulator: materials of construction, flow rate, type and specific gravity of the gas, inlet and outlet pressures, accuracy of control, and size and type of connections.

Provide valves suitable for shutoff or isolation service and conforming to [[MSS SP-110](#)][, [MSS SP-72](#)] [, [MSS SP-78](#)]and the following:

2.2.1 Steel Valves

Provide steel valves [40 mm 1-1/2 inches](#) and smaller installed underground conforming to [ASME B16.34](#), carbon steel, socket weld ends, with square wrench operator adaptor. Provide steel valves [40 mm 1-1/2 inches](#) and smaller installed aboveground conforming to [ASME B16.34](#), carbon steel, socket weld or threaded ends with handwheel or wrench operator. Provide steel valves [50 mm 2 inches](#) and larger installed underground conforming to [API Spec 6D](#), carbon steel, butt weld ends, Class [_____] with square wrench

operator adaptor. Provide steel valves 50 mm 2 inches and larger installed aboveground conforming to API Spec 6D, carbon steel, butt weld or flanged ends, Class [_____] with handwheel or wrench operator.

2.2.2 Steel Valve Operators

Provide valves 200 mm 8 inches and larger with worm or spur gear operators, totally enclosed, grease packed, and sealed, with operators having Open and Closed stops and position indicators. Provide locking feature where indicated. Wherever the lubricant connections are not conveniently accessible, provide extensions for the application of lubricant. Provide valves with lubricant compatible with gas service.

2.2.3 Polyethylene Valves

Provide polyethylene valves conforming to ASME B16.40. Polyethylene valves, in sizes 15 mm to 150 mm 1/2 inch to 6 inches, may be used with polyethylene distribution and service lines, in lieu of steel valves, for underground installation only.

2.3 PRESSURE REGULATORS

NOTE: Coordinate this paragraph with the specified requirements in paragraph VALVES.

Provide ferrous bodied regulators with backflow protection, designed to meet the pressure, load and other service conditions.

2.3.1 Gas Main Regulators

Equip pressure regulators for main distribution lines, supplied from a source of gas which is at a higher pressure than the maximum allowable operating pressure for the system, with pressure regulating devices of adequate capacity. In addition to the pressure regulating devices, provide a protective method to prevent overpressuring of the system in accordance with ASME B31.8. Suitable protective devices are as follows:

- a. Spring-loaded relief valve meeting the provisions of ASME BPVC SEC VIII D1.
- b. Pilot-loaded back pressure regulator used as relief valve, so designed that failure of the pilot system will cause the regulator to open.
- c. Weight-loaded relief valves conforming to ASME PTC 25.
- d. Monitoring regulator installed in series with the primary pressure regulator.
- e. Series regulator installed upstream from the primary regulator, set to limit the pressure on the inlet of the primary regulator continuously to the maximum allowable operating pressure of the system, or less.
- f. Automatic shutoff device installed in series with the primary regulator, set to shut off when the pressure on the distribution system reaches the maximum allowable operating pressure of the system, or

less, which remains closed until manually reset.

g. Spring-loaded, diaphragm type relief valves.

2.3.2 Service Line Regulators

NOTE: If service regulator does not have all the characteristics listed, or if gas contains materials which would interfere with operation of the regulator, install protective devices to prevent overpressuring of the user's system should the regulator fail. Install the following devices as an integral part of the regulator or as separate devices operating in conjunction with the regulator.

a. Monitoring regulator

b. Relief valve

c. Automatic shutoff device

a. Provide ferrous bodied pressure regulators for individual service lines, capable of reducing distribution line pressure to pressures required for users. Provide regulators where gas will be distributed at pressures in excess of 2.5 kPa 10 inches of water column, with pressure relief set at a lower pressure than would cause unsafe operation of any connected user.

b. Adjust regulators for liquified petroleum gas to 2.5 to 3 kPa 10 to 12 inches of water column, with pressure relief set at 4 kPa 16 inches of water column.

c. Provide regulator(s) having a single port with orifice diameter no greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet. Provide regulator valve vent of resilient materials designed to withstand flow conditions when pressed against the valve port, capable of regulating downstream pressure within limits of accuracy and limiting the buildup of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Provide a self contained service regulator, and pipe not exceeding exceed 50 mm2 inch size.

