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Gas Material Specifications

**City of Mesa
Energy Resources Department**

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Revision Log for the City of Mesa Gas Material Specifications Manual

March 2021

Section	Changes
Book-holders List	Removed L. Hall, J. King, B. Norton, and J. Urquijo Added A. Balderrama, M. Boyer, K. Korch, D. Salaiz and S. Sarager

Specification	Changes
GMS-1.1 Steel Pipe	Specified non-domestic pipe is acceptable for pipe purchased and delivered uncoated (i.e. bare pipe). Added 10 in and 12 in steel pipes as options. Minor edits for clarity.
GMS-2.2 Steel Butt-Welding Fittings	Added 10 in and 12 in steel fittings.
GMS-7.4.3 Rotary Gas Meters	Added Dresser 10C rotary meter as an option. Added Honeywell EC 350 volume corrector to the specified compatibility list. Minor edits for clarity.
GMS-7.4.4 500 Class Meters	New material specification.
GMS-8.4 ANSI Class 300 Weld-End Ball Valve	Specified vertical gear for Broen 8" Valve. Added Fluorolastomer as an acceptable stem o-ring material to reflect Broen's current stem seal design. Added 10" and 12" valves as options for Broen. Added MT Deason HiSeal as approved valves for 10" and 12" sizes.

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GAS MATERIAL SPECIFICATIONS BOOK-HOLDERS

HARD-COPY BOOK HOLDERS

- | | |
|--------------|--------------|
| 1. J. Montez | 2. S. Montez |
|--------------|--------------|

ELECTRONIC NOTIFICATION RECEIVERS

- | | |
|------------------|-------------------|
| 1. A. Balderrama | 12. R. Gump |
| 2. M. Blackmore | 13. H. Jones |
| 3. M. Boyer | 14. K. Korch |
| 4. J. Brooks | 15. G. Ramirez |
| 5. J. Ceja | 16. A. Rodeheaver |
| 6. A. Davison | 17. M. Saiz |
| 7. D. Denning | 18. D. Salaiz |
| 8. N. Estrada | 19. S. Sarager |
| 9. D. Forrest | 20. S. Sherwood |
| 10. D. Fugate | 21. G. Tran |
| 11. E. Gollihar | |

Note: Book holders elected to receive electronic notifications will only receive notifications to Gas Material Specifications updates via email with a copy of the change log as an attachment. The emails will be sent with high priority and contain “GAS MATERIAL SPECIFICATIONS UPDATE” as the subject.

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Scope:

The City of Mesa Gas Material Specifications manual includes gas-carrying pipe, components and miscellaneous construction material approved for use in the natural gas distribution systems. The Gas Material Specifications manual will be maintained within the Energy Resources Department by the Gas Planning Engineer (GPE). Changes and additions to the specifications will require the approval of (1) the Energy Resources Coordinator and (2) the Energy Resources Compliance Administrator. The Energy Resources Compliance Administrator will be responsible for final approval and the release of all specifications.

Procedure for Updating Gas Material Specifications:

The following approval and implementation process will ensure compliance with applicable codes and regulations:

QUESTIONS REGARDING MANUAL – All inquiries shall be forwarded to the GPE. The GPE will respond as required.

EDITS TO EXISTING SPECIFICATIONS - All edits shall be forwarded to the GPE. The GPE will analyze the request and make recommendations to the Energy Resources Coordinator and the Energy Resources Compliance Administrator. Upon final approval, the GPE will complete edits to specifications and forward updated material to book-holders.

ADDITIONS TO MANUAL - All requests for new material specifications shall be forwarded to the GPE. The final approval process will be determined by the type and scope of the request. Certain material may require extensive field testing to determine the long term performance of the material in the City of Mesa's natural gas distribution systems. Initially the GPE will research the request and make recommendations to the Energy Resources Coordinator and Energy Resources Compliance Administrator. Further approval will be secured as required. Upon final approval, the GPE will complete the additions to the manual and forward updated material to book-holders.

MANUAL UPDATES - Upon final approval, the GPE will distribute updated specifications and additions to the manual. A Revision Log will be distributed with all updates. The distribution will include a hard copy for those individuals on the current book-holders list and an electronic copy to the Public Information Officer. The Public Information Officer will update the Gas Material Specifications manual posted on the Energy Resources Department's webpage.

TRAINING - New material may require changes to existing practices and procedures. Upon recommendation from the Energy Resources Compliance Administrator, the GPE will work with the Energy Resources Compliance Coordinator to enhance existing or develop new training courses. The GPE will ensure that new pipe, components or other material are not released to the field until the Energy Resources Compliance Coordinator has implemented all applicable training.

MATERIAL INVENTORY - The GPE will notify the Gas Meter and Supply Supervisor and the Mail, Print, and Materials Administrator of any changes or additions to the manual. The GPE will also provide an implementation date that will coincide with applicable training. The Gas Meter and Supply Supervisor will work with the City's Material and Supply to set inventory limits and reorder points or stock the item within the Gas Division as applicable.

Manual Review:

The Material Specification Manual will be reviewed periodically and updates will be distributed upon approval of revisions. A Revision Log will be maintained and distributed to all Book-holders to track changes and updates.

<u>GM-1</u>	<u>Steel Pipe</u>	<u>Revision Date:</u>
GMS-1.1	Steel Pipe	Mar 2021
GM-1.2	Steel Pipe Casing	12/1/2009
GM-1.3	Mill Coating of Steel Pipe	
GM-1.3.1	Extruded Polyethylene Coating for Steel Pipe	9/27/2012
GM-1.3.2	Powercrete Coating of Steel Pipe	12/1/2009
GMS -1.3.3	Fusion Bonded Epoxy Coating for Steel Pipe	Nov 2018
<u>GM-2</u>	<u>Steel Fittings</u>	
GM-2.1	Steel Pipe Flanges	
GM-2.1.1	150 lb. Steel Pipe Flanges	4/17/1989
GM-2.1.2	300 lb. Steel Pipe Flanges	4/17/1989
GM-2.1.3	Flange Gaskets	5/13/1988
GM-2.1.4	Bolts for Pipe Flanges	2/10/1972
GM-2.1.5	Insulating Materials for Flanged Joints	2/10/1972
GM-2.2	Steel Butt-Welding Fittings	Mar 2021
GM-2.3	Screwed Fittings – Malleable Iron	Nov 2016
GM-2.4	Screwed Fittings – Malleable Iron Insulating Union	12/30/1971
GM-2.5	Compression Fittings – Boltless	-
GM-2.6	Compression Fittings – Boltless Insulating Couplings	-
GM-2.7	Steel Service Tees	
GM-2.7.1	Steel to P.E. Service Tee with Compression Outlet	4/4/2008
GM-2.7.2	Steel to Steel Service Tee	Nov 2016
GM-2.7.3	Steel to P.E. Transition Fitting Service Tee	12/1/2009
GM-2.7.4	Steel to P.E. Service Tee with Lycofit® Outlet	4/4/2008
GM-2.8	Steel Pipe Nipples	Nov 2016
<u>GM-3</u>	<u>Polyethylene Pipe</u>	
GMS-3.1	Medium Density Polyethylene Pipe	Jan 2019
<u>GM-4</u>	<u>Polyethylene Fittings</u>	
GM-4.1	Fusion Fittings	
GM-4.1.1	Medium Density Polyethylene Fusion Fittings	Mar 2019

GM-4.1.2	Medium Density Polyethylene Tapping Tees and Branch Saddles	Mar 2019
GM-4.2	Mechanical P.E. Fittings	
GM-4.2.1	Lycofit® Mechanical Fittings for P.E. Pipe	1/28/2014
GM-4.2.2	Permasert® Mechanical Fittings for P.E. Pipe	Mar 2019
GMS-4.3	Polyethylene Electrofusion Fittings	July 2014
<u>GM-5</u>	<u>Service Risers</u>	
GM-5.1	1" and 2" Anodeless Service Risers	Sept 2018
GM-5.2	¾" Pre-Assembled Anodeless Service Riser Kits	Sept 2018
GM-5.3	¾" Pre-Assembled Anodeless Service Risers with Service Valves	Sept 2018
GM-5.4	¾", Flexible, Anodeless Service Risers for Gas Street Lights	4/4/2008
GM-5.5	2" Straight Anodeless Service Riser	12/1/2009
<u>GM-6</u>	<u>Regulators</u>	
GM-6.1	¾" Service Regulators Straight-through Design, 3/16" Orifice	Nov 2016
GM-6.2	¾" Service Regulators 90-Degree Angle Body Design, 3/16" Orifice	Nov 2016
GM-6.3	1" Service Regulators	Nov 2016
GM-6.4	2" Service Regulators	Nov 2016
<u>GM-7</u>	<u>Meters and Components</u>	
GM-7.1	Meter Set Assembly with In-line Regulator	April 2017
GM-7.2	Meter Set Assembly with 90-Degree Angle Body In-line Regulator	1/28/2014
GM-7.3	Gas Meter Manifold	3/8/1999
GM-7.4	Gas Meters	
GMS-7.4.1	250 Class Residential Meters	July 2014
GMS-7.4.2	400 Class Residential Meters	Nov 2016
GMS-7.4.3	Rotary Gas Meters	Jan 2021
GMS-7.4.4	500 Class Meters	
GM-7.5	Property Line Meter Set Assembly with In-line Regulator	12/1/2009
<u>GM-8</u>	<u>Valves</u>	

GM-8.1	Meter and Service Valves	Nov 2016
GM-8.2	Non-Lubricated Gate Valves 275 CWP and 720 CWP	4/17/1989
GMS-8.3	ANSI Class 150 Weld-End Ball Valves (285 PSIG MAOP and Less)	July, 2014
GMS-8.4	ANSI Class 300 Weld-End Ball Valves (740 PSIG MAOP and Less)	Mar 2021
GM-8.5	Lubricated Plug Valves	4/17/1989
GM-8.6	Lubricant for Plug Valves	12/29/1971
GM-8.7	Gas Valve Safety Cap	12/1/2009
GM-8.8	Polyethylene Ball Valves	Nov 2016
GM-8.9	Pressure Control Valves for Regulator Stations	12/1/2009
<u>GM-9</u>	<u>Excess Flow Valve</u>	June 2017
GM-9.1	Mechanical Coupling with Excess Flow Valve	May 2019
GM-9.2	Mechanical Tapping Tee with Mechanical Outlet and Excess Flow Valve	May 2019
GM-9.3	Fusion Tapping Tee with Excess Flow Valve	May 2019
<u>GM-10</u>	<u>Miscellaneous Gas Fittings</u>	
GM-10.1	Transition Fitting – P.E. to Steel	12/1/2009
GM-10.2	Gas Repair Clamp	2/8/2001
<u>GM-11</u>	<u>Miscellaneous Construction Materials</u>	
GM-11.1	Magnesium Anodes	4/4/2008
GM-11.2	Vaults for Regulator Stations	
GM-11.2.1	Concrete Utility Vaults for Regulator Stations	3/2/2007
GM-11.2.2	Fiberglass Utility Vaults for Regulator Stations	12/1/2009
GM-11.3	Cold Applied Coating Tape	-
GM-11.4	Caution Signs	4/21/1988
GMS-11.5.1	Line Markers	July 2019
GMS-11.5.2	“Triview” Line Markers	
GMS-11.6	City of Mesa Gas Marker Decal	July 2019
GM-11.7	Polyethylene Sleeving	10/6/2004
<u>GM-12</u>	<u>Polyvinylchloride (PVC) Pipe</u>	1/20/1992



GM-12.1	PVC Gas Fittings	11/15/1988
GM-12.2	PVC Primer and Solvent Cement	11/15/1988
GM-12.3	PVC Punch Valve Saddle Tee	11/15/1988
GM-12.4	Transition Fitting – PVC to P.E.	11/14/1988
GM-12.5	Transition Fitting – PVC to Steel	11/14/1988
GM-13	<u>Polyamide 11 (PA11) Pipe</u>	5/10/2002
GM-13.1	PA11 Mechanical Tapping Tees and Branch Saddles	5/10/2002
GM-13.2	PA11 Butt Heat Fusion Fittings	5/10/2002
GM-13.3	PA11 Anodeless Service Risers	4/9/2003
<u>Appendix</u>		
Appendix A	Manufacturer/Vendor Contact Information	
Appendix B	Regulators	



Gas Material Specifications



GM-1 Steel Pipe

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GMS-1.1

STEEL PIPE

Use:

Steel pipe is used in the City of Mesa's natural gas systems as gas distribution mains and service lines.

Standards:

Steel pipe shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|--------------|--|
| • API 5L | Specification for Line Pipe |
| • API RP 5L1 | Recommended Practice for Railroad Transportation of Line Pipe |
| • API RP 5LT | Recommended Practice for Truck Transportation of Line Pipe |
| • ASTM A53 | Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |

Design and Performance:

GENERAL REQUIREMENTS: Only pipe manufactured in the United States ("Domestic Pipe") is acceptable for coated pipe. Pipe shall be delivered in lengths no shorter than the minimum lengths specified in Table 1 of this Specification (unless the purchase order specifies otherwise). Joints are not acceptable. Pipe manufactured by Electric Resistance Welding (ERW) or Seamless (SMLS) methods are acceptable. Plain ends for pipe diameters 2-inch and smaller are allowed. Ends of pipe with diameters greater than 2-inch shall be beveled for welding. The angle of bevel shall be 30 degrees (+5 degree/-0 degree), with a root face (land) of 1/16-inch \pm 1/32-inch. The surface of the pipe shall be bare and free from oil and grease.

All pipe 4-inch and larger must be manufactured to API 5L specifications. Pipe may be certified to ASTM A53 standards, however, it must also meet all API 5L standards and be certified as such.

PIPE GRADES: Pipe shall be marked with the highest steel grades (in term of yield strength) specified in the pipe's material test reports. Dual stamping of pipe is acceptable, but not preferred by the City of Mesa. The City of Mesa will not accept pipe that is marked at a higher grade than X-52 or is certified on the pipe's material test report to be a grade higher than X-52. The City of Mesa will not accept pipe that is marked at a lower grade than the acceptable grade(s) specified in Table 1.

PIPE CONDITION: Pipe shall be free of defects as defined in API 5L in the finished condition. This includes, but not limited to, cracks, dents, inclusions, pitting-type corrosion or electric-weld flash, both internal and external. The pipe surface shall be free from scale and injurious defects. The City of Mesa reserves the right to reject pipe that does not meet quality standards outlined in API 5L or that has sufficient surface corrosion that, in the City of Mesa inspector's professional opinion, may affect the structural integrity of the City of Mesa's natural gas system. Coated pipe must be coated within twelve (12) months of the pipe's manufactured date as listed on the pipe's Material Test Report (MTR). Rejected pipe will be replaced at vendor's expense.

MAGNETISM: If pipe delivered to, or planned for delivery to, the City of Mesa contains any residual magnetic field(s), the magnetic field strength shall not exceed ten (10) gauss when measured at the uncoated end of the pipe directly on the pipe's outer surface per API 5L measurement procedures. Pipe will be subject to magnetic field testing prior to coating as well as prior to being handled by any City of Mesa personnel at the City of Mesa's point of delivery. Any pipe measuring higher than the acceptable magnetic field strength will be subject to return and replacement at the vendor's expense.

Sizes and Dimensions:

The following are the City of Mesa's commonly used steel pipe sizes. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer or Senior Gas Engineer. All pipe sizes and grades listed in Table 1 are designed for use in all the City of Mesa's high-pressure systems.

Table 1:

Nominal Pipe Size (Inches)	O.D. (Inches)	Pipe Grade	Wall Thickness (Inches)	Minimum Lengths (Feet)
1/2	0.840	A or B	0.109 ^{c, d}	20
3/4	1.050	A or B	0.113 ^{c, d}	20
1	1.315	A or B	0.133 ^{c, d}	20
1-1/2	1.900	A or B	0.145 ^{c, d}	20

Nominal Pipe Size (Inches)	O.D. (Inches)	Pipe Grade	Wall Thickness (Inches)	Minimum Lengths (Feet)
2	2.375	A or B	0.154 ^{c, d}	20 or 40 ^a
3	3.500	A or B	0.216 ^{c, d}	40
4	4.5	B	0.188	40
			0.237 ^{c, d}	
		X-42	0.156	40
			0.188	
			0.237 ^{c, d}	
		X-52	0.156	40
			0.188	
6	6.625	B	0.280 ^{c, d}	40
			0.219	
		X-42	0.250	
			0.280 ^{c, d}	
		X-52	0.188	
			0.219	
8	8.625	X-42	0.250	40
			0.277	
			0.322 ^{c, d}	
		X-52	0.500	
			0.250	
			0.277	
10	10.750	X-42	0.322 ^{c, d}	40
			0.500	
			0.365 ^{c, d}	
		X-52	0.500	
			0.307	
			0.365 ^{c, d}	
12	12.750	X-42	0.500	40
			0.562	
			0.687	
		X-52	0.375 ^c	
			0.406 ^d	
			0.500	

- Notes:
- a) Required minimum length for 2" steel will be specified on the purchase order.
 - b) All pipe 4-inch and larger must be manufactured to API 5L specifications. Pipe may be certified to ASTM A53 standards; however, it must also meet all API 5L standards and be certified as such.
 - c) Standard (STD) wall.
 - d) Schedule 40 (Sch40) wall.

Finish:

If specified on the purchase order, the steel pipe shall be coated in accordance with City of Mesa's GM-1.3.1 – Extruded Polyethylene Coating for steel Pipe, GM-1.3.2 – Powercrete Coating of Steel Pipe, or GMS-1.3.3 – Fusion Bonded Epoxy Coating for Steel Pipe.

Markings:

The steel pipe shall be marked with at least the following information.

- a. Manufacturer's name or trademark.
- b. Specified outside diameter
- c. Specified wall thickness
- d. Pipe steel grade(s)
- e. Type of pipe (e.g. ERW or SMLS)
- f. Heat code

Handling/Packaging/Shipping:

Pipe handling activities including, but not limited to, unloading stacking or moving must be done in a manner to prevent any damage to the pipe walls, pipe roundness, beveled ends.

The pipe shall be shipped via a suitable carrier according to the recommended practices per API RP 5T and/or API 5L1. Sufficient care shall be taken to prevent damage during shipping and handling. The use of ropes, or an equivalent method, to keep pipes separated during storage and transit is highly recommended. The pipe shall arrive at the agreed location damaged free (and holiday free if coated). The vendor shall be responsible for all cost to replace damaged pipes at the discretion of the City of Mesa. Damaged shipments exceeding ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II will be rejected. The vendor shall be responsible for all cost for shipments rejected due to excessive damage.

Pipe ends shall be capped with plastic covers unless otherwise specified on purchase order.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

All manufacturers meeting the requirements set forth in this Specification are approved at this time.

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GM-1.2

STEEL CASING

Use:

Steel casing will be used as non-gas-carrying, underground structural protection for pipe in the City's natural gas distribution system.

General:

The steel pipe shall conform to those requirements of 49 CFR 192 as well as ASTM A252, ASTM A53 and/or API-5L, which do not conflict with the following requirements of the City of Mesa. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished:

1. Pipe shall be delivered in lengths no shorter than the minimum lengths specified in Table 1 of this specification unless the purchase order specifies otherwise. Joints are not acceptable.
2. Ends of pipes shall be beveled for welding. The angle of bevel shall be 30 degrees, +5, -0 degrees, with a root face (land) of 1/16-inch \pm 1/32-inch.
3. The surface of the pipe shall be bare and free from oil and grease.

Abbreviations:

API:	American Petroleum Institute
ASTM:	American Society for Testing Materials
ERW:	Electric resistance welded
DSAW:	Double submerged arc welded
Grade 2:	Grade 2, ERW or DSAW (per ASTM A252 specification) 35,000 PSI Specified Minimum Yield Strength
Grade B:	Grade B, ERW or DSAW (per API Std 5L or ASTM A53 Specification) 35,000 PSI Specified Minimum Yield Strength

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Table 1:

Dimensions, Process, Properties:

Nominal Pipe Size (Inches)	O.D. (Inches)	Wall Thickness (Inches)	I.D. (Inches)	Wt. Per Ft. (2) (Pounds)	Minimum Lengths (Feet)	Process	Class or Grade	Minimum Yield Strength (psi)
30	30.000	0.5000	29.000	157.68	40	DSAW	Grade 2 or Grade B	35,000



Gas Material Specifications

GM-1.3 Mill Coating of Steel Pipe

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GM-1.3.1

EXTRUDED POLYETHYLENE COATING FOR STEEL PIPE

Use:

The coating system covered in the Specification describes the adhesive undercoating applied to the exterior surface of the steel pipe and the yellow colored plastic sheath applied over the undercoating.

Standards:

Extruded Polyethylene Coating shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed 49 CFR 192 at the time the material is furnished:

- API SPEC 5L Specification for Line Pipe

Materials:

Adhesive: This shall be an undercoating consisting of a blend of rubber, asphalt and high molecular weight resins. The adhesive shall have sufficient adhesion to adhere to the metal surface and plastic sheath.

Plastic Sheath: The resin shall be prime virgin, high density POLYETHYLENE copolymer. The resin color shall be yellow. The yellow color shall match the standard color established and recognized by the National Utility Locating and Coordination Council.

Application of Coating System:

Preparation, application and inspections of the coating process shall be according to the coating manufacturer's requirements and the following procedures:

- The polyethylene sheath shall be applied according to the extrusion process to form a seamless bonded coating.
- Thickness of the adhesive undercoat and the polyethylene sheath shall be per the dimensions shown in Table A.
- Cut back of the sheath on each end of each length shall be per the dimensions shown in Table A.
- Polyethylene shall not be extruded over existing coating. If a length of pipe requires a rerun to correct flaws, the entire sheath shall be stripped off and heavy mastic or other objects removed, and a complete coverage of new adhesive undercoat and polyethylene sheath applied.
- Imprint the coating according to API Specification 5L and the following:
 Coating manufacturer's name or mark
 Date coated
- Cap pipe ends with plastic covers unless otherwise specified on purchase order.

TABLE A
DIMENSIONS FOR POLYETHYLENE PIPE COATING
(Inches Except Where Noted)

Nom. Pipe Size	Pipe OD	Adhesive Thickness + 0.001	Polyethylene Nominal	Thickness Minimum	Coating Weight Average (Lb./100 Lin. Ft.)	Cutback Length of PP Sheath For Beveled End Pipe
¾	1.050	0.010	0.025	0.023	5	5 in.
1	1.315	0.010	0.025	0.023	7	5 in.
1-½	1.900	0.010	0.025	0.023	10	5 in.
2	2.375	0.010	0.030	0.027	13	5 in.
3	3.500	0.010	0.035	0.032	22	5 in.
4	4.500	0.010	0.035	0.032	28	6 in.
6	6.625	0.010	0.040	0.036	45	6 in.

Nom. Pipe Size	Pipe OD	Adhesive Thickness + 0.001	Polyethylene Nominal	Thickness Minimum	Coating Weight Average (Lb./100 Lin. Ft.)	Cutback Length of PP Sheath For Beveled End Pipe
8	8.625	0.010	0.040	0.036	59	6 in.
10	10.750	0.010	0.040	0.036	73	6 in.
12	12.750	0.010	0.040	0.036	87	6 in.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of mill coating are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- Bredero–Shaw Company

Manufacturers not identified above may submit products that meet all qualifications set forth in this specification to the City of Mesa for review, examination and testing for approval. The City of Mesa hereby gives notice that completion of the approval process may take up to ninety (90) days. The City of Mesa therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

GM-1.3.2

POWERCRETE COATING FOR STEEL PIPE

Use:

The coating system covered in the specification describes the abrasion resistant overlay coating designed to protect the Fusion Bonded Epoxy (FBE) undercoating for directional drilling or other highly abrasive installation environments.

Standards:

Powercrete Coating shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished:

- API SPEC 5L Specification for Line Pipe

Materials:

All pipe shall conform to City of Mesa Gas Material Specification GM-1.1 and be coated with 14-16 mils of FBE coating and 60 mils of Barry Plastics Corporation "Powercrete DD" coating.

Application of Coating System:

Preparation, application and inspections of the coating process shall be according to the coating manufacturer's requirements and the following procedures:

- The FBE shall have a 6" minimum cutback
- The Powercrete shall have a 2" minimum cutback over the FBE
- Imprint the coating according to API Specification 5L and the following:
 - Coating manufacturer's name or mark
 - Date coated
- Plastic covers may be necessary on pipe ends. Cover requirement to be specified on purchase order.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

GMS-1.3.3

FUSION BONDED EPOXY COATING FOR STEEL PIPE

Use:

Fusion Bonded Epoxy (FBE) coating shall be used as a coating for steel pipe in the City of Mesa's intermediate pressure and high pressure systems.

Standards:

The FBE coating shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|------------------------|--|
| • API Specification 5L | Specification for Line Pipe. |
| • API RP 5LT | Recommended Practice for Truck Transportation of Line Pipe. |
| • API 5L1 | Recommended Practice for Railroad Transportation of Line Pipe. |
| • SSPC-SP1 | Solvent Cleaning. |
| • SSPC SP10 | Near-White Metal Blast Cleaning. |
| • SSPC VIS-1 | Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning. |
| • NACE RP-0394 | Application, Performance, and Quality Control of Plant-Applied, Fusion-Bonded Epoxy External Pipe Coating |
| • NACE RP-0490 | Standard Recommended Practice - Holiday Detection of External Fusion-Bonded Epoxy Coatings of 250 to 760 μm (10 to 30 mil). |
| • NAPCA 12-78-04 | External Application Procedures for Plant Applied Fusion Bonded Epoxy (FBE) Coatings and Abrasion Resistant Overlay (ARO) Coatings for Steel Pipe. |

Material and Manufacturing:

The coating material shall have the following properties:

- Full cure of coating shall be achievable at temperatures below 500° F.
- Coating shall withstand 15 inch pounds of impact per NACE International RP0394, latest edition.
- Coating shall withstand bending of 2.5 degrees per inch of pipe diameter (Deg./PD) at 0° F.
- Coating shall have sufficient weather resistance to withstand prolonged exposure to ultraviolet rays equivalent to 5 years of actual atmospheric exposure.
- Coating shall not ignite, blister or burn back more than 2 inches when pipe is welded or cut with a cutting torch.
- Coating shall not deform, deteriorate or disbond when exposed to soil stresses at temperatures up to 140° F.
- Additional Ultraviolet protection shall be added when specified on the Purchase Order.

The nominal thickness of the FBE coatings shall be per the dimensions shown in Table A:

Table A				
Nom. Pipe Size (Inch)	Minimum Anti-Corrosion Coating Thickness (mils)	Standard Abrasion Resistant Overcoat Thickness (mils)*	Special Abrasion Resistant Overcoat Thickness (mils)*	Cutback Length for Beveled End Pipe (Inch)
1-1/2 & Less	16-18	18-20	40	2.5 - 5
2	16-18	18-20	40	2.5 - 5
3	16-18	18-20	40	5
4	16-18	18-20	40	6
6	16-18	18-20	40	6
8	16-18	18-20	40	6

*Note: Abrasion Resistance Overcoat thickness will be specified on the Purchase Order.

The FBE coating shall have the following layers:

- Anti-Corrosion Coating Primary Coat: primary coating shall be an anti-corrosion specific coating. Coating shall be designed to protect against soil stress, bacteria, fungus, soil acids, alkaline soil and any other underground corrosive elements.

- Abrasion Resistant Overcoat: Secondary coating shall be an abrasion and impact resistant over-coating designed to protect the anti-corrosion primary coat from damage during handling and open-trench installation. Secondary coating shall be flexible enough to protect primary coat during handling, transportation and installation.

General Application Notes:

Preparation, application and inspection of the coating process shall be according to the coating manufacturer's requirements and application procedures which shall take precedent in all cases. At any time when conditions exist that may adversely affect the coating quality, coater shall be responsible for stopping the coating process until conditions are suitable to resume coating. Coating process shall follow NAPCA Bulletin 12-78-04 recommendations, NACE RP 0394 recommendations and shall adhere to the following procedures:

- Coating powder shall be segregated by batch numbers during shipment, storage and handling. Storage and handling conditions shall be in accordance with the manufacturer's recommendations. Batches shall be used consecutively during coating application and shall not be mixed except when necessary to keep the coating process continuous. No powder stored beyond the manufacturer's recommended shelf life shall be used for coating pipe. All contaminated, or otherwise damaged materials shall be discarded. The use of recycled powder is not permitted.
- The coating shall be applied in a manner rated for an operational temperature range of 28°F to 140°F.
- The coating shall be applied to form a seamless bonded coating without defect. FBE coating shall not be applied over existing coating except to apply the second layer of coating as specified herein.
- Primary and secondary layers shall be applied in the same coating run according to the manufacturer's recommendations for proper drying time of the primary layer.
- Only primary and secondary layers from the same manufacturer are permitted to be used in combination (Ex. Scotchkote 6233/6352, Pipe Clad 2000/2040).
- Thickness of the coating layers and coating cut back on each end of each length shall be per the dimensions shown in Table A. Any coating area measured to be more than 2 mil thinner than the specified thickness will be cause for rejection of that joint.

