

GPTC GUIDE FOR GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS

2003 EDITON

ADDENDUM NO. 12, August 2008

The changes in this addendum are marked by wide vertical lines inserted to the left of modified text, overwriting the left border of most tables, and use of a block symbol (■) where needed. The Federal Regulations were not changed. Fourteen (14) transactions by GPTC affected 26 sections of the Guide.

Editorial updates include application of the Editorial Guidelines, updating reference titles, adjustments to page numbering, and adjustment of text on pages. While only significant editorial updates are marked, all affected pages carry the current addendum footnote. Editorial updates affected 43 sections of the Guide.

The following table shows the affected sections, the pages to be removed, and their replacement pages.

FS Amendment - Amdt. Number
New or Updated GM - TR Number
GM Under Review - GMUR
Editorial Update - EU

Guide Section	Reason For Change	Pages to be Removed	Replacement Pages
Title Page	EU	i/ii	i/ii
Table of Contents	EU	v/vi thru ix/x	v/vi thru ix/x
Membership List	EU	li/lii thru lix/lx	li/lii thru lix/lx
Subpart A 192.3	EU, TR06-26, TR06-32, TR06-37	15/16 thru 19/20	15/16 thru 19/20
192.7	TR06-34	25/26	25/26
Subpart B 192.53	TR06-34	29/30	29/30
Subpart C 192.122	EU	45/46, 47/48	45/46, 47/48
192.123	EU, TR04-11		
192.125	EU		
Subpart D 192.197	EU	83/84	83/84
192.201	EU	87/88	87/88
Subpart F 192.279	TR06-34	99/100	99/100
Subpart G 192.321	EU	121/122, 123/124	121/122, 123/124
192.325	EU, TR06-09		
Subpart H 192.353	TR06-10	125/126, 127/128	125/126, 127/128
192.355	TR06-10		
192.361	TR02-18	133/134 thru 137/138	133/134 thru 137/138
192.363	EU		
192.365	EU		
192.367	EU		
192.369	EU		
192.371	EU		
192.373	EU		
192.375	EU		
Subpart I 192.457	TR03-37	145/146 thru 155/156	145/146 thru 155/156
192.459	EU		
192.461	EU, TR03-37		
192.463	EU		
192.465	EU, TR03-37		
192.467	EU		
192.469	EU		
192.471	EU		
192.475	EU		
Subpart L 192.615	TR03-14, TR06-32	203/204 thru 211(b)/212	203/204 thru 211(b)/212
192.616	EU		
192.617	EU		
192.625	TR06-26	217/218, 219/220	217/218, 219/220
Subpart M 192.755	EU	255/(256, 257,& 258)	255/(256, 257,& 258)
Subpart N Header note	TR05-03	259/260 thru 262(g)/262(h)	259/260 thru 262(g)/262(h)
192.803	EU, TR05-03		
192.805	EU, TR05-03		
192.807	EU		
192.809	EU, TR-05-03		

Guide Section	Reason For Change	Pages to be Removed	Replacement Pages
Subpart O 192.941	TR04-52	262(aq)/262(ar) thru 262(av-1)/262(av-2)	262(aq)/262(ar) thru 262(av-1)/262(av-2)
192.943	EU		
192.945	EU		
192.947	EU		
192.949	EU		
192.951	EU		
GMA G-192-1	EU, TR02-18, TR04-11, TR05-03, TR06-09, TR06-32	315/316, 319/320 thru 325/326, 326(c)/326(d), 326(e)/326(f)	315/316/, 319/320 thru 325/326, 326(c)/326(d) thru 326(g)/326(h)
GMA G-192-7	TR03-14	355/356	355/355(a) thru 355(d)/356
GMA G-192-8	EU		
GMA G-192-11	EU, TR03-25, TR06-17	361/362 thru 371/372	361/362 thru 371(h)/372
GMA G-192-11A	EU, TR03-25, TR06-17	373/374 thru 385/386	373/374 thru 385(f)/386
GMA G-192-13	TR06-10	391/392, 393/394	391/392, 393/394
GMA G-192-15A	EU, TR06-34	401/402	401/402

B L A N K

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PLEASE NOTE

Addenda to this Guide will also be issued in loose-leaf format so that users will be able to keep the Guide up-to-date by replacing the pages that have been revised with the new pages. It is advisable, however, that pages which have been revised be retained so that the chronological development of the Federal Regulations and the Guide is maintained.

CAUTION

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GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M													
Abraham, Richard A. Marathon Pipe Line LLC, Findlay, OH	X	X				X				X			
Affonso, Joaquin J. Consumers Energy, Jackson, MI	X			X		X	X						
Alexander, Thomas D. Willbros Engineers, Inc., Tulsa, OK	X			X	X								
Armstrong, Glen F. EN Engineering, Woodridge, IL	X	Chair				X	X		X		X		X
Ashcraft, Nicholas D. Kiefner & Associates, Worthington, OH		X					X						
Barkei, David E. We Engeries, Milwaukee, WI		X			X		X						
Bateman, Stephen Long Beach Energy, Long Beach, CA		X											
Beaver, Brett Advantica, Mechanicsburg, PA		X			X		X						
Becken, Robert C. Energy Experts International, Pleasant Hill, CA	X			X	X			X					
Benedict, Andrew G. Opvantek, Inc., Newtown, PA		X						X					
Bennett, Frank M. PPL Gas Utilities Corp., Lancaster, PA		X				X	X						

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GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Bervers, Bruce S. Williams Gas Pipeline, Houston, TX				X		X		X					
Blaney, Steven D. NY State Dept. of Public Service, Albany, NY	X	X				X	X			X			
Booth, Lloyd E. Telemark Solutions, Coppell, TX			X		X			X					
Boros, Stephen Plastics Pipe Institute, Irving, TX			X						X				
Breaux, David A. Broen, Inc., Birmingham, AL			X		X			X					
Brown, Charles E. NTH Consultants, Ltd., Lansing, MI		X				X		X					
Bryce, Wayne CINA, Mahwah, NJ		X					X		X				
Bull, David E. ViaData LP, Tobyhanna, PA	X	X				Sec		X					
Cabot, Paul W. American Gas Association, Washington, DC	Sec										Sec		
Cadorin, Robert J. TransCanada Corp., Troy, MI	X			Sec				X					

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M				X			X						
Cardin, Jeanne L. Southwest Gas Corp., Las Vegas, NV													
Carey, Willard S. Public Service Elec. & Gas Co., Newark, NJ	X	X				X		Chair			X		
Chin, John S. TransCanada Corp., Troy, MI	X			X	X	X	Chair				X		X
Clarke, Allan M. Spectra Energy Corp., Houston, TX				X	X	X	X						
Cody, Leo T. KeySpan Energy Delivery, Waltham, MA		X				X		X					
Craig, Jim M. McElroy Manufacturing, Inc., Tulsa, OK			X					X	X				
Del Buono, Amerigo J. Steel Forgings, Inc., League City, TX	X		X										
DeVore, James C. Consultant, Green Valley, AZ			X		X		X		X				
Dockweiler, Kenneth D. SourceGas LLC, Casper, WY	X			X		X		X					
Dolezal, Denise L. Metropolitan Utilities District, Omaha, NE		X			X		X						
Duncombe, Lauri Williams Gas Pipeline, Salt Lake City, UT				X	X		X						

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Erickson, John P. American Public Gas Association, Washington, DC		X						X					
Faulkenberry, Michael J. Avista Corp., Spokane, WA		X			X			X					
Fleet, F. Roy F. Roy Fleet, Inc., Westmont, IL	X			X		X				X			
Frantz, John H. Consultant, Philadelphia, PA	X										X	Chair	
Frederick, Victor M., III Omega Tools, Allentown, PA		X						X	X				
Friend, Mary S. Columbia Gas Trmn. Corp., Charleston, WV	X			X		X		X					
Fuller, William R., Jr. Xcel Energy Inc., Denver, CO		X			X		X		X				
Galante, Julie CYCLA Corp., Oakton, VA		X					X						
Gilchrist, Hart Intermountain Gas Co., Boise, ID		X						X					
Goble, Gregory H. R. W. Lyall & Co., Corona, CA	X		X		X				X				
Groeber, Steve A. Philadelphia Gas Works, Philadelphia, PA		X				X		X	X	X			

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M													
Gunther, Karl M. NTSB, Washington, DC	X	X							X				
Hansen, James P. Elster Perfection Corp., Madison, OH			X				X						
Hart, Thomas L. NSTAR Electric & Gas Corp., Westwood, MA		X				X		X					
Hazelden, Glyn Hazelden Group, Oak Park, IL		X				X		X					
Heintz, James R. UGI Utilities, Inc., Reading, PA	1 st V Chair										Chair		
Henry, Jill A. Ohio PUC, Columbus, OH	X	X				X			X				
Hotinger, James M. VA State Corp. Comm., Richmond, VA		X				X	X						
Humes, Dennis W. Mueller Co.- Gas Products Div., Decatur, IL	X		X										X
Hurbanek, Stephen F. NC Utilities Commission, New Bern, NC		X				X							
Huriaux, Richard D. Consultant, Baltimore, MD	X			X			X						
Kottwitz, John D. MO Public Service Comm., Jefferson City, MO	X	X				Chair		X		X	X		

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M													
Koym, Brent CenterPoint Energy, Inc., Pearl, MS		X			X		X						
Krummert, Lawrence M. Columbia Gas of PA, Inc., New Castle, PA		X						X					
Lathrap, Philip A. Consultant, Lafayette, CA	X	X			X	X		X					
Lewis, Raymond D. Rosen USA, Houston, TX				X			X						
Loker, Jon O. Pipeline Safety Consultant, Saint Albans, WV	X			X						Chair	X		
Lomax, George S. Heath Consultants Inc., Houston, TX	X		X			X		X					
Lopez, Paul El Paso Corp., Colorado Springs, CO				X				X					
Lueders, John D. DTE Energy - MichCon, Grand Rapids, MI		X				X		X					
Mackay-Smith, Seth UMAC Inc., Malvern, PA	X		X		X	X							
Marek, Marti Southwest Gas Corp., Las Vegas, NV	Chair										X		
McKenzie, James E. Atmos Energy Corp., Jackson, MS		X					X						

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

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	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
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Miller, D. Lane PHMSA, Oklahoma City, OK	X	X					X		X	Sec			
Modha, Kirit Iroquois Pipeline Operating Co., Shelton, CT				X			X						
Naper, Robert C. Energy Experts International, Waltham, MA	X	X				X							
Nichols, Danny Energy Transfer Company, Houston, TX				X		X	X						
Oleksa, Paul E. Oleksa & Assoc., Akron, OH	X	X			X		X			X			
Palermo, Eugene F. Palermo Plastics Pipe Consulting, Friendsville, TN	X		X		X				X				
Peters, Kenneth C. El Paso Corporation, Birmingham, AL	X			Chair		X		Sec			X		
Pioli, Christopher A. Jacobs Consultancy, Pasadena, CA		X			X	X	X						
Quezada, Leticia Nicor Gas, Naperville, IL	X	X				X			X		X		Chair
Reynolds, Donald Lee NiSource Corporate Services, Columbus, OH	X	X			Chair		X				X		
Schmidt, Robert A. Hackney Ladish Inc., Russellville, AR	X		Chair		X						X		