2.4 METERS

NOTE: Provide gas meters for each service line to every building. Where meters have a maximum anticipated demand of less than 28 cubic meters/hour (1000 SCFH), require the meter to meet a design working pressure of 690 kPa (100 psi).

Delete mounting and special features that are not required. Retain strainer upstream of meter only if installed upstream of pressure regulator. Delete pulse switch and pulse requirements except for Air Force projects or when required by other users. Air Force Engineering Technical Letter Number 87-5

"Utility Meters in New and Renovated Facilities"
provides guidance for when to exclude meters from
Air Force new and major renovation projects. Review
the requirements for gas meters in TI 800-01 Design
Criteria and 10 CFR 435.

Provide meters conforming to AGA ANSI B109.2, [pipe] [pedestal] mounted
[and be provided with a strainer immediately upstream]. [Provide meters
with [over-pressure protection as specified in ASME B31.8] [tamper-proof
protection] [frost protection] [fungus-proof protection] [seismic
protection], suitable for accurately measuring and handling gas at
pressures, temperatures, and flow rates indicated.] Provide meters with a
pulse switch initiator capable of operating up to speeds of 500 maximum
pulses per minute with no false pulses and requiring no field adjustments.
Provide not less than one pulse per 2.83 cubic meter 100 cubic feet of gas.

2.5 EARTHQUAKE ACTUATED AUTOMATIC GAS SHUTOFF SYSTEM

NOTE: Include earthquake actuated automatic gas
shutoff system if the facility is either essential
or hazardous. Determine the classification of the
facility per UFC 3-310-03A and provide a detail on
the drawings showing this system.

ASCE has developed a "Public-Approved Version" of
ASCE 25-06 - Standard Specification for EARTHQUAKE
ACTUATED AUTOMATIC GAS SHUTOFF DEVICES, dated 2008,
which includes a test procedure to verify that the
valve will activate during strong ground shaking but
will not activate for minor ground shaking or
accidental bumping by a pedestrian or vehicle.

The State of California, Division of the State
Architect/Real Estate Services Division maintains a
list of devices that have been tested and conform to
the ASCE Standard; inquiries can be directed to
telephone No. 916-445-2600.

Show the earthquake actuated automatic gas shutoff
on the drawings when required in the project. The
designer must fill the bracketed blank for
additional local requirements, and ensure that a
copy is included with the Contract documents.

Provide Earthquake Actuated Automatic Gas Shutoff devices conforming to
ASCE 25-06, [UL or AGA listed] [_____] [and] [requirements furnished by the
Contracting Officer] [as listed by the State of [California] [_____] ,
Division of the State Architect as being tested and in conformance with
specified requirements]. The valve may be either pendulum or ball
construction with [remote [, pneumatic] [electronic] [or] [electric]]
actuator.

2.6 EMERGENCY GAS SUPPLY CONNECTION

NOTE: Include emergency gas supply connections when

the customer determines the ability to provide gas to the building is necessary during an outage of the gas distribution system. Show the emergency gas piping connection on the drawings when required in the project.

Provide an emergency gas supply connection consisting of piping (same size as service line) and accessories that will enable a portable, commercial-sized gas cylinder system to be connected to the gas piping system. Cap this connection to prevent gas leakage with a lockable manual valve located to allow shutting off flow. Provide the entire assembly in a weatherproof, lockable box, with permanently installed written instructions stating the type and pressure of the gas allowed to be connected to the line, and providing specific instruction for testing of the integrity of the building's gas system with an inert gas before the fuel gas connection is made. Provide a subplate in the box that is required to be unbolted to gain access to the connection, and containing a warning regarding the potential consequences of using gas other than that specified or of failing to test system integrity before hooking up emergency fuel supply.

2.7 PROTECTIVE COVERING MATERIALS

Provide a continuously extruded polyethylene and adhesive coating system material conforming to NACE SP0185, Type A.

2.8 TELEMETERING OR RECORDING GAUGES

NOTE: On distribution systems supplied by a single district pressure regulating station, determine the necessity of installing telemetering or recording gauges in the supply line, taking into consideration the number of buildings supplied, the operating pressures, the capacity of installation, and other operating conditions.