Pipe Preparation:

- Pipe surfaces shall be inspected and precleaned to a near-white metal finish in accordance with according to SSPC-SP10 to remove oil, grease, and loosely adhering deposits. Visible oil and grease spots shall be removed by solvent wiping. Only approved safety solvents, which do not leave a residue, shall be used.

- Particle hardness and size distribution of the shot employed shall be continually controlled by screening to ensure that the surface profile after cleaning shall have a nominal height of 3.0 mils, with a minimum height of 2.5 mils, and a maximum height of 4.0 mils as measured by Testex Press-O-Film replication tape and SSPC-VIS-1. All cleaning shall be done in such a manner that beveled ends and any internal coating will not be damaged.
- The working abrasive mix shall be maintained clean of contaminants by continuous effective operations of cleaning machine scalping and air wash separators.
- Surface preparation shall not reduce the pipe wall thickness below the minimum required by GMS-1.1
- Prior to coating, the pipe exterior shall be phosphoric acid washed to remove any surface contaminants. The phosphoric acid shall be mixed with de-ionized or reverse osmosis water according to the manufacturer's recommendations. De-ionized or reverse osmosis water shall be used for the mixture and rinsing the pipe after the wash. The de-ionized water or reverse osmosis water shall have no more than 20 ppm of total dissolved solids or 35 μ S conductivity. The phosphoric acid wash shall be applied after blast cleaning and before the final heating process, just prior to coating application.
 - The application of the phosphoric acid mixture shall be at the rate and percentage recommended by the phosphoric acid supplier, unless otherwise approved by the purchaser. The mixing container shall be continually agitated during the application process. The concentration of the mixture shall be checked a minimum of once every eight hours by sampling the mix at the application point.
 - The mixture shall stay on the pipe surface for a minimum of 20 seconds after application or as required by the product manufacturer. The pH shall be checked by the Applicator a minimum of every two hours during production.
 - The mixture shall be rinsed from the pipe surface with a high pressure rinse system using de-ionized or reverse osmosis water. The high pressure rinse shall have a minimum tip pressure of 1,500 psi.
 - The pH of the cleaned wet pipe surface shall be no less than 6 and no greater than 7.5, and shall be checked by the Applicator a minimum of every two hours during production.
 - The contaminant levels shall be checked every eight hours on the phosphoric acid washed surface to insure acceptable contaminant levels.
- Prior to coating, the cleaned pipe exterior shall be inspected by the vendor to ensure that all cleaning steps have been adequately performed. A safe, well-lighted area for such inspection will be provided by the vendor. Presence of contaminants indicates a malfunction of the cleaning equipment, which shall be corrected immediately. Unacceptable pipe shall be recycled through the cleaning operation. No residue that will affect adhesion shall be left on the surface.

- Total elapsed time between cleaning and coating of the cleaned surface shall be kept to a minimum to avoid the formation of oxides on the surface. Oxidation of the steel prior to coating (in the form of “blooming” or other apparent oxide formation) is not acceptable. Visual formation of such oxides shall cause the entire pipe to be recleaned prior to coating. Any pipe not coated within three hours after cleaning shall be completely recleaned before coating at Coater’s expense.

Coating Application:

- The pipe shall be heated to a temperature within the tolerances recommended by the manufacturer of the coating material to be applied. The pipe shall not be heated to a temperature in excess of 525°F at any time during the process (pipe heated above 525 °F shall be removed from batch and replaced at Coater’s expense). Blue oxide formation shall not be used as an indicator that maximum temperature has been exceeded or that damage to steel properties has occurred. Pipe temperature shall be monitored continuously and recorded by means of thermometers and/or optical pyrometers.
- Manufacturer’s recommendations for full curing shall be followed. The curing reaction of the coating must be completed prior to any forced cooling. Forced cooling of the pipe to facilitate inspection and repair may be conducted after the coating has completely cured.
- The cured coating shall be of uniform color and gloss and shall be free of blisters, pinholes, fish eyes, sags or runs and any other regularities.
- Any coating which, in Mesa’s judgment, has not been applied in conformance with this Specification shall be rejected.
- Defective coating shall be recoated or repaired to meet specifications. If a length of pipe requires a rerun to correct flaws, the entire coating shall be stripped off and a complete coverage of new coating shall be applied. The coated pipe shall leave the coater’s facility free of holidays.
- The coating applicator shall be a current registered member of National Association of Pipe Coating Association (NAPCA).

Testing and Quality Control:

- Pipe heated in excess of 525 °F [274 C] (as determined by optical pyrometer and/or thermometer or by the formation of a blue oxide on the steel surface) shall be rejected; the Vendor shall have two alternatives:
 - o Reimburse the City of Mesa for the total cost of the pipe or,
 - o Pay the total cost of having yield strength, ultimate tensile strength, and full curve Charpy impact properties determined by both the City of Mesa and the pipe manufacturer on each overheated joint of pipe. If results are acceptable to the City of Mesa, the joint of pipe is acceptable for recoating.

- The pipe shall be monitored for proper temperature prior to coating by use of an optical pyrometer and/or thermometer. The use of Tempilsticks must be minimized.
- The dry coating thickness of each joint shall be measured using a nondestructive magnetic or electronic thickness gauge. A minimum of five (5) measurements randomly distributed along the length and circumference of each joint of pipe shall be made and recorded, with notation of the minimum, maximum and predominant thickness measured.
- All coated pipe shall be 100% inspected for holidays. Either a pulsating or a nonpulsating spiral coil or wet sponge detector is acceptable, provided it meets and is operated according to the requirements in NACE RP-0490-90. The holiday detector shall have an audible alarm and use the setting (volts/mil) recommended by the coating manufacturer. Holiday detector shall be recalibrated according to the schedule recommended by the equipment manufacturer. Travel rate shall meet NACE RP-0490-90 requirements.
- Pipe joints shall be rejected that meets any of the following criteria for any single joint:
 - o More than one pinhole (defect less than 1 mm in diameter) per 25 ft²
 - o More than three holidays (up to 3 in²)
 - o Any holidays greater than 3 in²

In-Process Coating Repair:

All rejected coatings shall be completely removed from the entire joint of pipe and the pipe surface prepared and recoated in conformance with the specifications above at the Coater's sole expense. Any coating defects eligible for repair shall follow the manufacturer's recommendations and the following:

- Repair materials shall be the original powder or other compatible material approved by the powder manufacturer.
- Pinholes (defects less than 1 mm in diameter) need no more surface preparation. The pipe to be repaired shall be cleaned to remove all dirt and damaged or disbonded coating using approved means. The edges of the original coating shall be abraded around the area to be coated ½ - 1 inch out from the pinhole and all dust wiped off before applying the patch coating. Files shall not be used.
- Large holidays (up to 3 in²) require surface preparation of the steel. Any exposed metal must be treated to remove contaminants using an abrasive blast (other means may be acceptable with Mesa's approval). The FBE must be abraded around the areas to be coated ½ - 1 inch out from the edge of the holiday and all dust removed before applying the patch coating. The patch coating shall be applied in accordance to manufacturer's recommendations and shall overlap the existing sound coating by a minimum of 1 inch.
- All freshly patch-coated areas shall be allowed to cure fully according to the coating manufacturer's specifications prior to handling those sticks.
- After curing, all patches shall be visually inspected and jeeped with a wand electrode of fine brass whiskers at the voltage recommended by the manufacturer and tested for adhesion by knife lifting. The use of a wet sponge detector set at the manufacturer's

recommended parameters is also acceptable. The patch shall be holiday-free and shall not disband when lifted with a knife.

Marking:

The identification of the bare pipe, marked per API 5L, shall be legibly reproduced on top of the coating along the length of the pipe in addition to the following information:

Coater's Name or mark

"FBE/ARO" and their thicknesses (e.g., FBE/ARO 16-18mil/20mil)

Date the coating was applied

"CoM GAS" and City of Mesa Purchase Order number (e.g., PO F300 XXXXXXXX-X)

Identification marking shall be reproduced at approximately every five (5) feet interval and contrasting in color with the coating. The marking shall be **yellow** if the final coating is a different color than yellow.

If specified on the purchase order and agreed upon, the coater shall include information such as barcodes for tracking and traceability.

Handling/Packaging/Shipping:

Prior to and after coating, there may be various operations of unloading, stacking or moving pipe. These pipe handling activities must be done in a manner to prevent any damage to the pipe walls, pipe roundness, beveled ends and finished coatings.

The coated pipes shall be shipped via a suitable carrier according to the recommended practices per API RP 5T and/or API 5L1. Sufficient care shall be taken to prevent damage during shipping and handling. The use of ropes, or an equivalent method, to keep pipes separated during storage and transit is highly recommended. The pipe shall arrive at the agreed location damaged and holiday free. The vendor shall be responsible for all cost to replace or field-repair pipes with damaged coating at the discretion of the City of Mesa. Damaged shipments exceeding ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II will be rejected. The vendor shall be responsible for all cost for shipments rejected due to excessive damage.

Pipe ends shall be capped with plastic covers unless otherwise specified on purchase order.

Mill Test Report (MTR):

MTRs will be required for all piping shipped to City of Mesa. City of Mesa reserves the right to inspect the pipe's MTRs to approve or reject piping prior to inspection. In the case that pipe has been dual certified from the mill (for example, certified X42 and X52), City of Mesa may select one of the certified ratings and require coater to only print the rating selected by City of Mesa on the final coating.

Pipe Inspection:

The City of Mesa reserves the right to inspect any pipe prior to coating and approve or reject piping as a result of inspection. Coater shall notify Mesa not less than five days in advance of the start of each production run and shall provide Mesa with a detailed time schedule to allow inspection of all processing and testing phases. Inspection may be photographic, via third party inspectors, or inspected by City of Mesa personnel at the coating yard. The inspector shall be provided free access to the applicator's plant at any time during any operation involving the pipe, with the right to inspect and to accept or reject work performed. City of Mesa reserves the right to inspect the pipe's Mill Test Records to approve or reject piping prior to inspection.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer. Coater shall supply the following information for each batch of powder used in coating along with standards for comparison: infrared scan of powder and typical powder scans for comparison, gel time at recommended application temperature, particle size distribution

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor at the vendor's expense.

Approved Manufacturers:

The following manufacturers of FBE coating are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>FBE Product:</u>	<u>ARO Product:</u>
• Bredero-Shaw	Dual Layer FBE	Dual Layer FBE
• Valspar	2000	2040
• 3M	Scotchkote 6233	Scotchkote 6352
• Nap-Gard (Axalta)	7-25XX	7-26XX

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

_____ [Pipe size] inch FBE coated steel pipe

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Gas Material Specifications



GM-2 Steel Fittings

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Gas Material Specifications

GM-2.1 Steel Pipe Flanges

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Approved by: K. Kent

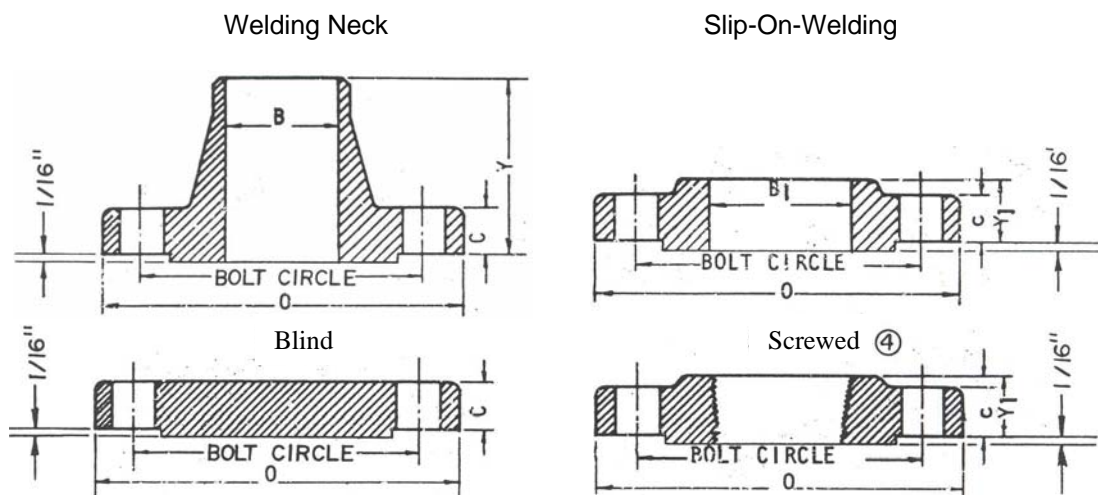
Revised: 3/19/86

Revised: 4/17/89

GM-2.1.1

150-LB STEEL PIPE FLANGES

PRESSURE RATING 275 PSIG



Material and dimensions:

Flanges shall conform to ANSI B16.5

Material shall be carbon steel ASTM A181 or A105, Grade 1

Each flange shall have 1/16" raised face. See note 7

Material and Dimensions (continued):

NOMINAL PIPE SIZE, INCHES	DIMENSIONS INCHES								
	BORE		THICKNESS OF FLANGE C (5) (7)	O.D. OF FLNG O	LENGTH THROUGH HUB		DRILLING		
	WELD NECK B (1)	SLIP ON B ₁			WELD NECK Y (5) (7)	SLIP-ON, SCREWED Y ₁ (4) (5)	DIAMETER OF BOLT CIRCLE	DIAMETER OF BOLT HOLES	NO. OF BOLT HOLES
2	2.07 (2)	2.44	11/16	6	2-7/16	15/16	4-3/4	3/4	4
3	3.07 (2)	3.57	7/8	7 ½	2-11/16	1-1/8 (4)	6	3/4	4
4	4.03 (2)	4.57	7/8	9	2-15/16	1-1/4 (4)	7-1/2	3/4	8
4x6	4.03 (2)	4.57	15/16	11	2-15/16	1-1/2 (4)	9-1/2	7/8	8
6	6.07 (2)	6.72	15/16	11	3-7/16	1-1/2 (4)	9-1/2	7/8	8
6x8	6.07 (2)	6.72	1-1/16	13-1/2	3-7/16	1-11/16 (4)	11-3/4	7/8	8
8	8.13 (2)	8.72	1-1/16	13-1/2	3-15/16	1-11/16 (4)	11-3/4	7/8	8
8x10	8.13 (3)	8.72	1-1/8	16	3-15/16	1-7/8 (4)	14-1/2	1	12
10	10.25 (3)	10.88	1-1/8	16	3-15/16	1-7/8 (4)	14-1/2	1	12
12	12.25 (3)	12.88	1-3/16	19	4-7/16	2-1/8 (4)	17	1	12
(6)									

Notes:

- (1) Bore of welding neck flanges (Dimension B) is correlated with inside diameter of pipe in GM-1.1.
- (2) Bore for standard wall (Sch 40) pipe. Use this bore with either thin wall or standard wall pipe. For flanges to be used with pipe of thicker wall (than Sch 40) specify appropriate bore.
- (3) Bore for Sch 20 (ANS B36.10) wall pipe. Use this bore with either thin wall or Sch 20 wall pipe. For flanges to be used with pipe or thicker wall (than Sch 40), specify appropriate bore.
- (4) Do not use screwed flange if pipe size is larger than 4" nor if pipe wall is thinner than standard (Sch 40).
- (5) With raised face removed. Add 1/16" for raised face flange.
- (6) For larger welding neck flanges, the purchase order shall specify bore.
- (7) Purchase order shall specify raised or flat-faced flanges.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.



Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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Approved by: K. Kent

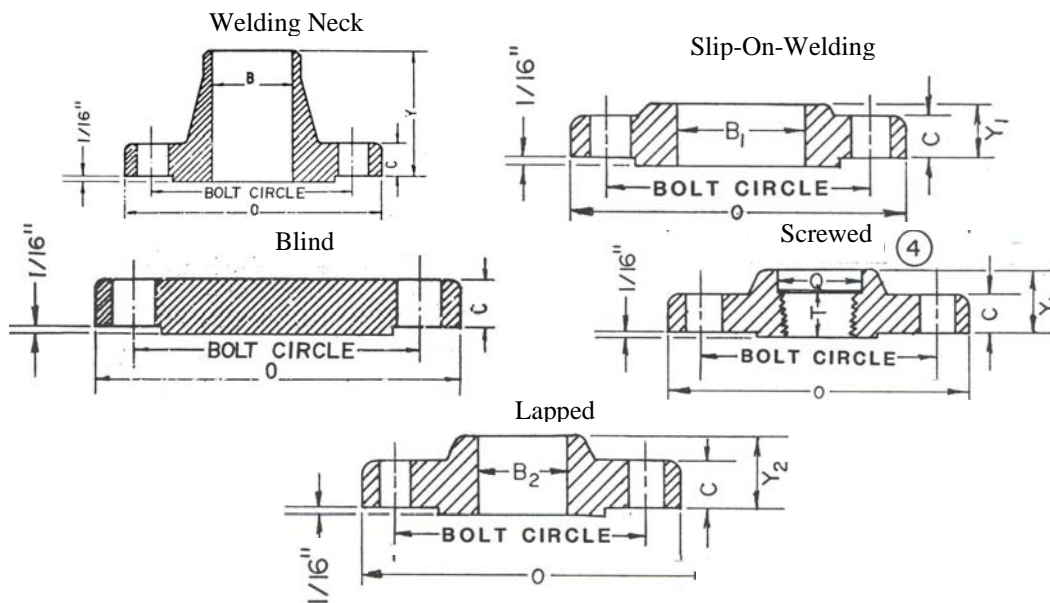
Revised: 3/19/86

Revised: 4/17/89

GM-2.1.2

300-LB STEEL PIPE FLANGES

PRESSURE RATING 720 PSIG



Material and dimensions:

Flanges shall conform to ANSI B16.5

Material shall be carbon steel ASTM A181 or A105, Grade 1

Each flange shall have 1/16" raised face. See note 7

Material and Dimensions (continued):

NOMINAL PIPE SIZE, INCHES	DIMENSIONS INCHES												
	BORE			THICKN ESS OF FLANGE (5) (7)	O.D. OF FLNG 0	LENGTH THROUGH HUB			SCRD. FLANGE		DRILLING		
	WELD NECK B (1)	SLIP ON B ₁	LAPPED B ₂			WELD NECK Y (5) (7)	SLIP-ON, SCREWED Y ₁ (4) (5)	LAPPED Y ₂ (5)	THD LG T (5)	C BORE Q	DIAME TER OF BOLT CIRCLE	DIAMET ER OF BOLT HOLES	NO. OF BOLT HOLES
2	2.07 (2)	2.44	2.46	13/16	6 ½	2-11/16	1- ¼	1-5/16	1-1/16	2.50	5	3/4	8
3	3.07 (2)	3.57	3.60	1-1/16	8 ¼	3-1/16	1- 5/8	1-11/16	1- 3/16 (4)	3.63 (4)	6-5/8	7/8	8
4	4.03 (2)	4.57	4.60	1-3/16	10	3-5/16	1- 13/16	1-7/8	1-3/8 (4)	4.63 (4)	7-7/8	7/8	8
6	6.07 (2)	6.72	6.75	1-3/8	12 ½	3-13/16	2	2-1/16	(4)	(4)	10-5/8	7/8	12
8	8.13 (2)	8.72	8.75	1-9/16	15	4-5/16	2- 3/8	2-7/16	(4)	(4)	13	1	12
10	10.25 (2)	10.88	10.92	1-13/16	17 ½	4-9/16	2- 9/16	3-3/4	(4)	(4)	15-¼	1-1/8	16
12	12.25 (2)	12.88	12.92	1-15/16	20 ½	5-1/16	2- 13/16	4	(4)	(4)	17-3/4	1-1/4	16
(6)													

Notes:

- (1) Bore of welding neck flanges (Dimension B) is correlated with inside diameter of pipe in GM-1.1.
- (2) Bore for standard wall (Sch 40) pipe. Use this bore with either thin wall or standard wall pipe. For flanges to be used with pipe or thicker wall (than Sch 40) specify appropriate bore.
- (3) Bore for Sch 20 (ANS B36.10) wall pipe. Use this bore with either thin wall or Sch 20 wall pipe. For flanges to be used with pipe or thicker wall (than Sch40) specify appropriate bore.
- (4) Do not use screwed flange if pipe size is larger than 4" nor if pipe wall is thinner than standard (Sch 40).
- (5) With raised face removed. Add 1/16" for raised face flange.
- (6) For larger welding neck flanges, the purchase order shall specify bore.
- (7) Purchase order shall specify raised or flat-faced flanges.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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GM-2.1.3

GASKETS

Flange ANSI Class 150 & 300

Use:

Flange gaskets will be used with ANSI Class 150 flanges and ANSI Class 300 flanges and shall be suitable for natural gas.

Standards:

Flange gaskets (ANSI Class 150 and 300) shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When National or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Material/Manufacturing:

Gasket materials and manufacturing shall conform to ANSI B16.5: Steel Pipe Flanges and Flanged Fittings. The gasket's dimensions shall conform to ANSI B16.21: Nonmetallic Gaskets for Pipe Flanges.

Type:

Gaskets shall be furnished in two types:

1. ANSI Class 150 – A ring gasket, beater-saturated compressed asbestos 1/16" thick
2. ANSI Class 300 – Flat ring gaskets, spiral-wound 304 stainless steel metal with asbestos filler.

Packaging:

Gaskets shall be packaged in cartons and labeled to fully identify the contents.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

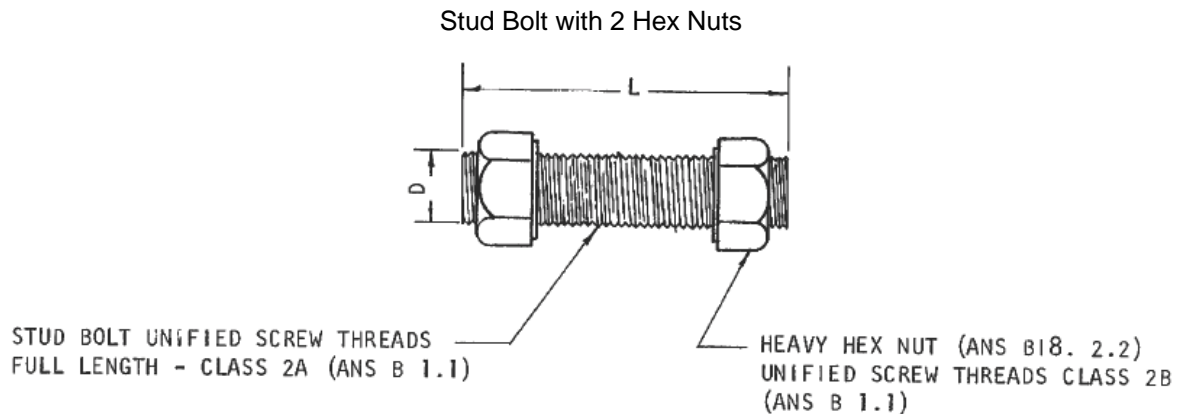
The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-2.1.4

BOLTS FOR PIPE FLANGES (1)



Material:

Stud Bolt – ASTM A-193, Grade B7, Chromium – Molybdenum (AISI 4140)

Hex Nut – ASTM A-194, Grade 2H, Carbon Steel

L Length (Inches)	Size and Weight per 100		
	D		
	Diameter (Inches) – Threads Per Inch		
	5/8-11	¾-10	7/8-9
3 ½ (2)	53 lb	-	-
4 (3)	-	88 lb	-
4 ½ (4)	-	94 lb	-
5 (5)	-	-	144 lb

Notes:

- (1) To be used when mating 150 lb steel to 150 lb steel or 125 lb cast iron (ANS B 16.1).
- (2) Use on 2, 3, and 4-inch flanges.
- (3) Use on 6-inch flanges.
- (4) Use on 8-inch flanges.
- (5) Use on 10 and 12 inch flanges.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

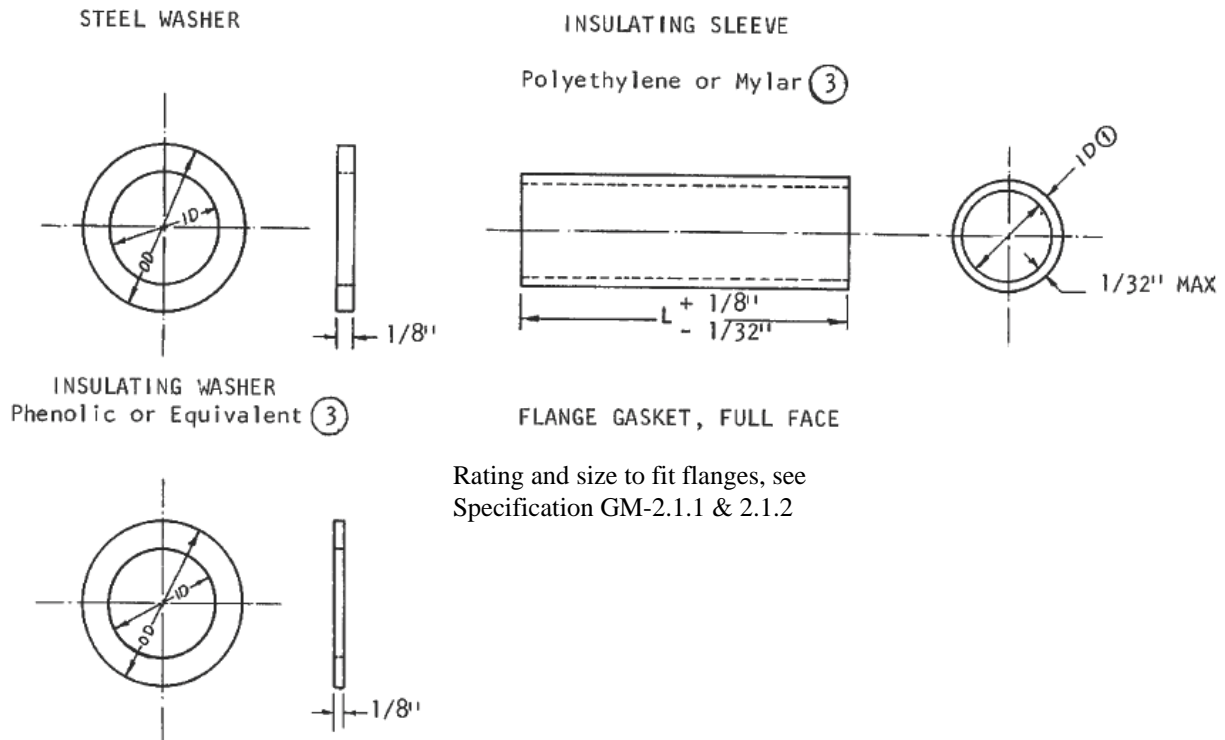
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Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-2.1.5

INSULATING MATERIALS FOR FLANGED JOINTS



Materials:

Materials required for American National Standard Flanges (dimensions and sizes are shown in inches)

Insulating Flange Assemblies (150-lb STL, 125-lb STL or CI)

Pipe Size	Washers		Sleeve		Qty. Ea. Item
	ID	OD	ID (1)	L (2)	
2	11/16	1 5/16	5/8	1 15/32	4
3	11/16	1 5/16	5/8	1 25/32	4
4	11/16	1 5/16	5/8	1 31/32	8
6	13/16	1 9/16	3/4	2 3/32	8
8	13/16	1 9/16	3/4	2 11/32	8
10	15/16	1 3/4	7/8	2 15/32	12
12	15/16	1 3/4	7/8	2 19/32	12

Notes:

- (1) ID of sleeve same as OD of bolt. Sleeve to slip over all-thread stud bolt, snug fit.
- (2) Calculated length for 150-lb steel flange (ANS B16.5) (Raised face removed) mated to 125-lb cast iron flange (ANS B16.1) with gasket 1/16" thick and ins washer. Sleeve does not enter steel washer.
- (3) Approved by the City of Mesa

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GMS-2.2

STEEL BUTT-WELDING FITTINGS

Use:

The steel butt-welding fittings are to be used in the City of Mesa's natural gas systems for connecting steel distribution mains.

Standards:

Steel butt-welding fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI/ASME B16.9 Factory-Made Wrought Buttwelding Fittings
- ASTM A234 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- MSS-SP-75 Specification for High-Test, Wrought, Butt-Welding Fittings

Design and Performance:

Steel butt-welding fittings shall be manufactured, as a minimum, to the following designated standards and meet the following specified minimum yield strength (SMYS):

Grade	Common Description	SMYS (psi)	Manufacturing Standard
WPB	WPB	35,000	ASTM A234
WPC	WPC	40,000	ASTM A234
WPHY-42	Y42	42,000	MSS SP-75
WPHY-46	Y46	46,000	MSS SP-75
WPHY-52	Y52	52,000	MSS SP-75

Fittings shall not be taper bored to obtain the specified wall thickness without prior approval from the City of Mesa. The reduced end of the reducers and reducing tees are exempt from this requirement. All taper boring will be completed in accordance with specifications in ASME B31.8, Appendix I.

Ends of fittings with diameters greater than 2-inch shall be beveled for welding in accordance with ANSI/ASME B16.9. The angle of bevel shall be 30 degrees (+5/-0 degree), with a root face (land) of 1/16-inch \pm 1/32-inch.