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M				X			X						
Schrunk, Rex Wilbros Engineers, Inc., Kansas City, MO							X						
Scott, Edward W. Ameren Illinois Utilities, Pawnee, IL		X					X		X				
Seamands, Patrick A. Laclede Gas Co., Saint Louis, MO		X				X			X	X			
Sher, Philip CT Dept. Public Utility Control, New Britain, CT	2 nd V Chair										X		
Siedlecki, Walter AEGIS Insurance Services, Inc., East Rutherford, NJ	X	X						X					
Slagle, Richard Vectren Energy Delivery, Evansville, IN	X	Sec				X			Chair		X		
Spangler, David Washington Gas Light Co. Springfield, VA		X				X		X					
Sprenger, Roger W. San Diego Gas & Elec. Co., San Diego, CA		X				X		X					
Themig, Jerome S. Ameren Services Co., Pawnee, IL		X				X		X					
Torbin, Robert N. Cutting Edge Solutions LLC, Framingham, MA		X					X						
Troch, Steven J. Baltimore Gas & Electric Co., Baltimore, MD		X					X						

GAS PIPING TECHNOLOGY COMMITTEE MEMBERSHIP LIST

(Continued)

	Main Body	DIVISIONS			TASK GROUPS					SECTIONS			
		Distribution	Manufacturers	Transmission	Design	DP/ER	IMP/Corrosion	O&M/OQ	Plastic Pipe	Editorial	Executive	Liaison	Regulations
Abbreviations: Chairperson: Chair First Vice Chairperson: 1 st V Chair Second Vice Chairperson: 2 nd V Chair Secretary: Sec Damage Prevention - Emergency Response: DP/ER Operation and Maintenance: O&M													
Ulanday, Alfredo S. Integrus Gas, Chicago, IL		X				X		X					
Veerapaneni, Ram DTE Energy – MichCon, Detroit, MI				X		X	X			X			
Volgstadt, Frank R. Volgstadt & Associates, Madison, OH	X		Sec						Sec				
Weber, David E. Consultant Engineer, Barnstable, MA	X	X							X	X			
Wells, William M. New Jersey Natural Gas, Neptune, NJ		X				X		X					
White, Gary R. PI Confluence, Inc., Houston, TX		X					X						
Wilkes, Alfred L. Performance Pipe, Plano, TX			X		X				X				
Yehle, Steve Excel Energy, St. Paul, MN		X							X				

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Cast iron. The unqualified term cast iron applies to gray-cast iron that is a cast ferrous material in which a major part of the carbon content occurs as free carbon in the form of flakes interspersed through the metal.

Cold-expanded pipe is seamless or welded pipe which is formed and then, expanded in the pipe mill while cold, so that the circumference is permanently increased by at least 0.50 percent.

Continuous-welded pipe is furnace-welded pipe which has a longitudinal butt joint that is forge-welded by the mechanical pressure developed in rolling the hot-formed skelp through a set of round pass welding rolls. It is produced in continuous lengths from coiled skelp and subsequently cut into individual lengths. Typical specifications: ASTM A53, API Spec 5L. See also *Furnace-butt-welded pipe and Pipe manufacturing processes*.

Control piping is pipe, valves, and fittings used to interconnect air, gas, or hydraulically operated control apparatus.

Curb valve is a valve installed for the purpose of shutting off the gas supply to a building. It is installed below grade in a service line, at or near the property line. It is operated by use of a removable key or wrench, through a curb box or standpipe.

Customer meter is a device that measures gas delivered to a customer for consumption on its premises.

Deactivation (Inactivation) is the process of making the pipeline inactive.

District regulator station or district pressure regulating station is a pressure regulating station that controls pressure to a high- or low-pressure distribution main. It does not include pressure regulation whose sole function is to control pressure to a manifold serving multiple customers.

Double submerged-arc-welded pipe is a pipe having longitudinal or spiral butt joints. The joints are produced by at least two passes, including at least one each on the inside and on the outside of the pipe. Coalescence is produced by heating with an electric arc or arcs between the bare metal electrode or electrodes and the work. The welding is shielded by a blanket or granular, fusible material on the work. Pressure is not used and filler metal for the inside and outside welds is obtained from the electrode or electrodes. Typical specifications: ASTM A381, API Spec 5L. See also *Pipe manufacturing processes*.

Ductile iron (sometimes called nodular iron) is a cast ferrous material in which the free graphite present is in a spheroidal form rather than a flake form. The desirable properties of ductile iron are achieved by means of chemistry and a ferritizing heat treatment of the castings.

Electric-flash-welded pipe is pipe having a longitudinal butt joint wherein coalescence is produced, simultaneously over the entire area of abutting surfaces, by the heat obtained from resistance to the flow of electric current between the two surfaces, and by the application of pressure after heating is substantially completed. Flashing and upsetting are accompanied by the expulsion of metal from the joint. Typical specification: API Spec 5L. See also *Pipe manufacturing processes*.

Electric-fusion-welded pipe is pipe having a longitudinal butt joint wherein coalescence is produced in the preformed tube by manual or automatic electric-arc welding. The weld may be single or double and may be made with or without the use of filler metal. Typical specifications: ASTM A134, ASTM A139: Single or double weld is permitted with or without the use of filler metal. ASTM A671, ASTM A672, ASTM A691, and API Spec 5L: Requires both inside and outside welds and use of filler metal.

Spiral-welded pipe is also made by the electric-fusion-welded process with either a butt joint, a lap joint or a lock-seam joint. Typical specifications: ASTM A134, ASTM A139, and API Spec 5L: Butt joint. ASTM A211: Butt joint, lap joint, or lock-seam joint. See also *Pipe manufacturing processes*.

Electric-resistance-welded pipe is pipe, which has a longitudinal butt joint wherein coalescence, is produced by the application of pressure and by the heat obtained from the resistance of the pipe to the flow of an electric current in a circuit of which the pipe is a part. It is produced in individual lengths or in continuous lengths from coiled skelp and subsequently cut into individual lengths. Typical specifications: ASTM A53, ASTM A135, and API Spec 5L. See also *Pipe manufacturing processes*.

Excess Flow Valve (EFV) is a device installed in a gas pipeline to automatically restrict or shut off the gas flow through the line when the flow exceeds a predetermined limit.

Excess Flow Valve-Bypass (EFVB) is an EFV that is designed to limit the flow of gas upon closure to a small, predetermined level. EFVBs reset automatically once the line downstream is made gastight and pressure is equalized across the valve.

Excess Flow Valve-Non-Bypass (EFVNB) is an EFV that is designed to stop the flow of gas upon closure. EFVNBs must be manually reset.

Furnace-butt-welded pipe. There are two such types of pipe defined in this glossary: *Bell-welded pipe* and *Continuous-welded pipe*. See also *Pipe manufacturing processes*.

Furnace-lap-welded pipe is pipe that has a longitudinal lap joint that is produced by the forge welding process. In this process, coalescence is produced by heating a preformed tube to welding temperature and then passing it over a mandrel. The mandrel is located between the two welding rolls that compress and weld the overlapping edges. Typical specification: API Spec 5L. The manufacture of this type of pipe was discontinued, and the process was deleted from API Spec 5L in 1962. See also *Pipe manufacturing processes*.

Gas control is a person or persons who acquire and maintain data to remotely monitor and direct the flow of gas to meet design and contractual obligations, and to assist in detecting pipeline emergencies and initiating response.

Ground temperature is the temperature of the earth at pipe depth. See also *Ambient temperature and Temperature*.

Heat fusion joint is a joint made in thermoplastic piping by heating the parts sufficiently to permit fusion of the materials when the parts are pressed together.

Holiday is a coating imperfection that exposes the pipe surface to the environment.

Holiday detection is testing of a coating for holidays using an instrument that applies a voltage between the external surface of the coating and the pipe.

Hoop stress is the stress in a pipe wall, acting circumferentially in a plane perpendicular to the longitudinal axis of the pipe, produced by the pressure of the fluid in the pipe. In this Guide, hoop stress in steel pipe is calculated by the formula:

$$S_h = \frac{PD}{2t}$$

Where:

- S_h = hoop stress, psi
- P = internal pressure, psig
- D = nominal outside diameter of pipe, inches
- t = nominal wall thickness, inches

See also *Maximum allowable hoop stress*.

Hot taps are connections made to transmission lines, mains, or other facilities while they are in operation.

The connecting and tapping is done while the facility is under gas pressure.

Hydrostatic Design Basis (HDB) is one of a series of established stress values specified in ASTM D2837, "Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products," for a plastic compound, obtained by categorizing the long-term hydrostatic strength as determined in accordance with ASTM D2837.

Inactive pipeline is a pipeline that is being maintained under Part 192 but is not presently being used to transport gas.

Instrument piping is pipe, valves, and fittings used to connect instruments to main piping, to other instruments and apparatus, or to measuring equipment.

Iron. See *Cast iron*, *Ductile iron*, and *Malleable iron*.

Jeeping is a method of *Holiday detection*.

Joint. See *Length*.

Lateral line (transmission). See guide material under §192.625.

Leakage surveys are systematic inspections made for the purpose of finding leaks in a gas piping system.

The types of inspections commonly made are described in Guide Material Appendix G-192-11 "Gas Leakage Control Guidelines for Natural Gas Systems" and Guide Material Appendix G-192-11A "Gas Leakage Control Guidelines for Petroleum Gas Systems."

Length is a piece of pipe as delivered from the mill. Each piece is called a length regardless of its actual longitudinal dimension. While this is sometimes called a "joint," the term "length" is preferred.

Light surface oxide is a non-damaging form of corrosion.

Long-term hydrostatic strength of plastic pipe is the estimated hoop stress, in psi, that would result in a failure of the pipe if the pipe were subjected to 100,000 hours of hydrostatic pressure.

Lower Explosive Limit (LEL) is the lower limit of flammability for a gas expressed as a percent, by volume, of gas in air.

Malleable iron is a mixture of iron and carbon, including small amounts of silicon, manganese, phosphorous and sulfur which, after being cast, is converted structurally by heat treatment into primarily a matrix of ferrite containing nodules of tempered carbon.

Maximum allowable hoop stress is the maximum hoop stress permitted for the design of a piping system. It depends upon the material used, the class location of the pipe, and the operating conditions. See also *Hoop stress*.

Maximum allowable test pressure is the maximum internal fluid pressure permitted for testing, for the materials and class location involved.