Equip each distribution system supplied by more than one district pressure regulating station with telemetering or recording pressure gauges to indicate the gas pressure in the district line.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 EXCAVATION AND BACKFILLING

Earthwork is as specified in Section 31 00 00 EARTHWORK.

3.3 GAS MAINS

Provide [steel] [polyethylene] [or] [fiberglass] pipe for gas mains. [Coat steel pipe and fittings with protective covering as specified.] [Do not

install polyethylene or fiberglass mains aboveground.]

3.4 SERVICE LINES AND EMERGENCY GAS SUPPLY CONNECTION

3.4.1 General

NOTE: Locate service line isolation valve as close to the supply main as possible, but at a safe distance from traffic lanes.

Construct service lines of materials specified for gas mains and extend from a gas main to and including the point of delivery within 1.5 meters 5 feet of the building. The point of delivery is the [meter set assembly] [service regulator] [shutoff valve]. Connect the service lines to the gas mains [as indicated] [through service tees, with end of run plugged]. Where indicated, provide service line with an isolation valve of the same size as the service line. Make the service lines as short and as straight as practicable between the point of delivery and the gas main, without bends or lateral curves unless necessary to avoid obstructions or otherwise permitted. Lay service lines with as few joints as practicable using standard lengths of pipe, use shorter lengths only for closures. Do not install polyethylene or fiberglass service lines aboveground [except as permitted in ASME B31.8].

3.4.2 Emergency Gas Supply Connection

NOTE: If it is expected that a portable gas tank providing pressure regulated gas would be provided during an emergency, locate the emergency gas connection downstream from the building's pressure regulator.

Provide an aboveground locked, valved and capped emergency gas supply connection [downstream] [upstream] of the pressure regulator, located outside of the building within 300 mm12 inches of the exterior wall and installed in a weatherproof box which is mounted on the exterior wall and clearly marked with an appropriate metal sign mounted on wall above.

3.5 WORKMANSHIP AND DEFECTS

Make pipe, tubing, and fittings clear and free of cutting burrs and defects in structure or threading, and thoroughly brushed and blown free of chips and scale. Do not repair, but replace defective pipe, tubing, or fittings.

3.6 PROTECTIVE COVERING

3.6.1 Protective Covering for Underground Steel Pipe

Except as otherwise specified, apply protective coverings mechanically in a factory or field plant especially equipped for the purpose. Hand apply protective covering to valves and fittings that cannot be coated and wrapped mechanically, preferably at the plant that applies the covering to the pipe. Coat and wrap joints by hand, in a manner and with materials that will produce a covering equal in thickness to that of the covering applied mechanically.

3.6.1.1 Thermoplastic Resin Coating System

Provide a thermoplastic coating system conforming to NACE SP0185, Type A. Clean the exterior of the pipe to a commercial grade blast cleaning finish in accordance with SSPC SP 6/NACE No.3, and apply adhesive compound to the pipe. Immediately after the adhesive is applied, extrude a seamless tube of polyethylene over the adhesive to produce a bonded seamless coating, with a nominal thickness of 0.25 mm 10 mils (plus or minus 10 percent) of adhesive and 1.0 mm 40 mils (plus or minus 10 percent) of polyethylene for pipes up to 400 mm 16 inches in diameter. For pipes 450 mm 18 inches and larger in diameter, apply a minimum thickness to the pipe of 0.25 mm 10 mils (plus or minus 10 percent) adhesive and 1.5 mm 60 mils (plus or minus 10 percent) polyethylene. Apply joint coating and field repair material as recommended by the coating manufacturer, consisting of one the following:

- a. Heat shrinkable polyethylene sleeves.
- b. Polyvinyl chloride pressure-sensitive adhesive tape.
- c. High density polyethylene/bituminous rubber compound tape.

Inspect the coating system for holes, voids, cracks, and other damage during installation.

3.6.1.2 Inspection of Pipe Coatings

Repair any damage to the protective covering during transit and handling before installation. After field coating and wrapping has been applied, inspect the entire pipe using an electric holiday detector with impressed current set at a value in accordance with NACE RP0274 using a full-ring, spring-type coil electrode. Equip the holiday detector with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Immediately repair all holidays in the protective covering upon detection. The Contracting Officer reserves the right to inspect and determine the suitability of the detector. Furnish labor, materials, and equipment necessary for conducting the inspection.