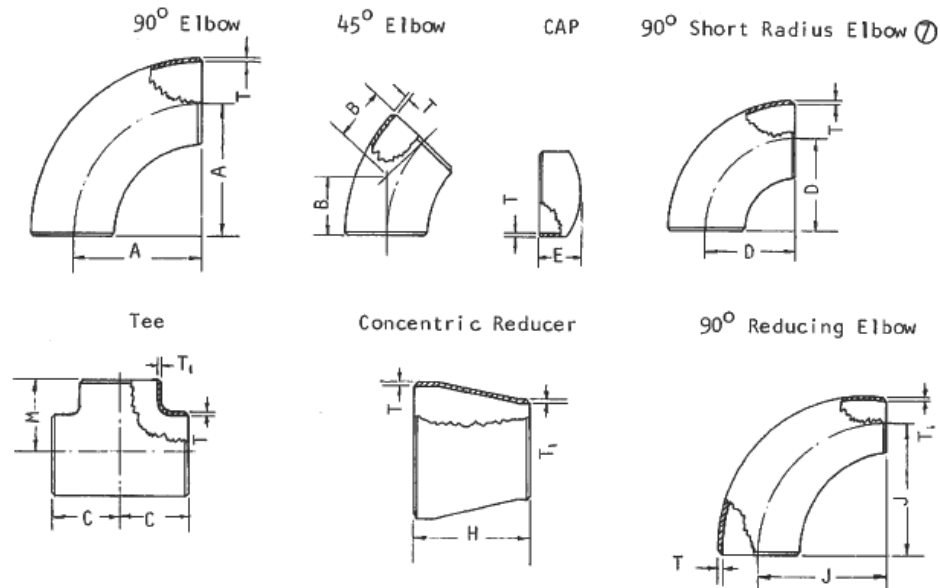
Sizes and Dimensions:

Steel butt-welding fittings shall meet the following grades and wall thicknesses.

Nominal Pipe Size (Inch)	Common Designation	Min. Wall Thickness (Inch)	Acceptable Steel Grade			
			WPB	WPC	Y42	Y46, Y52
3/4	STD or SCH 40	0.113	Yes	Yes	Yes	Yes
1	STD or SCH 40	0.133				
1-1/4	STD or SCH 40	0.140				
2	STD or SCH 40	0.154				
3	STD or SCH 40	0.216				
4	STD or SCH 40	0.237				
6	STD or SCH 40	0.280				
8	STD or SCH 40	0.322	<u>NO</u>	<u>NO</u>	<u>NO</u>	
10	STD or SCH 40	0.365				
12	STD	0.375				

Note: The specified wall thicknesses and steel grades are chosen to meet City of Mesa's highest designed maximum allowable operating pressure (MAOP) at 539 psig and market availability. Other wall thickness and steel grade combinations may be authorized by the City of Mesa Gas Planning Engineer or Senior Gas Engineer.

The following are the City of Mesa's commonly used steel butt-welding fitting sizes. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer or Senior Gas Engineer. All dimensions for fittings shall meet the inspection tolerances specified in ANSI/ASME B16.9.



90° Elbow, 45° Elbow and End cap:

NOMINAL PIPE SIZES "INCHES"	90° ELBOW CENTER-TO-END (INCHES) "A"	45° ELBOW CENTER-TO-END (INCHES) "B"	90° S.R. ELBOW CENTER-TO-END (INCHES) "D"	CAP LENGTH (INCHES) "E"
¾	1-1/8	9/16		1-½
1	1 ½	7/8	1	1-½
1 ¼	1-7/8	1	1-¼	1-½
2	3	1 3/8	2	1-½
3	4 ½	2	3	2
4	6	2-½	4	2-½
6	9	3-¾	6	3-½
8	12	5	8	4
10	15	6.25	10	5
12	18	7.5	12	6

Concentric reducer, 3-way tees, and reducing 90° Elbow:

NOMINAL PIPE SIZES (INCHES)	TEE CENTER-TO-END (INCHES)		REDUCER END-TO-END (INCHES)	90° REDUCING ELL CENTER-TO-END (INCHES)
	"C"	"M"		
¾	1 1/8	1 1/8		
1	1 ½	1 ½		
1 X ¾	1 ½	1 ½	2	
1 ¼	1 7/8	1 7/8		
1 ¼ X 1	1 7/8	1 7/8	2	
1 ¼ X ¾	1 7/8	1 7/8	2	
2	2 ½	2 ½		
2 X 1 ¼	2 ½	2 ¼	3	3
2 X 1	2 ½	2	3	3
2 X ¾	2 ½	1 ¾	3	
3	3 3/8	3 3/8		
3 X 2	3 3/8	3	3 ½	4 ½
3 X 1 ¼	3 3/8	2 ¾	3 ½	
3 X 1	3 3/8	2 5/8	3 ½	
4	4 1/8	4 1/8		
4 X 3	4 1/8	3 7/8	4	6
4 X 2	4 1/8	3 ½	4	6
6	5 5/8	5 5/8		
6 X 4	5 5/8	5 1/8	5 ½	9
6 X 3	5 5/8	4 7/8	5 ½	9
6 X 2	5 5/8	4 5/8		
8	7	7		
8 X 6	7	6 5/8	6	12
8 X 4	7	6 1/8	6	12
10	8 1/2	8 1/2		
10 X 8	8 1/2	8	7	15
10 X 6	8 1/2	7 5/8	7	15
10 X 4	8 1/2	7 1/4	7	
12	10	10		
12 X 10	10	9 ½	8	18
12 X 8	10	9	8	18
12 X 6	10	8 5/8	8	18

NOTE: For 3-way Tees – pipe sizes indicate Run x Branch (i.e. 8x6 is 8" run with 6" branch)

Finish:

The surface of the fittings shall be free from oil and grease. Fittings may be painted or treated with corrosion inhibiting agents to prevent rusting.

Markings:

The steel butt-welding fittings shall be marked with at least the following information.

- a. Manufacturer's name or trademark.
- b. Fitting's steel grade (e.g. WPB, Y42, Y52, etc.).
- c. Nominal pipe size.
- d. Schedule or nominal wall thicknesses.

Packaging/Shipping:

The steel butt-welding fittings shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such

tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

All manufacturers meeting the requirements set forth in this Specification are approved at this time.

GMS-2.3

MALLEABLE IRON SCREWED FITTINGS

Use:

The Class 150 (150#) Malleable Iron Screwed Fittings are to be used in the City of Mesa's intermediate pressure natural gas systems with design pressures up to 60 psig. Class 150 Malleable Iron Screwed Fittings may not be used in any City of Mesa's high pressure gas systems.

The Class 300 (300#) Malleable Iron Screwed Fittings are to be used exclusively in the City of Mesa's high pressure natural gas systems with design pressures up to 539 psig.

Standards:

The Malleable Iron Screwed Fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification where applicable. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI/ASME B1.20.1 Pipe Threads, General Purpose (INCH).
- ANSI/ASME B16.3 Malleable Iron Threaded Fittings.
- ANSI/ASME B16.14 Ferrous Pipe Plugs, Bushings and Locknuts with Pipe Threads.
- ASTM A197/A197M Standard Specification for Cupola Malleable Iron.

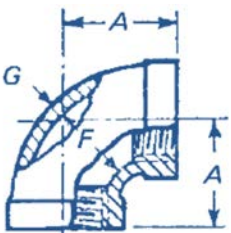
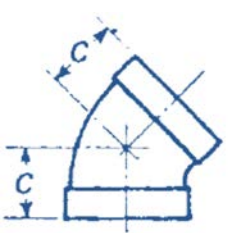
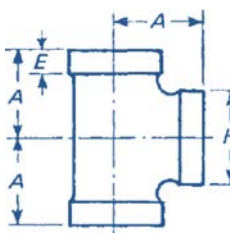
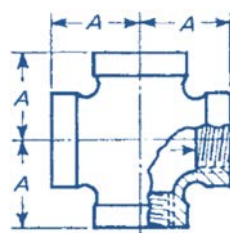
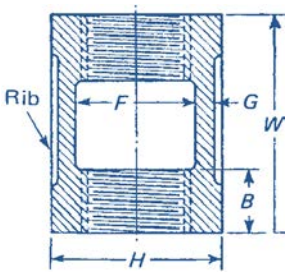
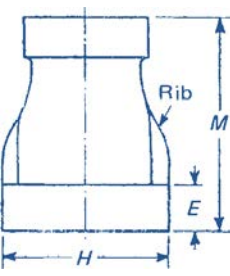
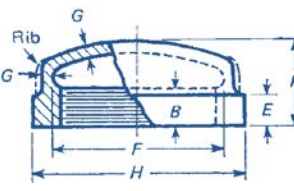
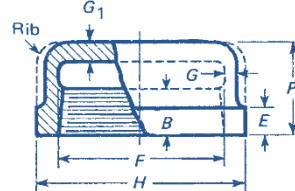
Design:

The Malleable Iron Screwed Fittings shall meet the following design pressure rating requirements as specified in ANSI/ASME B16.3 for operating temperature between -20°F to 150°F.

Class 150	Class 300		
300 psig	1/4" to 1" IPS	1-1/4" to 2" IPS	2-1/2 to 3" IPS
	2,000 psig	1,500 psig	1,000 psig

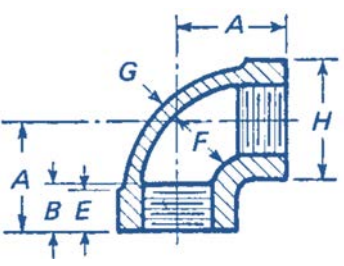
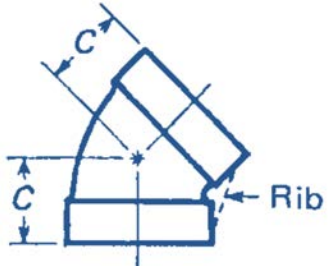
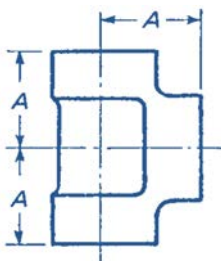
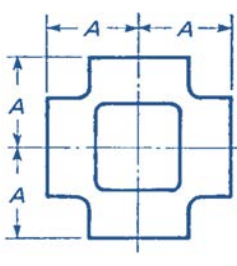
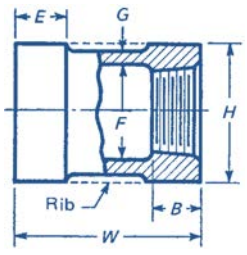
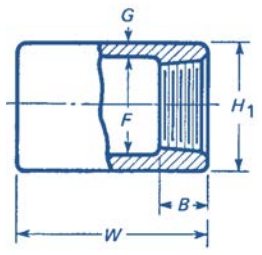

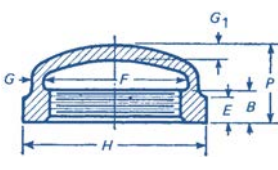
Sizes and Dimensions:

The following are the City of Mesa's commonly used malleable iron screwed fitting sizes. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer. All dimensions for fittings shall meet the inspection tolerances specified in ANSI/ASME B16.3.

Figure 1a: 150# Fittings			
90° Elbow	45° Straight Elbow	Tee	Cross
			
Coupling	Reducer	Cap	Flat-Top Cap
			

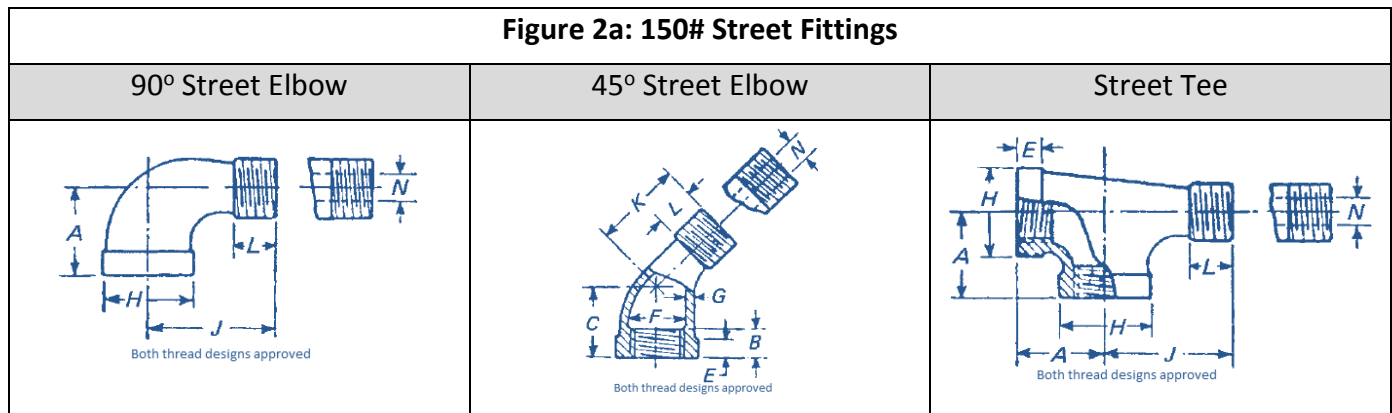
NPS (Inch)	Table 1a: Dimensions for 150# fittings in Figure 1a are per ANSI B16.3 in inches (value to nearest 1/16")										
	A	B _{min}	C	E _{min}	F _{min}	F _{max}	G	G ₁	H _{min} *	M	W
1/2	1.12 (1-1/8)	0.43 (7/16)	0.88 (7/8)	0.25 (1/4)	0.84 (13/16)	0.90 (7/8)	0.10 (1/8)	-	1.2 (1-3/16)	1.25 (1-4/16)	1.34 (1-5/16)
3/4	1.31 (1-5/16)	0.5 (1/2)	0.98 (1)	0.27 (1/4)	1.05 (1-1/16)	1.11 (1-1/8)	0.12 (1/8)	0.13 (1/8)	1.46 (1-7/16)	1.44 (1-7/16)	1.52 (1-1/2)
1	1.50 (1-1/2)	0.58 (9/16)	1.12 (1-1/8)	0.3 (5/16)	1.31 (1-5/16)	1.38 (1-3/8)	0.13 (1/8)	0.15 (1/8)	1.77 (1-3/4)	1.69 (1-11/16)	1.67 (1-11/16)
1-1/4	1.75 (1-3/4)	0.67 (11/16)	1.29 (1-5/16)	0.34 (5/16)	1.66 (1-11/16)	1.73 (1-3/4)	0.14 (1/8)	0.17 (3/16)	2.15 (1-1/8)	2.06 (1-1/16)	1.93 (1-15/16)
1-1/2	1.94 (1-15/16)	0.70 (11/16)	1.43 (1-7/16)	0.37 (3/8)	1.90 (1-7/8)	1.97 (2)	0.15 (1/8)	0.19 (3/16)	2.43 (2-7/16)	2.31 (2-5/16)	2.15 (2-1/8)
2	2.25 (2-1/4)	0.75 (3/4)	1.68 (1-11/16)	0.42 (7/16)	2.37 (2-3/8)	2.44 (2-7/16)	0.17 (3/16)	0.22 (1/4)	2.96 (2-15/16)	2.81 (2-13/16)	2.53 (2-1/2)
4	3.79 (3-13/16)	1.08 (1-1/16)	2.61 (2-5/8)	0.66 (11/16)	4.5 (4-1/2)	4.6 (4-5/8)	0.26 (1/4)	0.36 (3/8)	5.4 (5-3/8)	4.38 (4-3/8)	3.69 (3-11/16)
Notes: Dimension H for all reduction of reducing couplings shall be the same as shown for the largest opening.											

Figure 1b: 300# Fittings

90° Elbow	45° Straight Elbow	Tee	Cross
			
Coupling with band	Coupling w/out band	Reducer	Cap
			

NPS (Inch)	Table 1b: Dimensions for 300# fittings in Figure 1b are per ANSI B16.3 in inches (value to nearest 1/16")											
	A	B	C	E	F _{min}	F _{max}	G	G ₁ *	H	H ₁	W	W ₁
1/2	1.25 (1-1/4)	0.57 (9/16)	1 (1)	0.5 (1/2)	0.84 (13/16)	0.9 (7/8)	0.16 (3/16)	0.20 (3/16)	1.34 (1-5/16)	1.16 (1-3/16)	1.87 (1-7/8)	1.69 (1-11/16)
3/4	1.44 (1-7/16)	0.64 (5/8)	1.13 (1-1/8)	0.56 (9/16)	1.05 (1-1/16)	1.11 (1-1/8)	0.18 (3/16)	0.23 (1/4)	1.63 (1-5/8)	1.41 (1-7/16)	2.12 (2-1/8)	1.75 (1-3/4)
1	1.63 (1-5/8)	0.75 (3/4)	1.31 (1-5/16)	0.62 (5/8)	1.31 (1-5/16)	1.38 (1-3/8)	0.2 (3/16)	0.25 (1/4)	1.95 (1-15/16)	1.71 (1-11/16)	2.37 (2-3/8)	2 (2)
2	2.5 (2-1/2)	1 (1)	2 (2)	0.84 (13/16)	2.37 (2-3/8)	2.44 (2-7/16)	0.26 (1/4)	0.33 (5/16)	3.28 (3-1/4)	2.89 (2-7/8)	3.62 (3-5/8)	3.69 (3-11/16)
4	1.25 (1-1/4)	0.57 (9/16)	1 (1)	0.5 (1/2)	0.84 (13/16)	0.9 (7/8)	0.16 (3/16)	0.20 (3/16)	1.34 (1-5/16)	1.16 (1-3/16)	1.87 (1-7/8)	1.69 (1-11/16)
Notes: Dimension G ₁ is recommended but shall in no case be less than dimension G. Dimension W ₁ for all reduction of reducing couplings shall be the same as shown for the largest opening.												

Figure 2a: 150# Street Fittings

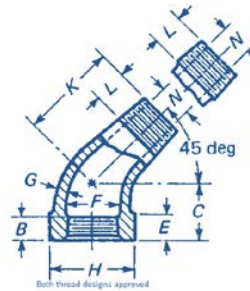
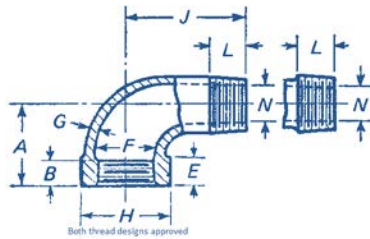


NPS (Inch)	Table 2a: Dimensions for 150# Street Fittings in Figure 2a are per ANSI B16.3 in inches (value to nearest 1/16")											
	A	B _{min}	C	E _{min}	F _{min}	F _{max}	G	H _{min}	J	K	L _{min}	N _{max}
1/2	1.12 (1-1/8)	0.43 (7/16)	0.88 (7/8)	0.25 (1/4)	0.84 (13/16)	0.9 (7/8)	0.1 (1/8)	1.2 (1-3/16)	1.63 (1-5/8)	1.15 (1-1/8)	0.53 (1/2)	0.51 (1/2)
3/4	1.31 (1-5/16)	0.5 (1/2)	0.98 (1)	0.27 (1/4)	1.05 (1-1/16)	1.11 (1-1/8)	0.12 (1/8)	1.46 (1-7/16)	1.89 (1-7/8)	1.29 (1-5/16)	0.55 (9/16)	0.69 (11/16)
1	1.5 (1-1/2)	0.58 (9/16)	1.12 (1-1/8)	0.3 (5/16)	1.31 (1-5/16)	1.38 (1-3/8)	0.13 (1/8)	1.77 (1-3/4)	2.14 (2-1/8)	1.47 (1-1/2)	0.68 (11/16)	0.91 (15/16)
2	2.25 (2-1/4)	0.75 (3/4)	1.68 (1-11/16)	0.42 (7/16)	2.37 (2-3/8)	2.44 (2-7/16)	0.17 (3/16)	2.96 (2-15/16)	3.26 (3-1/4)	2.22 (2-1/4)	0.76 (3/4)	1.79 (1-13/16)
4	3.79 (3-13/16)	1.08 (1-1/16)	2.61 (2-5/8)	0.66 (11/16)	4.5 (4-1/2)	4.6 (4-5/8)	0.26 (1/4)	5.4 (5-3/8)	5.69 (5-11/16)	3.7 (3-11/16)	1.3 (1-5/16)	3.7 (3-11/16)

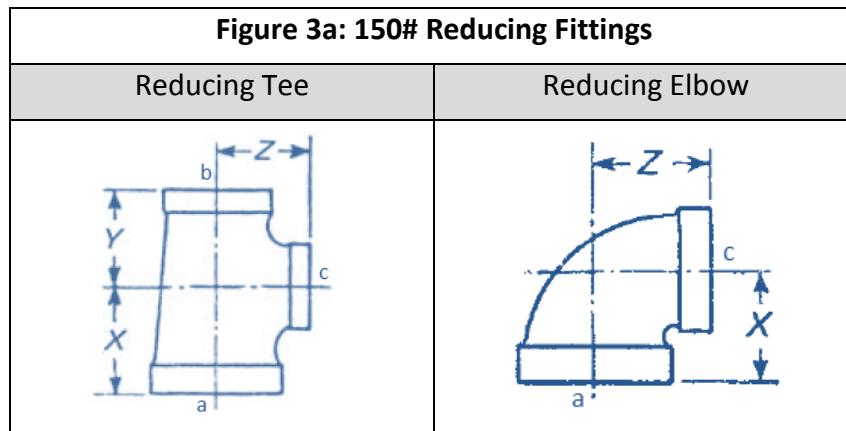
Figure 2b: 300# Street Fittings

90° Street Elbow

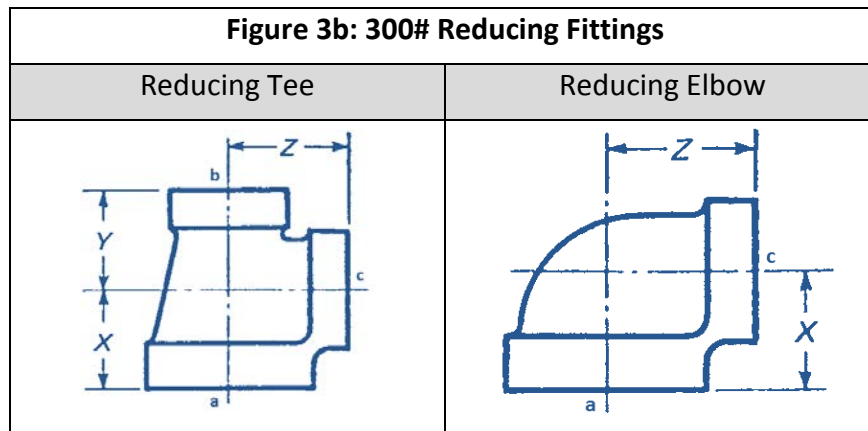
45° Street Elbow



NPS (Inch)	Table 2b: Dimensions for 300# Street Fittings in Figure 2b are per ANSI B16.3 in inches (value to nearest 1/16")											
	A	B _{min}	C	E _{min}	F _{min}	F _{max}	G	H _{min}	J	K	L _{min}	N _{max}
1/2	1.25 (1-1/4)	0.57 (9/16)	1 (1)	0.5 (1/2)	0.84 (13/16)	0.9 (7/8)	0.16 (3/16)	1.34 (1-5/16)	2 (2)	1.38 (1-3/8)	0.53 (1/2)	0.49 (1/2)
3/4	1.44 (1-7/16)	0.64 (5/8)	1.13 (1-1/8)	0.56 (9/16)	1.05 (1-1/16)	1.11 (1-1/8)	0.18 (3/16)	1.63 (1-5/8)	2.19 (2-3/16)	1.56 (1-9/16)	0.55 (9/16)	0.67 (11/16)
1	1.63 (1-5/8)	0.75 (3/4)	1.31 (1-5/16)	0.62 (5/8)	1.31 (1-5/16)	1.38 (1-3/8)	0.2 (3/16)	1.95 (1-15/16)	2.56 (2-9/16)	1.81 (1-13/16)	0.68 (11/16)	0.88 (7/8)
2	2.5 (2-1/2)	1 (1)	2 (2)	0.84 (13/16)	2.37 (2-3/8)	2.44 (2-7/16)	0.26 (1/4)	3.28 (3-1/4)	3.69 (3-11/16)	2.69 (2-11/16)	0.76 (3/4)	1.75 (1-3/4)



NPS (Inch)			Table 3a: Dimensions for 150# Reducing Fittings in Figure 3 are per ANSI B16.3 in inches (value to nearest 1/16")			
a	b	c	X	Y	Z	
¾	¾	1	1.45 (1-7/16)	1.45 (1-7/16)	1.37 (1-6/16)	Tee
1	¾	1	1.5 (1-1/2)	1.45 (1-7/16)	1.5 (1-1/2)	
1	1	¾	1.37 (1-3/8)	1.37 (1-3/8)	1.45 (1-7/16)	
1	1	2	2.02 (2)	2.02 (2)	1.73 (1-3/4)	
2	¾	2	2.25 (2-1/4)	1.97 (2)	2.25 (2-1/4)	
2	1	2	2.25 (2-1/4)	2.02 (2)	2.25 (2-1/4)	
2	2	¾	1.6 (1-5/8)	1.6 (1-5/8)	1.97 (2)	
2	2	1	1.73 (1-3/4)	1.73 (1-3/4)	2.02 (2)	
4	4	2	2.74 (2-3/4)	2.74 (2-3/4)	3.41 (3-7/16)	
¾	-	½	1.2 (1-3/16)	-	1.22 (1-1/4)	Elbow
1	-	½	1.26 (1-1/4)	-	1.36 (1-3/8)	
1	-	¾	1.37 (1-3/8)	-	1.45 (1-7/16)	
1-1/4	-	¾	1.45 (1-7/16)	-	1.62 (1-5/8)	
1-1/4	-	1	1.58 (1-5/8)	-	1.67 (1-11/16)	
1-1/2	-	¾	1.52 (1-1/2)	-	1.75 (1-3/4)	
1-1/2	-	1	1.65 (1-5/8)	-	1.80 (1-13/16)	
2	-	¾	1.6 (1-5/8)	-	1.97 (2)	
2	-	1	1.73 (1-3/4)	-	2.02 (2)	



NPS (Inch)			Table 3b: Dimensions for 300# Reducing Fittings in Figure 3b are per ANSI B16.3 in inches (value to nearest 1/16")			
a	b	c	X	Y	Z	
¾	½	¾	1.44 (1-7/16)	1.38 (1-3/8)	1.44 (1-7/16)	Tee
¾	¾	½	1.31 (1-5/16)	1.31 (1-5/16)	1.38 (1-3/8)	
1	¾	1	1.63 (1-5/8)	1.56 (1-9/16)	1.63 (1-5/8)	
1	1	½	1.44 (1-7/16)	1.44 (1-7/16)	1.5 (1-1/2)	
1	1	¾	1.5 (1-1/2)	1.5 (1-1/2)	1.56 (1-9/16)	
2	2	½	1.75 (1-3/4)	1.75 (1-3/4)	2.06 (2-1/16)	
2	2	¾	1.81 (1-13/16)	1.81 (1-13/16)	2.13 (2-1/8)	
2	2	1	2 (2)	2 (2)	2.25 (2-1/4)	
¾	-	½	1.31 (1-5/16)	-	1.38 (1-3/8)	Elbow
1	-	¾	1.5 (1-1/2)	-	1.56 (1-9/16)	

Figure 4: Bushings

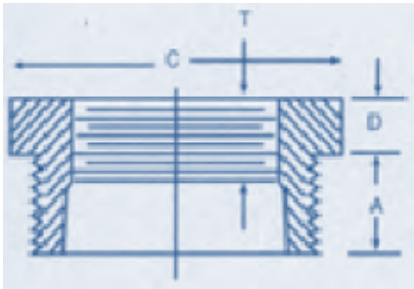
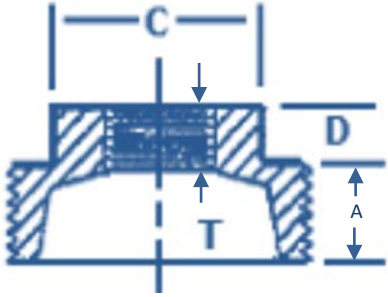
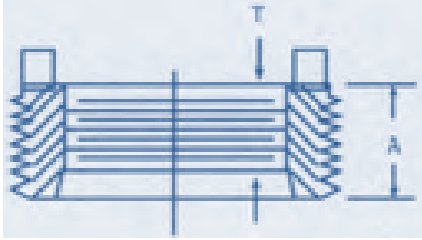
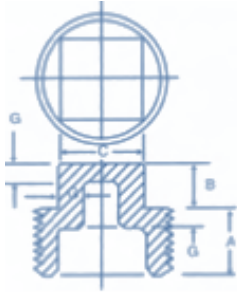
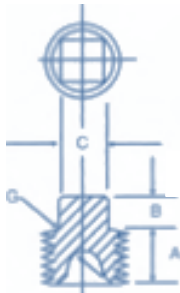

Outside Hex Head Bushing (Class 150)	Inside Hex Head Bushing (Class 150)	Face Bushing (Class 300)
		

Table 4: Dimensions for fittings in Figure 4 are in inches (value to nearest 1/16")

NPS (Inch)	Table 4: Dimensions for fittings in Figure 4 are in inches (value to nearest 1/16")				
	Ext. Thread, A _{min}	Outside Head Width, C _{min}	Inside Head Width, C _{min}	Head Height, D _{min}	Int. Thread, T _{min}
¾ x ½	0.63 (5/8)	1.15 (1-1/8)	-	0.22 (1/4)	0.53 (1/2)
1 x ½	0.75 (3/4)	1.42 (1-7/16)	-	0.25 (1/4)	0.43 (7/16)
1 x ¾	0.75 (3/4)	1.42 (1-7/16)	-	0.25 (1/4)	0.50 (1/2)
2 x ½	0.88 (7/8)	-	1.34 (1-5/16)	0.41 (7/16)	0.43 (7/16)
2 x ¾	0.88 (7/8)	-	1.63 (1-5/8)	0.41 (7/16)	0.50 (1/2)
2 x 1	0.88 (7/8)	-	1.95 (1-15/16)	0.41 (7/16)	0.58 (9/16)

Figure 5: Plugs

Cored Plug – Type 1 (Class 150)	Cored Plug – Type 2 (Class 150)	Solid Plug (Class 300)
		

NPS (inch)	Table 5: Dimensions for fittings in Figure 5 are in inches (value to nearest 1/16")			
	Thread Length, A _{min}	Square Height, B _{min}	Nominal width across flat, C	Nominal metal thickness, G
½	0.56 (9/16)	0.38 (3/8)	9/16	0.16 (3/16)
¾	0.63 (5/8)	0.44 (7/16)	5/8	0.18 (3/16)
1	0.75 (3/4)	0.5 (1/2)	13/16	0.20 (3/16)
2	0.88 (7/8)	0.68 (11/16)	1-5/16	0.26 (1/4)

Coating:

When specified on purchase order, fittings shall be coated according to NACE Standard RP0394-94 and conforming to the following criteria:

- Product - Fusion-Bonded Epoxy Powder.
- Application - Electrostatic Spray.
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).
- Thickness - Min. 2 mils dry to max. 4 mils dry.
- Finish - Semi-gloss smooth
- Threads - Male (external threads) must be masked from receiving direct or indirect paint coating on the first 4 threads. There must not be any major coating build-up on the threads that inhibits fit and function.