Meters. See *Customer meter and Meter set assembly*.

Meter set assembly is that exposed portion of the service line extending from the service line riser valve to the connection of the customer's fuel line, including the meter, and (if present) the regulator and relief vent line. In the absence of a service line riser valve, the meter set assembly starts at the first exposed fitting. The meter set assembly does not include the customer's buried or exposed fuel line.

Monitoring regulator is a pressure regulator, set in series with another pressure regulator, for the purpose of providing automatic overpressure protection in the event of a malfunction of the primary regulator.

Nodular iron. See *Ductile iron*.

Nominal outside diameter (D) is the outside diameter, in inches, as listed in Table 192.105i for nominal pipe size 12 inches and less, and is the same as the nominal pipe size greater than 12 inches. It is used in the design formula for steel pipe in §192.105 and the calculation for hoop stress.

Nominal wall thickness (t) is the wall thickness, in inches, computed by, or used in, the design formula for steel pipe in §192.105. Pipe may be ordered to this computed wall thickness without adding an allowance to compensate for the under-thickness tolerances permitted in approved specifications.

Operating stress is the stress in a pipe or structural member under normal operating conditions.

Overpressure protection is the use of a device or equipment installed for the purpose of preventing pressure in a pipe system or other facility from exceeding a predetermined limit. See also *Pressure limiting station*, *Pressure regulating station*, *Pressure relief station*, and *Service regulator*.

Parallel encroachment pertains to that portion of the route of a transmission line or main that lies within, runs in a generally parallel direction to, and does not necessarily cross, the rights-of-way of a road, street, highway, or railroad.

Pipe. See *Bell-welded pipe*, *Cold expanded pipe*, *Continuous-welded pipe*, *Control piping*, *Double-submerged-arc-welded pipe*, *Electric-flash-welded pipe*, *Electric-fusion-welded pipe*, *Electric-resistance-welded pipe*, *Furnace-butt-welded pipe*, *Furnace-lap-welded pipe*, *Instrument piping*, *Length*, *Pipe-container*, *Pipe manufacturing processes*, *Pipe-type holder*, *Sample piping*, and *Seamless pipe*.

Pipe-container is a gastight structure assembled from pipe and end closures. See also *Pipe-type holder*.

Pipe manufacturing processes. A reference is ASME I00396 "History of Line Pipe Manufacturing in North America." Types and names of welded joints are used herein as defined in the American Welding Society (AWS) Publication A3.0 "Standard Welding Terms and Definitions" except for the following terms which are defined in this glossary.

- Bell-welded pipe*
- Continuous-welded pipe*
- Double-submerged-arc-welded pipe*
- Electric-flash-welded pipe*
- Electric-fusion-welded pipe*
- Electric-resistance-welded pipe*
- Furnace-butt-welded pipe*
- Furnace-lap-welded pipe*
- Seamless pipe*

Pipe-type holder is any pipe-container or group of interconnected pipe-containers installed at one location for the sole purpose of storing gas. See also *Pipe-container*.

Plastic (noun) is a material that contains one or more organic polymeric substances of high molecular weight as an essential ingredient, is solid in its finished state, and can be shaped by flow at some stage of its manufacture or processing into finished articles. The two general types of plastic referred to in this Guide are thermoplastic and thermosetting. See also *Thermoplastic* and *Thermosetting plastic*.

Plastic pipe joints. See *Adhesive joint*, *Heat fusion joint*, and *Solvent cement joint*.

Pressure (expressed in pounds per square inch above atmospheric pressure, i.e., gauge pressure (abbreviation: psig), unless otherwise stated). See also *Maximum allowable test pressure*, *Overpressure protection*, *Pressure limiting station*, *Pressure regulating station*, *Pressure relief station*, and *Standup pressure test*.

Pressure limiting station consists of apparatus which, under abnormal conditions, will act to reduce, restrict or shut off the supply of gas flowing into a transmission line, main, holder, pressure vessel or compressor station piping in order to prevent the gas pressure from exceeding a predetermined limit. While normal pressure conditions prevail, the pressure limiting station may exercise some degree of control of the flow of gas or may remain in the wide-open position. Included in the station are any enclosures and ventilating equipment, and any piping and auxiliary equipment, such as valves, control instruments, or control lines.

Pressure regulating station consists of apparatus installed for the purpose of automatically reducing and regulating the gas pressure in the downstream transmission line, main, holder, pressure vessel or compressor station piping to which it is connected. Included in the station are any enclosures and ventilating equipment, and any piping and auxiliary equipment, such as valves, control instruments, or control lines.

Pressure relief station consists of apparatus installed to vent gas from a transmission line, main, holder, pressure vessel, or compressor station piping in order to prevent the gas pressure from exceeding a predetermined limit. The gas may be vented into the atmosphere or into a lower pressure gas system capable of safely receiving the gas being discharged. Included in the station are any enclosures and ventilating equipment, and any piping and auxiliary equipment, such as valves, control instruments, or control lines.

Private rights-of-way are those that are not located on roads, streets or highways used by the public, or on railroad rights-of-way.

Proprietary items are items made by a company having the exclusive right of manufacture.

Public place is a place that is generally open to all persons in a community as opposed to being restricted to specific persons. A public place includes churches, schools, and commercial property, as well as any publicly owned right-of-way or property that is frequented by people.

Regulators. See *Pressure limiting station*, *Pressure regulating station*, *Pressure relief station*, and *Service regulator*.

Sample piping is pipe, valves, and fittings used for the collection of samples of gas or other fluids.

SCADA is supervisory control and data acquisition. SCADA is a remote control system that allows the transmission of data from a remote site (e.g., a delivery point) to a central control location. SCADA systems are used to monitor and control flow, pressure, and other parameters of the pipeline system. SCADA systems may generate an alarm when an event has occurred or an unusual situation is developing.

Seamless pipe is a wrought tubular product made without a welded seam. It is manufactured by hot working steel or, if necessary, by subsequently cold finishing the hot-worked tubular product to produce the desired shape, dimensions, and properties. See also *Pipe manufacturing processes*.

Secondary stress is stress created in the pipe wall by loads other than internal fluid pressure. Examples are backfill loads, traffic loads, beam action in a span and loads at supports and at connections to the pipe.

Service line valve is a valve located in the service line ahead of the service regulator, or ahead of the meter where there is no regulator.

I *Slack loop* is extra pipe length installed to counter the effects of pipe expansion and contraction.

Solvent cement joint is a joint made in PVC piping by using solvent cement to join the piping components.

Standup pressure test is a test to demonstrate that a pipe or piping system does not leak as evidenced by the lack of a drop in pressure over a specified period of time after the source of pressure has been isolated.

Steel is an iron-base alloy, malleable in some temperature range as initially cast, containing manganese, carbon, and often other alloying elements. See also *Carbon steel*.

Stress is the resultant internal force that resists change in the size or shape of a body acted on by external forces. See also *Hoop stress*, *Maximum allowable hoop stress*, *Operating stress*, *Secondary stress*, *Tensile strength*, and *Yield strength*.

Temperature (expressed in degrees Fahrenheit (°F) unless otherwise stated). See also *Ambient temperature* and *Ground temperature*.

Tensile strength is the highest unit tensile stress (referred to the original cross section) that a material can sustain before failure (psi)

Thermoplastic is a plastic that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature. Examples of thermoplastic materials include polyethylene (PE), polyamide (PA or nylon), and polyvinyl chloride (PVC).

Thermosetting plastic is a plastic that is capable of being changed into a substantially infusible or insoluble product when cured under the application of heat or by chemical means. Examples of thermosetting plastic materials include:

- (a) Epoxy as used in epoxy fiberglass pipe, "Red Thread®" pipe, and fiber-reinforced pipe (FRP); and
- (b) Unsaturated polyester as used in fiberglass composites for steel pipe repair sleeves, and cured-in-place (CIP).

Thickness. See *Nominal wall thickness*.

Valve. See *Curb valve and Service line valve*.

Vault is an underground structure which may be entered, and which is designed to contain piping and piping components, such as valves or pressure regulators.

Yield strength is the strength at which a material exhibits a specified limiting permanent set, or produces a specified total elongation under load. The specified limiting set or elongation is usually expressed as a percentage of gage length, and its values are specified in the various material specifications acceptable under this Guide.

GLOSSARY OF COMMONLY USED ABBREVIATIONS	
<i>Note:</i> For added organizational abbreviations, see Guide Material Appendix G-192-1, Sections 4 and 5.	
Abbreviation	Meaning
ABS	acrylonitrile-butadiene-styrene
ASV	automatic shutoff valve
BAP	baseline assessment plan
CAB	cellulose acetate butyrate
CDA	confirmatory direct assessment
CGI	combustible gas indicator
DA	direct assessment
ECDA	external corrosion direct assessment
EFV	excess flow valve
EFVB	excess flow valve – bypass (automatic reset)
EFVNB	excess flow valve – non-bypass (manual reset)
ERW	electric resistance welded
ESD	emergency shutdown
FAQ	frequently asked question
HCA	high consequence area
HDB	hydrostatic design basis
HFI	hydrogen flame ionization
IC	internal corrosion
ICDA	internal corrosion direct assessment
ICS	Incident Command System
ILI	In-line inspection
IMP	integrity management program
IR drop	voltage drop
LEL	lower explosive limit
LNG	liquefied natural gas
LPG	liquid petroleum gas
LTHS	long-term hydrostatic strength
MAOP	maximum allowable operating pressure
MRS	minimum required strength
NDE	nondestructive evaluation
NPS	nominal pipe size
O&M	operations and maintenance
OCS	outer continental shelf

GLOSSARY OF COMMONLY USED ABBREVIATIONS (Continued)	
Abbreviation	Meaning
OQ	operator qualification
PA	Polyamide
P&M measures	preventive and mitigative measures
PDB	pressure design basis
PE	Polyethylene
PIC	potential impact circle
PIR	potential impact radius
PVC	poly (vinyl chloride), also written as polyvinyl chloride
RCV	remote control valve
SCADA	supervisory control and data acquisition
SCC	stress corrosion cracking
SCCDA	stress corrosion cracking direct assessment
SDB	strength design basis
SDR	standard dimension ratio
SMYS	specified minimum yield strength

TABLE 192.3i

§192.5 Class locations.

[Effective Date: 7-13-98]

(a) This section classifies pipeline locations for purposes of this part. The following criteria apply to classifications under this section.

(1) A "class location unit" is an onshore area that extends 220 yards (200 meters) on either side of the centerline of any continuous 1- mile (1.6 kilometers) length of pipeline.

(2) Each separate dwelling unit in a multiple dwelling unit building is counted as a separate building intended for human occupancy.

(b) Except as provided in paragraph (c) of this section, pipeline locations are classified as follows:

(1) A Class 1 location is:

(i) An offshore area; or

(ii) Any class location unit that has 10 or fewer buildings intended for human occupancy.