3.6.2 Protective Covering for Aboveground Piping Systems

Apply finish painting conforming to the applicable paragraphs of Section 09 90 00 PAINTS AND COATINGS and as follows:

3.6.2.1 Ferrous Surfaces

Touch up shop primed surfaces with ferrous metal primer of the same type paint as the shop primer. Solvent-clean surfaces that have not been shop primed in accordance with SSPC SP 1. Mechanically clean surfaces that contain loose rust, loose mill scale, and other foreign substances by power wire brushing in accordance with SSPC SP 3 or brush-off blast clean in accordance with SSPC SP 7/NACE No.4 and primed with ferrous metal primer in accordance with SSPC Paint 25. Finish primed surfaces with two coats of exterior alkyd paint conforming to MPI 9.

3.6.2.2 Nonferrous Surfaces

NOTE: Retain only the first sentence for normal conditions; delete the first sentence for corrosive

conditions.

[Do not paint nonferrous surfaces.] [Paint nonferrous surfaces to corrosive conditions. Solvent-clean the surfaces in accordance with SSPC SP 1. Apply a first coat of MPI 10, and 2 coats of [MPI 119] [or] [MPI 11].]

3.6.3 Protective Covering for Piping in Valve Boxes and Manholes

Apply protective coating to piping in valve boxes or manholes as specified for underground steel pipe.

3.7 INSTALLATION

NOTE: When existing gas piping is abandoned, show disconnect details on the drawings. Refer to ASME B31.8 for guidance on preparing the disconnect details. ASME B31.8 requires physical disconnection from gas sources. Shutoff valves are not an acceptable means of disconnect.

Install gas distribution system and equipment in conformance with the manufacturer's recommendations and applicable sections of ASME B31.8, AGA XR0603 and 49 CFR 192. Perform abandonment of existing gas piping in accordance with ASME B31.8. Cut the pipe without damaging the pipe; unless otherwise authorized, use an approved type of mechanical cutter. Use wheel cutters where practicable. On steel pipe 150 mm 6 inches and larger, an approved gas-cutting-and-beveling machine may be used. Cut plastic pipe in accordance with AGA XR0603. Design valve installation in plastic pipe to protect the plastic pipe against excessive torsional or shearing loads when the valve is operated and from other stresses which may be exerted through the valve or valve box. [Install polyethylene mains and service lines for LPG only below ground in accordance with NFPA 58.]

3.7.1 Installing Pipe Underground

NOTE: Indicate profile of gas lines on the drawing. If it is impractical to comply with the minimum cover specified for pipe, and necessary to prevent damage from external loads, the pipe will be installed in a casing. The locations of all casings and details of the installation will be indicated.

Grade gas mains and service lines as indicated. Weld joints in steel pipe except as otherwise permitted for installation of valves. Provide mains with 600 mm 24 inch minimum cover; service lines with 485 mm 18 inch minimum cover; and place both mains and service lines on firmly compacted select material for the full length. Where indicated, encase, bridge, or design the main to withstand any anticipated external loads as specified in ASME B31.8. Provide standard weight black steel pipe encasement material with a protective coating as specified. Separate the pipe from the casing by insulating spacers and seal the ends with casing bushings. Excavate the trench below pipe grade, bed with bank sand, and compact to provide full-length bearing. Laying pipe on blocks to produce uniform grade is not permitted. Ensure that the pipe is clean inside before it is lowered into

the trench and keep free of water, soil, and all other foreign matter that might damage or obstruct the operation of the valves, regulators, meters, or other equipment. When work is not in progress, securely close open ends of pipe or fittings with expandable plugs or other suitable means. Minor changes in line or gradient of pipe that can be accomplished through the natural flexibility of the pipe material without producing permanent deformation and without overstressing joints may be made when approved. Make changes in line or gradient that exceed the limitations specified with fittings. When cathodic protection is furnished, provide electrically insulated joints or flanges. When polyethylene or fiberglass piping is installed underground, place foil backed magnetic tape above the pipe to permit locating with a magnetic detector. After laying of pipe and testing, backfill the trench in accordance with Section 31 00 00 EARTHWORK.

