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INTRODUCTION

The purpose of the construction standards is to serve as a primary reference for Eversource Gas construction and design practices. Operations and Maintenance functions are covered in the O&M Procedures (OM's). Construction related references to the OM's are listed as needed.

FOREWORD

Any exceptions to these standards must have the prior written consent of the Manager, Policy and Compliance.

Any recommended change to the standards will be reviewed on a case by case basis. Interim changes will be published in the Gas Standards Technical Bulletin until the Standards are updated.

For information on topics not covered by these Standards, please refer to the Manager, Policy and Compliance.

This standard covers plastic services operating at pressure of up to 99 pounds per square inch gauge (PSIG) and steel services operating at pressure of up to 199 PSIG.

NOTE: This Construction Standard is divided into two subsections: Service Design and Service Construction. The Service Construction Standards apply to all services, regardless of size. However, the materials for service sizes four (4) inches and larger are addressed in CS-100, <u>Construction Standards - Gas Mains</u>.



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S.	Plastic Services		
Т.	Steel Services		
U.	Steel Services Operating at MAOP's	Over 99 PSIG to 199 PSIG.	
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I. Design

- Α. Service Design
 - 1. Plastic is preferred over steel for service material designed up to 99 PSIG.

NOTE

For New Business installations, refer to the Network Analysis Guidelines, located on the intranet under Gas Engineering.

2. Gas Flow Formulas

Plastic a.

(1) Low Pressure (Mueller Formula – Less than 1 PSIG)

$$Q = \frac{2971}{G^{0.425}} \left(\frac{h}{L}\right)^{0.575} \times d^{2.725}$$

High Pressure (Mueller Formula – Greater than or (2) Equal to 1 PSIG)

$$Q = \frac{2826}{G^{0.425}} \left[\frac{P_1^2 - P_2^2}{L} \right]^{0.575} \times d^{2.725}$$

- Q = Flow Rate in standard cubic feet per hour (SCFH)
- G = Specific gravity of gas (0.6)

h = Pressure loss in inches of water column (use 0.5" w.c.)

- d = actual internal diameter of pipe
- L = length of pipe run in feet
- P₁ = Inlet pressure in PSIA*
- P₂ = Outlet pressure in PSIA*



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(atmospheric pressure) to that pressure to obtain pressure used in calculation of 34.73 PSIA.

- B. Service Selection Size and Material:
 - 1. Services are classified by pipe size and pipe material. The entire service should be of the same pipe size and the same pipe material.
 - 2. Services should be adequately sized for present and anticipated future loads. Pressure drops should be kept to a minimum and should not exceed 10% of the inlet pressure.

Pressure			Plastic (CTS)
Low	(under 2 PSIG)	11⁄4"	1"
Intermediate	(2 PSIG to 60 PSIG)	3⁄4"	1/2"
High	(61 PSIG to 99 PSIG)	3⁄4"	1/2"
Special Service	(over 99 PSIG up to 199 PSIG)	3⁄4"	n/a

Table 1 – Minimum Service Sizes

- 3. All taps in the main should be of the maximum size possible with a given tee and shall be performed in accordance with the tee manufacturer's instructions.
- 4. Service Maximum Design Pressure
 - This is one of the factors which must be considered in establishing the Maximum Allowable Operating Pressure (MAOP). Pipe cannot be operated at a pressure which exceeds the MAOP, although other factors may further limit MAOP. The maximum test pressure cannot be more than 2.5 times the design pressure.



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- C. Location and Identification (Utility Clearances)
 - 1. Facilities should be installed in straight lines with angled offsets for obstructions whenever possible.
 - 2. Avoid installing the service in a diagonal or "wandering" pattern in the street or right-of-way.
 - 3. Avoid service installation in septic system fields.
 - 4. Avoid circuitous routes.
 - 5. Changes in direction should be at 90° or 45° (see **Figure 1**). For plastic tubing sizes the pipe can be swept for changes in direction.



Figure 1 – Preferred installation configurations

- 6. Services shall be installed with twelve (12) inches of clearance from any other underground structures.
 - a. Exceptions:
 - (1) Services should be installed with two (2) inches of clearance from separate gas facilities, such as a service crossing a main. This may be achieved with additional protection precautions.
 - (2) Exceptions must be approved by a supervisor, manager, or Gas Engineering Department and included on the Daily Activity Report.
- 7. All measurements, including depth, to utilities shall be documented on the Daily Activity Report.