When specified on purchase order, zinc coated fittings shall be hot dipped in accordance with ASTM A153 or have an electrodeposited zinc coating conforming to ASTM B633, Type I, Service Condition 4. Hot-dipped coatings shall be 0.0034 in. minimum thickness and applied prior to threading. Electrodeposited zinc shall be 0.001 in. minimum thickness.

Marking:

Each Class 150 fitting shall be marked for identification with the manufacture's name or trademark.

Each Class 300 fitting shall be marked for identification with the following:

- a) The manufacturer's name or trademark
- b) The numeral "**300**"
- c) The letters "**MI**" to designate malleable iron
- d) The size

Each plug shall be marked with the manufacturer's name or trademark, except where marking is impractical.

Packaging/Shipping:

The Malleable Iron Screwed Fittings shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.



Approved Manufacturers:

All manufacturers meeting the requirements set forth in this Specification are approved at this time.

Warehouse Stock Descriptions:

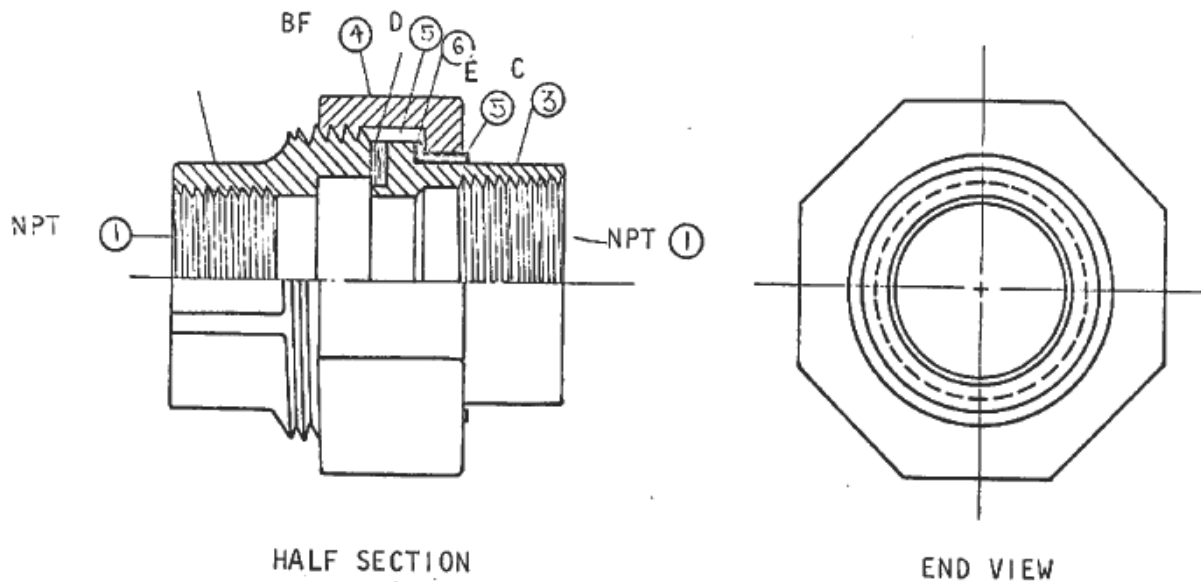
_____[Elbow, Tee, Cross, Coupling, Plug, Bushings, Cap], _____[45°, 90°], _____ [Straight, Reducing, Street], _____ [Black, Galvanized, Coated], Malleable, _____ [Size], _____ [150,300] # Class.

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GM-2.4

SCREWED FITTINGS – MALLEABLE IRON

INSULATING UNION



Loc.	Materials Required	Qty.
A	THREAD PIECE, BLACK, 150 POUND, GASKET TYPE (2)	1
B	UNION RING, BLACK, 150 POUND, GASKET TYPE (2)	1
C	TAIL PIECE, BLACK, 150 POUND, GASKET TYPE	1
D	SEAL GASKET, GARLOCK NO. 353, OR EQUIVALENT	1
E	INSULATING GASKET, GRADE LE TUBE STOCK (N.E.M.A. STD.)	1
F	YELLOW JAPAN (VARNISH)	AS REQ.

Notes:

- (1) Nominal pipe size, inches: $\frac{3}{4}$, 1, or 1 $\frac{1}{2}$ (ANS B2.1)
- (2) With modifications to accommodate insulating features, this part shall conform to applicable requirements of ANS B16.3 as a minimum.
- (3) Remove or omit lugs to receive insulating gasket.
- (4) Japanned yellow for identification

(5) The assembly shall meet the following requirements for:

- a. Mechanical Strength – Withstand bending moment at least equal in magnitude to that required to break standard steel pipe connected to the union with normal thread engagement, and applied successively in at least 2 planes intersecting at equal angles on the longitudinal axis of the union.
- b. Leakage – Withstand at least 50-psig internal air pressure.
- c. Dielectric Strength – Withstand at least 1000 V. difference in potential between tailpiece and other union parts.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

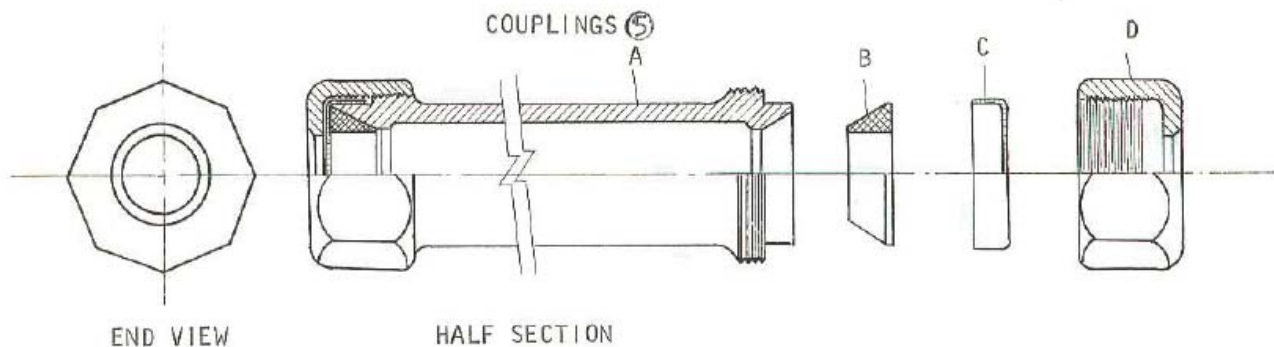
The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-2.5

COMPRESSION FITTINGS – BOLTLESS



Ref.	Materials Required (5)	Quantity		
		Reg.	Long	Short
A	BODY, STEEL OR MALLEABLE IRON, BLACK (1)			
	REGULAR (5" APPROX. LENGTH)	1		
	LONG (10" APPROX. LENGTH)		1	
	SHORT (2)			1
B	GASKET, ARMORED RUBBER FOR NATURAL GAS (3)	2	2	2
C	GASKET RETAINER, STEEL, BLACK	2	2	2
D	END NUT, FORGED STEEL OR MALLEABLE IRON (4)	2	2	2

Notes:

- (1) Steel bodies shall be forged or seamless, with wall thickness and strength at least equal to that of standard weight steel pipe in the same nominal size. Malleable iron bodies shall conform to applicable requirements of American Standard for malleable iron screwed fittings 150-lb (ANSI B16.3).
- (2) Length varies from 2" (for ¾" size) to 3" (for 2" size).
- (3) Wedge-shaped cross section is preferred
- (4) Strength shall be sufficient to prevent crushing by grim of pipe wrench. External cross section shall be octagonal or such other shape as to afford adequate grip

for a pipe wrench. Malleable iron end nuts shall meet requirements of Note 1 for malleable iron bodies in so far as applicable.

(5) Couplings shall fit bare steel pipe as shown below.

Nominal size of coupling, inches:	$\frac{3}{4}$	1	1 $\frac{1}{2}$	2
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Outside diameter of pipe, inches:	1.050	1.315	1.900	2.375
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Couplings shall be assembled, covered with a rust-preventative that does not adversely affect pipe coating, and packed in standard packages for convenient handling.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.



Approved Manufacturers:

The following manufacturers of boltless compression fittings are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

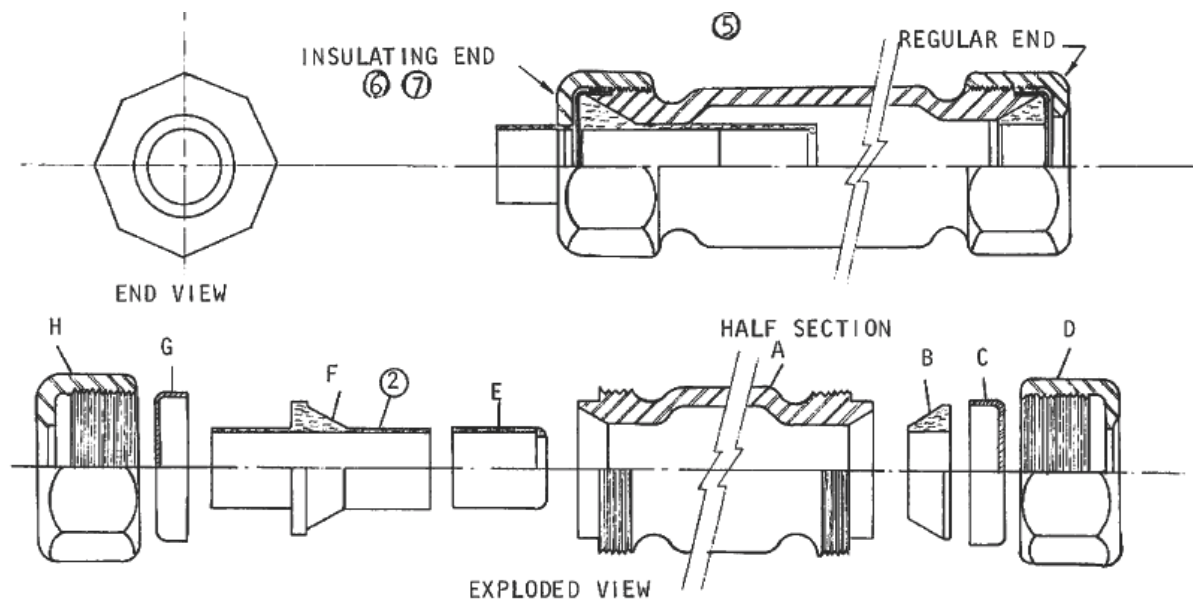
- Dresser, Inc.

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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GM-2.6

COMPRESSION FITTINGS – BOLTLESS INSULATING UNION



Ref.	Materials Required	Quantity	
		Reg.	Long
A	BODY, STEEL OR MALLEABLE IRON, BLACK (1)		
	REGULAR (5" APPROX. LENGTH)	1	
	LONG (10" APPROX. LENGTH)		1
B	GASKET, ARMORED RUBBER FOR NATURAL GAS (3)	1	1
C	GASKET, RETAINER, STEEL, BLACK, FOR REGULAR END	1	1
D	END NUT, FORGED STEEL OR MALLEABLE IRON, FOR REGULAR END (4)	1	1
E	TUBE, INSULATING, PLASTIC	1	1
F	GASKET, INSULATING, RUBBER FOR NATURAL GAS	1	1
G	GASKET, RETAINER, STEEL, BLACK, FOR INSULATING END	1	1
H	END NUT, FORGED STEEL OR MALLEABLE IRON, FOR INSULATING END (4)	1	1

Notes:

- (1) Steel bodies shall be forged or seamless, with wall thickness and strength at least equal to that of standard weight steel pipe in the same nominal size.
Malleable iron bodies shall conform to applicable requirements of ANSI Standard for malleable iron screwed fittings, 150-lb (ANSI B16.3)
- (2) For regular (5") body this skirt is omitted.
- (3) Wedge-shaped cross section is preferred.
- (4) Strength shall be sufficient to prevent crushing by grip of pipe wrench. External cross section shall be octagonal or such other shape as to afford adequate grip for a pipe wrench. Malleable iron end nuts shall meet requirements of Note 1 for malleable iron bodies in so far as applicable.
- (5) Couplings shall fit bare steel pipe as shown below.

Nominal size of coupling, inches:	$\frac{3}{4}$	1	1 $\frac{1}{2}$	2
Outside diameter of pipe, inches:	1.050	1.315	1.900	2.375

Couplings shall be assembled, covered with a rust-preventative that does not adversely affect pipe coating, and packed in standard packages for convenient handling.
- (6) Insulated compression joint shall be sufficient to withstand at least 100-psig internal pressure with no leakage. Maximum electrical leakage: 2 to 5 microamps with 1000 volts D.C.
- (7) Design of insulating end may vary depending upon manufacturer.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not

Sampling/Testing (continued):

conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Approved Manufacturers:

The following manufacturers of insulated, boltless compression fittings are approved for use in the City of Mesa natural gas distribution system:

Manufacturer:

- Continental Industries, Inc.

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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Gas Material Specifications

GM-2.7 Steel Service Tees

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GM-2.7.1

STEEL SERVICE TEES

STEEL MAIN TO POLYETHYLENE SERVICE LINES WITH COMPRESSION OUTLET

Use:

Steel service tees will be used to connect PE service lines to steel mains. The tee shall be designed to be welded to the main and have a compression-coupling outlet to the PE service line. Steel service tees may be used in the City's natural gas system with design pressures up to 60 psig.

Standards:

The steel service tees shall comply with the requirements of 49 CFR 192. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Material:

All steel service tees may be cast, forged or fabricated from pipe or tubing. They shall be of high quality, sound, clean and free from injurious defects and shall be made of material at least equal to one of the following:

1. Carbon steel conforming to ASTM A27: Mild-to-medium strength carbon steel castings for general application, Grades 65-35, 70-36 Annealed.
2. Carbon steel conforming to ASTM Standard A711: Carbon and alloy steel blooms, billets, and slabs for forging, Grade AISI 1020 or 1025.
3. Steel pipe conforming to ASTM A53: Pipe, steel, black and hot dipped zinc coated welded and seamless steel, Grade A or B, black, Schedule 40 minimum.
4. Carbon steel conforming to ASTM Standard A-105: Forgings, carbon steel, for piping components

Gaskets:

The gasket shall be made of an elastomer, which shall not change or deteriorate when exposed to methanol, odorants, water or other materials commonly found in natural gas pipelines. The gasket shall meet or exceed the ASTM Standard D2000: Rubber Products in Automotive Applications

Compression Fittings:

All compression fittings furnished under these specifications shall provide a gas tight seal on all pipe with dimensional tolerances conforming to ASTM D2513: Thermoplastic Gas Pressure Pipe, Tubing, Fittings.

Stiffener:

A rigid internal tubular stiffener to control cold flow shall be an integral part of each service tee. The stiffener shall have sufficient length to extend under the entire compressed area. The ends shall be free of rough or sharp edges and the ends shall be tapered or rounded. The stiffener shall be capable of withstanding the compression forces exerted by the wedging action of the ring. Split tubular stiffeners are prohibited.

Component Parts:

All component parts of the service tee shall have sufficient strength, thickness, and elasticity to insure against the possibility of breakage or permanent distortion during normal handling, installation and operation at its rated pressure. All component parts of the service tee which are to be exposed to gas flow when properly installed and assembled shall be resistant to the effects of all constituents of natural gas and odorants.

Piercing Punches:

Punch shall consist of material of high quality suitable for the purpose and of adequate strength to prevent deformation and breakage under normal service conditions. The cutting end of the punch shall have Rockwell C hardness of 53 to 63.

Instructions:

All service tees shall be supplied with proper installation instruction.

Design:

Inlet weld end shall conform to ANSI B16.25: Butt Welding Ends or ANSI B31.8: Gas Transmission and Distribution Piping Systems, figure 823-A. The weld end according to

Design (continued):

ANSI B16.25 shall be furnished beveled at an angle of 35 degree to 40 degree (measured from a line perpendicular to the axis of fittings) with a 1/16" (+/- 1/32") flat. The weld ends according to ANSI B31.8 shall be furnished beveled to an angle of 45 degree to 50 degree. The punch shall be "Coupon retaining" unless otherwise specified. The top of the piercing punch shall be furnished with an Allen Key socket. The punch shall be able to seat against the pipe and shut off the flow of gas. The escape of gas during the piercing and capping operations shall be negligible. The top of the fitting shall be provided with a cap. The cap shall provide a gas-tight seal.

Finish:

The fittings shall be black, coated with a light oil and clean.

Marking:

All service tees shall be marked according to the specification standard to which they were manufactured. If any of the above information is coded, key to such coding shall be furnished in writing to the City of Mesa Gas Planning Engineer prior to payment.

Threads:

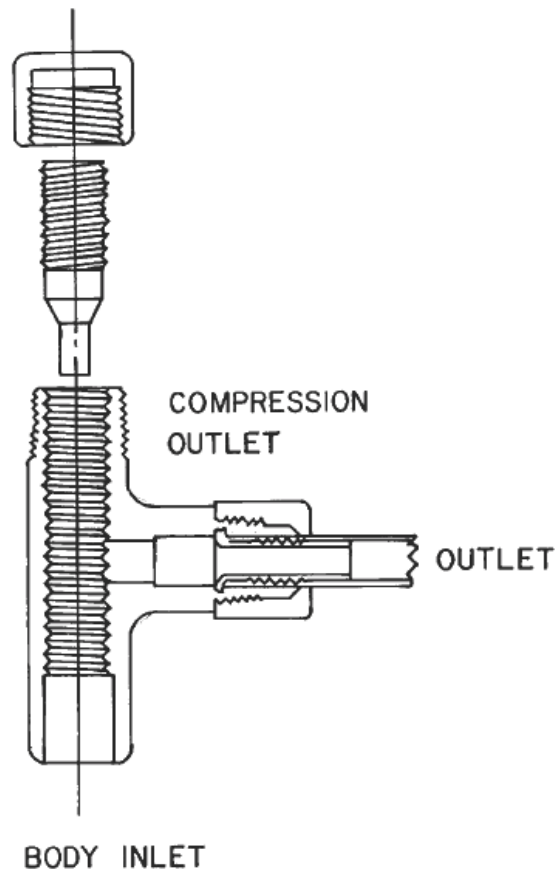
The pipe threads shall conform to the NPT Standard Taper Pipe Threads including dimensions and tolerances shown in ANSI B2.1: Pipe Threads (Except Dryseal). Inspection may be by optical or mechanical methods (see Sec. 16 and 33 of ANSI).

Test Requirements:

The service tees shall be designed for pressures up to 100 psi. The mechanical coupling shall be designed to resist a tensile pull that will fail the pipe, before the pipe pulls out of the coupling.

Sizes:

The following are the City's standard service tee sizes. This specification shall apply in all instances, although other sizes may be authorized by the City of Mesa Gas Planning Engineer.



Body Size, IPD	Outlet Size	PE Material	SDR	PE Tubing Nominal Wall Thickness	Punch Size
1/2" IPS	1/2" CTS	2306/2406	7	.090	3/8"
1/2" IPS	1/2" IPS	2306/2406	9.3	.090	3/8"

Packaging/Shipping:

Service tees shall be packaged to prevent any damage in shipping or warehousing. The supplier shall exercise extreme care in the shipping of all service tees to protect them from damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192.

Approved Manufacturers:

The following manufacturers of steel service tees are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- Continental Industries, Inc.

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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GMS-2.7.2

STEEL SERVICE TEES

Use:

The steel service tees are to be used in the City of Mesa's natural gas systems for connecting steel distribution mains to steel service or sensing lines.

Standards:

The steel service tees shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification where applicable. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI/ASME B1.20.1 Pipe Threads, General Purpose (INCH)

Sizes and Dimensions:

The following are the City of Mesa's standard service tee sizes.

Body Size (IPS)	Outlet Size (IPS)	Outlet O.D. Size (Inch)	Outlet Nominal Wall Thickness (Inch)	Punch Size	Manufacturer
½"	¾"	1.050	.113	3/8"	Continental
1"	1"	1.315	.133	¾"	Continental
¾"	¾"	1.050	.113	N/A	Mueller
1"	1"	1.315	.133	N/A	Mueller
2"	2"	2.375	.154	N/A	Mueller

Test requirements:

All steel service tees shall be tested to a pressure of at least 1.5 times their manufacturer's rated working pressure. Each tee's rated working pressure shall be clearly stated on the material certification included with each shipment of tees.

Coating and Finish:

The service steel tees shall be supplied coated with a light oil and free of surface rust or debris.

Design and Performance:

All steel service tees shall meet the following design specifications:

- Steel components of steel service tee's inlet and outlet shall be manufactured from carbon steel.
- All components of the steel service tees will be compatible with the components in natural gas.
- The completion plug and cap shall be compatible with the pressure rating for the service tee.
- Inlet weld end – Beveled at an angle of $37 \frac{1}{2}$ degree $\pm 2 \frac{1}{2}$ degree with a $\frac{1}{16}$ ", $\pm \frac{1}{32}$ " flat
 - Or 30 degree $+5/-0$ degree with a $\frac{1}{16}$ ", $\pm \frac{1}{32}$ " flat
- Outlet weld end – Beveled at an angle of $37 \frac{1}{2}$ degree, $\pm 2 \frac{1}{2}$ degree with a $\frac{1}{16}$ ", $\pm \frac{1}{32}$ " flat
 - Or 30 degree $+5/-0$ degree with a $\frac{1}{16}$ ", $\pm \frac{1}{32}$ " flat
- Steel punch shall be furnished with an Allen key socket.
- Steel punch shall be coupon retaining.
- Punch shall consist of material of high quality suitable for the purpose and of adequate strength to prevent deformation and breakage under normal service conditions. The cutting end of the punch shall be capable of cutting API-5L X52 steel pipe of 0.250" and 0.280" wall thickness for $\frac{3}{4}$ " and $\frac{3}{8}$ " punch sizes, respectively.

Marking:

Each steel service tee shall be marked for identification with the manufacture's name or trademark.

Packaging/Shipping:

The service steel tees shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following steel service tees are approved for use in the City of Mesa's natural gas distribution systems:

Body/Inlet Size (IPS)	Outlet Size & Style (IPS)	Punch Size & Style	Manufacturer	Model	For use in Mesa's system with MAOP of:
½" weld	½" Butt weld	3/8" CR	Continental	1214-12-0612-00	200 psig or less
½" weld	¾" Fillet weld	3/8" CR	Continental	1214-12-0612-00	200 psig or less
¾" weld	½" socket weld	3/8" CR	Continental	1315-09-0712-00	200 psig or less
¾" weld	¾" socket weld	3/8" CR	Continental	1315-09-0713-00	200 psig or less
¾" weld	¾" plain	3/8" CR	Continental	1315-09-0813-00	200 psig or less
¾" weld	1" plain	3/8" CR	Continental	1315-09-0814-00	200 psig or less
1" weld	¾" plain	3/8" CR	Continental	1416-09-0813-00	200 psig or less
1" weld	1" plain	¾" CR	Continental	1416-09-0814-00	200 psig or less
3/4"	¾"	N/A	Mueller	H-17501	522 psig or less
1"	1"	N/A	Mueller	H-17501	522 psig or less
2"	2"	N/A	Mueller	H-17501	522 psig or less



Warehouse Stock Descriptions:

_____[Continental, Mueller], Steel to steel service tee _____[3/4, 1, 2]" X _____ [3/4, 1, 2]"

GM-2.7.3

STEEL SERVICE TEES

STEEL MAIN TO POLYETHYLENE SERVICE LINES

TRANSITION FITTING

Use:

Steel service tees will be used to connect PE service lines to steel mains. The tee shall be designed to be welded to the steel main and a transition fitting fused to the PE service line. Steel service tees may be used in the City's natural gas system with design pressures up to 60 psig.

Standards:

Steel service tees shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished.

Material:

All steel service tees may be cast, forged, or fabricated from pipe or tubing. They shall be of high quality, sound, clean and free from injurious defects and shall be made of material at least equal to one of the following:

1. Carbon steel conforming to ASTM A27:
Mild-to-medium strength carbon steel castings for general application, Grades 65-35, 70-36 Annealed.
2. Carbon steel conforming to ASTM Standard A711:
Carbon and alloy steel blooms, billets, and slabs for forging, Grade AISI 1020 or 1025.

Material (continued):

3. Steel pipe conforming to ASTM A53:
Pipe, steel, black and hot dipped zinc coated welded and seamless steel, Grade A or B, black, Schedule 40 minimum.
4. Carbon steel conforming to ASTM Standard A105:
Forgings, carbon steel, for piping components.

Component Parts:

All component parts of the service tee shall have sufficient strength, thickness, and elasticity to insure against the possibility of breakage or permanent distortion during normal handling, installation and operation at its rated pressure. All component parts of the service tee which are to be exposed to gas flow when properly installed and assembled shall be resistant to the effects of all constituents of natural gas and odorants.

Piercing punch:

Punch shall consist of material of high quality suitable for the purpose and of adequate strength to prevent deformation and breakage under normal service conditions. The cutting end of the punch shall have Rockwell C hardness of 53 to 63.

Instructions:

All service tees shall be supplied with proper installation instructions.

Transition Fitting:

The transition fitting shall meet all requirements described in City of Mesa Gas Material Specification GM-10.1.

Design:

Inlet weld end shall conform to ANSI B16.25: Butt Welding Ends or ANSI B31.8: Gas Transmission and Distribution Piping Systems, figure 823-A. The weld ends according to ANSI B16.25 shall be furnished beveled at an angle of 35 to 40 degree (measured from a line perpendicular to the axis of fitting) with a 1/16", +/-1/32" flat. The weld ends according to ANSI B31.8 shall be furnished beveled to an angle of 45 to 50 degree. The punch shall be "coupon retaining" unless otherwise specified. The top of the piercing punch shall be furnished with an Allen key socket. The punch shall be able to seat against the pipe and shut off the flow of gas. The escape of gas during the piercing and capping operations shall be negligible. The top of the fitting shall be provided with a cap. The cap shall provide a gas-tight seal.

Finish:

The fittings shall be black, coated with a light oil and clean.

Marking:

All service tees shall be marked according to the specifications standard to which they were manufactured. P.E. pipe shall be marked according to ASTM D2513 and contain at least the following information:

- a. ASTM D2513
- b. Manufacturer's name or trademark
- c. Nominal pipe or tubing size and SDR number
- d. Material designation (P.E. 2406/2708)
- e. Temperature/Pressure Rating (minimum rating of CE)
- f. Base resin material
- g. Year and month of manufacture

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Sizes:

The following are the City's standard service tee sizes. This specification shall apply in all instances, although other sizes may be authorized by the City of Mesa Gas Planning Engineer.

Body Size I.P.S.	P.E. Outlet Size I.P.S.	P.E. Material	SDR	P.E. Tubing Nominal Wall Thickness	Punch Size
1"	1"	2406/2708	11	0.119	3/8"

Threads:

The pipe threads shall conform to the NPT (National Pipe Thread) Standard Taper Pipe Threads including dimensions and tolerance shown in ANSI B2.1: Pipe Threads (Except Dryseal). Inspection may be optical or by mechanical methods (see Sec. 16 and 33 of ANSI).

Test Requirements:

The service tees shall be designed for pressures up to 100 psi. The connection point between steel pipe and P.E. pipe shall be designed to resist a tensile pull that will fail the pipe, before the pipe pulls out of the coupling.