3.7.2 Installing Pipe Aboveground

Protect aboveground piping against dirt and other foreign matter, as specified for underground piping. Weld joints in steel pipe ; however, joints in pipe 40 mm 1-1/2 inches in diameter and smaller may be threaded; joints may also be threaded to accommodate the installation of valves. Provide flanges of the weld neck type to match wall thickness of pipe.

3.8 PIPE JOINTS

Design and install pipe joints to effectively sustain the longitudinal pullout forces caused by the contraction of piping or superimposed loads.

3.8.1 Threaded Steel Joints

Provide threaded joints in steel pipe with tapered threads evenly cut, made with UL approved graphite joint sealing compound for gas service or polytetrafluoroethylene tape applied to the male threads only. Caulking of threaded joints to stop or prevent leaks is not permitted.

3.8.2 Welded Steel Joints

Perform gas pipe weldments as indicated. Make changes in direction of piping by welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction is not permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Use forged or flared branch outlet fittings for improvement of flow where attached to the run, and reinforced against external strains. Perform all beveling, alignment, heat treatment, and inspection of welds conforming to ASME B31.8. Remove weld defects and repair the weld, or remove the weld joints entirely and reweld. After filler metal has been removed from its original package, protect it or store so that its characteristics or welding properties are not affected adversely. Do not use electrodes that have been wetted or have lost any of their coating.

3.8.3 Polyethylene and Fiberglass Pipe Jointing Procedures

Use jointing procedures conforming to AGA XR0603. Avoid making indiscriminate heat fusion joining of plastic pipe or fittings made from different polyethylene resins by classification or by manufacturer if other alternative joining procedures are available. If heat fusion joining of dissimilar polyethylene is required, special procedures are required. Test the method of heat fusion joining dissimilar polyethylene resins in accordance with paragraph TESTS, subparagraph Destructive Tests of Plastic Pipe Joints.

3.8.4 Connections Between Metallic and Plastic Piping

Only make metallic to plastic connections outside, underground, and with approved transition fittings.

3.9 VALVE BOXES

Provide valve boxes of cast iron not less than 4.7 mm 3/16 inch thick at each underground valve except where concrete or other type of housing is indicated. Provide valve boxes with locking covers that require a special wrench for removal, and furnish the correctly marked wrench for each box. Cast the word "gas" in the box cover. When the valve is located in a roadway, protect the valve box by a suitable concrete slab at least 1 square meter 3 square feet. When in a sidewalk, provide the top of the box as a removable concrete slab 600 mm 2 feet square and set flush with the sidewalk. Make the boxes adjustable extension type with screw or slide-type adjustments. Separately support valve boxes to not rest on the pipe, so that no traffic loads can be transmitted to the pipe. Only locate valves valve boxes or inside of buildings.

[3.10 DRIPS

NOTE: If gas mains are for the distribution of high-pressure natural gas (above 400 kPa (60 psig)) only, delete the entire paragraph: DRIPS. Require drips for lines transmitting natural gas at the low point immediately following reduction from high pressure (above 400 kPa (60 psig)) to medium pressure (400 kPa (60 psig) or less), and at occasional low points throughout the system, to provide for blowing out the lines. Require drips at all low points in lines transmitting manufactured gas or a mixture of manufactured and natural gas. Indicate locations of drips. Locate drip points to provide for proper drainage of pipe system. Detail drips and discharge terminal (outlet) piping. If the need to contain and dispose of liquids through the valve for environmental concerns is required, delete the first bracketed sentence.

Install drips at locations where indicated, conforming to the details shown, or provide commercial units of approved type and capacity. Connect a blow off pipe 32 mm 1-1/4 inches or larger to each drip at its lowest point and extend to or near the ground surface at a convenient location away from traffic. Provide a reducing fitting for each discharge at each drip terminal (outlet), a plug valve, and a 15 mm 1/2 inch nipple turned down. Locate the discharge terminal (outlet) inside a length of 300 mm 12 inches or larger vitrified clay pipe, concrete sewer pipe or concrete terminal box [set vertically on a bed of coarse gravel 300 mm 1 foot thick and 1 m3 feet square,] [with concrete bottom to contain liquids and a connection to remove liquids for disposal,] and closed at the ground surface with a suitable replacement cover.