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Construction Standards Page 9 of 49 Gas Services CS-200 8 Services shall not be installed parallel to existing main or as a substitute for a gas main. Parallel services may be installed, but a minimum twelve inches of separation is required between the services. Excess Flow Valve (EFV) D. An EFV shall be installed in accordance with OM-260 Installation and Testing of Excess Flow Valves and (*ADM). Ε. Curb Valve 1. New and replaced/relayed services (excluding tie-overs) shall be installed with a curb valve. 2. The preferred location is a grass area behind the curb. If such an area is not available, the next best location is in a sidewalk (see Figure 2). The curb valve should not be in a public road unless approved by a 3. Manager, Gas Operations. 4. Curb valves shall be installed on the same side of the street as the customer being served. Exceptions must be approved by a Supervisor or Manager, Gas Operations, and included on the Daily Activity Report. Alternate Sidewalk Location Preferred Curb **Box Locations** Curb Street Figure 2 – Preferred curb valve locations F. Service Termination 1. The preferred service termination is at an outside location. 2. If the location makes the new installation of an outside riser and meter manifold impractical due to spacing limitations, location of building openings, public safety (the meter set is in a walkway) or



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other constraints a new manifold may be installed inside only with

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		the approval of a Gas Operations, Director and docur Daily Activity Report. Refer to CS-300, <u>Construction Meter Fits - General</u> for additional guidance.	nented on the <u>Standard –</u>
	3.	In all cases, service line valves must be in readily acc locations that are outside of the building.	essible
G.	. One	Call Systems [Call Before You Dig (CBYD) and Dig Sal	fe]
	1.	Mark out newly installed services per the requirement <u>"Damage Prevention and Markout of Gas Facilities"</u> a	ts of <u>OM-150,</u> ind (<u>*ADM</u>).
H.	Unde	erground Sources of Heat	
	1.	If crossing or near a steam or underground electric tra- line, contact Gas Engineering Department for a non-sidesign. Steam or underground electric transmission increase the average annual ground temperature of the therefore, an analysis may need to be performed to en- conditions.	ansmission standard lines may he earth; valuate the
I.	Case	ed Bridge and Railroad Crossings	
	1.	If crossing a bridge or installing at a railroad crossing Engineering Department for a non-standard design.	, contact Gas
J.	Plas	tic Services	
	1.	Plastic Service Pressure Limitations	
		a. Plastic services are designed for pressure systems PSIG maximum allowable operating pressure	tems up to a 99 (MAOP).
	2.	Services shall be pressure tested in accordance with <u>Pressure Testing of Services</u> and (<u>*ADM</u>).	<u>OM-210</u>
	3.	Plastic pipe shall not be installed with a bend radius t the minimum bend radius specified by the manufactu diameter of pipe being installed, usually <u>27 times the</u> radius is illustrated in Figure 3.	hat is less than rer for the <u>pipe OD</u> . Bend



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П. Installation

Α. Gas Pipelines of Unknown Status

> When working with gas pipelines that are of unknown status, the company's policy is to assume that they are active until the status can be verified.

Β. Site Preparation

- Services installed at sites undergoing construction may be subjected 1. to damages due to construction activity or changing site grades. In these cases, certain additional precautions should be observed.
 - Gas facilities will not be installed in close proximity to other a. underground structures, per Section I.C.6.
 - For outside meter installations, the riser and manifold should b. only be installed after the foundation, outside walls, windows, roofing and other building related tasks are completed. If installation must occur before these tasks are completed, additional precautions must be taken to protect the riser and manifold.
 - For inside meter installations, the wall penetration and meter C. manifold should only be installed after the ceiling construction is complete. This will include all support members for the ceiling which may consist of flooring joists with decking or poured concrete floors. If there is still significant construction to be completed at the meter manifold site, the completion of the meter manifold should be scheduled after the other construction is complete.
 - d. The site must be rough graded to ensure that the pipe is installed with adequate cover and that the cover is constant and meets the requirements of Section II.H.
 - The subgrade should be within six (6) inches to twelve (1)(12) inches of final grade.
 - The final grade should be marked by the builder on the (2) foundation before service installation.
 - In all cases the final installation should have no more than е five (5) feet of cover or no less than eighteen (18) inches of cover in roadways and twelve (12) inches of cover off road.