Packaging/Shipping:

Service tees shall be packaged to prevent any damage in shipping or warehousing. The supplier shall exercise extreme care in the shipping of all service tees to protect them from damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of steel service tees are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- Continental Industries, Inc.

Manufacturers may submit products not identified above but meeting all qualifications set forth in this specification to City for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer at (480) 644-4851.

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GM-2.7.4

STEEL SERVICE TEES

STEEL MAIN TO POLYETHYLENE SERVICE LINES

LYCOFIT® OUTLET

Use:

Steel service tees will be used to connect PE service lines to steel mains. The tee shall be designed to be welded to the main and have a R.W. Lyall & Co. Lycofit® outlet to the PE service line. Steel service tees may be used in the City's natural gas system with design pressures up to 60 psig.

Standards:

The mechanical fittings shall comply with the requirements of 49 CFR 192. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Material:

All steel service tees may be cast, forged or fabricated from pipe or tubing. They shall be of high quality, sound, clean and free from injurious defects and shall be made of material at least equal to one of the following:

1. Carbon steel conforming to ASTM A27:
Mild-to-medium strength carbon steel castings for general application, Grades 65-35, 70-36 Annealed.
2. Carbon steel conforming to ASTM Standard A711:
Carbon and alloy steel blooms, billets, and slabs for forging, Grade AISI 1020 or 1025.
3. Steel pipe conforming to ASTM A53:
Pipe, steel, black and hot dipped zinc coated welded and seamless steel, Grade A or B, black, Schedule 40 minimum.
4. Carbon steel conforming to ASTM Standard A-105:
Forgings, carbon steel, for piping components

Tee Outlet:

Only the Lycofit® fitting as manufactured by R. W. Lyall and Company, Inc. is approved for use as the tee outlet for this specification.

Component Parts:

All component parts of the service tee shall have sufficient strength, thickness, and elasticity to insure against the possibility of breakage or permanent distortion during normal handling, installation and operation at its rated pressure. All component parts of the service tee which are to be exposed to gas flow when properly installed and assembled shall be resistant to the effects of all constituents of natural gas and odorants.

Piercing Punches:

Punch shall consist of material of high quality suitable for the purpose and of adequate strength to prevent deformation and breakage under normal service conditions. The cutting end of the punch shall have Rockwell C hardness of 53 to 63.

Instructions:

All service tees shall be supplied with proper installation instruction.

Design:

Inlet weld end shall conform to ANSI B16.25: Butt Welding Ends or ANSI B31.8: Gas Transmission and Distribution Piping Systems, figure 823-A. The weld end according to ANSI B16.25 shall be furnished beveled at an angle of 35 degree to 40 degree (measured from a line perpendicular to the axis of fittings) with a 1/16" (+/- 1/32") flat. The weld end according to ASNI B31.8 shall be furnished beveled to an angle of 45 degree to 50 degree. The punch shall be "Coupon retaining" unless otherwise specified. The top of the piercing punch shall be furnished with an Allen Key socket. The punch shall be able to seat against the pipe and shut off the flow of gas. The escape of gas during the piercing and capping operations shall be negligible. The top of the fitting shall be provided with a cap. The cap shall provide a gas-tight seal.

Finish:

All material, except for tee outlet, cap threads and weld area, shall be coated according to NACE Standard RP0394-94 and according to the following criteria:

Product -	Fusion-Bonded Epoxy Powder
Application -	Electrostatic Spray
Color -	Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
Thickness -	Min. 2 mils dry to max. 4 mils dry
Finish -	Semi-gloss smooth

Marking:

All service tees shall be marked according to ASTM D-2513 and all other specification standards to which they were manufactured. If any of the above information is coded, key to such coding shall be furnished in writing to the City of Mesa Gas Planning Engineer prior to payment.

Sizes:

The following are the City's standard service tee sizes. This specification shall apply in all instances, although other sizes may be authorized by the City of Mesa Gas Planning Engineer.

Body Size, IPD	Outlet Size	SDR	Punch Size	Tee Manufacturer
½" IPS	½" CTS	7	3/8"	Continental
½" IPS	½" IPS	9.3	3/8"	Continental
1" IPS	1" IPS	11	3/4"	Continental

Threads:

The pipe threads shall conform to the NPT Standard Taper Pipe Threads including dimensions and tolerances shown in ANSI B2.1: Pipe Threads (Except Dryseal). Inspection may be by optical or mechanical methods (see Sec. 16 and 33 of ANSI).

Test Requirements:

The service tees shall be designed for pressures up to 100 psi. The mechanical coupling shall be designed to resist a tensile pull that will fail the pipe, before the pipe pulls out of the coupling.

Packaging/Shipping:

Service tees shall be packaged to prevent any damage in shipping or warehousing. The supplier shall exercise extreme care in the shipping of all service tees to protect them from damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192.

Approved Manufacturers:

The following manufacturers of steel service tees are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- R.W. Lyall & Co.

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

GMS-2.8

STEEL PIPE NIPPLES

Use:

Steel pipe nipples (weld and threaded ends) are to be used in the City of Mesa's natural gas systems with various design pressures for above ground natural gas metering and regulating facilities.

Standards:

The Steel Pipe Nipples shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification where applicable. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|---------------------|--|
| • ANSI/ASME B1.20.1 | Pipe Threads, General Purpose (INCH). |
| • ASTM A53 | Standard Specification for Welded and Seamless Steel Pipe. |
| • ASTM A106 | Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service. |
| • ASTM A733 | Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples. |
| • API 5L | Specification for Line Pipe. |

Materials:

Steel pipe nipples purchased to this Specification shall be produced from pipe manufactured in accordance with one of the following, as applicable:

- a) ASTM A53 Type E (Electric-Resistance Weld) or S (Seamless), Grade A or B
- b) ASTM A106, Grade A or B
- c) API 5L Grade A or B

Sizes and Dimensions:

The following are the City of Mesa's commonly used steel pipe nipple sizes. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer.

NPS	Sch. 40 WT	Sch. 80 WT	Longitudinal Length																
			Close Nipple	1-½	2	2-½	3	3-½	4	4-½	5	5-½	6	7	8	9	10	11	12
½	0.109	0.147	1-⅝	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
¾	0.113	0.154	1-¾	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1	0.133	0.179	1-½		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	0.154	0.218	2			X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	0.237	0.337	2-⅞						X	X	X	X	X	X	X	X	X	X	X

Notes: Dimensions are in Inches.

"X" indicates nipples of that length is available and acceptable for use. Blank space indicates nipple of that length is not available.

The use of Sch. 40 close nipples for the installation of meters and regulators is prohibited.

High Pressure Use:

The following steel pipe nipples may be used in the City's 522 psig MAOP high pressure system:

	½" NPS	¾" NPS	1" NPS	2" NPS	4" NPS
Schedule 40	X	X	X	NO	NO
Schedule 80	X	X	X	X	X

Finishing:

- The steel pipe nipples will be deburred, cleaned and free of rust, scale, steel chips, paint, dirt, sand and debris.
- Threaded nipples will be threaded in accordance with ANSI B1.20.1
- Weld end nipples will be beveled at 37½° (±2½°) and with a root face (land) of 1/16" (±1/32") or 30° (+5°/-0°) and with a root face (land) of 1/16" (±1/32")

Coating:

When specified on purchase order, steel pipe nipples shall be coated according to NACE Standard RP0394-94 and conforming to the following criteria:

- Product - Fusion-Bonded Epoxy Powder.
- Application - Electrostatic Spray.
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).
- Thickness - Min. 2 mils dry to max. 4 mils dry.
- Finish - Semi-gloss smooth
- Threads - Male (external threads) must be masked from receiving direct or indirect paint coating on the first 4 threads. There must not be any major coating build-up on the threads that inhibits fit and function.

Packaging/Shipping:

The steel pipe nipples shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

All manufacturers meeting the requirements set forth in this Specification are approved at this time.

Warehouse Stock Descriptions:

Nipple, Steel, Coated/Uncoated, Sch. _____ [40,80], _____ [Diameter] – Inch X _____ [Length] – Inch



Gas Material Specifications

GMS-3: Polyethylene
Pipe

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GMS-3.1

MEDIUM DENSITY POLYETHYLENE PIPE

Use:

Medium density polyethylene (PE 2708) pipe is to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

PE 2708 pipe shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
- ASTM F2897 Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)

Resin Material:

The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI) and maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2708. Material shall have a cell classification of 234373E per ASTM D3350. The manufacturer shall not change the resin without written permission from the Gas Planning Engineer. The resin color shall be YELLOW. The yellow color shall match or be similar to the standard color in ANSI Z53.1. Acceptable resin manufacturers are as follows:

Ineos Olefins & Polymers USA (K38-20-160) and DOW DGDA-2420. All resin shall have a minimum HDB of 1,000 psi at 140 °F.

Chevron Phillips Chemical (CP Chem) Marlex TR-418. The resin shall have a minimum HDB of 800 psi at 140 °F. Pipe produced using this resin is only acceptable if manufactured after January 22, 2019.

PE 2708 pipe shall not contain reworked resin.

Marking:

PE 2708 pipe shall be marked according to ASTM D2513 with permanent marking and contrasting in color with the pipe. The marking shall contain at least the following information:

- a. ASTM D2513
- b. Manufacturer's name or trademark
- c. Nominal pipe or tubing size and SDR number
- d. Material designation (PE 2708)
- e. Temperature/Pressure Rating (CD or CE)
- f. Base resin material
- g. Year and month of manufacture
- h. "NR" to indicate non-rework resin
- i. Tracking and traceability information per ASTM F2893 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Length:

Standard length of pipe is as follows unless specified otherwise on purchase order:

Size	Coil Length	Joint Length*
½" CTS	1,000'	
½" IPS	1,000'	
¾" IPS	500' or 1,000'	
1" IPS	500'	
2" IPS	500'	20' or 40'
4" IPS	500'	40'
6" IPS	500'	40'

* Specified length is the minimum requirement. The vendor shall contact the City of Mesa prior to shipment for approval if the actual joint length exceeds the specified length by 5% or more.

Sizes:

The following are the City of Mesa's standard PE 2708 pipe sizes and shall apply in all instances. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer.

Size	DR	O.D.	I.D.	Min. Wall
½" CTS	7	0.625"	0.445"	0.090"
½" IPS	9.3	0.840"	0.660"	0.090"
¾" IPS	11	1.050"	0.860"	0.095"
1" IPS	11	1.315"	1.077"	0.119"
2" IPS	11	2.375"	1.943"	0.216"
4" IPS	11	4.500"	3.682"	0.409"
4" IPS	11.5	4.500"	3.718"	0.391"
6" IPS	11	6.625"	5.421"	0.602"

Packaging/Shipping:

PE 2708 pipe shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage. Pipe with a nominal size of 2" and above shall be capped at each end.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and

the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of PE 2708 pipe are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- CP Chem – Performance Pipe
- JM Eagle – USPoly
- Duraline - PolyPipe

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

____[Size] x ____[20', 40', 500', 1,000'] PE Pipe



Gas Material Specifications



GM-4 PE Fittings

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Gas Material Specifications

GM-4.1 Fusion Fittings

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GMS-4.1.1

MEDIUM DENSITY POLYETHYLENE FUSION FITTINGS

Use:

Medium density polyethylene (PE 2708) fusion fittings are to be used in the City of Mesa's natural gas distribution systems with design pressures up to 60 psig. This Specification covers butt and socket style couplings, 3-way tees, elbows, caps and reducers.

Standards:

PE 2708 fusion fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
- ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
- ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- ASTM F2897 Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)

Resin Material:

PE 2708 fusion fittings shall conform to the requirements in ASTM D2513. The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI), maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2708 material and meet the resin requirements under City of Mesa's GMS-3.1 – Medium Density Polyethylene Pipe. Only resin manufacturers approved under GMS-3.1 are acceptable. All fittings shall not contain reworked resin.

Sizes:

The following are the City of Mesa's standard fusion fitting sizes and shall apply in all instances. Other sizes may be authorized only by the Gas Planning Engineer. All fittings shall be socket fusion style fittings, except for 4" and 6" fittings, which can be butt style when specified on the purchase order.

FITTINGS

Size	Style
½" CTS	Socket only
½" IPS	Socket only
¾" IPS	Socket only
1" IPS	Socket only
1 ¼" IPS	Socket only
2" IPS	Socket only
4" IPS	Socket or Butt for pipe DR 11.5/11
6" IPS	Socket or Butt for pipe DR 11

PURGE CAP

Inlet Style	Outlet Style
2" IPS socket 4" IPS socket 6" IPS socket or butt	½" IPS socket or ½" IPS DR 9.3 pup
	¾" IPS socket or ¾" IPS DR 11 pup
	1" IPS socket or 1" IPS DR 11 pup
	2" IPS socket or 2" IPS DR 11 pup

Marking:

PE 2708 fusion fittings shall be marked according to ASTM D2513 and contain at least the following information:

- ASTM D2513
- ASTM D2683 or ASTM D3261 (as applicable)
- Manufacturer's name or trademark
- Nominal pipe or tubing size and SDR number
- Material designation (PE 2708)

- f. Temperature/Pressure Rating (CD or CE, as applicable)
- g. Base resin material*
- h. Year and month of manufacture
- i. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

*NOTE: An exception can be made only if the fitting manufacturer indicates in the material certification provided to the City of Mesa that the company exclusively uses only one type of resin and the resin is one of City of Mesa's approved types.

Packaging/Shipping:

PE 2708 fusion fittings shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of PE 2708 fusion fittings are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- CP Chem – Performance Pipe
- JM Eagle – USPoly
- Georg Fischer - Central Plastics

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

Fusion _____ [Socket, Butt], _____ [Size], _____ [IPS, CTS], _____ [Coupling, 3-way tee, Cap
[Coupling, 3-way tee, 45° elbow, 90° elbow, Cap]

Fusion Socket _____ [Size] _____ [IPS, CTS] x _____ [Size] _____ [IPS, CTS] Reducer

GMS-4.1.2

MEDIUM DENSITY POLYETHYLENE FUSION TAPPING TEES & BRANCH SADDLES

Use:

Medium density polyethylene (2708) fusion tapping tees and branch saddles are to be used in the City of Mesa's natural gas distribution systems with design pressures up to 60 psig.

Standards:

PE 2708 fusion tapping tees and branch saddles shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|--------------|---|
| • ASTM D2513 | Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings. |
| • ASTM D2683 | Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing. |
| • ASTM D3261 | Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing. |
| • ASTM F2897 | Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances) |

Resin Material:

PE 2708 fusion tapping tees and branch saddles shall conform to the requirements in ASTM D2513. The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI), maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2708 material and meet the resin requirements under City of Mesa's GMS-3.1 – Medium Density Polyethylene Pipe. Only resin manufacturers approved under GMS-3.1 are acceptable. All PE 2708 fusion tapping tees and branch saddles shall not contain reworked resin.

Sizes:

The following are the City of Mesa's standard fusion tapping tees and branch saddle sizes and shall apply in all instances. Other sizes may be authorized only by the Gas Planning Engineer.

TAPPING TEE SIZES

Main/Saddle Size	Outlet Size	Coupon Punch Size	Outlet Style
2" IPS, 4" IPS & 6" IPS	½" IPS	0.80"	SOCKET OUTLET ONLY
2" IPS, 4" IPS & 6" IPS	¾" IPS	0.80"	SOCKET OUTLET ONLY
2" IPS, 4" IPS & 6" IPS	1" IPS	0.80"	SOCKET OUTLET ONLY
2" IPS	2" IPS	1.50" or 1.88"	SOCKET or SDR 11 OUTLET
4" IPS & 6" IPS	2" IPS	1.88"	SOCKET or SDR 11 OUTLET

BRANCH SADDLE SIZES¹

Main/Saddle Size	Outlet Size	Outlet Style
2" IPS ²	½" IPS	SOCKET OUTLET ONLY
2" IPS ²	¾" IPS	SOCKET OUTLET ONLY
2" IPS & 4" IPS	2" IPS	SDR 11 OUTLET

NOTE 1: Branch saddles shall not be used with an EFV-equipped service line.

NOTE 2: This saddle also commonly referred to as a "service saddle" or "side saddle."

Design:

- All saddle bases shall have a rectangular design (filleted corners are allowable).
- The tapping tees and branch saddles shall be designed to be fused to the main and to the service line.
- The tapping tee assembly shall be able to "hot tap" gas mains and shall also stop the flow of gas with the tap run down into the main.
- The assembly shall provide a gas tight seal when the tee is fully opened or closed.
- The tapping tee's punch shall retain the coupon.
- The top of the fitting shall be provided with a cap.

- The cap shall use a Buna-N O-ring(s) to provide a gas-tight seal when hand tightened.

Marking:

PE 2708 fusion tapping tees and branch saddles shall be marked according to ASTM D2513 and contain at least the following information:

- a. ASTM D2513
- b. ASTM D2683 or ASTM D3261 (as applicable)
- c. Manufacturer's name or trademark
- d. Nominal pipe or tubing size and SDR number
- e. Material designation (PE 2708)
- f. Temperature/Pressure Rating (CD or CE, as applicable)
- g. Base resin material*
- h. Year and month of manufacture
- i. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

*NOTE: An exception can be made only if the fitting manufacturer indicates in the material certification provided to the City of Mesa that the company exclusively uses only one type of resin and the resin is one of City of Mesa's approved types.

Protective Sleeve:

The tapping tees and branch saddles shall be provided with a protective sleeve unless otherwise specified on purchase order. The protective sleeve shall be manufactured from plastic having the same physical properties as specified in ASTM D2513. The sleeve's ID shall be just big enough as to slip snugly over the OD of the tee's outlet. The sleeve sizes shall be:

Outlet or Pipe Size	Sleeve Inner Diameter	Sleeve Length
½" IPS	1.370"	12" or 18"
¾" IPS	1.370"	12" or 18"
1" IPS	1.875"	12" or 18"
2" IPS	4.250"	24"

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Packaging/Shipping:

The PE 2708 fusion tapping tees and branch saddles shall be individually packaged (along with protective sleeve, where applicable) in dust tight plastic bags, then packaged in boxes or cartons.

The PE 2708 fusion tapping tees and branch saddles shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of PE 2708 fusion tapping tees and saddles are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- CP Chem – Performance Pipe
- JM Eagle – USPoly
- Georg Fischer - Central Plastics

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

Fusion _____ [Tapping tee, branch saddle], _____[Size] _____ [IPS, CTS] x _____ [Size] _____ [IPS, CTS]

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Gas Material Specifications

GM-4.2 Mechanical Fittings

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GM-4.2.1

LYCOFIT® MECHANICAL FITTINGS

Use:

Lycofit® Mechanical Fittings are to be used to connect polyethylene (PE) pipe in the City of Mesa's natural gas system with design pressure up to 60 PSIG. This Specification shall be used for couplings, tees, elbows, caps and tapping tees.

Standards:

The Lycofit® Mechanical Fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
- ASTM F1924 Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing

Sizes:

The following are the City's standard fitting sizes. In addition to the standard fitting sizes shown below, the Gas Utility Department will stock $\frac{3}{4}$ " and 1-1/4" sizes on an as needed basis.

Double End Coupling

2" IPS – SDR 11

1" IPS – SDR 11

 $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " CTS – SDR 7End Cap Coupling

2" IPS – SDR 11

1" IPS – SDR 11

 $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " CTS – SDR 73-Way Tee Coupling

2" IPS – SDR 11

1" IPS – SDR 11

 $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " CTS – SDR 790° Elbow Coupling

2" IPS – SDR 11

1" IPS – SDR 11

 $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " CTS – SDR 7Stop and Go Coupling $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " CTS – SDR 7Repair Coupling

2" IPS – SDR 11

Bolt on Tapping Tee

2" IPS – SDR 11 by 1" IPS- SDR 11

2" IPS – SDR 11 by $\frac{1}{2}$ " IPS – SDR 9.32" IPS – SDR 11 by $\frac{1}{2}$ " CTS- SDR 7

4" IPS – SDR 11 by 1" IPS – SDR 11

4" IPS – SDR 11 by $\frac{1}{2}$ " IPS – SDR 9.3Reducer Coupling1" IPS – SDR 11 by $\frac{1}{2}$ " IPS – SDR 9.3 $\frac{1}{2}$ " IPS – SDR 9.3 by $\frac{1}{2}$ " CTS – SDR 7

Marking:

Fittings shall be marked in according to ASTM D2513 and contain at least the following information:

- a. ASTM D2513
- b. Manufacturer's name or trademark
- c. Nominal fitting size and SDR number
- d. Material designation
- e. Temperature/Pressure Rating (minimum rating of CE)
- f. Year and month of manufacture OR unique lot number that can be used to infer year and month of manufacture

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturer:

Only the Lycofit® fitting as manufactured by R. W. Lyall and Company, Inc. is approved for use in the City of Mesa Natural Gas Distribution System.

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa hereby gives notice that completion of the approval process may take up to ninety (90) days. The City of Mesa therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

GMS-4.2.2

PERMASERT MECHANICAL FITTINGS

Use:

Permasert Mechanical Fittings (also known as “stab” fittings) are to be used in the City of Mesa’s natural gas distribution with design pressures up to 60 psig to connect medium density polyethylene mains and services. This Specification covers couplings, caps and tapping tees.

Standards:

Permasert Mechanical Fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.
- ASTM F1924 Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing.
- ASTM F2897 Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances).

Design:

Permasert Mechanical Fittings shall be capable of operating at 60 psig and 140° F simultaneously in natural gas distribution systems. The fittings shall conform to the requirements of ASTM D2513 and ASTM 1924 and classified as in-line fittings, Category 1 (CAT1).

Materials:

Permasert Mechanical Fittings shall be manufactured using the following materials:

- a. Body – ASTM D2513 gas grade PE4710
- b. Gripping collet – Acetal (POM)
- c. Thrust Washer – Polyethylene (PE)

- d. O-rings – BUNA-N (Nitrile)
- e. Spacer Retainer Rings – Acetal (POM)
- f. Insert stiffener – Zinc-plated carbon steel
- g. Tapping tee port cutter – steel with a 0.80" diameter.

Sizes:

The following are the City of Mesa's standard Permasert mechanical fitting sizes and shall apply in all instances. Other sizes may be authorized only by the Gas Planning Engineer.

Double End Coupling, Reducer Coupling, and Stop-and-Go Coupling

Size	Dimension Ratio (DR)
½" CTS	7
½" IPS	9.3
¾" IPS	11
1" IPS	11
1 ¼" IPS	11
2" IPS	11

Bolt on Tapping Tee with Permasert Outlet*

Main/Saddle Size	Permasert Outlet Size
2" IPS	½" CTS - DR 7; ½" IPS – DR 9.3; ¾" IPS – DR 11; 1" IPS – DR 11
4" IPS	½" IPS – DR 9.3; ¾" IPS – DR 11; 1" IPS – DR 11; 2" IPS – DR 11
6" IPS	½" IPS – DR 9.3, ¾" IPS – DR 11, 1" IPS – DR 11, 2" IPS – DR 11

*Also known as PermaLock Mechanical Tapping Tee.

Marking:

Permasert mechanical fittings shall be marked according to ASTM D2513 and ASTM F1924, where applicable, and contain at least the following information:

- a. ASTM D2513
- b. ASTM F1924
- c. CAT1
- d. Manufacturer's name or trademark
- e. Nominal pipe or tubing size and SDR number
- f. Material designation (e.g. PE 2708)
- g. Temperature/Pressure Rating for polyethylene material (CD or CE, as applicable)
- h. Year and month of manufacture or unique lot number that can be used to investigate year and month of manufacture.
- i. Version 2.0 and color coded to designate the design version, as applicable
- j. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Packaging/Shipping:

Each Permasert mechanical fitting shall come in a sealed plastic bag and includes the following:

- a. Instructions on installation of fitting
- b. Statement of compliance to 49 CFR 192.283 – Plastic pipe: Qualifying joining procedures
 - Statement of compliance included on the material certification or with every shipment is also acceptable.

Permasert mechanical fittings shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

The Certification shall note when the product is the Permasert 2.0 version.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

Permasert and PermaLock are the registered trademarks of Honeywell – Elster Perfection and the products are only manufactured by Honeywell – Elster Perfection.

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.



Gas Material Specifications

GM-4.3 Electrofusion Fittings

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GMS-4.3

POLYETHYLENE ELECTROFUSION FITTINGS

Use:

The polyethylene (PE) electrofusion fittings are to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

The PE electrofusion fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
- ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

Resin Material:

The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI) and maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2708 or PE 4710 material (where applicable). "Medium Density" material shall have a cell classification of 234373E per ASTM D3350. "High Density" material shall have a cell classification of 445576C or 445474C per ASTM D3350. The manufacturer shall not change the resin without written permission from the Gas Planning Engineer. Acceptable resin manufacturers are Ineos Olefins & Polymers USA and Chevron Phillips Chemical Company.

Marking:

Fittings shall be marked according to ASTM D2513 and contain at least the following information:

- a. ASTM D2513
- b. Manufacturer's name or trademark
- c. Nominal pipe or tubing size (and SDR number for couplings)
- d. Material designation (PE 2406/2708 or PE 3408/4710)
- e. Temperature/Pressure Rating (minimum rating of CE)
- f. Base resin material
- g. Year and month of manufacture

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Sizes & Styles:

The following are the City of Mesa's standard fitting sizes and styles and shall apply in all instances. Other sizes may be authorized only by the City of Mesa Gas Planning Engineer. Material type ("Medium Density" or "High Density") shall be specified on purchase order.

Fitting Style	Nominal Size	SDR
Coupling	2" IPS	11
Coupling	4" IPS	11/11.5
Repair Saddle	4" IPS	N/A

Fitting Compatibility:

All PE electrofusion fittings shall come labeled with a barcode printed to ANSI HM 10.8M-1983 or ISO CD13950/08.94. Fittings shall be directly compatible with the following Electrofusion Processors:

Manufacturer:

Ipex-Friatec

Model:

FRIAMAT® II

Packaging/Shipping:

The PE electrofusion fittings shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of PE electrofusion fittings are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- Kerotest - Innogaz
- Ipex - Friatec

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.



Gas Material Specifications



GM-5 Service Risers

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GMS-5.1

PRE-ASSEMBLED 1" & 2" ANODELESS SERVICE RISERS

Use:

Pre-assembled polyethylene anodeless service risers are to be used in the City of Mesa's natural gas system designed for a maximum allowable operating pressure (MAOP) of 60 psig or less.

Standards:

Pre-assembled polyethylene anodeless risers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|----------------|--|
| • ANSI B1.20.1 | Pipe Threads, General Purpose (INCH) |
| • ASTM A53 | Specification for Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless |
| • ASTM A513 | Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing |
| • ASTM D2000 | Standard Classification System for Rubber Products in Automotive Applications |
| • ASTM D2513 | Standard Specifications for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings |
| • ASTM F1973 | Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems |

Materials:

STEEL PIPE: The steel gas carrying pipe shall be Schedule 40 or Schedule 80 pipe, as specified on the purchase order, and manufactured in accordance with ASTM A53.

CASING: The casing shall be Schedule 10 or greater steel pipe in accordance with ASTM A53 or 0.075" minimum wall thickness tubing flash controlled to 0.0010 of an inch in accordance with ASTM A513.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located on the below ground inlet to the casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM D2000. The watertight seal shall be between the PE pigtail and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the PE to steel interface.

POLYETHYLENE (PE) PIPE: The riser shall be supplied with yellow PE 2708 pipe conforming to City of Mesa Gas Material Specification GMS-3.1. The pipe shall be installed in the casing in the coil direction; reverse bending of the PE shall not be permitted.

CENTERING INSULATOR(S): Centering insulator(s) on the above ground portion of the PE shall be installed to prevent the PE from contacting the steel casing.

Bypass:

The requirement for a bypass nipple shall be specified on the purchase order. If required, the bypass nipple shall be furnished per design drawing on page 5 of this specification.

Finish:

The steel casing and carrier pipe shall be coated with a gray thin film fusion bonded epoxy coating 7 to 10 mils thick.

Markings:

The PE pipe shall be marked in accordance with ASTM D2513. Each riser shall be marked with a label on the top of the casing 3"+ below the threads with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. Maximum and minimum bury depth indicators shall be installed below the PE transition and the gas-carrying portion of the steel pipe.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

PE to Steel Transition:

The PE to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PE pipe and comply with all applicable pipe joint standards. The PE to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling.