(2) A Class 2 location is any class location unit that has more than 10 but fewer than 46 buildings intended for human occupancy.

(3) A Class 3 location is:

(i) Any class location unit that has 46 or more buildings intended for human occupancy; or

(ii) An area where the pipeline lies within 100 yards (91 meters) of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period. (The days and weeks need not be consecutive.)

(4) A Class 4 location is any class location unit where buildings with four or more stories above ground are prevalent.

(c) The length of Class locations 2, 3, and 4 may be adjusted as follows:

(1) A Class 4 location ends 220 yards (200 meters) from the nearest building with four or

[Amdt. 192-37, 46 FR 10157, Feb. 2, 1981; Amdt. 192-51, 51 FR 15333, Apr. 23, 1986; Amdt. 192-68, 58 FR 14519, Mar. 18, 1993; Amdt. 192-78, 61 FR 28770, June 6, 1996 with Amdt. 192-78 Correction, 61 FR 30824, June 18, 1996; Amdt. 192-94, 69 FR 32886, June 14, 2004 with Amdt. 192-94 Correction, 69 FR 54591, Sept. 9, 2004; RIN 2137-AD77, 70 FR 11135, Mar. 8, 2005; Amdt. 192-99, 70 FR 28833, May 19, 2005 with Amdt. 192-99 Correction, 70 FR 35041, June 16, 2005; Amdt. 192-102, 71 FR 13289, Mar. 15, 2006; Amdt. 192-103, 71 FR 33402, June 9, 2006; Amdt. 192-103, 72 FR 4655, Feb. 1, 2007; RIN 2137-AE29, 73 FR 16562, Mar. 28, 2008]

GUIDE MATERIAL

Additional standards and specifications recommended for use under this Guide, and the names and addresses of the sponsoring organizations, are shown in Guide Material Appendix G-192-1. See Guide Material Appendix G-192-1A for documents previously incorporated by reference in the Regulations.

§192.8

How are onshore gathering lines and regulated onshore gathering lines determined?

[Effective Date: 4-14-06]

(a) An operator must use API RP 80 (incorporated by reference, see §192.7), to determine if an onshore pipeline (or part of a connected series of pipelines) is an onshore gathering line. The determination is subject to the limitations listed below. After making this determination, an operator must determine if the onshore gathering line is a regulated onshore gathering line under paragraph (b) of this section.

(1) The beginning of gathering, under section 2.2(a)(1) of API RP 80, may not extend beyond the furthestmost downstream point in a production operation as defined in section 2.3 of API RP 80. This furthestmost downstream point does not include equipment that can be used in either production or transportation, such as separators or dehydrators, unless that equipment is involved in the processes of “production and preparation for transportation or delivery of hydrocarbon gas” within the meaning of “production operation.”

(2) The endpoint of gathering, under section 2.2(a)(1)(A) of API RP 80, may not extend beyond the first downstream natural gas processing plant, unless the operator can demonstrate, using sound engineering principles, that gathering extends to a further downstream plant.

(3) If the endpoint of gathering, under section 2.2(a)(1)(C) of API RP 80, is determined by the commingling of gas from separate production fields, the fields may not be more than 50 miles from each other, unless the Administrator finds a longer separation distance is justified in a particular case (see 49 CFR §190.9).

(4) The endpoint of gathering, under section 2.2(a)(1)(D) of API RP 80, may not extend beyond the furthestmost downstream compressor used to increase gathering line pressure for delivery to another pipeline.

(b) For purposes of §192.9, “regulated onshore gathering line” means:

(1) Each onshore gathering line (or segment of onshore gathering line) with a feature described in the second column that lies in an area described in the third column; and

(2) As applicable, additional lengths of line described in the fourth column to provide a safety buffer:

Type	Feature	Area	Safety Buffer
A	<p>— Metallic and the MAOP produces a hoop stress of 20 percent or more of SMYS. If the stress level is unknown, an operator must determine the stress level according to the applicable provisions in subpart C of this part.</p> <p>— Non-metallic and the MAOP is more than 125 psig (862 kPa).</p>	Class 2, 3, or 4 location (see §192.5).	None.
B	<p>— Metallic and the MAOP produces a hoop stress of less than 20 percent of SMYS. If the stress level is unknown, an operator must determine the stress level according to the applicable provisions in subpart C of this part.</p> <p>— Non-metallic and the MAOP is 125 psig (862 kPa) or less.</p>	<p>Area 1. Class 3 or 4 location.</p> <p>Area 2. An area within a Class 2 location the operator determines by using any of the following three methods:</p> <p>(a) A Class 2 location.</p> <p>(b) An area extending 150 feet (45.7 m) on each side of the centerline of any continuous 1 mile (1.6 km) of pipeline and including more than 10 but fewer than 46 dwellings.</p> <p>(c) An area extending 150 feet (45.7 m) on each side of the centerline of any continuous 1000 feet (305 m) of pipeline and including 5 or more buildings.</p>	If the gathering line is in Area 2(b) or 2(c), the additional lengths of line extend upstream and downstream from the area to a point where the line is at least 150 feet (45.7 m) from the nearest dwelling in the area. However, if a cluster of dwellings in area 2(b) or 2(c) qualifies a line as Type B, the Type B classification ends 150 feet (45.7 m) from the nearest dwelling in the cluster.

[Issued by Amdt. 192-102, 71 FR 13289, Mar. 15, 2006]

GUIDE MATERIAL

No guide material available at present.

SUBPART B MATERIALS

§192.51

Scope.

[Effective Date: 11-12-70]

This subpart prescribes minimum requirements for the selection and qualification of pipe and components for use in pipelines.

GUIDE MATERIAL

No guide material necessary.

§192.53

General.

[Effective Date: 11-12-70]

Materials for pipe and components must be --

- (a) Able to maintain the structural integrity of the pipeline under temperature and other environmental conditions that may be anticipated;
- (b) Chemically compatible with any gas that they transport and with any other material in the pipeline with which they are in contact; and
- (c) Qualified in accordance with the applicable requirements of this subpart.

GUIDE MATERIAL

This guide material is under review following Amendment 192-103 (primarily evaluating current API 5L).

1 FRACTURE TOUGHNESS REQUIREMENTS

- (a) Seam-welded steel pipe, 20 inches and larger in diameter and with SMYS of 52,000 psi or higher to be installed in transmission lines to operate at 40 percent or more of SMYS and at operating pipe temperature less than 60 °F, should exhibit sufficient notch ductility at the operating pipe temperature. Compliance with either the Charpy impact or drop weight test criteria specified in SR5 or SR6 of API Spec 5L is sufficient evidence of such ductility when impact tests are made at or below the design pipe temperature.
- (b) For special installations (e.g., compressor station piping and small replacement sections), the notch ductility should be determined by appropriate criteria, which may include those specified in SR5 or SR6.
- (c) Notch ductility tests are not necessary on pipe for small special installations (e.g., new highway crossings and extensions of compressor station headers) where pipe to be installed (i) is on hand from earlier purchases to specifications at least equal to those applicable at the time of the original installation, or (ii) is a short portion of a larger order that exhibited adequate notch ductility.

2 SOUR GAS COMPATIBILITY

- (a) See guide material under §192.475 for internal corrosion considerations.
- (b) NACE MR0175 contains guidelines for selecting materials for valves used in sour gas service. The use of controlled hardness techniques and the use of alternate materials, as described in NACE MR0175, may be effective for other components in controlling sulfide stress cracking. The use of controlled hardness techniques should not be considered a solution to other problems involving H₂S.

§192.55

Steel pipe.

[Effective Date: 7-13-98]

- (a) New steel pipe is qualified for use under this part if --
 - (1) It was manufactured in accordance with a listed specification;
 - (2) It meets the requirements of --
 - (i) Section II of Appendix B to this part; or
 - (ii) If it was manufactured before November 12, 1970, either section II or III of Appendix B to this part; or
 - (3) It is used in accordance with paragraph (c) or (d) of this section.
- (b) Used steel pipe is qualified for use under this part if --
 - (1) It was manufactured in accordance with a listed specification and it meets the requirements of paragraph II-C of Appendix B to this part;
 - (2) It meets the requirements of --
 - (i) Section II of Appendix B to this part; or
 - (ii) If it was manufactured before November 12, 1970, either section II or III of Appendix B to this part;
 - (3) It has been used in an existing line of the same or higher pressure and meets the requirements of paragraph II-C of Appendix B to this part; or
 - (4) It is used in accordance with paragraph (c) of this section.
- (c) New or used steel pipe may be used at a pressure resulting in a hoop stress of less than 6,000 p.s.i. (41 MPa) where no close coiling or close bending is to be done, if visual examination indicates that the pipe is in good condition and that it is free of split seams and other defects that would cause leakage. If it is to be welded, steel pipe that has not been manufactured to a listed specification must also pass the weldability tests prescribed in paragraph II-B of Appendix B to this part.
- (d) Steel pipe that has not been previously used may be used as replacement pipe in a segment of pipeline if it has been manufactured prior to November 12, 1970, in accordance with the same specification as the pipe used in constructing that segment of pipeline.
- (e) New steel pipe that has been cold expanded must comply with the mandatory provisions of API Specification 5L.

[Amdt. 192-3, 35 FR 17659, Nov. 17, 1970; Amdt. 192-12, 38 FR 4760, Feb. 22, 1973; Amdt. 192-51, 51 FR 15333, Apr. 23, 1986; Amdt. 192-68, 58 FR 14519, Mar. 18, 1993; Amdt. 192-85, 63 FR 37500, July 13, 1998]

GUIDE MATERIAL

Listed specifications are shown in Section I of Appendix B. The user is cautioned that there may be more recent editions of some of these specifications than those approved and listed in Section I of Appendix B.

Hence, the interpolation calculation determines that $S_T = 1506.86$ psi or 1507 psi.

- (3) To determine the HDB at 78 °F, the interpolated LTHS value is categorized using Table 1 from ASTM Standard D 2837-04, a selection of which is shown in Table 192.121ii.

Range of Calculated LTHS Values		Hydrostatic Design Basis (HDB)	
Psi	(MPa)	Psi	(MPa)
600 to <760	(4.14 to <5.24)	630	(4.34)
760 to <960	(5.24 to <6.62)	800	(5.52)
960 to <1200	(6.62 to <8.27)	1000	(6.89)
1200 to <1530	(8.27 to <10.55)	1250	(8.62)
1530 to <1920	(10.55 to <13.24)	1600	(11.03)

TABLE 192.121ii

- (4) Based upon an interpolated LTHS value of 1510 psi, the HDB to be used in the design formula for this example is 1250 psi.