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		(1) Shallow protectio external	installations must be provided n such as casings to withsta loads or damage due to excava	with additional and anticipated tion.	
C.	IP/HP	Inside Meter Fits			
		Refer to CS-300, <u>Cons</u> <u>Information</u> , when per	<u>struction Standards – Meter Fits</u> forming work on IP/HP inside m	<u>– General</u> eter fits.	
D.	Sleeve	es			
	1.	It may be advantageou facilitate future service paved areas and allow	us for certain installations to ins installations. The sleeves typic / the service installation to be co	tall sleeves to ally cross ompleted later.	
	2.	The sleeve must be in regulations and docke	stalled in accordance with state ts, as appropriate.	and local	
	3.	The installation shall b accordance with the <u>E</u> <u>Written Plan</u> .	e inspected by personnel qualif versource Operator Qualificatio	ied in <u>n Compliance</u>	
	4.	A sleeve does not prov	vide a gas-tight seal around the	carrier pipe.	
	5.	Sleeve installation shall meet the cover requirements for service pipe and includes the installation of tracer wire and identification tape.			
		a. Sand padding o	of the sleeve is not required.		
		b. It is preferred the installed; however tubing is installed	nat tracer wire is installed when ver, it may be installed later, wh ed.	the sleeve is en the service	
	6. If it is discovered at the time of insertion that the state and local requirements for sleeve installations are not met, the responsible Supervisor or Manager, Gas Construction shall be notified to determine a resolution			and local responsible tified to	
	 Sleeves may be schedule 40 PVC and should be large enough to allow insertion of one (1) appropriately sized service pipe. See Table 3 for suggested sleeve sizes. Polyethylene (PE) gas pipe shall not be used as sleeve material. Other suitable materials may be substituted for PVC. 		e enough to pipe. See E) gas pipe laterials may		
		a. Exception: Whe service line can services.	en replacing services, each exis be used as a "sleeve" for new i	ting plastic inserted	
	8.	No more than one (1) Double-inserted servic insert, another plastic	service may be inserted into a s ces are not allowed (e.g., existin insert).	sleeve. g steel-plastic	
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9. Sleeves containing inserted carrier pipe shall be sealed with a product to prevent water intrusion into the annular space (for example, <u>Putty, Duct Sealing).</u>

Table 3			
Plastic Pipe/Tubing Size	Suggested Casing/Sleeve Size		
1⁄2" CTS	1" IPS		
3⁄4" CTS	1¼" IPS		
1" CTS	2" IPS		
1¼" CTS	3" IPS		
1¼" IPS	3" IPS		
2" IPS	4" IPS		
4" IPS	10" IPS		

E. Encased Pipe

- 1. A casing provides a gas-tight seal around the carrier pipe.
- 2. Casings are sized in accordance with Table 3. PE pipe shall not be used as casing material.
 - a. Exception: When replacing services, each existing plastic service line can be used as a casing for new inserted services.
- 3. Encased plastic pipe shall be protected from damage during insertion by:
 - a. Closing the leading edge and preparing the casing by removing any sharp edges, projections or abrasive material.
 - (1) End bushings or casing spacers are required to prevent the carrier from being damaged by contacting a sharp feature on the inside wall of the pipe or the inner edge of the entry/exit points.
 - b. Inspecting the leading section of the plastic pipe for damage after insertion.
 - (1) Cut out any damaged pipe and remove the cause of the damage before making another insertion.
- 4. No more than one (1) service may be inserted into a casing. Double-inserted services are not allowed (e.g., existing steel-plastic insert, another plastic insert).



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- 5. Tracer wire is preferred but not required for encased pipe.
- 6. All encased pipe shall be pressure tested prior to connecting it to any other gas pipe.
- Casings containing inserted carrier pipe shall be sealed with a product to prevent water intrusion into the annular space, (for example, <u>Putty, Duct Sealing</u>).
- F. Service Stubs
 - 1. Service stubs are live gas services of any length that do not terminate with a service riser or at a location inside a building.
 - 2. Termination of the stub shall be with a curb valve and cap. The termination must remain below grade.
 - 3. The top of the valve box and cover shall be painted yellow.
 - 4. The site owner shall provide additional precautions as necessary to protect the stub locations which can include barriers to protect the service stub termination point.
 - 5. If, at the time the service installation is to be completed, the stub installation does not meet construction requirements (depth, clearance from other utilities, presence of locator wire, presence of identification tape), the installation must be brought up to the standard or the stub must be abandoned at the main.
 - Service stubs may require EFVs to be installed (See OM-260, <u>Installation and Testing of Excess Flow Valves</u> and (<u>*ADM</u>) for requirements). If the records are unclear as to the presence of an EFV on a stub, test for EFV function and install an EFV at the stub if necessary.
 - Ball markers (Item Number 582852) should be placed at least four (4) inches above the stub end.
 - 8. Stubs will be recorded on the Daily Activity Report and submitted to the Mapping Department.



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G **Materials**

- 1. All materials must be inspected before use. The material must be free from damage and marked correctly.
- 2. All new below grade metallic fittings must be coated. The installation of anodes and test stations will be as specified by the Corrosion Department.
- 3. Plastic pipe must be installed as described in OM-270, "Polyethylene Plastic Pipe Installation and Repair Practices" and (*ADM). Table 4 contains links to pipe information.