Packaging/Shipping:

The pre-assembled risers shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of pre-assembled riser kits are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• R.W. Lyall	Pre-assembled riser
• Elster-Perfection	Pre-assembled riser
• Continental Industries	Pre-assembled riser
• Georg Fischer - Central Plastics	Pre-assembled riser

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

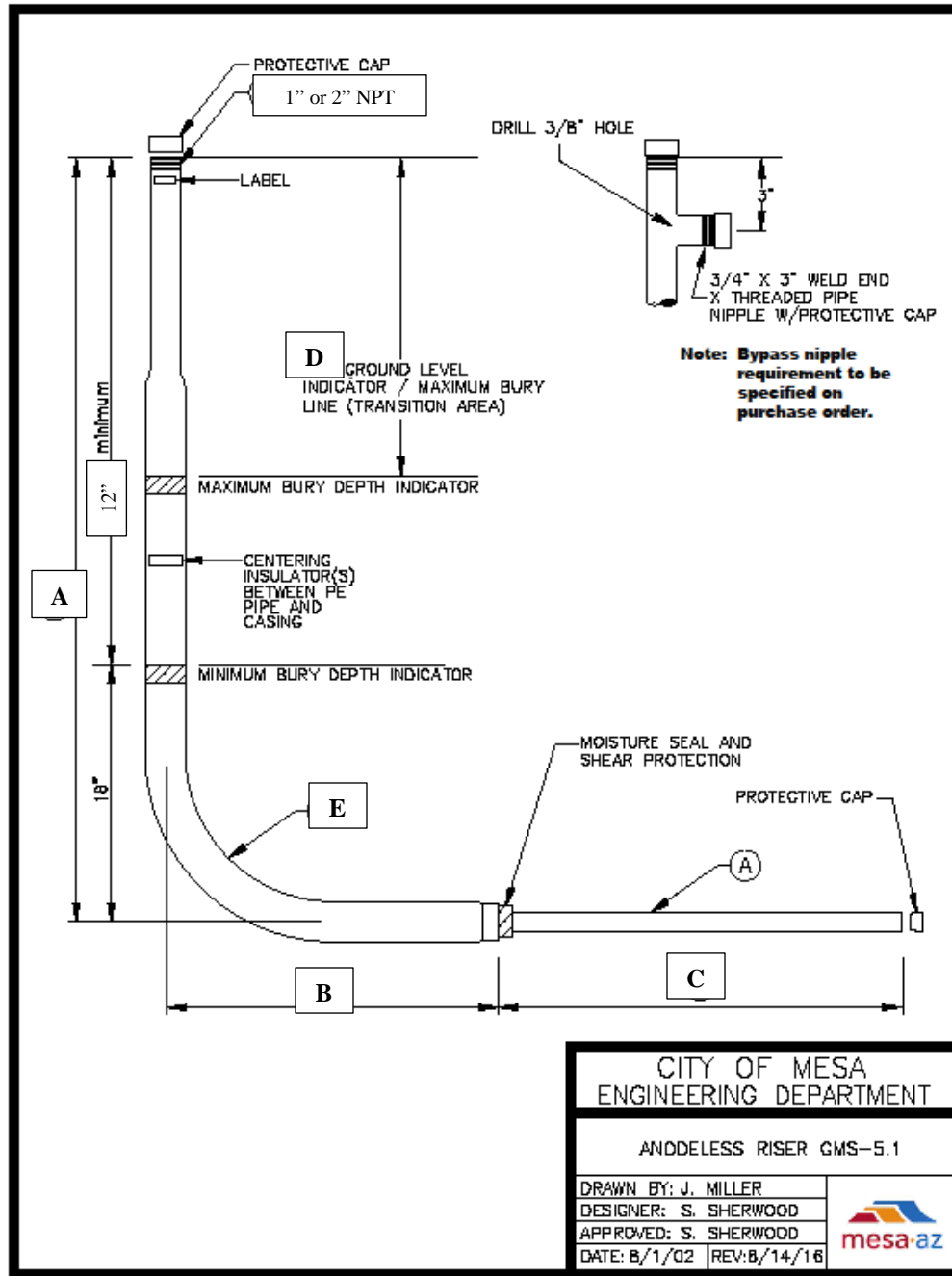
Warehouse Stock Descriptions:

_____[Size] anodeless riser _____[with, without] bypass.

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per detail GMS-5.1.

Size	Total Height (A)	Width of Casing (B)	Minimum PE Stub Length (C)	Max bury depth indicator (D)	Bend Radius (E)	Min bury line indicator (F)
1"	32 inch, minimum	30 to 36 inch	8 inch	At point of steel to PE transition	11 inch, minimum	18 inch
2"		30 to 51 inch	10 inch		19 inch, minimum	



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GMS-5.2

PRE-ASSEMBLED $\frac{3}{4}$ " ANODELESS SERVICE RISER KITS

Use:

Pre-assembled polyethylene anodeless service riser kits are to be used in the City of Mesa's natural gas system designed for a maximum allowable operating pressure (MAOP) of 60 psig or less.

Standards:

Pre-assembled polyethylene anodeless riser kits shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|--------------------|--|
| • ANSI B1.20.1 | Pipe Threads, General Purpose (INCH) |
| • ANSI B16.33-2012 | Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS $\frac{1}{2}$ through NPS 2) |
| • ASTM A53 | Specification for Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless |
| • ASTM A513 | Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing |
| • ASTM D2000 | Standard Classification System for Rubber Products in Automotive Applications |
| • ASTM D2513 | Standard Specifications for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings |
| • ASTM F1973 | Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems |

Materials:

STEEL PIPE: The gas-carrying steel pipe used to fabricate the upper portion of the riser shall be Schedule 40 or Schedule 80 pipe, as specified on the purchase order, and manufactured in accordance with ASTM A53.

CASING: The casing shall be Schedule 10 or greater steel pipe in accordance with ASTM A53 or 0.075" minimum wall thickness tubing flash controlled to 0.0010 of an inch in accordance with ASTM A513.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located at the below ground inlet to the casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM D2000. The watertight seal shall be between the PE pigtail and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the PE pipe to steel interface.

POLYETHYLENE (PE) PIPE: The riser shall be supplied with yellow PE 2708 pipe conforming to City of Mesa Gas Material Specification GMS-3.1. The PE pipe size shall be ½-inch IPS with SDR of 9.3 or ¾-inch IPS with SDR 11, as specified on the purchase order. The pipe shall be installed in the casing in the coil direction; reverse bending of the PE shall not be permitted.

SERVICE VALVE: All riser kits shall include a ¾-inch insulated gas valve installed on top of the riser. The service valve shall comply with City of Mesa Specification GMS-8.1 and ANSI B16.33-2012. The valve operating head shall be in same direction as bend.

TRACER WIRE: Riser assembly shall be furnished with coated copper wire. Wire size shall be a minimum of 14 AWG. Tracer wire shall be taped or cable tied to the PE pipe and steel riser. Wire shall extend one (1) foot beyond top of riser and the end of PE pigtail.

CENTERING INSULATORS: Centering insulator(s) on the above ground portion of the PE shall be installed to prevent the PE from contacting the steel casing.

PROTECTIVE SLEEVE: Protective sleeve shall be high density PE plastic, 2" diameter by 12" or 18" long.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

Finish:

The steel casing and carrier pipe shall be coated with a gray thin film fusion bonded epoxy coating 7 to 10 mils thick.

Markings:

The PE pipe shall be marked in accordance with ASTM D2513. Each riser shall be marked with a label on the above ground portion of the riser with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. Maximum and minimum bury depth indicators shall be installed below the PE transition and the gas-carrying portion of the steel pipe.

PE to Steel Transition:

The PE to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PE pipe pigtail and comply with all applicable pipe joint standards. The PE to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling.

Packaging/Shipping:

The pre-assembled riser kits shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of pre-assembled riser kits are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• R.W. Lyall	Pre-assembled riser kit
• Elster-Perfection	Pre-assembled riser kit
• Continental Industries	Pre-assembled riser kit
• Georg Fischer - Central Plastics	Pre-assembled riser kit

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

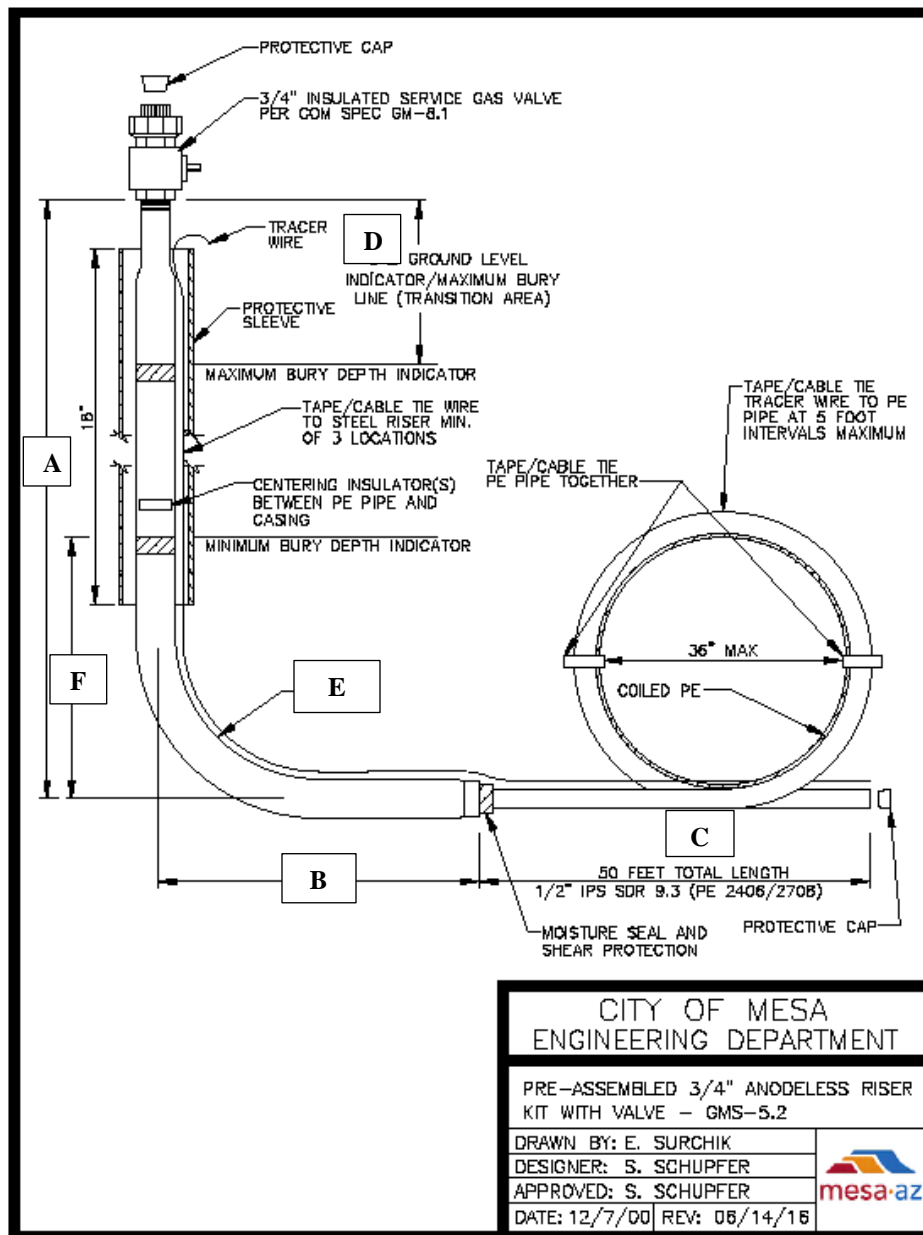
Warehouse Stock Descriptions:

¾" anodeless riser kit with 50' pigtail.

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per detail GMS-5.2.

Total Height (A)	Width of Casing (B)	Minimum PE Stub Length (C)	Max bury depth indicator (D)	Bend Radius (E)	Min bury line indicator (F)
32 inch, minimum	22 to 30 inch	50 feet total length	At point of steel to PE transition	8.5 inch, minimum	18 inch



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GMS-5.3

PRE-ASSEMBLED $\frac{3}{4}$ " ANODELESS SERVICE RISERS WITH SERVICE VALVES

Use:

Pre-assembled polyethylene anodeless service risers are to be used in the City of Mesa's natural gas system designed for a maximum allowable operating pressure (MAOP) of 60 psig or less.

Standards:

Pre-assembled polyethylene anodeless risers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|--------------------|--|
| • ANSI B1.20.1 | Pipe Threads, General Purpose (INCH) |
| • ANSI B16.33-2012 | Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS $\frac{1}{2}$ through NPS 2) |
| • ASTM A53 | Specification for Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless |
| • ASTM A513 | Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing |
| • ASTM D2000 | Standard Classification System for Rubber Products in Automotive Applications |
| • ASTM D2513 | Standard Specifications for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings |
| • ASTM F1973 | Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems |

Materials:

STEEL PIPE: The gas-carrying steel pipe used to fabricate the upper portion of the riser shall be Schedule 40 or Schedule 80 pipe, as specified on the purchase order, and manufactured in accordance with ASTM A53.

CASING: The casing shall be Schedule 10 or greater steel pipe in accordance with ASTM A53 or 0.075" minimum wall thickness tubing flash controlled to 0.0010 of an inch in accordance with ASTM A513.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located on the below ground inlet to the casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM D2000. The watertight seal shall be between the PE pipe and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the PE to steel interface.

POLYETHYLENE (PE) PIPE: The riser shall be supplied with yellow PE 2708 pipe conforming to City of Mesa Gas Material Specification GMS-3.1. The PE pipe size shall be ½-inch IPS with SDR of 9.3 or ¾-inch IPS with SDR 11, as specified on the purchase order. The pipe shall be installed in the casing in the coil direction; reverse bending of the PE shall not be permitted.

SERVICE VALVE: All risers shall include a ¾-inch insulated gas valve installed on top of the riser. The service valve shall comply with City of Mesa Gas Material Specifications GMS-8.1 and ANSI B16.33-2012. The valve operating head shall be in same direction as bend.

CENTERING INSULATOR(S): Centering insulator(s) on the above ground portion of the PE shall be installed to prevent the PE from contacting the steel casing.

PROTECTIVE SLEEVE: Protective sleeve shall be high density polyethylene plastic, 2" diameter by 12" or 18" long

Finish:

The steel casing and carrier pipe shall be coated with a gray thin film fusion bonded epoxy coating 7 to 10 mils thick.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

Markings:

PE pipe shall be marked in accordance with ASTM D2513. Each riser shall be marked with a label on the above ground portion of the riser with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. Maximum and minimum bury depth indicators shall be installed below the PE transition and the gas-carrying portion of the steel pipe.

PE to Steel Transition:

The PE to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PE pipe and comply with all applicable pipe joint standards. The PE to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling.

Packaging/Shipping:

Pre-assembled risers shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at

vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of pre-assembled riser kits are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• R.W. Lyall	Pre-assembled riser
• Elster-Perfection	Pre-assembled riser
• Continental Industries	Pre-assembled riser
• Georg Fischer - Central Plastics	Pre-assembled riser

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

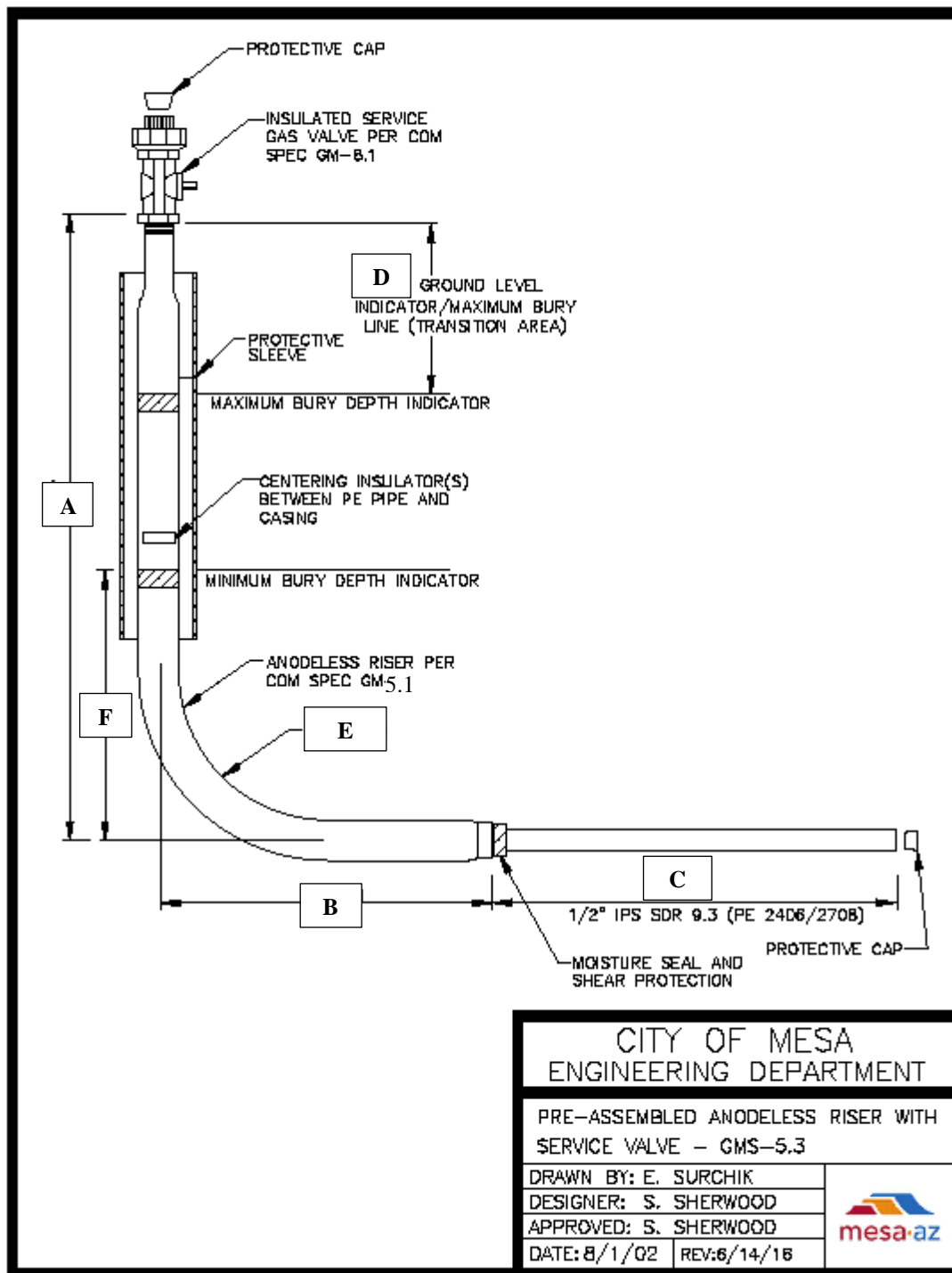
Warehouse Stock Descriptions:

¾" anodeless riser with service valve

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per detail GMS-5.3.

Total Height (A)	Width of Casing (B)	Minimum PE Stub Length (C)	Max bury depth indicator (D)	Bend Radius (E)	Min bury line indicator (F)
32 inch, minimum	22 to 30 inch	8 inch	At point of steel to PE transition	8.5 inch, minimum	18 inch



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GM-5.4

$\frac{3}{4}$ ", FLEXIBLE, ANODELESS SERVICE RISERS FOR GAS STREETLIGHTS

Use:

This specification covers $\frac{3}{4}$ -inch anodeless risers used in a gas distribution system operating at pressures to 60 psig for gas streetlights.

Standards:

The risers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192.

- 49 CFR 192 Transportation of Natural and other Gas by Pipeline;
Minimum Federal Safety Standards
- ANSI B1.20.1 Pipe Treads, General Purpose (INCH)
- ANSI/ASQC Z1.4 Single Sampling Plan, General Inspection Level II
- ASTM A-53 Specification for Pipe, Steel, Black and Hot Dipped Zinc-
Coated Welded and Seamless
- ASTM A-513 Electric – Resistance Welded Carbon and Alloy Steel
Mechanical Tubing
- ASTM D-638 Test Methods for Tensile Properties of Plastic
- ASTM D-2000 Rubber Products in Automotive Applications
- ASTM D-2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings
- UL 360 Liquid-Tight Flexible Steel Conduit

Materials:

STEEL PIPE: The gas-carrying pipe used to fabricate the upper portion of the riser shall be $\frac{3}{4}$ " Schedule 40, steel pipe, manufactured in accordance with ASTM A-53.

FLEXIBLE CASING: The flexible casing shall be constructed with an internal flexible zinc-plated steel core 1.66 O.D. gas tubing armor with a PVC sheath. The minimum bending radius shall be 9-inches. The PVC sheath shall be black in color and sunlight resistant as defined in Underwriters Laboratory Specification UL 360 with a minimum wall thickness of .050 inches.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located on the below ground inlet to the flexible casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM-D-2000. The watertight seal shall be between the polyethylene pigtail and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the P.E. to steel interface.

CENTERING INSULATOR(S): Centering insulator(s) on the above ground portion of the polyethylene shall be installed to prevent the polyethylene from contacting the steel casing.

Finish:

The service head adapter shall be zinc coated to prevent corrosion.

Markings:

Each riser shall be marked with a label on the above ground portion of the riser with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. A ground level indicator shall be installed, below the polyethylene transition and the gas-carrying portion of the steel pipe, indicating the maximum buried depth of the riser. No riser shall be buried in the ground above the level indicator.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1-20.1.

PE to Steel Transition:

The PE to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PE pipe pigtail and comply with all applicable pipe joint standards. The polyethylene to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling as per ASTM D-638.

Packaging/Shipping:

Risers shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Both ends of the riser shall be capped. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192.

Approved Manufacturers:

The following manufacturers of flexible risers for streetlights are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- R.W. Lyall and Co.

Model:

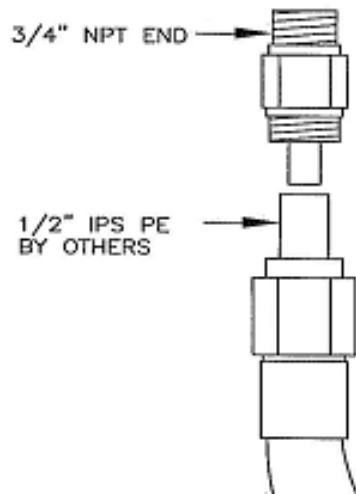
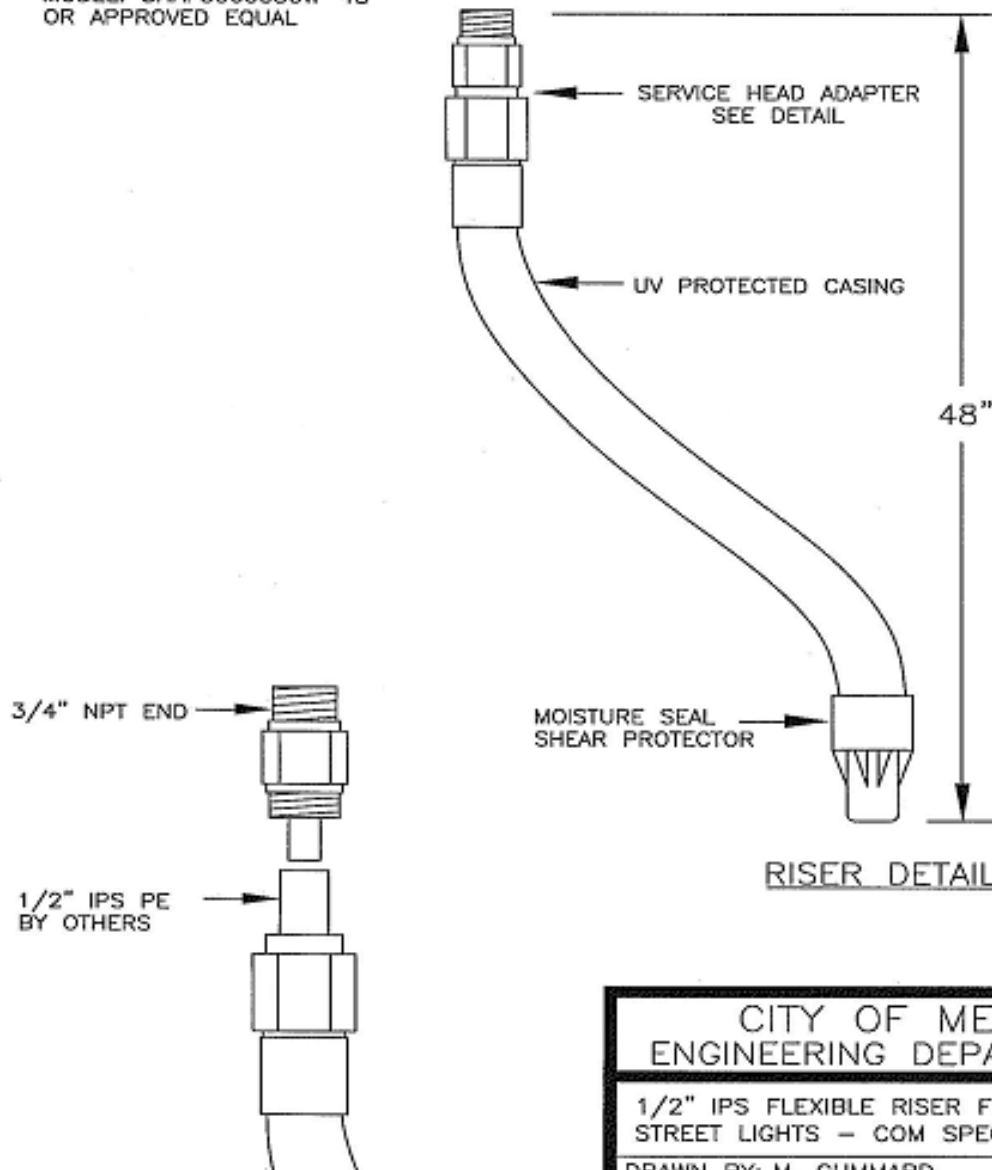
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For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per detail on sheet 5.

SPECIFICATIONS:
RW LYALL
MODEL: SHAF060050W-48
OR APPROVED EQUAL



SERVICE HEAD ADAPTER DETAIL

**CITY OF MESA
ENGINEERING DEPARTMENT**

**1/2" IPS FLEXIBLE RISER FOR GAS
STREET LIGHTS - COM SPEC. GM-5.4**

DRAWN BY: M. CUMMARD
DESIGNER: S. SHERWOOD
APPROVED: S. SHERWOOD
DATE: 10/28/05 REV:

PAGE 5

FILE: ESDOCUMENTS/GAS SPECS/GM-20.4

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GM-5.5

2" STRAIGHT ANODELESS SERVICE RISER

Use:

This specification covers 2-inch polyethylene (anodeless) risers used in the City's gas distribution system operating with design pressures up to 60 psig. All risers shall be furnished with by-pass nipple.

Standards:

The risers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished:

- CFR 49 PART 192 Transportation of Natural and other Gas by Pipeline;
Minimum Federal Safety Standards
- ANSI B1.20.1 Pipe Treads, General Purpose (INCH)
- ANSI/ASQC Z1.4 Single Sampling Plan, General Inspection Level II
- ASTM A53 Specification for Pipe, Steel, Black and Hot Dipped Zinc-Coated Welded and Seamless
- ASTM A513 Electric – Resistance Welded Carbon and Alloy Steel
Mechanical Tubing
- ASTM D368 Test Methods for Tensile Properties of Plastic
- ASTM D2000 Rubber Products in Automotive Applications
- ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings

Materials:

STEEL PIPE: The gas-carrying steel pipe shall be Schedule 40 pipe, manufactured in accordance with ASTM A53.

CASING: The casing shall be Schedule 10 or greater steel pipe in accordance with ASTM A53 or 0.075" minimum wall thickness tubing flash controlled to 0.0010 of an inch in accordance with ASTM A513.

POLYETHYLENE PIPE: The riser shall be supplied with yellow Polyethylene P.E. 2406/2708 pipe conforming to City of Mesa Gas Material Specification GM-3.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located on the below ground inlet to the casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM D2000. The watertight seal shall be between the polyethylene pipe and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the P.E. to steel interface.

CENTERING INSULATOR(S): Centering insulator(s) on the above ground portion of the polyethylene shall be installed to prevent the polyethylene from contacting the steel casing.

Finish:

The steel casing and carrier pipe shall be coated with a gray thin film fusion bonded epoxy coating 7 to 10 mils thick.

Markings:

The polyethylene pipe shall be yellow P.E. 2406/2708, marked in accordance with ASTM D2513. Each riser shall be marked with a label on the top of the casing 3"± below the threads with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. A red level indicator shall be installed below the polyethylene transition and the gas-carrying portion of the steel pipe indicating the maximum buried depth of the riser.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

PE to Steel Transition:

The PE to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PE pipe pigtail and comply with all applicable pipe joint standards. The polyethylene to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling as per ASTM D638.

Packaging/Shipping:

Risers shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Both ends of the riser shall be capped. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of straight, anodeless service risers are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- R.W. Lyall and Co.