For this SDR 11 PE pipe with an anticipated service temperature of 78 °F, the design pressure is calculated in accordance with §192.121 using the interpolated HDB of 1250 psi as follows.

$$P = \frac{2S}{(SDR-1)} (.32) = \frac{2(1250 \text{ psi})}{(11-1)} (.32) = 80 \text{ psig}$$

5 REFERENCES

- (a) PPI TR-4, "PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe."
- (b) PPI TR-22, "Polyethylene Piping Distribution Systems for Components of Liquid Petroleum Gases."

§192.123

Design limitations for plastic pipe.

[Effective Date: 7-10-06]

(a) Except as provided in paragraph (e) of this section, the design pressure may not exceed a gauge pressure of 100 psig (689 kPa) for plastic pipe used in:

- (1) Distribution systems; or
- (2) Classes 3 and 4 locations.

(b) Plastic pipe may not be used where operating temperatures of the pipe will be:

(1) Below -20 °F (-29 °C), or -40 °F (-40 °C) if all pipe and pipeline components whose operating temperature will be below -20 °F (-29 °C) have a temperature rating by the manufacturer consistent with that operating temperature; or

(2) Above the following applicable temperatures:

(i) For thermoplastic pipe, the temperature at which the HDB used in the design formula under §192.121 is determined.

(ii) For reinforced thermosetting plastic pipe, 150 °F (66 °C).

(c) The wall thickness for thermoplastic pipe may not be less than 0.062 inches (1.57 millimeters).

(d) The wall thickness for reinforced thermosetting plastic pipe may not be less than that listed in the following table:

Nominal size in inches (millimeters)	Minimum wall thickness in inches (millimeters)
2 (51)	0.060 (1.52)
3 (76)	0.060 (1.52)
4 (102)	0.070 (1.78)
6 (152)	0.100 (2.54)

(e) The design pressure for thermoplastic pipe produced after July 14, 2004 may exceed a gauge pressure of 100 psig (689 kPa) provided that:

- (1) The design pressure does not exceed 125 psig (862 kPa);
- (2) The material is a PE2406 or a PE3408 as specified within ASTM D2513 (incorporated by reference, see §192.7);
- (3) The pipe size is nominal pipe size (IPS) 12 or less; and
- (4) The design pressure is determined in accordance with the design equation defined in §192.121.

[Amdt. 192-31, 43 FR 13880, Apr. 3, 1978; Amdt. 192-78, 61 FR 28770, June 6, 1996 with Amdt. 192-78 Correction, 61 FR 30824, June 18, 1996; Amdt. 192-85, 63 FR 37500, July 13, 1998; Amdt. 192-93, 68 FR 53895, Sept. 15, 2003; Amdt. 192-94, 69 FR 32886, June 14, 2004 with Amdt. 192-94 Correction, 69 FR 54591, Sept. 9, 2004; Amdt. 192-103, 71 FR 33402, June 9, 2006]

GUIDE MATERIAL

1 IMPACT AND DUCTILITY

- (a) The impact and ductility properties of plastics should be evaluated when the material is intended for use in facilities subjected to low temperatures. Lower temperatures will affect thermoplastic pipe by increasing stiffness and vulnerability to impact damage.
- (b) Significant impact or shock loads on thermoplastic pipe at low temperatures can fracture the pipe. Care should be taken to avoid dropping or striking the pipe with handling equipment, tools, or other objects.
- (c) For coiled pipe, lower temperatures will require more effort to uncoil the pipe, and it can spring back forcibly if the ends are not anchored or restrained. The forceful movement of the loose pipe ends becomes more pronounced in cold weather and personnel should be aware of this for their own safety. Extra precautions should be taken when installing larger diameter coiled pipe (>3-inch) in cold temperature conditions. The manufacturer of straightening and re-rounding equipment should be consulted for recommendations regarding low-temperature equipment operation.

2 PETROLEUM GASES

The pressure-temperature relationship with petroleum gases should be such that condensation will not occur when using PE piping.

3 HOT TAPS

- (a) When making a hot-plate saddle fusion on PE pipelines, the probability of a blowout increases with an increase in pressure or a decrease in wall thickness. This should be considered, particularly when performing hot-plate saddle fusion on PE pipelines as follows: 1-inch and 1¼-inch pipe with an SDR greater than 10, and 2-inch, 3-inch, and 4-inch pipe with an SDR greater than 10. Where this is a concern, the pipeline pressure may need to be reduced during such operations. Alternatively,

a heavier wall thickness could be used than that required by the pressure design formula. See PPI TR-41, "Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping."

- (b) Electrofusion tapping tees may be used as an alternate to hot-plate fusion tapping tees to reduce the probability of blowouts when hot tapping PE pipes. The manufacturer of the electrofusion fitting should be contacted for recommendations.
- (c) Mechanical tapping tees may be used as an alternative to heat-fusion tapping tees to avoid the possibility of blowouts when tapping PE pipes.

4 EFFECTS OF LIQUID HYDROCARBONS

4.1 General.

Liquid hydrocarbons such as gasoline, diesel fuel, and condensates, either inside the pipe or in the surrounding soil, are known to have a detrimental effect on PE and PVC plastic piping materials. PA 11 piping is not affected by liquid hydrocarbons. Contact the piping manufacturer for specific recommendations.

4.2 Effect on design pressure (see §192.121).

- (a) If thermoplastic materials covered by ASTM D 2513 are to be exposed continuously to liquid hydrocarbons, it is recommended that the design pressure be de-rated in accordance with the following formula. See 4.3 below for references on this subject.

$$P_{\text{de-rated}} = P_{\S 192.121} \times DF_C$$

Where:

$P_{\text{de-rated}}$ = De-rated design pressure, gauge, psig (kPa).

$P_{\S 192.121}$ = Design pressure, gauge, psig (kPa) determined under §192.121.

DF_C = Chemical Design Factor determined in accordance with Table 192.123i.

Pipe Material	Chemical Design Factor
PA (polyamide)	1.00
PE (polyethylene)	0.50
PVC (polyvinyl chloride)	0.50

TABLE 192.123i

- (b) If PE or PVC pipe is to be exposed intermittently to liquid hydrocarbons, the pipe manufacturer should be consulted to determine the appropriate DF_C .

4.3 References.

(a) PA pipe.

- (1) "An Evaluation of Polyamide 11 for Use in High Pressure/High Temperature Gas Piping Systems," T.J. Pitzi et al., 15th Plastic Fuel Gas Pipe Symposium Proceedings - 1997, p. 107.
- (2) "Polyamide 11 Liners Withstand Hydrocarbons, High Temperature," A. Berry, Pipeline & Gas Journal, December 1998, p. 81.

(b) PE pipe.

- (1) PPI TR-9, "Recommended Design Factors and Design Coefficients for Thermoplastic Pressure Pipe."
- (2) PPI TR-22, "Polyethylene Piping Distribution Systems for Components of Liquid Petroleum Gases."
- (3) "Mechanical Integrity of Fusion Joints Made from Polyethylene Pipe Exposed to Heavy Hydrocarbons," S.M. Pimputkar, 14th Plastic Fuel Gas Pipe Symposium Proceedings - 1995, p. 141.
- (4) "Strength of Fusion Joints Made from Polyethylene Pipe Exposed to Heavy Hydrocarbons," S.M. Pimputkar, 15th Plastic Fuel Gas Pipe Symposium Proceedings - 1997, p. 309.

- (5) GRI 96/0194, "Service Effects of Hydrocarbons on Fusion and Mechanical Performance of Polyethylene Gas Distribution Piping."
- (c) PVC pipe.
"Prediction of Organic Chemical Permeation through PVC Pipe," A.R. Berens, Research Technology, November 1985, p. 57.

5 PLASTIC PIPE MANUFACTURED BEFORE MAY 18, 1978

The following language was removed from §192.123(b)(2)(i) by Amendment 192-93:

"However, if the pipe was manufactured before May 18, 1978 and its long-term hydrostatic strength was determined at 73 °F (23 °C), it may be used at temperatures up to 100 °F (38 °C)."

This language permitted the installation and operation of plastic pipe manufactured prior to May 18, 1978, at temperatures up to 100 °F using the 73 °F HDB. This sentence was removed since this vintage plastic pipe is no longer available nor is it still being installed. However, pipe installed under this clause is "grandfathered" and can continue to be operated at temperatures up to 100 °F using the 73 °F HDB.

§192.125

Design of copper pipe.

[Effective Date: 7-13-98]

(a) Copper pipe used in mains must have a minimum wall thickness of 0.065 inches (1.65 millimeters) and must be hard drawn.

(b) Copper pipe used in service lines must have wall thickness not less than that indicated in the following table:

Standard size inch (millimeter)	Nominal O.D. inch (millimeter)	Wall thickness inch (millimeter)	
		Nominal	Tolerance
1/2 (13)	.625 (16)	.040 (1.06)	.0035 (.0889)
5/8 (16)	.750 (19)	.042 (1.07)	.0035 (.0889)
3/4 (19)	.875 (22)	.045 (1.14)	.0040 (.1020)
1 (25)	1.125 (29)	.050 (1.27)	.0040 (.1020)
1 1/4 (32)	1.375 (35)	.055 (1.40)	.0045 (.1143)
1 1/2 (38)	1.625 (41)	.060 (1.52)	.0045 (.1143)

(c) Copper pipe used in mains and service lines may not be used at pressures in excess of 100 p.s.i. (689 kPa) gage.

(d) Copper pipe that does not have an internal corrosion resistant lining may not be used to carry gas that has an average hydrogen sulfide content of more than 0.3 grains/100 ft³ (6.9/m³) under standard conditions. Standard conditions refers to 60 °F and 14.7 psia (15.6 °C and one atmosphere) of gas.

[Amdt. 192-62, 54 FR 5625, Feb. 6, 1989; Amdt. 192-85, 63 FR 37500, July 13, 1998]

GUIDE MATERIAL

See §192.377 for additional requirement regarding copper service lines.

§192.197

Control of the pressure of gas delivered from high-pressure distribution systems.

[Effective Date: 10-15-03]

(a) If the maximum actual operating pressure of the distribution system is 60 psi (414 kPa) gage, or less, and a service regulator having the following characteristics is used, no other pressure limiting device is required:

(1) A regulator capable of reducing distribution line pressure to pressures recommended for household appliances.

(2) A single port valve with proper orifice for the maximum gas pressure at the regulator inlet.

(3) A valve seat made of resilient material designed to withstand abrasion of the gas, impurities in gas, cutting by the valve, and to resist permanent deformation when it is pressed against the valve port.

(4) Pipe connections to the regulator not exceeding 2 inches (51 millimeters) in diameter.

(5) A regulator that, under normal operating conditions, is able to regulate the downstream pressure within the necessary limits of accuracy and to limit the build-up of pressure under no-flow conditions to prevent a pressure that would cause the unsafe operation of any connected and properly adjusted gas utilization equipment.

(6) A self-contained service regulator with no external static or control lines.