Table 4		
Pipe	Refer to Material Standard	
⅓ — 1 ¼" Plastic Pipe (CTS)	PIPE, PLASTIC	
2" Plastic Pipe (IPS)	PIPE, PLASTIC	

Η. Excavation and Backfill

- 1. See CS-600, Construction Standard – Cross Bore Prevention and Trenchless Installation for excavation requirements using trenchless technology.
- When trenching machines are used for the installation of services 2. the maximum pipe size allowed is a nominal two (2) inch.
- 3. Figure 8 describes the type, minimum compacted depth, and placement order of trench backfill.
- 4. Backfill should be in the ranges listed.
- 5. Preferred pipe cover in normal soil is twenty-four (24) inches.
 - When conditions do not permit normal depths such as with a. consolidated rock or a utility crossing, then a minimum cover of eighteen (18) inches in streets and roads and twelve (12) inches in private property are acceptable for the length of the crossing.
 - b. In street locations where future changes in grade are a possibility, depth of subgrade work must be considered as well as the final grade.
- 6. The bottom of the trench shall be free of clumps of hardened earth, rocks or sharp objects.



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Construction Standards Page 22 of 49 Gas Services CS-200 2. If both distances cannot be met, the tape should be placed approximately halfway between the ground surface and the top of the pipe. J. Pipe support Each open trench service line must be installed so as to minimize anticipated piping strain and external loading. Each service line must be properly supported on undisturbed or well compacted soil, and material used for backfill must be free of materials that could damage the pipe or its coating. K. Sand Padding 1. Padding is not required if the original soil consists of material similar to the sand or rock free fill specified for padding, compacted to a minimum depth of four (4) inches below the pipe. 2. Sand or rock-free fill free of organic material (rocks no larger than half $(\frac{1}{2})$ inch in diameter) shall be used directly above the pipe and mechanically compacted to a minimum depth of six (6) inches above the pipe. 3. Replacement sand padding will be graded as specified in SPC T-2, Trench – Gas Main – Sand Padding L. Fill 1. Material suitable to the final surface restoration shall be used to complete the backfilling. If the material that was removed from the trench is unsuitable for backfilling, suitable material must be obtained. 2. If required, replacement fill shall meet the requirements as specified in SPC T-4, Trench – Gas Main – Replacement Fill. Μ. Processed Aggregate (Stone) 1. If a processed aggregate base is required the installation shall be in a manner which conforms to the lines, grades, compacted thickness and typical cross sections required by state, municipal or company specifications as required. 2. Materials shall consist of a mixture of coarse and fine aggregates combined and mixed by approved methods so that the resulting material shall meet all requirements for processed stone as specified in SPC T-3, Trench – Gas Main – Processed Aggregate. N. Compaction EVERS Original Issue Date: 02/28/2017 **Revision Number: 2** GAS OPERATIONS

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	Compaction should be p <u>Excavation in MA Roady</u> OM-281-ADM, <u>Excavation</u> Connecticut.	performed in accordance with <u>ways-Administrative</u> in Massa on in CT Roadways-Administr	OM-280-ADM, chusetts, or <u>rative</u> in	
Curb	Valve and Box			
1.	Backfill material shall be carefully compacted. This will serve to stabilize both the valve and the box and protect the pipe against excessive torsional or shear loads when the valve is operated.			
2.	A plastic snap-on curb box with sliding halves is preferred for curb valves that are located away from wheel loads and hot asphalt (see Figure 9).			
3.	Use a heavy-duty valve would expose the curb b cutouts to fit over the va stresses to the valve wh	box when the location of the o box to wheel loads. These box lve to minimize the transmitta en it is being operated.	curb valve kes provide l of shear	
4.	When a valve box with a screw adjustment is used, care must be taken to avoid transmitting wheel loads to the service line by supporting the box independently.			
5.	The top of the valve box	and cover shall be painted ye	ellow.	
		Table 5		
	Fittings	Refer to Material Standard		
	Curb Valve	VALVE, CURB, STAB, PLAST	IC	

Table 6		
Fittings	Refer to Material Standard	
Plastic Curb Box	BOX VALVE, CURB	
Heavy Duty Curb Box	BOX VALVE, HEAVY DUTY	



О.