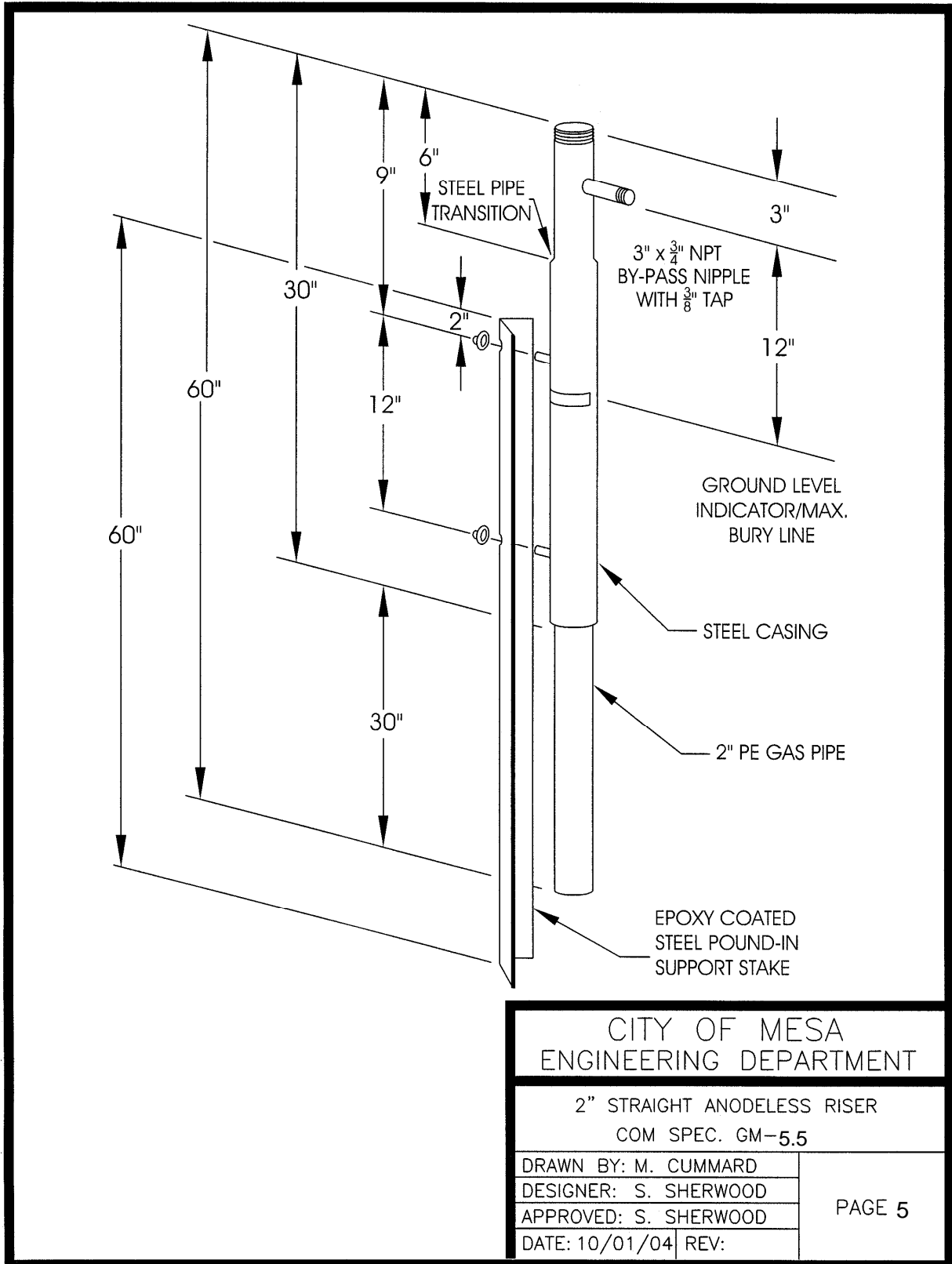
Model:

Straight Anodeless Riser

Manufacturers may submit products not identified above but meeting all qualifications set forth in this specification to City for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer at (480) 644-4851.

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per attached detail on sheet 5.



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Gas Material Specifications



GM-6 Regulators

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GMS-6.1

$\frac{3}{4}$ " SERVICE REGULATORS

Straight-Through Design

$\frac{3}{16}$ " Orifice

Use:

The $\frac{3}{4}$ " spring loaded, self-operated, pressure-reducing service regulators with full capacity internal relief valves are to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

The $\frac{3}{4}$ " service regulators shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B1.20.1 Pipe Threads, General Purpose (INCH)
- ANSI B109.4 Self-Operated Diaphragm Type Natural Gas Service Regulators

Valve Body:

The valve body shall be cast iron, straight through, inline-type with $\frac{3}{4}$ " Female NPT (National Pipe Thread) ends. The maximum inlet pressure rating shall be no less than 125 psig.

Capacity:

The regulator shall supply a minimum of 1,000 cubic feet per hour (C.F.H.) with 20 pounds per square inch gage (psig) inlet pressure and 7 inches of water column outlet pressure through a $\frac{3}{16}$ " orifice.

Failure:

The regulator shall fail in the fully-relieving open position (venting gas).

Spring & Orifice:

The regulator shall come supplied with a 3/16" orifice. The regulator's spring shall be sized to maintain a nominal 7 inches of water column outlet pressure with 10 to 60 psig of inlet pressure.

Vent:

With the spring-housing facing the viewer, the regulator installed on a vertical pipe, bottom inlet and diaphragm housing to the left side of piping, the vent shall be located at the 6 o'clock position. The vent shall be screened to prevent insects and foreign materials from entering the diaphragm case.

Finish:

Regulator valve body shall be coated according to NACE Standard RP0394-94 and conform to the following criteria:

- Product - Primer coat with zinc phosphate or fusion-bonded epoxy powder
- Application - Electrostatic spray or hot dipped (protecting internal threads)
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
- Thickness - Min. 2 mils dry to max. 4 mils dry
- Finish - Semi-gloss smooth

Packaging/Shipping:

The 3/4" service regulators shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of ¾" service regulators are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster-American	1813C
• Itron	B42R
• Fisher	HSR

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

¾" straight-body service regulator

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GMS-6.2

¾" SERVICE REGULATORS

90-Degree Angle Body Design

3/16" Orifice

Use:

This specification covers service type spring loaded, self-operated, pressure-reducing regulators with full capacity internal relief valves suitable for natural gas service to be used in a gas distribution system operating at pressures up to 60 psig.

Standards:

¾" service regulators shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B1.20.1 Pipe Threads, General Purpose (INCH)
- ANSI B109.4 Self-Operated Diaphragm Type Natural Gas Service Regulators

Valve Body:

The valve body shall be cast iron, 90-degree type with ¾" Female NPT (National Pipe Thread) ends. The maximum inlet pressure rating shall be no less than 125 psig.

Capacity:

The regulator shall supply a minimum of 1,000 cubic feet per hour (C.F.H.) with 20 pounds per square inch gage (psig) inlet pressure and 7 inches of water column outlet pressure through a 3/16" orifice.

Spring & Orifice:

The regulator shall come supplied with a 3/16" orifice. The regulator's spring shall be sized to maintain a nominal 7 inches of water column outlet pressure with a 10 to 60 psig inlet pressure.

Vent:

With the spring-housing facing the viewer, the inlet at the 6 o'clock position and the outlet at the 3 o'clock position, the vent shall be located at the 6 o'clock position. The vent shall be screened to prevent insects and foreign materials from entering the diaphragm case.

Failure:

The regulator shall fail in the fully-relieving, open position (venting gas).

Finish:

Regulator valve body shall be coated according to NACE Standard RP0394-94 and conform to the following criteria:

- Product - Primer coat with zinc phosphate or fusion-bonded epoxy powder
- Application - Electrostatic spray or hot dipped (protecting internal threads)
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
- Thickness - Min. 2 mils dry to max. 4 mils dry
- Finish - Semi-gloss smooth

Packaging/Shipping:

The ¾" service regulators shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of ¾" service regulators are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster-American	1813C
• Itron	B42R
• Fisher	HSR

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

¾" angle-body service regulator

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GMS-6.3

1" SERVICE REGULATORS

Straight-Through Design

1/4" Orifice

Use:

The 1" spring loaded, self-operated, pressure-reducing service regulators with full capacity internal relief valves are to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

The 1" service regulators shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B1.20.1 Pipe Threads, General Purpose (INCH)
- ANSI B109.4 Self-Operated Diaphragm Type Natural Gas Service Regulators

Valve Body:

The valve body shall be cast iron, straight through, inline-type with 1" Female NPT (National Pipe Thread) ends. The maximum inlet pressure rating shall be no less than 125 psig.

Capacity:

The regulator shall supply a minimum of 1,400 cubic feet per hour (C.F.H.) with 20 pounds per square inch gage (psig) inlet pressure and 7 inches of water column outlet pressure through a 1/4" orifice.

Spring & Orifice:

The regulator shall come supplied with a 1/4" orifice. The regulator's spring shall be sized to maintain a nominal 7 inches of water column outlet pressure with a 10 to 60 psig inlet pressure.

Vent:

With the spring-housing facing the viewer, the regulator installed on a vertical pipe, bottom inlet and diaphragm housing to the left side of piping, the vent shall be located at the 6 o'clock position. The vent shall be screened to prevent insects and foreign materials from entering the diaphragm case.

Failure:

The regulator shall fail in the fully relieving, open position (venting gas).

Finish:

Regulator valve body shall be coated according to NACE Standard RP0394-94 and conform to the following criteria:

- Product - Primer coat with zinc phosphate or fusion-bonded epoxy powder
- Application - Electrostatic spray or hot dipped (protecting internal threads)
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
- Thickness - Min. 2 mils dry to max. 4 mils dry
- Finish - Semi-gloss smooth

Packaging/Shipping:

The 1" service regulators shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of 1" service regulators are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster-American	1813C
• Itron	B42R
• Fisher	HSR

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

1" straight-body service regulator

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GMS-6.4

2" SERVICE REGULATORS

Straight-Through Design

1/2" Orifice

Use:

The 2" spring loaded, self-operated, pressure-reducing service regulators with full capacity internal relief valves are to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

The 2" service regulators shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B1.20.1 Pipe Threads, General Purpose (INCH)
- ANSI B109.4 Self-Operated Diaphragm Type Natural Gas Service Regulators

Valve Body:

The valve body shall be cast iron, straight through, inline-type with 2" Female NPT (National Pipe Thread) ends. The maximum inlet pressure rating shall be no less than 125 psig.

Capacity:

The regulator shall supply a minimum of 7,000 cubic feet per hour (C.F.H.) with 20 pounds per square inch gage (psig) inlet pressure and 7 inches of water column outlet pressure through a 1/2" orifice.

Spring & Orifice:

The regulator shall come supplied with a 1/2" orifice. The regulator's spring shall be sized to maintain a nominal 7 inches of water column outlet pressure with a 10 to 60 psig inlet pressure.

Vent:

With the spring-housing facing the viewer, the regulator installed on a vertical pipe, bottom inlet and diaphragm housing to the left side of piping, the vent shall be located at the 6 o'clock position. The vent shall be screened to prevent insects and foreign materials from entering the diaphragm case.

Failure:

The regulator shall fail in the fully relieving, open position (venting gas).

Finish:

Regulator valve body shall be coated according to NACE Standard RP0394-94 and conform to the following criteria:

- Product - Primer coat with zinc phosphate or fusion-bonded epoxy powder
- Application - Electrostatic spray or hot dipped (protecting internal threads)
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
- Thickness - Min. 2 mils dry to max. 4 mils dry
- Finish - Semi-gloss smooth

Packaging/Shipping:

The 2" service regulators shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of 2" service regulators are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster-American	1813B
• Itron	B38R
• Fisher	CS800

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

2" straight-body service regulator

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Gas Material Specifications



GM-7 Meters & Components

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GMS-7.1

METER SET ASSEMBLY

In-Line Regulator Design

Use:

Meter Set Assemblies (MSA) are to be used in the City of Mesa's distribution system with normal operating pressures up to 60psig.

Standards:

The MSA shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|---------------------|--|
| • ANSI/ASME B1.20.1 | Pipe Threads, General Purpose (INCH) |
| • ANSI/ASME B16.3 | Malleable Iron Threaded Fittings. |
| • ANSI B109.1 | Diaphragm Type Gas Displacement Meters
(Under 500 Cubic Feet Per Hour Capacity) |
| • ANSI B109.4 | Self-Operated Diaphragm Type Natural Gas
Service Regulators |
| • ASTM A53 | Standard Specification for Pipe, Steel, Black and
Hot-Dipped, Zinc-Coated, Welded and Seamless |
| • ASTM A513 | Standard Specification for Electric-Resistance-
Welded Carbon and Alloy Steel Mechanical
Tubing. |
| • ASTM D2000 | Standard Classification System for Rubber
Products in Automotive Applications. |

Material and Design:

STEEL PIPE: The gas-carrying steel pipe used to fabricate the meter set assembly shall be NPS $\frac{3}{4}$, Schedule 40, Grade A pipe, manufactured in accordance with ASTM A53.

THREADS: Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

SERVICE REGULATOR: The service regulator shall comply with City of Mesa Gas Material Specification GMS-6.1.

OUTLET/INLET SWIVEL: Swivels shall be ¾" NPT x #1A Sprague per ANSI B109.1

OUTLET TEE & FITTINGS: ANSI B16.3 Class 150 1"NPT x 1"NPT x ¾" NPT with 1" NPT plug installed.

LABELING: Label to include manufacturer part number, lot number and minimum testing requirements.

LEAK TEST: MSA shall be leak tested, at minimum, 60 psig for 15 seconds.

METER SET ASSEMBLY COATING: All material, except for threads, shall be coated according to NACE Standard RP0394-94 and according to the following criteria:

- Product - Fusion-Bonded Epoxy Powder
- Application - Electrostatic Spray
- Color - Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
- Thickness - Min. 2 mils dry to max. 4 mils dry
- Finish - Semi-gloss smooth
- Threads - Masked from receiving direct or indirect paint coating

METER BAR: A meter bar shall be included with every meter set as shown per detail GMS-7.1 in this Specification. The meter bar shall form a gas-tight fit with the outlet swivel nut and hold, at minimum, 15 psig of pressure. Plastic meter bar is only acceptable when specified on the purchase order.

Packaging/Shipping:

The MSAs shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of MSAs are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Product:</u>
• R.W. Lyall	MSA kit with in-line regulator
• Elster-Perfection	MSA kit with in-line regulator
• Continental Industries	MSA kit with in-line regulator
• Advance Engineering	MSA kit with in-line regulator
• Georg Fischer-Central Plastics	MSA kit with in-line regulator

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

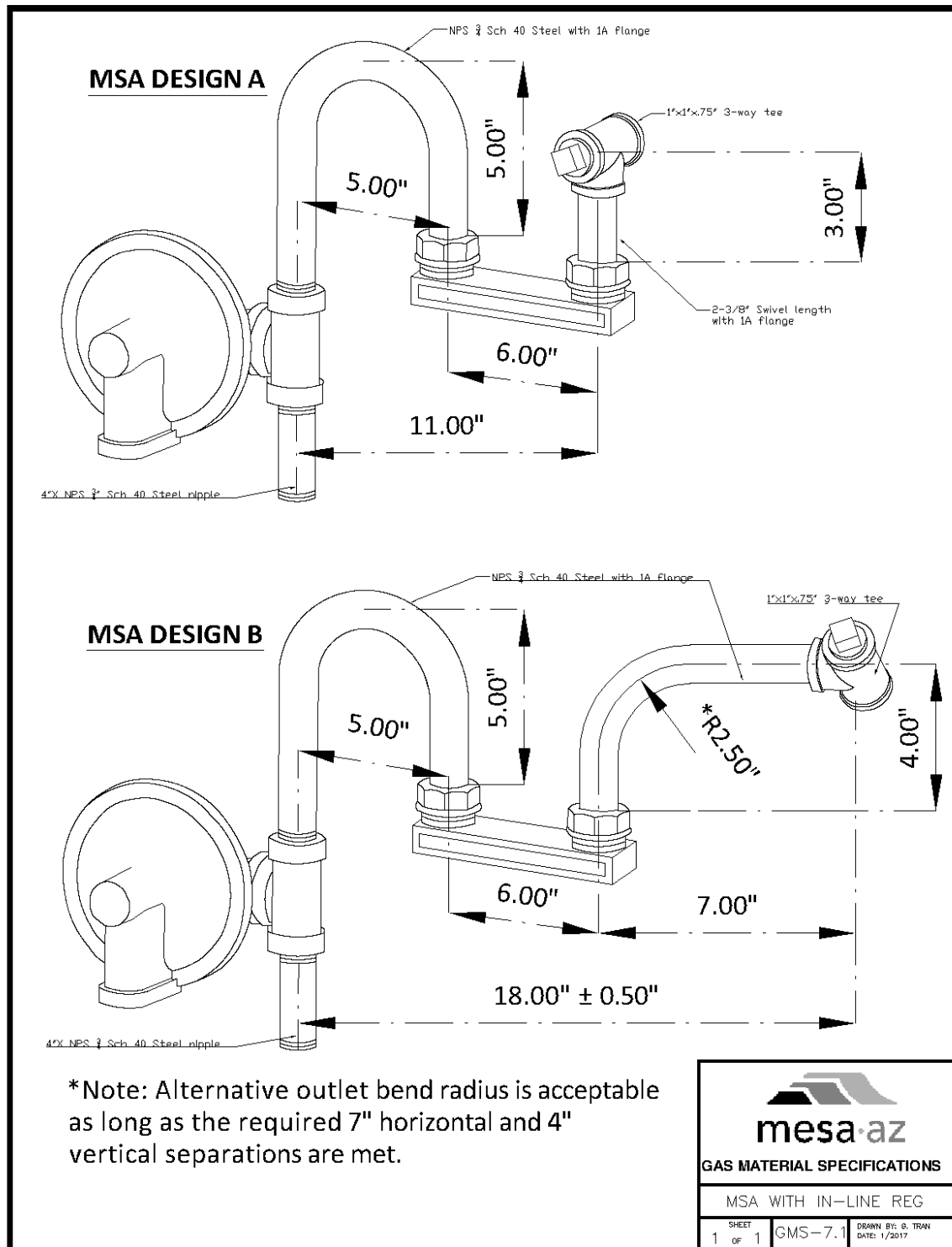
Warehouse Stock Descriptions:

MSA kit with in-line regulator

Design Drawing:

The MSAs shall comply with all design sizes and dimensions shown per detail GMS-7.1. Specific design (A or B) will be specified on the purchase order.

The vendor shall submit a production design drawing for approval on the first order and any manufacturer proposed design change(s).



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GM-7.2

METER SET ASSEMBLY WITH 90-DEGREE ANGLE BODY REGULATOR

Use:

Meter Set Assemblies (MSA) with Angle Body Regulators are to be used in the City of Mesa's natural gas distribution system with design pressures up to 60 psig.

Standards:

All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished. The MSA shall comply with the requirements of 49 CFR 192 and the requirements set forth in these specifications:

- 49 CFR 192 Transportation of Natural and other Gas by Pipeline;
Minimum Federal Safety Standards
- ANSI B1.20.1 Pipe Treads, General Purpose (INCH)
- ANSI B109.1 Diaphragm Type Gas Displacement Meters (Under 500
Cubic Feet Per Hour Capacity)
- ASTM A53 Specification for Pipe, Steel, Black and Hot Dipped Zinc-
Coated Welded and Seamless
- ASTM A513 Electric – Resistance Welded Carbon and Alloy Steel
Mechanical Tubing
- ANSI B16.3 Malleable Iron Threaded fittings

Materials:

STEEL PIPE: The gas-carrying steel pipe used to fabricate the meter set assembly shall be NPS $\frac{3}{4}$, Schedule 40, Grade A pipe, manufactured in accordance with ASTM A53.

SERVICE REGULATOR: The service regulator shall comply with City of Mesa Gas Material Specification GM-6.2.

OUTLET/INLET SWIVEL: Swivels shall be $\frac{3}{4}$ NPT (National Pipe Thread) x #1A Sprague per ANSI B109.1

OUTLET TEE & FITTINGS: Class 150 $\frac{3}{4}$ "x1"x1" with plug installed per ANSI B16.3

LABELING: Label to include manufacturer part number, lot number and minimum testing requirements.

INLET/OUTLET LEAK TEST: Leak test at minimum 50 PSI for 15 Seconds

METER SET ASSEMBLY COATING: All material, except for threads, shall be coated according to NACE Standard RP0394-94 and according to the following criteria:

Product -	Fusion-Bonded Epoxy Powder
Application -	Electrostatic Spray
Color -	Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
Thickness -	Min. 2 mils dry to max. 4 mils dry
Finish -	Semi-gloss smooth
Threads -	Masked from receiving direct or indirect paint coating

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

Meter Bar:

A meter bar shall be included with every meter set as shown on page four of this Specification.

Packaging/Shipping:

Meter set assemblies shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Both ends of the meter set assembly shall be capped to prevent damage to threads. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of meter set assemblies are approved for use in the City of Mesa Natural Gas Distribution System:

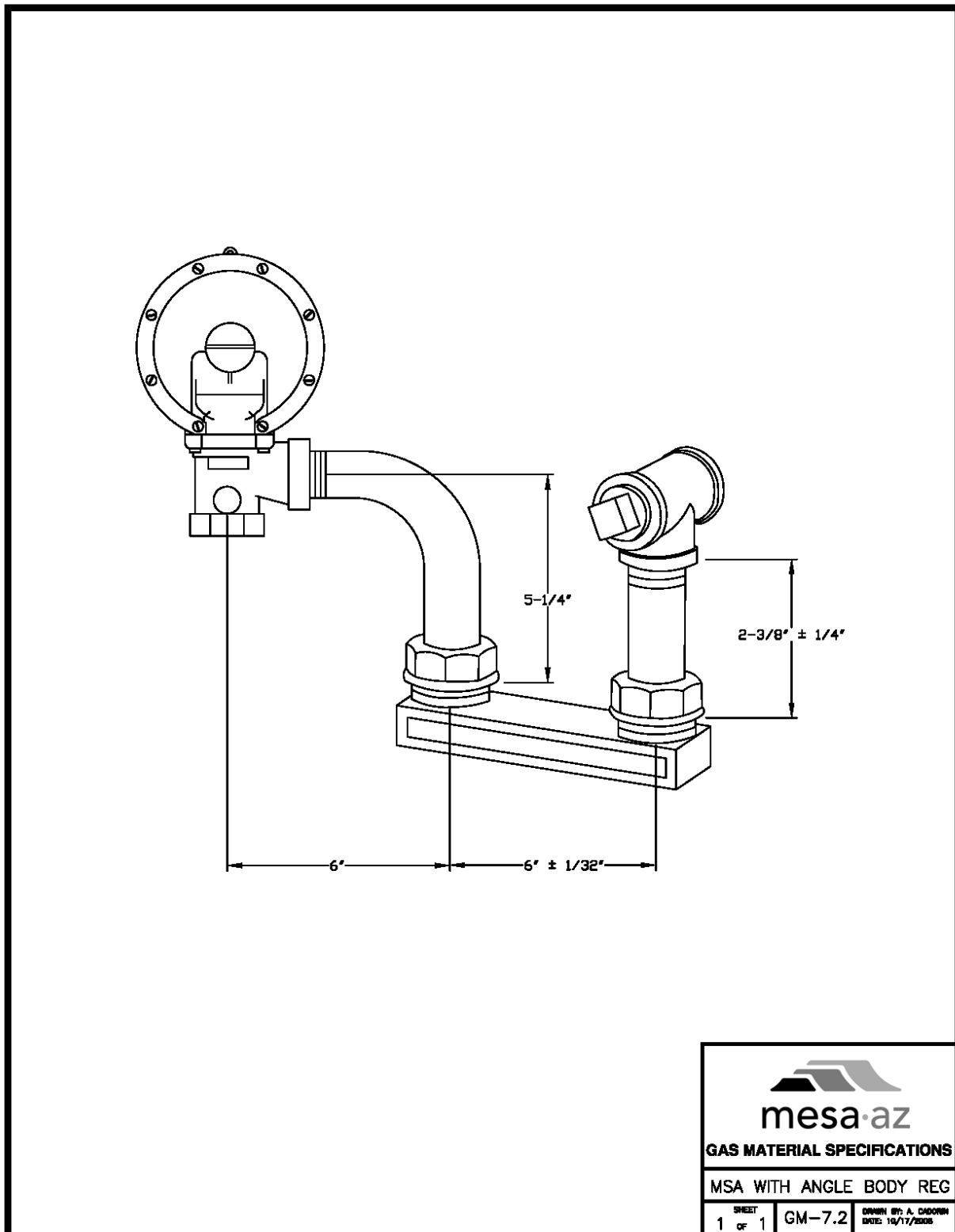
Manufacturer:

- R.W. Lyall and Co.
- Elster-Perfection Corporation
- Continental Industries, Inc.
- Advance Engineering Corporation.

Manufacturers may submit products not identified above but meet all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Design Drawing:

The meter set assembly shall also comply with all design sizes and dimensions shown:



GM-7.3

GAS METER MANIFOLD

Use:

The gas meter manifold is for use in the City of Mesa Natural Gas System for the installation of 2 or more gas meters at one location.

Standards:

Pipeline and Hazardous Materials Safety Administration Code of Federal Regulation (CFR), Title 49, Part 192 Transportation of Natural and Other Gas by Pipeline; Minimum Federal Safety Standards.

Materials:

Pipe including nipples shall be ASTM A-53 Types E (Electric-Resistance Weld) or S (Seamless), Grade A or B and/or API 5L Grade A-25, Class I or II. Weld cap shall conform to ANSI B16.9 and material shall conform to ASTM A234.

Threads:

All threaded ends will be threaded in accordance with ANSI B1.20.1.

Welding:

All welding shall be in accordance with Sub-part 3 of the City of Mesa Operations Manual. Welders shall be qualified by the City of Mesa. All costs to qualify the welder shall be borne by the Contractor.

Coating:

After manifold is completed, all material, except for threads, shall be coated according to NACE Standard RP0394-94 and according to the following criteria:

Product -	Fusion-Bonded Epoxy Powder
Application -	Electrostatic Spray
Color -	Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
Thickness -	Min. 2 mils dry to max. 4 mils dry
Finish -	Semi-gloss smooth
Threads -	Masked from receiving direct or indirect paint coating

Leak Test:

All completed manifolds shall be leak tested with air or nitrogen at 100 psig for not less than 15 minutes, with no drop in pressure.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Packaging/Shipping:

Manifolds shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Threaded ends shall be capped. Damaged shipments will be rejected at the vendor's expense.

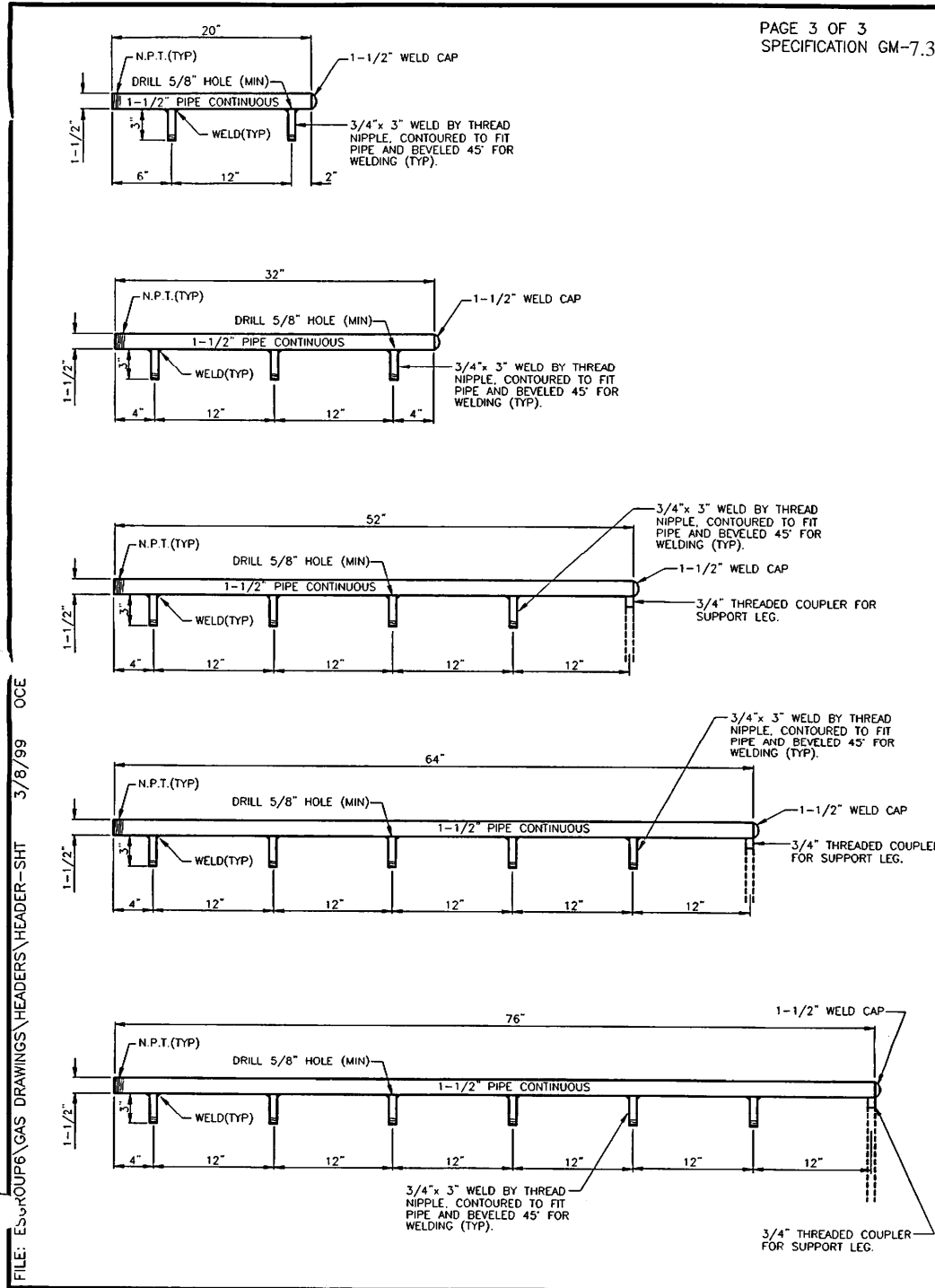
Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Design Drawing:



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Gas Material Specifications

GM-7.4 Gas Meters

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GMS-7.4.1

250 CLASS METERS

Use:

The 250 Class meters are to be used in the City of Mesa's natural gas distribution systems for the purpose of billing customer gas usage.