(b) If the maximum actual operating pressure of the distribution system is 60 p.s.i. (414 kPa) gage or less, and a service regulator that does not have all of the characteristics listed in paragraph (a) of this section is used, or if the gas contains materials that seriously interfere with the operation of service regulators, there must be suitable protective devices to prevent unsafe overpressuring of the customer's appliances if the service regulator fails.

(c) If the maximum actual operating pressure of the distribution system exceeds 60 p.s.i. (414 kPa) gage, one of the following methods must be used to regulate and limit, to the maximum safe value, the pressure of gas delivered to the customer:

(1) A service regulator having the characteristics listed in paragraph (a) of this section, and another regulator located upstream from the service regulator. The upstream regulator may not be set to maintain a pressure higher than 60 p.s.i. (414 kPa) gage. A device must be installed between the upstream regulator and the service regulator to limit the pressure on the inlet of the service regulator to 60 p.s.i. (414 kPa) gage or less in case the upstream regulator fails to function properly. This device may be either a relief valve or an automatic shutoff that shuts, if the pressure on the inlet of the service regulator exceeds the set pressure (60 p.s.i. (414 kPa) gage or less), and remains closed until manually reset.

(2) A service regulator and a monitoring regulator set to limit, to a maximum safe value, the pressure of the gas delivered to the customer.

(3) A service regulator with a relief valve vented to the outside atmosphere, with the relief valve set to open so that the pressure of gas going to the customer does not exceed a maximum safe value. The relief valve may either be built into the service regulator or it may be a separate unit installed downstream from the service regulator. This combination may be used alone only in those cases where the inlet pressure on the service regulator does not exceed the manufacturer's safe working pressure rating of the service regulator, and may not be used where the inlet pressure on the service regulator exceeds 125 p.s.i. (862 kPa) gage. For higher inlet pressures, the methods in paragraph (c)(1) or (2) of this section must be used.

(4) A service regulator and an automatic shutoff device that closes upon a rise in pressure downstream from the regulator and remains closed until manually reset.

[Amdt. 192-3, 35 FR 17659, Nov. 17, 1970; Amdt. 192-85, 63 FR 37500, July 13, 1998; Amdt. 192-93, 68 FR 53895, Sept. 15, 2003]

GUIDE MATERIAL

Suitable protective devices to prevent overpressuring of customer's appliances, *as a result of service regulator failure*, with the conditions described in §192.197 (b) include the following.

- (a) A monitoring regulator.
- (b) A relief valve.
- (c) An automatic shut-off device.

These devices may be installed as an integral part of the service regulator or as a separate unit.

§192.199

Requirements for design of pressure relief and limiting devices.

[Effective Date: 11-12-70]

Except for rupture discs, each pressure relief or pressure limiting device must--

- (a) Be constructed of materials such that the operation of the device will not be impaired by corrosion;
- (b) Have valves and valve seats that are designed not to stick in a position that will make the device inoperative;
- (c) Be designed and installed so that it can be readily operated to determine if the valve is free, can be tested to determine the pressure at which it will operate, and can be tested for leakage when in the closed position;
- (d) Have support made of noncombustible material;
- (e) Have discharge stacks, vents, or outlet ports designed to prevent accumulation of water, ice, or snow, located where gas can be discharged into the atmosphere without undue hazard;
- (f) Be designed and installed so that the size of the openings, pipe, and fittings located between the system to be protected and the pressure relieving device, and the size of the vent line are adequate to prevent hammering of the valve and to prevent impairment of relief capacity;
- (g) Where installed at a district regulator station to protect a pipeline system from overpressuring, be designed and installed to prevent any single incident such as an explosion in a vault or damage by a vehicle from affecting the operation of both the overpressure protective device and the district regulator; and
- (h) Except for a valve that will isolate the system under protection from its source of pressure, be designed to prevent unauthorized operation of any stop valve that will make the pressure relief valve or pressure limiting device inoperative.

[Amdt. 192-3, 35 FR 17659, Nov. 17, 1970]

GUIDE MATERIAL

1 RUPTURE DISKS

Rupture disks should meet the requirements for design as described in the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

2 CONTROL LINES

All control lines should be protected from falling objects, excavation, or other foreseeable causes of damage. They should be designed and installed so that damage to any one control line cannot render both the district regulator and overpressure protective device inoperative.

2 DETERMINATION OF RELIEF DEVICE CAPACITY

- (a) When installed in accordance with the provisions of §192.199(f):
 - (1) Relief devices stamped by the manufacturer with a capacity certified under the rules of Section VIII of the ASME Boiler and Pressure Vessel Code, including recertification stampings, may be considered capable of relieving the capacity stamped. An adjustment should be made to determine the capacity at actual operating conditions.
 - (2) Capacities listed in information published by the manufacturer may be used to identify the capacity of the relief device under the stated conditions.
 - (3) The use of published data or data otherwise obtained from the manufacturer, and data calculated using recognized formulas, is acceptable.
- (b) Relief device capacities as set out above are normally based on the pressure measured at the inlet to the relief device with discharge to atmosphere without vent stack piping. Therefore, when the installation is not in accordance with the provisions of §192.199(f), consideration should be given to the pressure loss in the inlet piping to the relief device, the control piping location and back pressure on the discharge side caused by vent stack piping.
- (c) References include the following.
 - (1) For the calculations in 2(a)(3) above, UG-131 of Section VIII of the ASME Boiler and Pressure Vessel Code. It is not the intent herein that the capacity be limited to 90 percent of the actual capacity as set out in Section VIII rules, but only that this information is useful in calculating the actual capacity of a relief device.
 - (2) For data on relief devices which have been certified by the NBBI, "Relieving Capacities of Safety Valves and Relief Valves Approved by the National Board" (Discontinued).
 - (3) For the effect of backpressure on relief device discharge, Figure D-1 of API RP 520 P2, "Sizing, Selection and Installation of Pressure-Relieving Devices in Refineries, Part 2 Installation."

§192.203

Instrument, control, and sampling pipe and components.

[Effective Date: 7-13-98]

(a) **Applicability.** This section applies to the design of instrument, control, and sampling pipe and components. It does not apply to permanently closed systems, such as fluid-filled temperature-responsive devices.

(b) **Materials and design.** All materials employed for pipe and components must be designed to meet the particular conditions of service and the following:

(1) Each takeoff connection and attaching boss, fitting, or adapter must be made of suitable material, be able to withstand the maximum service pressure and temperature of the pipe or equipment to which it is attached, and be designed to satisfactorily withstand all stresses without failure by fatigue.

(2) Except for takeoff lines that can be isolated from sources of pressure by other valving, a shutoff valve must be installed in each takeoff line as near as practicable to the point of takeoff. Blowdown valves must be installed where necessary.

(3) Brass or copper material may not be used for metal temperatures greater than 400 °F (204 °C).

(4) Pipe or components that may contain liquids must be protected by heating or other means from damage due to freezing.

(5) Pipe or components in which liquids may accumulate must have drains or drips.

(6) Pipe or components subject to clogging from solids or deposits must have suitable connections for cleaning.

(7) The arrangement of pipe, components, and supports must provide safety under anticipated operating stresses.

(8) Each joint between sections of pipe, and between pipe and valves or fittings, must be made in a manner suitable for the anticipated pressure and temperature condition. Slip type expansion joints may not be used. Expansion must be allowed for by providing flexibility within the system itself.

(9) Each control line must be protected from anticipated causes of damage and must be designed and installed to prevent damage to any one control line from making both the regulator and the over-pressure protective device inoperative.

[Amdt. 192-78, 61 FR 28770, June 6, 1996 with Amdt. 192-78 Correction, 61 FR 30824, June 18, 1996; Amdt. 192-85, 63 FR 37500, July 13, 1998]

GUIDE MATERIAL

Instrument, control, and sampling pipe and components which extend to a remote location (adjacent room or building) should be identified by color code, signs, diagrams, or other appropriate means so that proper valves can be located and operated in an emergency. At locations where the identification of such piping is obvious, color coding, marking, diagrams, etc., may not be necessary. Also, see Guide Material Appendix G-192-13 and 3.3 of the guide material under §192.199.

§192.275

Cast iron pipe.

[Effective Date: 3-8-89]

- (a) Each caulked bell and spigot joint in cast iron pipe must be sealed with mechanical leak clamps.
- (b) Each mechanical joint in cast iron pipe must have a gasket made of a resilient material as the sealing medium. Each gasket must be suitably confined and retained under compression by a separate gland or follower ring.
- (c) Cast iron pipe may not be joined by threaded joints.
- (d) Cast iron pipe may not be joined by brazing.

[Amdt. 192-62, 54 FR 5625, Feb. 6, 1989]

GUIDE MATERIAL

No guide material necessary.

§192.277

Ductile iron pipe.

[Effective Date: 3-8-89]

- (a) Ductile iron pipe may not be joined by threaded joints.
- (b) Ductile iron pipe may not be joined by brazing.

[Amdt. 192-62, 54 FR 5625, Feb. 6, 1989]

GUIDE MATERIAL

No guide material necessary.

§192.279

Copper pipe.

[Effective Date: 4-19-93]

Copper pipe may not be threaded except that copper pipe used for joining screw fittings or valves may be threaded if the wall thickness is equivalent to the comparable size of Schedule 40 or heavier wall pipe listed in Table C1 of ASME/ANSI B16.5.

[Amdt. 192-62, 54 FR 5625, Feb. 6, 1989; Amdt. 192-68, 58 FR 14519, Mar. 18, 1993]

GUIDE MATERIAL

*This guide material is under review following Amendment 192-103
(primarily evaluating current ASME B16.5).*

- (a) Copper pipe may be joined by a mechanical joint or a brazed or soldered lap joint. The filler material used for brazing should be a copper-phosphorous or a silver base alloy.
- (b) Butt welds should not be used for joining copper pipe or copper tubing.

§192.281

Plastic pipe.

[Effective Date: 7-8-96]

(a) **General.** A plastic pipe joint that is joined by solvent cement, adhesive, or heat fusion may not be disturbed until it has properly set. Plastic pipe may not be joined by a threaded joint or miter joint.

(b) **Solvent cement joints.** Each solvent cement joint on plastic pipe must comply with the following:

(1) The mating surfaces of the joint must be clean, dry, and free of material which might be detrimental to the joint.

(2) The solvent cement must conform to ASTM Designation D 2513.

(3) The joint may not be heated to accelerate the setting of the cement.

(c) **Heat-fusion joints.** Each heat-fusion joint on plastic pipe must comply with the following:

(1) A butt heat-fusion joint must be joined by a device that holds the heater element square to the ends of the piping, compresses the heated ends together, and holds the pipe in proper alignment while the plastic hardens.

(2) A socket heat-fusion joint must be joined by a device that heats the mating surfaces of the joint uniformly and simultaneously to essentially the same temperature.