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Construction Standards Page 25 of 49 Gas Services CS-200 (1) **CONNECTICUT:** Protective coatings shall be applied at the time of installation on bare fittings, and to repair factory applied coatings of the piping. Table 7 Fittings **Refer to Material Standard** Lockwing Meter Valve VALVE, METER Lockwing Meter Valve VALVE, METER, INSULATING Tamper Proof Lock LOCK, EQUIPMENT 2. **Outside Termination** Plastic pipe shall be installed below ground. If a service a. terminates above ground level: (1)It shall be protected against deterioration and external damage (e.g., sunlight, temperature, mechanical impact). (2) It shall not be used to support external loads. An anodeless service riser two (2) inches and below will have b. a lockwing valve installed. Risers installed in concrete and/or asphalt shall be sleeved to C. protect from heat or mechanical damage. The material may be metal or plastic. Approved PVC shear sleeves may be used. It is important to note that the closest point on a meter fit d. should be about six (6) inches from the building. Riser installation should take this distance into account. Installation of service lines under buildings is not allowed. e. Table 8 Fittings **Refer to Material Standard** PVC sleeve **SLEEVE, PROTECTION, PVC** 3. **Inside Termination** a. The meter valve and meter set must be located as close as practical to the service entrance Each new service line, not in use, shall be left with the meter b. valve locked in the closed position utilizing a lockwing meter valve and plugged or capped. Additionally, if installed, all manifold valves shall be in the closed position and open pipe ends shall be sealed.



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	given to properly compact the backfill so protection sleeve.	il under the
(5)	See Figure 10 & Figure 11 for protection illustrations.	n sleeve
(6)	Change in Temperature - Tensile stress thermal expansion/contraction can be av- installing the plastic pipe with slack. Cor- main should be made with a sweep ben- When sweep bends cannot be formed, s provided in the plastic pipe before conne- tee.	es caused by voided by mections at the d if possible. slack must be ection to the
	Table 9	_
Fittings	Refer to Material Standard	
Transition Fitting	FITTING, TRANSITION, STEEL TO PLASTIC, PE4710	
Couplings	COUPLING, COMPRESSION, STEEL / PLASTIC	



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- 2. Service Line Insertion
 - (1)
 - b. An abandoned service used as a sleeve for insertion of pipe must meet current requirements for cover. The cover will be verified at insertion and exit points of the sleeve, or at any other points where the pipe sleeve is visible.
 - (1) If the requirements for cover cannot be met with the existing sleeve, any exceptions must be approved by a supervisor, manager, or Gas Engineering Department and included on the Daily Activity Report.
 - c. The abandoned service pipe should be evaluated for any potential changes in expected service conditions when used as an insert.

Table 10			
Fittings	Refer to Material Standard		
End Protector Bushing	BUSHING, PLASTIC		
Protection Sleeve	SLEEVE, PROTECTION, PVC		

- 3. Tracer Wire
 - a. Each service must be installed so that an electrically conductive path exists from the main to the service termination.
 - b. The tracer wire must <u>never</u> be electrically connected to a steel or cast iron main.
 - c. Upon installation, verify that the facility can be located. The tracer wire shall be replaced or repaired if the facility cannot be located. A tone generating continuity checking tool or a traditional locator can be used for this process.
 - d. When services are installed from plastic mains the tracer wire shall be spliced into the tracer wire for the main.
 - e. For inserted outside risers, the tracer wire shall be bonded to the end of the casing and terminated above ground at the riser.
 - f. The tracer wire shall be firmly attached to the riser using company approved materials with sufficient slack to prevent the tracer wire from being buried during backfill.



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g.	Tracer wire may be wrapped around the servic	e tee on stee
h.	For inside terminations, the tracer wire shall be riser using the approved grounding clamp.	bonded to the
i.	For inside terminations, a loop of tracer wire sh brought up into the curb box. With access to th markout technicians will be able to connect the directly to the wire and locate the service as ac possible.	nould be e tracer wire ir equipment ccurately as
j.	For outside terminations, the tracer wire shall t above ground at the base of the riser for facility purposes.	erminate / locating
k.	All tracer wire splices shall be protected using approved materials. The preferred method for protecting tracer wire splices is a split bolt con housing. Electrical tape is not an approved coa	company joining and nector with ating material
I.	When performing installation by directional dril ten (10) gage wires to the pulling head prior to	ling, attach tv pull back.
m.	For installations utilizing a mole, or by direction tracer wire should be free of splices and may b with the service line. Care must be taken not to continuity of the wire during this process.	nal drilling, the pe pulled alor o damage the
n.	When utilizing a sleeve for the conductive path the casing such as for the removal of a valve s jumpered (bonded) to maintain electrical contir	, any gaps in hall be nuity.
Ο.	Electrical connections to steel sleeve pipes ma accomplished by thermite welding the wire(s) t by mechanically attaching the wire(s) to the pip grounding clamp. See Figure 12 .	ly be o the pipe or be using a
Thermite welding of as the heat generation CS-500 <u>Constru</u>	<u>WARNING</u> (cadwelding) must be completed prior to insertion ated from the process will likely damage the plast action Standards – Corrosion Control for more info	of the pipe ic. Refer to ormation.