] 3.11 PRESSURE REGULATOR INSTALLATION

3.11.1 Main Distribution Line Regulators

NOTE: Remove reference to bypasses around pressure regulators for main distribution lines unless continuity of service is imperative and the bypass is regulated to prevent possible overpressure of downstream lines.

Install pressure regulators where shown. Install a valve on each side of the regulator for isolating the regulator for maintenance. [Provide a bypass line with bypass valves or 3 way valves and an over-pressurization pressure regulating device.] Install regulators and valves in rectangular reinforced concrete boxes, large enough so that all required equipment can be properly installed, operated, and maintained, with box sidewalls extending above ground line. Provide the boxes with [steel door] [cast iron manhole] covers with locking provisions and 100 mm 4 inch diameter vents. Furnish one key or other unlocking device with each cover. Locate discharge stacks, vents, or outlet ports of all pressure relief devices where gas can be discharged into the atmosphere without undue hazard. Provide stacks and vents with fittings to preclude entry of water.

3.11.2 Service Line Regulators

NOTE: Delete inapplicable requirements.

Install a shutoff valve, [meter set assembly,] and service regulator on the service line outside the building, 450 mm 18 inches above the ground on the riser. Install an insulating joint on the inlet side of the [meter set assembly and] service regulator and construct to prevent flow of electrical current. Provide a 10 mm 3/8 inch tapped fitting equipped with a plug on both sides of the service regulator for installation of pressure gauges for adjusting the regulator. Terminate all service regulator vents and relief vents in the outside air in rain and insect resistant fittings. Locate the open end of the vent where gas can escape freely into the atmosphere, away from any openings into the building and above areas subject to flooding.

[3.12 METER INSTALLATION

NOTE: Air Force Engineering Technical Letter Number 87-5 "Utility Meters in New and Renovated Facilities" provides guidance for when to exclude meters from Air Force new and major renovation projects. Review the requirements for gas meters in TI 800-01 Design Criteria and 10 CFR 435.

Install meters in accordance with ASME B31.8. Install permanent gas meters with provisions for isolation and removal for calibration and maintenance, and suitable for operation in conjunction with an energy monitoring and control system.

] 3.13 CONNECTIONS TO EXISTING LINES

NOTE: If connections to existing mains are required, retain this subparagraph, and select the appropriate Paragraph. Drawings will show existing gas lines when interface with the existing gas system is required.

Make connections between new work and existing gas lines, where required, in accordance with ASME B31.8, using proper fittings to suit the actual conditions. When connections are made by tapping into a gas main, provide the same size connecting fittings as the pipe being connected.

3.13.1 Connections to Publicly or Privately Operated Gas Utility Lines

NOTE: Delete inapplicable requirements.

Provide materials for the connections to the existing gas lines. The Utility is to make final connections and turn on the gas. The Utility is to also disconnect, purge and cap, plug or otherwise effectively seal existing lines that are to be abandoned or taken out of service. Notify the Contracting Officer, in writing, 10 days before final connections and turning on of gas lines. Make necessary arrangements with the Utility for tie in and activation of new gas lines. Only the Operating Agency/Utility Company may reactivate the system after tie in. Furnish a certification by the Operating Agency/Utility Company that all Utility work has been satisfactorily completed.

3.13.2 Connection to Government Owned/Operated Gas Lines

NOTE: Provide the name and location of the Utility or Operating Agency of the existing gas lines. Show on the drawings, the location of valves to be operated for existing system deactivation. When lines are to be abandoned, give consideration to any effects the abandonment may have on an active cathodic protection system and take appropriate action. If the segment is long and there are few line valves, give consideration to plugging the abandoned segment at intervals.

Provide connections to the existing gas lines in accordance with approved procedures. Only perform deactivation of any portion of the existing system at the valve location shown on the drawings. Reactivation of any existing gas lines will only be done by the [Government] [local Utility] [Operating Agency]. Submit the approved Contractor's Connection and Abandonment Plan prior to making any connections to existing gas lines, manicure the [Operating Agency's] [Utility's] required procedures which may be obtained from [____]. Notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made.