(3) An electrofusion joint must be joined utilizing the equipment and techniques of the fittings manufacturer or equipment and techniques shown, by testing joints to the requirements of §192.283(a)(1)(iii), to be at least equivalent to those of the fittings manufacturer.

(4) Heat may not be applied with a torch or other open flame.

(d) **Adhesive joints.** Each adhesive joint on plastic pipe must comply with the following:

(1) The adhesive must conform to ASTM Designation D 2517.

(2) The materials and adhesive must be compatible with each other.

(e) **Mechanical joints.** Each compression type mechanical joint on plastic pipe must comply with the following:

(1) The gasket material in the coupling must be compatible with the plastic.

(2) A rigid internal tubular stiffener, other than a split tubular stiffener, must be used in conjunction with the coupling.

[Amdt. 192-34, 44 FR 42968, July 23, 1979 with Amdt. 192-34 Correction, 44 FR 50841, Aug. 30, 1979 and Amdt. 192-34 Correction, 44 FR 57100, Oct. 4, 1979; Amdt. 192-58, 53 FR 1633, Jan. 21, 1988; Amdt. 192-61, 53 FR 36793, Sept. 22, 1988; Amdt. 192-68, 58 FR 14519, Mar. 18, 1993; Amdt. 192-78, 61 FR 28770, June 6, 1996 with Amdt. 192-78 Correction, 61 FR 30824, June 18, 1996]

GUIDE MATERIAL

1 INTRODUCTION (Plastic-to-plastic and plastic-to-metal)

To achieve sound joints in plastic piping requires skillful application of qualified procedures and the use of proper materials and equipment in good condition. Joints should be made by personnel who are qualified in the written procedures required for the type of joint involved.

6 DAMAGE PREVENTION DURING DIRECTIONAL DRILLING

See Guide Material Appendix G-192-6 for damage prevention considerations while performing directional drilling or using other trenchless technologies.

7 PLASTIC PIPE TEMPORARILY INSTALLED ABOVE GROUND

7.1 *Aboveground exposure to sunlight.*

Before using plastic pipe above ground, the operator should obtain the recommended maximum exposure time from the manufacturer and determine the date of manufacture from the Pipe Production Code marked on the pipe. If the operator cannot accurately document the actual time that pipe was stored outdoors, the entire time since the date of manufacture should be considered as aboveground exposure.

7.2 *Protection from external forces.*

Means to protect the pipe may include:

- (a) Barricades.
- (b) Fencing.
- (c) Elevation support. To prevent strain on the plastic pipe due to sagging or wind forces, elevation support should be provided. A reference for determining support spacing is PPI Handbook of Polyethylene Pipe, Chapter 8, "Above-Ground Applications for Polyethylene Pipe."
- (d) Signs and markers.
- (e) Physical barriers such as planks or sleeves.

7.3 *Temperature exposure.*

Aboveground pipe is exposed to greater variations in temperature than pipe installed below ground. During installation, consideration should be given to pipe elongation and contraction as the temperature changes during the day or seasonally.

7.4 *Valves.*

Valves installed in aboveground plastic pipe should be braced or anchored, or the adjacent pipe stiffened or reinforced, to decrease torque forces being transferred to the pipe during operation of the valve.

8 PLASTIC PIPE INSTALLED ON BRIDGES

8.1 *Design considerations.*

The following information for temperature, ultraviolet radiation, external damage, and chemical resistance should be considered when designing plastic pipe systems for installation on bridges.

(a) Temperature.

- (1) Ensure that the hydrostatic design basis (HDB) of the plastic material for the highest temperature anticipated is sufficient to meet the design pressure required by §192.121. Consider heavier wall plastic pipe or a plastic pipe material with a higher HDB at the anticipated use temperature.
- (2) If the existing HDB is insufficient for the anticipated temperature, consider the potential of both temperature increase and decrease to ensure that the pipeline and joints are adequate for the longitudinal stresses imposed by temperature variations.
- (3) Where the pipeline is installed in a casing, consider installing the pipe in a manner that minimizes thermal effects of heat transfer from the casing to the pipeline and prevents abrasion of the pipe due to thermal expansion and contraction of the plastic pipe. Methods to minimize thermal forces include the following.
 - (i) Installation of spacers. The spacers should be placed sufficiently close together to prevent excessive deflection (sag) between the spacers for anchored and guided pipe. Consideration should be given to significant longitudinal stresses when deflection is minimized. Alternatively, the spacers may be placed at a sufficient distance to allow deflection between the spacers to reduce the longitudinal stress. In either case, the amount of deflection should not allow the pipe to contact the casing between spacers. It may be necessary to consider the thermal conductivity of the spacers if they are metallic.

- (ii) Filling the annular space between the pipe and its casing with a tight-fitting insulating material.
- (b) Ultraviolet radiation.
Methods to protect plastic pipe from ultraviolet radiation include the following.
 - (1) Installation of pipe within a casing.
 - (2) Use of compatible external coating on the pipe.
- (c) External damage.
 - (1) Position the pipeline to protect it from external damage. Consider providing additional protection, such as installation in a casing or utility tunnel.
 - (2) Where installed in a casing, the pipeline should be protected from shear forces imposed by soil or other loading at the ends of the casing.
- (d) Chemical resistance.
Consider the installation environment (e.g., salts used on roads during winter, vehicle oils), and ensure that the plastic pipe is adequate for the exposure.

8.2 Other considerations.

- (a) Other regulations. The agency having jurisdiction over the bridge should be consulted to determine if there are additional requirements.
- (b) Casing end seals. Consider the installation of casing end seals to prevent water from entering the annular space between a casing and the pipeline.
- (c) Valves. Consider installing valves to isolate the pipe on the bridge in case of a leak or failure.
- (d) Seismic. Consider the effects of abnormal movement in areas of seismic activity.
- (e) Joints. Butt fusion, electrofusion, or ASTM D2513 Category 1 mechanical fittings should be used. However, Category 2 or Category 3 mechanical fittings may be used provided their joining procedure includes additional restraint as needed to meet the pullout requirements of §192.283(b).

8.3 References.

- (a) ASME I00353, "Installation of Plastic Gas Pipeline in Steel Conduits Across Bridges."
- (b) PPI Handbook of Polyethylene Pipe, Chapter 8, "Above-Ground Applications for Polyethylene Pipe."

§192.323

Casing.

[Effective Date: 11-12-70]

Each casing used on a transmission line or main under a railroad or highway must comply with the following:

- (a) The casing must be designed to withstand the superimposed loads.
- (b) If there is a possibility of water entering the casing, the ends must be sealed.
- (c) If the ends of an unvented casing are sealed and the sealing is strong enough to retain the maximum allowable operating pressure of the pipe, the casing must be designed to hold this pressure at a stress level of not more than 72 percent of SMYS.
- (d) If vents are installed on a casing, the vents must be protected from the weather to prevent water from entering the casing.

GUIDE MATERIAL

- (a) Where plastic piping must be cased or bridged, suitable precautions should be taken to prevent crushing or shearing the piping. See guide material under §192.321.
- (b) A reference for the design, installation, maintenance, repair, and monitoring of steel-cased pipelines is NACE RP0200, "Steel-Cased Pipeline Practice."

§192.325

Underground clearance.

[Effective Date: 7-13-98]

(a) Each transmission line must be installed with at least 12 inches (305 millimeters) of clearance from any other underground structure not associated with the transmission line. If this clearance cannot be attained, the transmission line must be protected from damage that might result from the proximity of the other structure.

(b) Each main must be installed with enough clearance from any other underground structure to allow proper maintenance and to protect against damage that might result from proximity to other structures.

(c) In addition to meeting the requirements of paragraph (a) or (b) of this section, each plastic transmission line or main must be installed with sufficient clearance, or must be insulated from any source of heat so as to prevent the heat from impairing the serviceability of the pipe.

(d) Each pipe-type or bottle-type holder must be installed with a minimum clearance from any other holder as prescribed in §192.175(b).

[Amdt. 192-85, 63 FR 37500, July 13, 1998]

GUIDE MATERIAL

1 CLEARANCE

1.1 Transmission lines (§192.325(a)).

If a minimum of 12 inches of clearance cannot be attained at the time of installation, less clearance may be allowed provided:

- (a) Adequate measures are undertaken to prevent contact between the pipeline and the underground structure, such as encasement of the pipeline with concrete, polyethylene or vulcanized elastomer, or the installation of sand-cement bags, concrete pads or open-cell polyurethane pads in the space between the pipeline and the underground structure.
- (b) Adequate measures are taken to prevent mechanical damage to the pipe and coating of multiple pipeline bundles installed by directional boring. Adequate measures should be employed to provide separation between the individual pipelines in the bundle in order to minimize damage to the pipe and coating. This may be accomplished by employing dielectric spacing devices (e.g., dense rubber spacers) or vulcanized elastomer spacers between the individual pipelines in the bundle. See §192.461(e).

1.2 Mains (§192.325(b)).

The following possible activities should be considered when determining the clearance to be attained between the main being installed and other underground structures.

- (a) Installation and operation of maintenance and emergency control devices, such as leak clamps, pressure control fittings, and squeeze-off equipment.
- (b) Connection of service laterals to both the main and other underground structures.
- (c) For additional methods of protection in lieu of sufficient clearance, see 1.1(a) above.

1.3 Clearance between plastic main or transmission line and any source of heat (§192.325(c)).

The operator should consider the degree of the hazard presented by the heat source when determining the clearance, insulation, or protective material. For installations near electric or steam lines, the operator should also consider the following.

- (a) A minimum radial separation of 12 inches is recommended by the Common Ground Alliance's "Best Practices" Guide, Practice Statement 2-12, which is available at www.commongroundalliance.com. See 5.3(d) of the guide material under §192.361.
- (b) For installations near electric lines, see 5.3(e) of the guide material under §192.361.

2 ADJACENT UNDERGROUND STRUCTURES

When installing new mains or replacing existing mains, the proximity and condition of existing conduits, ducts, sewer lines, and similar structures, including abandoned structures, should be considered since they have the potential to provide a path for the migration of leaking gas.

§192.327

Cover.

[Effective Date: 9-9-04]

(a) Except as provided in paragraphs (c), (e), (f), and (g) of this section, each buried transmission line must be installed with a minimum cover as follows:

Location	Normal soil Inches (Millimeters)	Consolidated rock Inches (Millimeters)
Class 1 locations	30 (762)	18 (457)
Class 2,3, and 4 locations	36 (914)	24 (610)
Drainage ditches of public roads and railroad crossings	36 (914)	24 (610)

(b) Except as provided in paragraphs (c) and (d) of this section, each buried main must be installed with at least 24 inches (610 millimeters) of cover.

(c) Where an underground structure prevents the installation of a transmission line or main with the minimum cover, the transmission line or main may be installed with less cover if it is provided with additional protection to withstand anticipated external loads.