1) Thermite welding is the preferred method of making such connections because the electrical connection is



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		permanent and is protected from corros itself.	ion by the w	eld
	(2)	Mechanical grounding clamps are alternate method.	an accepta	ble
	(3)			
p.	Enca with I	psulate thermite weld or grounding clamp below ground use wax tape (see Table 11	connection).	
q.	Direc	t Burial		
	(1)	The tracer wire will be laid in the trench and the pipe to ensure the wire is not the pipe. If there is good reason the installed beneath the pipe as descr Manager, Gas Operations can approvinstallation on a case by case basis. The result in a tracer wire being n approximately nine (9) inches away from the pipe (see Figure 12).	below the sa in contact w wire cannot ibed above, /e an alterna nis standard o more the om centerline	nd vith be ate will an of
		NOTE 1		
Contact betv	veen th	e tracer wire and the plastic pipe is not all	owed.	

NOTE 2

Incidental contact in the trench between the plastic pipe and the tracer wire is permissible when avoidance is not practical, such as when the service is installed in a sleeve or installed by directional drilling.

Table 11		
Fittings	Refer to Material Standard	
Tracer Wire	CABLE, MEDIUM DENSITY POLYETHYLENE	
	COPPER	
Tie Wraps	TIE, LASHING, BLACK NYLON	
Housing	CONNECTOR, HOUSING, SPLIT BOLT	
Mechanical Bug	CONNECTOR, SPLIT BOLT	
Wax Tape	TAPE, CORROSION, PROTECTION, WAX, FOR	
(Below Ground)	BELOW GROUND USE	



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Construction Standards Page 34 of 49 Gas Services CS-200 4. Joining Techniques General a. (1)Each plastic pipe joint must be made in accordance with OM-270, Polyethylene Plastic Pipe Installation and Repair Practices and (*ADM). (2) Pipe, up to and including 1-1/4 inch CTS, shall be joined using mechanical fittings or electrofusion fittings. (3) Service pipe two (2) inches and larger shall be joined using one of the following joining methods listed in order of preference: (a). Heat Fusion Joints (b). **Electrofusion Joints** (c). **Mechanical Joints** 5. Service Tee Connections to Cast Iron Mains a. Each new service-line connection to a main must be located at the top of the main or, if that is not practical, at the side of the main. Where a tap is made in cast iron pipe, the diameter of the b. tapped hole may not be more than twenty-five (25) percent of the nominal diameter of the pipe unless the pipe is reinforced, except that: Existing taps may be used for replacement services if (1) the taps are free of cracks; and, (2) A $1-\frac{1}{4}$ inch tap may be made in a four (4) inch cast iron pipe without reinforcement. A pipe repair clamp or a split sleeve will be used for main C. connections when a reinforced joint is necessary. d. When an unreinforced tap is allowed, the connection to mains eight (8) inch in diameter and smaller will be made with a saddle. Street tees with outlets for plastic are available in tubing sizes e. and up to two (2) inch IPS pipe. A threaded main connection will be used to connect the street tee to the main, see Figure 14 and Figure 15. EVERS=URCE Original Issue Date: 02/28/2017

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Construction Standards Page 36 of 49 Gas Services CS-200 6. Service Tee Connections to Steel Mains General a. (1) Service tees should be selected according to the pressure of the distribution system. (2) All taps shall be of the maximum size possible with a given tee and will be done according to the tee manufacturer's instructions. Street tees shall only be used on low pressure mains. (3) Each service-line connection to a main shall be located (4) at the top of the main or, if that is not practical, at the side of the main. Coating removed for the main connection shall be (5) repaired. Low Pressure b. Welded service line connections to low pressure steel (1) mains is preferred; if weld connections are not practical, a company approved mechanical connection will be utilized. (2) A threaded main connection (street tee) shall be used to connect these low-pressure service tees to the main. Street tees with outlets for plastic are available in sizes up to two (2) inch IPS pipe. Intermediate and High Pressure c. (1) Service-line connections to intermediate and highpressure steel mains shall be made by welding the service tee directly on the main. For outlet sizes two (2) inch and greater, a transition (2) fitting shall be welded and fused or coupled to the plastic service. Weld base service tees shall be used on all steel (3) mains as shown in **Figure 16** (exceptions are LP steel mains and where street tees are utilized). Table 14 Fittings **Refer to Material Standard** Coupling COUPLING, STAB, PLASTIC Transition Fitting FITTING, TRANSITION, STEEL TO PLASTIC No-Blo Tee TEE, STEEL, NON-BLOWING VALVE, EXCESS FLOW Excess Flow Valve