- a. Physically disconnect from the pipeline system if facilities are abandoned in place. Purge, cap, plug or otherwise effectively seal the

open ends of all abandoned facilities. Do not complete abandonment until it has been determined that the volume of gas or liquid hydrocarbons contained within the abandoned section poses no potential hazard. Use air or inert gas for purging, or fill the facility with water or other inert material. If air is used for purging, ensure that a combustible mixture is not present after purging.

b. When a main is abandoned, together with the service lines connected to it, only the customer's end of such service lines is required to be sealed as stipulated above.

c. Disconnect abandoned service lines from the active mains as close to the main as practicable.

d. Close all valves left in the abandoned segment.

e. Remove all above grade valves, risers, and vault and valve box covers. Fill vault and valve box voids with suitable compacted backfill material.

3.14 CATHODIC PROTECTION

NOTE: Cathodic protection is mandatory for
underground metallic gas distribution lines. Select
the type and design of cathodic protection in
accordance with UFC 3-570-02A. Provide testing
stations for the cathodic protection system.

Provide cathodic protection for all metallic gas piping installed underground and install as specified in [Section 26 42 14.00 10 - CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)] [Section 26 42 17.00 10 - CATHODIC PROTECTION SYSTEM (IMPRESSED CURRENT)].

3.15 TESTS

[3.15.1 Destructive Tests of Plastic Pipe Joints

NOTE: Destructive tests of plastic pipe joints are
provided as a designer option. Destructive tests
are considered useful in assuring that good joints
will be made. Delete the paragraph if this option
is not exercised.

Each day, prior to making polyethylene heat fusion joints or fiberglass adhesive joints, make a joint of each size and type to be installed that day by each person performing joining of plastic pipe that day and destructively test. Cut at least 3 longitudinal straps from each joint. Visually examine each strap for voids or discontinuities on the cut surfaces of the joint area, deformations by bending, torque, or impact. If failure occurs, it must not initiate in the joint area. If a joint fails the visual or deformation test, the qualified joiner who made that joint is not allowed to make further field joints in plastic pipe on this job until that joiner has been retrained and re-qualified. Record the results of the destructive tests including the date and time of the tests, size and type of the joints, ambient conditions, fusion iron temperature and names of

inspectors and joiners.

]3.15.2 Pressure and Leak Tests

NOTE: Specify correct test pressure (including Class Location) to be used for tests of gas line systems in accordance with ASME B31.8. Specify correct test pressure (including Class Location) to be used for tests of gas line systems in accordance with NFPA 58. Test pressures should recognize the weakest component of each system tested for the design pressure, the maximum allowable operating pressure, and the gas supplier's maximum operating pressure.

The test pressure will be 150 percent of the maximum operating pressure or 350 kPa (50 psig), whichever is greater. However, the maximum test pressure must not be more than three times the design pressure of the pipe.

Test the system of gas mains and service lines after construction and before being placed in service, using air as the test medium. Conform testing to ASTM D 1598 and ASTM D 1599 for plastic piping. The normal operating pressure for the system is [____]. The test pressure is [____].

- a. Prior to testing the system, blow-out, clean, and clear the interior of all foreign materials. Remove all meters, regulators, and controls before blowing out and cleaning, and reinstall after clearing of all foreign materials.
- b. Perform testing of gas mains and service lines with due regard for the safety of employees and the public during the test. Keep persons not working on the test operations out of the testing area while testing is proceeding. Perform the test on the system as a whole or on sections that can be isolated.
- c. Test joints in sections prior to backfilling when trenches will be backfilled before the completion of other pipeline sections. Continue the test for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. Do not take the initial test readings of the instrument for at least 1 hour after the pipe has been subjected to the full test pressure. Do not take initial or final readings at times of rapid changes in atmospheric conditions, and temperatures are representative of the actual trench conditions. No indication of reduction of pressure is allowed during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship $T(1)P(2)=T(2)P(1)$, in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial and final readings.
- d. During the test, completely isolate the entire system from all compressors and other sources of air pressure. Test each joint by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. Secure approval of testing instruments from the Contracting Officer. Furnish all labor, materials and equipment for conducting the tests subject to inspection at all

times during the tests. Maintain safety precautions for air pressure testing at all times during the tests.

-- End of Section --