(d) A main may be installed with less than 24 inches (610 millimeters) of cover if the law of the State or municipality --

- (1) Establishes a minimum cover of less than 24 inches (610 millimeters);
- (2) Requires that mains be installed in a common trench with other utility lines; and
- (3) Provides adequately for prevention of damage to the pipe by external forces.

(e) Except as provided in paragraph (c) of this section, all pipe installed in a navigable river, stream, or harbor must be installed with a minimum cover of 48 inches (1,219 millimeters) in soil or 24 inches (610 millimeters) in consolidated rock between the top of the pipe and the underwater natural bottom (as determined by recognized and generally accepted practices).

(f) All pipe installed offshore, except in the Gulf of Mexico and its inlets, under water not more than 200 feet (60 meters) deep, as measured from the mean low tide, must be installed as follows:

(1) Except as provided in paragraph (c) of this section, pipe under water less than 12 feet (3.66 meters) deep, must be installed with a minimum cover of 36 inches (914 millimeters) in soil or 18 inches (457 millimeters) in consolidated rock between the top of the pipe and the natural bottom.

(2) Pipe under water at least 12 feet (3.66 meters) deep must be installed so that the top of the pipe is below the natural bottom, unless the pipe is supported by stanchions, held in place by anchors or heavy concrete coating, or protected by an equivalent means.

(g) All pipelines installed under water in the Gulf of Mexico and its inlets, as defined in §192.3, must be installed in accordance with §192.612(b)(3).

[Amdt. 192-27, 41 FR 34598, Aug. 16, 1976; Amdt. 192-78, 61 FR 28770, June 6, 1996 with Amdt. 192-78 Correction, 61 FR 30824, June 18, 1996; Amdt. 192-85, 63 FR 37500, July 13, 1998; Amdt. 192-98, 69 FR 48400, Aug. 10, 2004]

GUIDE MATERIAL

See Guide Material Appendix G-192-13.

SUBPART H CUSTOMER METERS, SERVICE REGULATORS, AND SERVICE LINES

§192.351

Scope.

[Effective Date: 11-12-70]

This subpart prescribes minimum requirements for installing customer meters, service regulators, service lines, service line valves, and service line connections to mains.

GUIDE MATERIAL

No guide material necessary.

§192.353

Customer meters and regulators: Location.

[Effective Date: 10-15-03]

(a) Each meter and service regulator, whether inside or outside a building, must be installed in a readily accessible location and be protected from corrosion and other damage, including, if installed outside a building, vehicular damage that may be anticipated. However, the upstream regulator in a series may be buried.

(b) Each service regulator installed within a building must be located as near as practical to the point of service line entrance.

(c) Each meter installed within a building must be located in a ventilated place and not less than 3 feet (914 millimeters) from any source of ignition or any source of heat which might damage the meter.

(d) Where feasible, the upstream regulator in a series must be located outside the building, unless it is located in a separate metering or regulating building.

[Amdt. 192-85, 63 FR 37500, July 13, 1998; Amdt. 192-93, 68 FR 53895, Sept. 15, 2003]

GUIDE MATERIAL

1 GENERAL RECOMMENDATIONS

- (a) Where practical, no building should have more than one service line.
- (b) Meters should normally be installed at the service regulator. When more than one meter is set on a particular premises, they should typically be set at one location. If meters are installed at multiple locations on the premises, the operator should consider providing a tag or other means to indicate that there are multiple meter locations.
- (c) An outside, aboveground meter location is desirable when weather conditions, availability of space, and other conditions permit.

- (d) When selecting a meter or service regulator location, consideration should be given to the potential damage by outside forces, such as those from vehicles, construction equipment, tools, materials that might be placed on the meter, and falling objects (e.g., packed snow or ice from a roof). When such potential is evident, the meter or service regulator should be protected or an alternate location selected. See Guide Material Appendix G-192-13.
- (e) Meters and service regulators should not be installed in contact with the soil or other potentially corrosive materials. The potential for shorting out the insulating fitting should also be considered.
- (f) See guide material under §192.479 for the following relative to atmospheric corrosion.
 - (1) General considerations.
 - (2) Specific considerations regarding the meter and service regulator location and the regulator vent lines and tubing.
- (g) Section 192.353(a) requires that each meter and service regulator be installed in a readily accessible location. Each location should accommodate access for reading, inspection, repairs, testing, changing, and operation of the gas shutoff valve.
- (h) The meter location should normally permit the installation of the service line in a straight line perpendicular to the main.
- (i) Meters and service regulators should not be installed in the following locations.
 - (1) Under or in front of windows or other building openings which may be used as emergency fire exits or under interior or exterior stairways.
 - (2) A crawl space with limited clearance.
 - (3) Near building air intakes.

2 OUTSIDE METER OR SERVICE REGULATOR LOCATIONS

- (a) Outside meters or service regulators should be installed in the following locations.
 - (1) Preferably, above ground in a protected location, adjacent to the building served.
 - (2) In a properly designed buried vault or meter box.
 - (i) The vault or meter box should be located on the customer's property, either adjacent to the building served or near the gas main.
 - (ii) Vaults may be located in a public right-of-way. Consent of local jurisdictions may be required.
 - (iii) Proper design and location considerations should include ventilation, vehicular traffic (see §192.355(c)), potential for soil accumulation, surface water runoff, high water table, and proximity to building air intakes or openings.
 - (iv) Piping installed through vault walls should be properly coated to protect from corrosion.
 - (v) Note §192.189(b) that states:
A vault containing gas piping may not be connected by means of a drain connection to any other underground structure.
 - (vi) When outside a paved surface, consideration should be given to the potential for fill, topsoil, or sod being placed over the vault.
 - (vii) See guide material under §192.355 for considerations involving service regulator and relief vents in vaults.
- (b) At locations where vehicular damage is reasonably anticipated, some means of providing protection to the meter set assembly include the following.
 - (1) Distance from roadways or driveways.
 - (2) Installation of posts, parking bumpers, or barricades.
 - (3) Location behind existing protective structures.
 - (4) Installation in a buried vault or meter box.

3 INSIDE METER OR SERVICE REGULATOR LOCATIONS

- (a) Inside meter locations should be considered under the following conditions.
 - (1) An acceptable outside location is not available or practical.
 - (2) Protection from ambient temperatures is necessary to avoid meter freeze-ups. (This condition is most often encountered in low-pressure systems that pick up moisture from water-sealed gas holders or other sources.)
- (b) Where practical, meters and service regulators should not be located in confined engine, boiler, heater, or electrical equipment rooms, nor should they be located in living quarters, closets, restrooms, bathrooms, or similar locations.
- (c) Each service regulator installed within a building should be located as near as practical to the service line entry point. When selecting the service regulator location, venting requirements and the vent piping location and length should be considered. See §§192.355 and 192.357.
- (d) Where a meter or service regulator is located inside a building, §192.365 requires a readily accessible shutoff valve that, if feasible, is located outside the building.
- (e) Meters and service regulators in certain inside locations (e.g., parking garages) may require protection from vehicular damage. See 2(b) above.
- (f) For additional considerations regarding plastic service lines, see guide material under §192.375.

4 OTHER METER OR SERVICE REGULATOR LOCATIONS

An alternate consideration is a specially constructed cabinet recessed in the building wall, sealed from inside the building and vented to and accessible from outside the building.

§192.355

Customer meters and regulators: Protection from damage.

[Effective Date: 2-22-88]

- (a) *Protection from vacuum or back pressure.* If the customer's equipment might create either a vacuum or a back pressure, a device must be installed to protect the system.
- (b) *Service regulator vents and relief vents.* Service regulator vents and relief vents must terminate outdoors, and the outdoor terminal must --
 - (1) Be rain and insect resistant;
 - (2) Be located at a place where gas from the vent can escape freely into the atmosphere and away from any opening into the building; and
 - (3) Be protected from damage caused by submergence in areas where flooding may occur.
- (c) *Pits and vaults.* Each pit or vault that houses a customer meter or regulator at a place where vehicular traffic is anticipated must be able to support that traffic.

[Amdt. 192-58, 53 FR 1633, Jan. 21, 1988]

GUIDE MATERIAL

1 PROTECTIVE DEVICE

A suitable protective device should be installed downstream of the meter and regulator under the following conditions.

- (a) If the customer's utilization equipment, such as a gas compressor, could produce an excessive drop in gas pressure or a vacuum at the meter or regulator, a protective device such as the following should be used.
 - (1) Automatic shutoff valve with manual reset (for decreasing pressure).
 - (2) Restricting orifice.
 - (3) Regulating device set to close at a predetermined decrease in pressure.
- (b) If the customer's utilization equipment could cause compressed gas, compressed air, oxygen, etc., to flow back into the meter or regulator, a protective device such as the following should be used.
 - (1) Check valve.
 - (2) Automatic shutoff valve with manual reset (for increasing pressure).
 - (3) Regulating device set to close at a predetermined increase in pressure. The protective device should provide gastight shutoff if flow reversal occurs. Consideration should be given to the explosion hazard of air or oxygen mixed with natural gas or other hydrocarbons.
- (c) If a supplementary or an alternate gas supply (e.g., LPG) is interconnected for standby use and could flow back into the meter or regulator, a protective device such as those listed in 1 (a) and (b) above should be used. A 3-way valve that closes the normal gas supply before admitting the alternate supply could eliminate the need for a protective device.

2 CORROSION DAMAGE

If corrosion damage is likely to occur to meters and service regulators, see guide material under §192.479.

3 CONSIDERATIONS TO MINIMIZE DAMAGE BY VEHICLES AND OTHER OUTSIDE FORCES

See Guide Material Appendix G-192-13.

4 REGULATOR AND RELIEF VENTS AND VENT PIPING

4.1 *Outside vents and vent piping termination.*

All outside regulator vents and the outside terminations of all service regulator vent and relief lines should have vented caps, fittings, or other protection. The protection should be installed in accordance with the manufacturer's instructions, and should meet the requirements of §192.355(b). Where there is a potential for exposure to severe water or freezing conditions, special fittings or other arrangements should be used which will prevent blocking of the vent or relief line or interference with the operation of the regulator due to ice and water.

4.2 *Inside regulators.*

See §192.353 and §192.357 for design and location considerations for inside regulators. See 4.3 for vent piping design considerations.

4.3 *Vent piping design.*

- (a) Single regulator or relief vent.

The vent piping should be designed to minimize the backpressure if the regulator diaphragm ruptures or the relief valve activates.
- (b) Multiple regulator or relief vents.

Typically, a separate vent line is used for each regulator or relief valve as in (a), but a properly designed common vent line may be used.

 - (1) A common vent line should be designed and sized to:
 - (i) Minimize backpressure to the connected regulator having the largest venting flow rate, if venting occurs.
 - (ii) Ensure that the outlet pressure of the other connected regulators does not increase to an unsafe value. If a regulator diaphragm ruptures or a relief valve activates and gas