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8.	Term	ination	S	
	a.	Outsi	ide Termination	
		(1)	The "Do Not Bury" line on the prefabrica service riser shall be located at or above grade.	ted anodeless finished
		(2)	Straight risers must be supported with a	bracket.
	b.	Inside	e Termination	
		(1)	Each underground plastic service line in the foundation wall of a building must ind protective casing/sleeve and be sealed a foundation wall to prevent leakage of ga the building (see Figure 5).	stalled through clude a at the s or water into
		(2)	At the shear point, protection must be pr	ovided.
		(3)	If the service is not in use, it must be clo and plugged at the termination. See <u>Sec</u>	sed, locked, tion II.T.6.c.
	C.	Inser	t	
		(1)	The plastic tubing shall terminate in a pla adapter fitting threaded on to the steel c	astic to steel asing.
		(2)	The structural integrity of the existing ga should be evaluated for use as a sleeve proceeding with the insert.	s service before
	d.	The r	iser valve shall be locked in the closed po	sition.
		(1)	Exception: For each service line that is the meter valve should be left in the close does not need to be locked.	not energized ed position but
			Table 15	
Fi	ittings		Refer to Material Standard (CT)	
Service	Head A	dapter	(MA materials will be included at a later time) ADAPTER, STEEL/PLASTIC. For Service I	lead
Elbow			ELBOW, THREADED, 90 DEGREE	
Pipe			NIPPLE, THREADED PIPE	
Riser			RISER, SERVICE	
Protectio	on Sleev	/e	SLEEVE, PROTECTION, PVC	

T. Steel Services

1. Service Line Protection

Lockwing Meter Valve VALVE, METER, INSULATING



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- a. Each new steel service must have an external protective coating and be part of a cathodic protection system. Field application of protective coatings will be necessary to repair factory applied coatings and when bare fittings are used. The protective coating must be inspected just prior to backfilling and any damage detrimental to effective corrosion control must be repaired. The protective coating must be protected from damage resulting from adverse ditch conditions.
- b. The cathodic protection system for each service shall be reviewed by corrosion technician or Gas Engineering.
- c. Coated pipe installed by boring or driving shall not be used as a gas carrier without review and approval of the manager, Corrosion. Refer to <u>CS-500 Construction Standards –</u> <u>Corrosion Control</u> for more information.
- 2. Joining Techniques and Operating Pressures
 - Each mechanical or welded joint must be made in accordance with the <u>Eversource Welding Manual</u>. See <u>CS-120, Construction Standards Mains Steel</u>, for requirements on mitered joints.
- 3. Maximum Allowable Operating Pressure (MAOP)
 - a. See <u>OM-210 Testing of Service Lines</u> and (<u>*ADM</u>), for pressure testing requirements.
- 4. Connections to Mains
 - a. Steel Mains Each service connection to a main must be located at the top of the main or, if that is not practical, at the side of the main. Coating removed for the main connection must be repaired.
 - (1) High Pressure Service-line connections to high pressure steel mains will be made by welding the service tee directly on the main.



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- 5. Service Tees
 - a. Service tees should be selected according to the wall thickness of the main and the size of the service pipe. Nonblowing tees must be used on all intermediate and highpressure mains. Since all non-blowing tees stocked have a weld inlet and weld outlet, it will be necessary to install an insulated compression coupling or weld insulator near the tee if an insulated service is specified by a Corrosion Test Specialist. Service tees must be field coated. Refer to <u>CS-500 Construction Standards – Corrosion Control</u> for more information.
 - b. Non-Blowing Punch Tees These service tees are for use on high-pressure steel gas mains with a wall thickness up to 0.375 inches.
 - c. Non-Blowing Drilled Tees These service tees are for use on high-pressure steel gas mains with a wall thickness in excess of 0.250 inches or when the wall thickness is unknown or when the service size is greater than 3/4 inch.

Table 16		
Fittings	Refer to Material Standard	
Steel Punch Tee	TEE STEEL NON-BLOWING, PUNCH	
Steel No-Blo Tee	TEE, STEEL, NON-BLOWING, OR	
	TEE, STEEL, NON-BLOWING, INSULATED	

d. Street Tees - The street tees are listed below. The tee selected must be appropriate for the pressure system. Low pressure street tees should not be used on intermediate or high-pressure mains.

Table 17	
Fittings	Refer to Material Standard)
Steel Street Tee	TEE, STREET



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	The material may be metal or plastic. Ap shear sleeves may be used.	pproved PVC
Fittings PVC sleev	Table 20Sector Refer to Material StandardWe SLEEVE, PROTECTION, PVC	
c. Inside	Termination	
(1)	Each underground steel service line inst grade through the outer foundation wall must be inserted through a sleeve when through the foundation wall and opening a product to prevent water intrusion into space (for example, <u>Putty, Duct Sealing</u>)	talled below of a building e it passes gs sealed with the annular).
(2)	The meter valve and meter set must be close as practical to the service entranc insulating fitting will be installed to elect the service from the customer's piping. <u>Construction Standards -Corrosion Con</u> acceptable methods of insulation.	located as e. An rically isolate See CS-500, <u>trol</u> for
	Table 21	
Fittings Elbow Pipe Insulated Union Lockwing Meter V	Refer to Material Standard ELBOW, THREADED, 90 DEGREE NIPPLE, THREADED PIPE UNION, INSULATED Valve VALVE, METER, INSULATING	
Steel Services Ope	rating at MAOP's Over 99 PSIG to 199 P	SIG
1. Scope	5	
The construct steel service	ction and testing of these steel services is sexcept as noted.	s the same as
2. Service-Line	Valves	
The weld end regulator and square adap for service-lin valve.	d valve located before the aboveground f d an additional weld end valve, with a two ter installed as a curb valve, will satisfy th ne valves. Use the heavy-duty valve box	irst cut (2) inch ne requirement over the curb
	Con Fittings PVC sleev c. Inside (1) (2) Fittings (1) (2) (2) Fittings (1) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	Construction Standards Gas Services CS-200 The material may be metal or plastic. At shear sleeves may be used. Table 20 Fittings Refer to Material Standard PVC sleeve SLEEVE, PROTECTION, PVC c. Inside Termination (1) Each underground steel service line ins grade through the outer foundation wall and opening a product to prevent water intrusion into space (for example, Putty, Duct Sealing (2) The meter valve and meter set must be close as practical to the service entrance insulating fitting will be installed to elect the service from the customer's piping. Construction Standards -Corrosion Con acceptable methods of insulation. Table 21 Table 21 Etitings Refer to Material Standard Elbow Pipe NIPPLE, THREADED, 90 DEGREE Pipe NIPPLE, THREADED or PIPE Insulated Union UNION, INSULATED Lockwing Meter Valve VALVE, METER, INSULATING Steel Services Operating at MAOP's Over 99 PSIG to 199 P 1. Scope The construction and testing of these steel services is steel services except as noted. The weld end valve located before the aboveground for regulator and an additional weld end valve, with a two square adapter installed as a curb valve, will satisfy th



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3. Joining Techniques

All joints before the first cut regulator shall be welded.

4. Excess Flow Valve

See OM-260, Installation and Testing of Excess Flow Valves and (<u>*ADM</u>), for more information.

- 5. First Cut Regulator
 - a. Preferred Design
 - (1) For customers with a connected load of up to 1,000 SCFH, a first cut combination regulator-relief valve will be installed above ground just ahead of the service regulator. See illustration below. Also, see CS-300, Construction Standards – Meter Fits - General for more information.

	Table 22		
	Fittings	Refer to Material Standard (CT) (MA materials will be included at a later time)	
1	Square Head Adapter	ADAPTER, SQUARE HEAD, 2"	
2	Heavy Duty Curb Box	BOX, VALVE, HEAVY DUTY	
3	Elbow	ELBOW, WELDING, 90 DEGREE	
4	Pipe, Coated	PIPE, STEEL, ELECTRIC RESISTANCE WELD	
5	Pipe, Coating Removed	PIPE, STEEL, ELECTRIC RESISTANCE WELD	
6	Regulator/Relief Valve	REGULATOR, GAS, SELF OPERATED, INTERNAL RELIEF, 3/4" IPS INLET	
7	Тее	TEE, STEEL, NON-BLOWING, With Cast Iron Cap	
8	Flow Limiter	VALVE, EXCESS FLOW	
9	Valve	VALVE, PLUG, 3/4" IPS, WELD ENDS	
10	Insulated Union	UNION INSULATED	
11	Lockwing Valve	VALVE, METER	
12	Ball valve	VALVE, BALL, STEEL, WELD/WELD	



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1	3/23/2018	Original Issue.	
2	9/23/2019	 Section I.B.4.a.: changed maximum test pressure from 3 times design pressure to 2.5 times design pressure Section I.J.3.: added Figure 3 to illustrate bend radius Section I.J.4.: updated Figure 4 Section II.D.: added paragraph 9; changed "Maxiumum Casing/Sleeve Size" to "Suggested Casing/Sleeve Size" Section II.E.: added paragraph 7 Section II.H.: referred to CS-600 for trenchless installation requirements Section II.S.3.: added requirement to test tracer wire continuity at installation Throughout document: editorial changes to improve readability or formatting. 	

Note: Section numbers referenced in the table correspond to section numbers in the updated procedure.



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