Standards:

The 250 Class meters shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B109.1-2000 Diaphragm-Type Gas Displacement Meters
(Under 500-Cubic-Feet-per-hour Capacity)

Design:

Meters shall be of the diaphragm type, positive displacement, and non-temperature compensated design.

INDICES: There shall be four reading circles each divided into ten equal parts with division marks labeled from "0" to "9" on the meter's index panel in a single horizontal row. The "0" division mark shall be located at the top of the circle. All reading dials shall have an arrow indicating the direction of registration. Indices shall conform to the specifications outlined in ANSI B109.1-2000 section 2.7 "METER INDEX".

TEST INDICES: A 2 cfh test index and a ½ cfh test index shall be included on the meter's index panel. The test indices shall not be on the same line as the reading dials.

INDEX COVER: The meter index cover shall be constructed of Lexan or similar impact resistant plastic that is resistant to the effects of solar radiation and resistant to the degenerative effects of exposure to the atmosphere. The cover shall be constructed so that it does not obstruct the view of the Index from the top or sides.

INTERNAL MATERIALS: All internal parts shall be made of materials that do not corrode or react to natural gas supplied by the City of Mesa. Parts made of all copper or parts with a copper content exceeding 75% are considered unacceptable.

DIAPHRAGM: Diaphragms shall be made of a synthetic fabric reinforced material compatible with natural gas and with normal amounts of odorant additives, and shall not be affected by gas liquids, oil, water or temperatures between 0 – 140 degrees Fahrenheit.

METER CASE: All meter cases shall be constructed of Aluminum.

METER CONNECTIONS: All meters shall have No. 1A Sprague standard connections.

SEALING DEVICES: Sealing wires will not be used. Index boxes and handhold plates shall be equipped with snap seal, rock seal or other approved sealing devices.

AUTOMATED METER READ: All meters shall be adaptable or compatible with current automated electronic metering interface units/devices (endpoint).

Finish:

The meter case and external components shall be made of protected materials resistant to attack by atmosphere, weather or sun light and agents used in meter cleaning and repair over the expected meter life. Meter exterior shall be capable of meeting or exceeding the following tests:

ASTM D822 – 2000 hours

ASTM B117-1973 – 1000 hours

The meters shall be finished with the standard color Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).

Pressure Testing:

All meters shall be tested per ANSI B109.1-2000 section 3.4 "PRESSURE AND LEAK TESTS".

ID Badging:

City of Mesa Identification Badges shall be affixed to the meter. The badge shall read as follows:

City of Mesa
← Meter number

Numbers and lettering shall be ¼" high. Badge material must be brass or aluminum with a minimum hardness of Rockwell F-61 and a thickness within the range of 0.013" to 0.028". The Meter numbers will be supplied by the City of Mesa upon the time of order.

An unpainted manufacturer's badge shall also be affixed to the meter in accordance with ANSI B109.1-2000 and shall contain at least the following information:

- a. Meter class
- b. Manufacturer's name or trademark
- c. MAOP
- d. Meter capacity at ½-inch WC pressure differential
- e. Purchase year
- f. Manufacturer's serial number

Meter Accuracy:

Meters shall be able to accurately track gas usage at a Maximum Allowable Operating Pressure of 5 psig. Meter accuracy shall be tested according to ANSI B109.1-2000 section 3.3 "ACCURACY OF METERS".

Packaging/Shipping:

The 250 Class meters shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Meters shall be supplied without nuts and swivels. The warranty information, a list showing final proof results and a meter number of each meter shall be provided by the manufacturer at the time of delivery. All openings to the meter shall be capped to prevent contaminants from entering the meter as well as to protect any threads from damage during shipping.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of 250 Class meters are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster - American	AC250
• Sensus	R-275
• Itron	I-250

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GMS-7.4.2

400 CLASS METERS

Use:

400 Class meters are to be used in the City of Mesa's natural gas distribution systems for the purpose of billing customer gas usage.

Standards:

400 Class meters shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B109.1-2000 Diaphragm-Type Gas Displacement Meters
(Under 500-Cubic-Feet-per-hour Capacity)

Design:

Meters shall be of the diaphragm type, positive displacement, and non-temperature compensated design.

INDICES: Index style shall be indicated on purchase order:

Dial Style: There shall be four reading circles each divided into ten equal parts with division marks labeled from "0" to "9" on the meter's index panel in a single horizontal row. The "0" division mark shall be located at the top of the circle. All reading dials shall have an arrow indicating the direction of registration. Indices shall conform to the specifications outlined in ANSI B109.1-2000 section 2.7 "METER INDEX".

Odometer Style: There shall be four digits in an odometer style index in the units of hundred cubic feet (CCF). Odometer digits shall be black with white digits.

TEST INDICES: A 2 cfh test index and a ½ cfh test index shall be included on the meter's index panel. The test indices shall not be on the same line as the reading dials.

METER CASE: All meter cases shall be constructed of Aluminum.

INDEX COVER: The meter index cover shall be constructed of Lexan or similar impact resistant plastic that is resistant to the effects of solar radiation and resistant to the degenerative effects of exposure to the atmosphere. The cover shall be constructed so that it does not obstruct the view of the Index from the top or sides.

INTERNAL MATERIALS: All internal parts shall be made of materials that do not corrode or react to natural gas supplied by the City of Mesa. Parts made of all copper or parts with a copper content exceeding 75% are considered unacceptable.

Meter Indexing components:

The City of Mesa has experienced a series of failures with the meter index drive shaft and supporting bushing in these meters and requires that any changes to the material or design of these components be reported to the Gas Planning Engineer for evaluation before any meters with the new design/material are to be delivered to the City of Mesa. Meter index drive shaft and seal assembly shall be designed to retain an air and gas tight seal under extended exposure to solar radiation.

DIAPHRAGM: Diaphragms shall be made of a synthetic fabric reinforced material compatible with natural gas and with normal amounts of odorant additives, and shall not be affected by gas liquids, oil, water or temperatures between 0 – 140 degrees Fahrenheit.

METER CONNECTIONS: All meters shall have Sprague #3 or Sprague #4 Standard Connections.

HUB SPACING: The meter shall have 7" center-to-center hub spacing.

SEALING DEVICES: Sealing wires will not be used. Index boxes and handhold plates shall be equipped with snap seal, rock seal or other approved sealing devices.

AUTOMATED METER READ: All meters shall be adaptable or compatible with current automated electronic metering interface units/devices (endpoint).

Pressure Testing:

All meters shall be tested per ANSI B109.1-2000 section 3.4 "PRESSURE AND LEAK TESTS".

Finish:

The meter case and external components shall be made of protected materials resistant to attack by atmosphere, weather or sun light and agents used in meter cleaning and repair over the expected meter life. Meter exterior shall be capable of meeting or exceeding the following tests:

ASTM D822 – 2000 hours

ASTM B117-1973 – 1000 hours

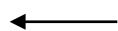
The meters shall be finished with the standard color Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).

ID Badging:

City of Mesa Identification Badges shall be affixed to the meter. The badge shall read as follows:

City of Mesa

#####



Meter number

Numbers and lettering shall be ¼" high. Badge material must be brass or aluminum with a minimum hardness of Rockwell F-61 and a thickness within the range of 0.013" to 0.028". The Meter numbers will be supplied by the City of Mesa upon the time of order.

An unpainted manufacturer's badge shall also be affixed to the meter in accordance with ANSI B109.1-2000 and shall contain at least the following information:

- a. Meter class
- b. Manufacturer's name or trademark
- c. MAOP
- d. Meter capacity at ½-inch WC pressure differential
- e. Purchase year
- f. Manufacturer's serial number

Meter Accuracy:

Meters shall be able to accurately track gas usage at a Maximum Allowable Operating Pressure of 5 psig. Meter accuracy shall be tested according to ANSI B109.1-2000 Section 3.3 "ACCURACY OF METERS".

Packaging/Shipping:

The 400 Class Meters shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Meters shall be supplied without nuts and swivels. The warranty information, a list showing final proof results and a meter number of each meter shall be provided by the manufacturer at the time of delivery. All openings to the meter shall be capped to prevent contaminants from entering the meter as well as to protect any threads from damage during shipping.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of 400 Class meters are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster – American	AL-425
• Sensus	415
• Itron	400A

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

400 Class diaphragm meter

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GMS-7.4.3

ROTARY GAS METERS

Use:

Rotary gas meters are to be used in the City of Mesa's natural gas distribution systems for the purpose of billing customer gas usage.

Standards:

Rotary gas meters (and volume correcting device when used) shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B109.3 Rotary-Type Gas Displacement Meters
- ANSI/ASME B16.5 Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard

Design:

Meter shall be rotary type, positive displacement and must be compatible with an integrated volume corrector. Meter shall have the capability of both top inlet and side inlet mounting configurations, and the direction of flow through the meter shall be permanently and clearly indicated.

INTERNAL MATERIALS: All internal parts and surfaces shall be made of materials resistant to corrosion or chemical attack that would adversely affect the operation of the meter when used to measure pipeline quality gas. Parts made of all copper or parts with a copper content exceeding 75% are considered unacceptable.

METER CASE: All meter cases shall be constructed of Aluminum.

PIPING CONNECTION: Meter piping connections shall be configured as noted in Table 1 and conform dimensionally to the flange class specifications in ANSI/ASME B16.5 where applicable.

SEALING DEVICES: Sealing wires will not be used. Index covers and handhold plates shall be equipped with snap seal, rock seal or other approved sealing devices.

Table 1: Meter Specifications*

Meter Size	Standard Meter Capacity (cubic feet per hour)	Connection Type	Flange to Flange Spacing (Inch)	Flange Size	Pressure Rating (minimum)	Index Type (To be specified on PO)
8C	800	Threaded (Sprague 4)	n/a	n/a	15 psig	Direct Reading Index or Digital Read out
10C	1,000				25 psig	
1M - 3.5M	1,000 to 3,500	Flanged (ANSI 150 Class)	6-3/4"	2"	175 psig	
5M - 5.5M	5,000 to 5,500			3"		
7M – 9M	7,000 to 9,000		9-1/2"	3"		
11M - 16M	11,000 to 16,000			4"		

*These are the commonly used rotary gas meters in the City of Mesa gas distribution system. Other sizes and styles may be specified by the Gas System Administrator or the Senior Gas Engineer.

Indices:

MECHANICAL INDICES: When mechanical indices are specified, the index face and markings shall be of contrasting colors to provide for ease of reading. All markings shall be permanent and not adversely affected by environmental conditions, such as ultraviolet or infrared radiation. The digits of the meter's counter shall be arranged in a horizontal straight line that can be viewed through a cutout in the index face or counter mask. Permanent multiplier or zeroes must appear on the index face of the meter and include an appropriate test hand or unit for proving of the meter. It shall be suitable for scanning by photoelectric or other mechanical or electronic means.

DIGITAL INDICES: When volume correction is specified, all other uncorrected indices must not be visible to prevent accidental reading. All volume correcting devices shall be fully integrated;

capable of pressure and temperature compensation without the use of external thermowells. Estimated device battery life must be a minimum of 5 years. The meter must be compatible with, at minimum, one of the following approved pressure and temperature compensating volume correcting devices:

- a. Dresser/Roots IMC/W2
- b. Honeywell Mercury Mini-Max
- c. Honeywell EC 350
- d. Eagle Research MP Plus

INDEX COVER: The meter index cover shall be constructed of Lexan or similar impact resistant plastic that is resistant to the effects of solar radiation and resistant to the degenerative effects of exposure to the atmosphere. The meter shall be constructed so that it does not obstruct the view of the index from the top.

AUTOMATED METER READ: All meters shall be adaptable or compatible with current automated electronic metering interface units/devices (endpoint).

Finish:

The meter case and external components shall be made of protected materials resistant to attack by atmosphere, weather or sun light and agents used in meter cleaning and repair over the expected meter life. The meters shall be finished with the standard color Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).

Pressure Testing:

All meters shall be tested per ANSI B109.3 "PRESSURE AND LEAK TESTS"

ID Badging:

City of Mesa Identification Badges shall be affixed to the meter. The badge shall read as follows:

MESA

← Meter number

The numbers and lettering may also be on the same line. Numbers and lettering shall be ¼" high. Badge material must be brass or aluminum with a minimum hardness of Rockwell F-61 and a thickness within the range of 0.013" to 0.028". The meter numbers will be supplied by the City of Mesa upon the time of the order.

An unpainted manufacturer's badge shall also be affixed to the meter in accordance with ANSI B109.3 and shall contain the following information:

- a. Meter model
- b. Manufacturer's identification
- c. Manufacturer's meter serial number
- d. Year of manufacture
- e. Maximum Allowable Operation Pressure (MAOP) rating
- f. Rated capacity

Meter Accuracy:

Meters shall be able to track gas usage at 10% to 100% of the meter's rated capacity with an accuracy of $100 \pm 1\%$. Meter accuracy shall be tested according to ANSI B109.3 "ACCURACY"

Packaging/Shipping:

The rotary gas meters shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

All openings to the meter shall be capped to prevent contaminants from entering the meter as well as to protect any threads from damage during shipping. Warranty information shall be provided by manufacturer prior to delivery. A list showing final proof results and a meter number of each meter shall be provided by the manufacturer at the time of delivery.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of rotary gas meters are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Honeywell – American	See Table 1
• Dresser	See Table 1
• Romet	See Table 1

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GMS-7.4.4

500 CLASS METERS

Use:

500 Class meters are to be used in the City of Mesa's natural gas distribution systems for the purpose of billing customer gas usage.

Standards:

500 Class meters shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ANSI B109.2 Diaphragm-Type Gas Displacement Meters
(Over 500-Cubic-Feet-per-hour Capacity)

Design:

Meters shall be of the diaphragm type, positive displacement, and non-temperature compensated design. The meters shall be configured as noted in Table 1:

Table 1:

Model	Test Indices	Hub Spacing	Meter Connection
AC-630	2 cfh and 0.5 cfh	7-inch	Sprague #3/#4
675A	10 cfh and 2.5 cfh	10-inch	

INDICES: Index style shall be indicated on purchase order:

Dial Style: There shall be four reading circles each divided into ten equal parts with division marks labeled from "0" to "9" on the meter's index panel in a single horizontal row. The "0" division mark shall be located at the top of the circle. All reading dials shall have an arrow indicating the direction of registration. Indices shall conform to the specifications outlined in ANSI B109.2 section 2.7 "METER INDEX".

Odometer Style: There shall be four digits in an odometer style index in the units of hundred cubic feet (CCF). Odometer digits shall be black with white digits.

TEST INDICES: The test indices shall not be on the same line as the reading dials.

METER CASE: All meter cases shall be constructed of Aluminum.

INDEX COVER: The meter index cover shall be constructed of Lexan or similar impact resistant plastic that is resistant to the effects of solar radiation and resistant to the degenerative effects of exposure to the atmosphere. The cover shall be constructed so that it does not obstruct the view of the Index from the top or sides.

INTERNAL MATERIALS: All internal parts shall be made of materials that do not corrode or react to natural gas supplied by the City of Mesa. Parts made of all copper or parts with a copper content exceeding 75% are considered unacceptable.

Meter Indexing components:

The City of Mesa has experienced a series of failures with the meter index drive shaft and supporting bushing in these meters and requires that any changes to the material or design of these components be reported to the Gas Planning Engineer for evaluation before any meters with the new design/material are to be delivered to the City of Mesa. Meter index drive shaft and seal assembly shall be designed to retain an air and gas tight seal under extended exposure to solar radiation.

DIAPHRAGM: Diaphragms shall be made of a synthetic fabric reinforced material compatible with natural gas and with normal amounts of odorant additives, and shall not be affected by gas liquids, oil, water or temperatures between 0 – 140 degrees Fahrenheit.

SEALING DEVICES: Sealing wires will not be used. Index boxes and handhold plates shall be equipped with snap seal, rock seal or other approved sealing devices.

AUTOMATED METER READ: All meters shall be adaptable or compatible with current automated electronic metering interface units/devices (endpoint).

MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP): 25 PSIG, minimum.

Pressure Testing:

All meters shall be tested per ANSI B109.2 section 3.5 "PRESSURE AND LEAK TESTS".

Finish:

The meter case and external components shall be made of protected materials resistant to attack by atmosphere, weather or sun light and agents used in meter cleaning and repair over the expected meter life. Meter exterior shall be capable of meeting or exceeding the following tests:

ASTM D822 – 2000 hours

ASTM B117-1973 – 1000 hours

The meters shall be finished with the standard color Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49).

ID Badging:

City of Mesa Identification Badges shall be affixed to the meter. The badge shall read as follows:

City of Mesa
← Meter number

Numbers and lettering shall be ¼" high. Badge material must be brass or aluminum with a minimum hardness of Rockwell F-61 and a thickness within the range of 0.013" to 0.028". The Meter numbers will be supplied by the City of Mesa upon the time of order.

An unpainted manufacturer's badge shall also be affixed to the meter in accordance with ANSI B109.2 and shall contain at least the following information:

- a. Meter class
- b. Manufacturer's name or trademark
- c. MAOP
- d. Meter capacity at ½-inch WC pressure differential
- e. Purchase year
- f. Manufacturer's serial number

Meter Accuracy:

Meters shall be able to accurately track gas usage at the MAOP of the meter. Meter accuracy shall be tested according to ANSI B109.2-2000 Section 3.3 "ACCURACY OF METERS".

Packaging/Shipping:

The 500 Class Meters shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Meters shall be supplied without nuts and swivels. The warranty information, a list showing final proof results and a meter number of each meter shall be provided by the manufacturer at the time of delivery. All openings to the meter shall be capped to prevent contaminants from entering the meter as well as to protect any threads from damage during shipping.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of the 500 Class meters are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Honeywell	AC-630
• Itron	675A

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GM-7.5

PROPERTY LINE METER SET ASSEMBLY WITH IN-LINE REGULATOR

Use:

Property Line Meter Set Assemblies are to be used in the City's natural gas distribution system with design pressures up to 60 psig.

Standards:

The meter set assemblies shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished:

- 49 CFR 192 Transportation of Natural and other Gas by Pipeline;
 Minimum Federal Safety Standards
- ANSI B1.20.1 Pipe Treads, General Purpose (INCH)
- ANSI/ASQC Z1.4 Single Sampling Plan, General Inspection Level II
- ANSI B109.1 Diaphragm Type Gas Displacement Meters (Under 500
 Cubic Feet Per Hour Capacity)
- ASTM A53 Specification for Pipe, Steel, Black and Hot Dipped Zinc-
 Coated Welded and Seamless
- ASTM A513 Electric – Resistance Welded Carbon and Alloy Steel
 Mechanical Tubing
- ANSI B16.3 Malleable Iron Threaded fittings

Materials:

STEEL PIPE: The gas-carrying steel pipe used to fabricate the meter set assembly shall be NPS $\frac{3}{4}$, Schedule 40, grade A pipe, manufactured in accordance with ASTM A53 for the portion between the service valve and the meter inlet. The gas-carrying steel pipe between the meter outlet and the customer side riser shall be NPS 1", Schedule 40, grade A pipe, manufactured in accordance with ASTM A53

SERVICE REGULATOR: The service regulator shall comply with City of Mesa Gas Material Specification GM-6.1.

OUTLET/INLET SWIVEL: Swivels shall be ¾ NPT (National Pipe Thread) x #1A Sprague per ANSI B109.1

OUTLET TEST PORT: The meter outlet shall have a ¼" NPT female tap to be used as a pressure test port that shall come from the manufacturer with a square headed plug installed

LABELING: Label to include manufacturer part number, lot number and minimum testing requirements.

INLET/OUTLET LEAK TEST: Leak test at minimum 50 PSI for 15 Seconds

METER SET ASSEMBLY COATING: All material, except for threads, shall be coated according to NACE Standard RP0394-94 and according to the following criteria:

Product -	Fusion-Bonded Epoxy Powder
Application -	Electrostatic Spray
Color -	Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49)
Thickness -	Min. 2 mils dry to max. 4 mils dry
Finish -	Semi-gloss smooth
Threads -	Masked from receiving direct or indirect paint coating

Threads:

Pipe threads shall be made NPT (National Pipe Thread) in accordance with ANSI B1.20.1.

Packaging/Shipping:

Meter set assemblies shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Both ends of the meter set assembly shall be capped to prevent damage to threads. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of meter set assemblies are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- R.W. Lyall and Co.

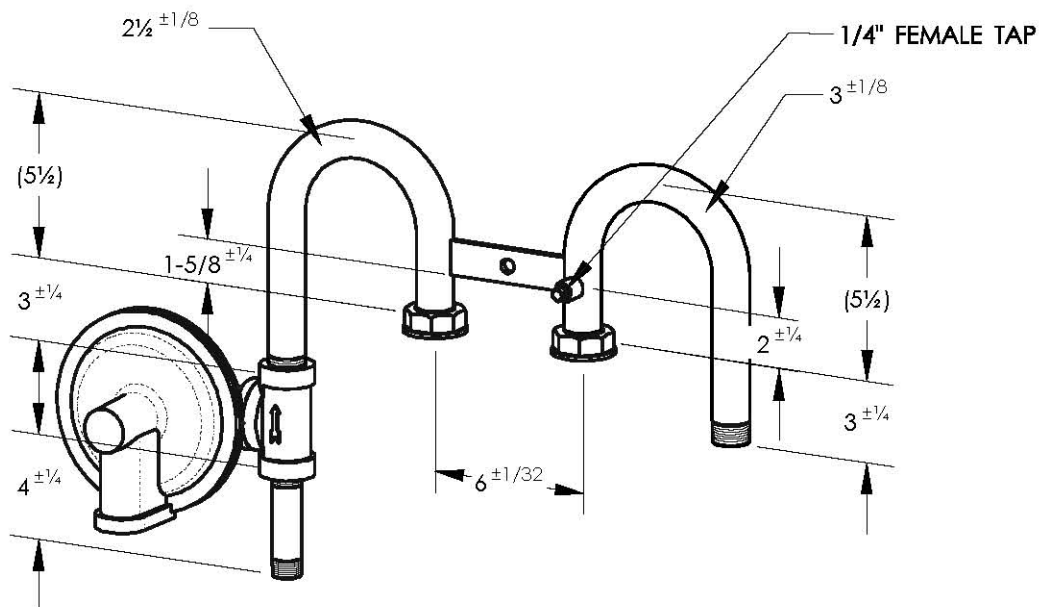
Manufacturers not identified above may submit products that meet all qualifications set forth in this specification to the City for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further

Approved Manufacturers (continued):

questions regarding the approval process please contact the City of Mesa Gas Planning Engineer at (480) 644-4851.

Design Drawing:

The meter set assembly shall also comply with all design sizes and dimensions shown on page 5 of this specification:





mesa.az

GAS MATERIAL SPECIFICATIONS

PROPERTY LINE MSA		
SHEET 1 of 1	GM-7.5	DRAWN BY: A. CHODURA DATE: 10/17/2008

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Gas Material Specifications



GM-8 Valves

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GMS-8.1

METER AND SERVICE VALVES

Use:

The meter and service valves are to be used in the City of Mesa's natural gas systems designed for a maximum allowable operating pressure (MAOP) of 60 psig or less and as part of the customer's meter-set and bypass.

Standards:

The meter and service valves shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASME B16.33-2012 Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS ½ through NPS 2)
- ANSI/ASME B1.20.1 Pipe Threads, General Purpose (INCH).

Sizes and styles:

Valve Size:	Inlet & Outlet:	Style:
¾"	¾" Female Iron (National) Pipe Thread	Full Port Ball Valve
1"	1" Female Iron (National) Pipe Thread	Full Port Ball Valve
2"	2" Female Iron (National) Pipe Thread	Full Port Plug or Ball Valve

Test Requirements:

The manufacturer shall test valves according to the ASME B16.33-2012 testing methods.

Design and Performance:

All meter and service valves shall meet the following specifications:

- Non-Lubricated
- Temperature Rating of 0° F to 150° F
- Flat head with locking ½ inch diameter hole to lock in the closed position.
- 1/4 turn from fully open to fully closed position.
- In the closed position, the longitudinal axis of the flat head shall be perpendicular to the longitudinal axis of the valve.
- Valve shall have tamperproof design and be constructed to minimize the possibility of removal of the plug or core with other than specialized tools.
- Valve shall have a built-in minimum torque, capable of not being operated by hand without the use of a mechanical advantage such as a wrench or other non-permanent affixed operating device.
- Working pressure rating of no less than 175 psig.
 - Valve shall be of a full port design and accept installation of a plugging device (similar to the NO-BLO valve changer manufactured by the Mueller Company) to permit changing of the valve under pressure without blowing gas.
- Electrically insulating material shall be Zytel Nylon molded into the body of the insulating union.

Coating:

All meter and service valves shall be coated according to NACE Standard RP0394-94 and conform to the following criteria:

Product: Primer coat with zinc phosphate, fusion-bonded epoxy powder or cationic epoxy electrocoat.

Application: Electrostatic spray or hot dipped (protecting internal threads)

Color: Munsell Renotation System 10 BG 4.9/0.6 (formerly ANSI Grey 49) or Black

Thickness: Min. 2 mils dry to max. 4 mils dry

Finish: Semi-gloss smooth

Threads: Masked from receiving direct or indirect paint coating

Packaging/Shipping:

The meter and service valves shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of meter and service valves are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>	<u>Size:</u>
• AY McDonald	8276N (Insulated)	¾", 1", 2"
• AY McDonald	860N (Non-insulated)	¾", 1", 2"
• Mueller	Centurion II (Insulated)	¾", 1"
• Mueller	Centurion II (Non-insulated)	¾", 1"
• Dresser Manufacturing Co.	175 (Non-insulated)	2"

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

Meter Service Valve, 175psig, ____ [¾", 1", 2"], ____ [insulated, non-insulated].

GM-8.2

NON-LUBRICATED GATE VALVES

275 CWP AND 720 CWP

(COLD WORKING PRESSURE)

Use:

Ball valves are the preferred application. Prior to installing gate valves, consult the Gas Engineer or Gas Planning Engineer. Non-lubricated gate valves 275 CWP (Cold Working Pressure), will be used in the City's system that operate at 200 psig MAOP (Maximum Allowable Operating Pressure) or less. The 720 CWP will be used in the City's 539-psig MAOP system. Gate valves shall be suitable for use with natural gas. They shall be suitable for burial, installation in a vault, and for above grade piping.

Standards:

All non-lubricated gate valves (275 & 720 CWP) shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. 275 CWP gate valves and 720 CWP gate valves shall conform to the requirements of API-6D. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Materials:

- A. Body – Carbon steel, ANSI/ASTM Standard A-216: Carbon Steel Castings Suitable for Fusion Welding for High Temperature Service, Grade WCB.
- B. Wedge – Semi-steel, ASTM Standard A-126: Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Grade B.
- C. Stem – Austenitic stainless steel, type 416.
- D. Stem Nut – Bronze.

Materials (continued):

- E. Stem, Seal Member and Bonnet “O” Ring – Buna N, ASTM D2000: Rubber Products in Automotive Applications
- F. Operating Head – Malleable Iron, ANSI/ASTM Standard A-47: Malleable Iron Castings, Grade 35018
- G. Bonnet – Cast Steel, ASTM Standard A-126, Grade WCB

Finish:

Valves shall be coated with a suitable metal paint. Primer and any subsequent paint shall be applied after pressure testing.

Marking:

Valve markings shall meet API-6D.

Design:

All gate valves shall meet the following design specifications:

1. General – All gate valves shall have a system that provides the wedge easy movement in the body. The machined surfaces of the wedge or body shall not be exposed to the flow stream when fully opened.
2. Stem – The stem shall not rise out of the valve’s body when the wedge moves to any open or closed position.
3. Valve Position Indicator – The valve can be furnished with an open/close indicator.
4. Operating Head – The operating nut shall be 2-inch square.
5. Locks – Locking devices shall be available for all wrench-operated valves. Locking devices shall permit valves to be locked in an open or closed position.

Ends:

The gate valve’s ends shall be beveled for welding. The angle of the bevel shall be 30 degrees, +5, -0 degrees or 37 ½ degrees +/- 2 ½ degrees.

Test Requirements:

The manufacturer shall test valves according to the MSS Standard Practice SP-82: Valve Pressure Testing Methods.

Approval:

Valves must be reviewed and approved by the City of Mesa Gas System Engineering Department prior to bidding.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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GMS-8.3

ANSI CLASS 150 WELD-END BALL VALVE (285 PSIG MAOP & LESS)

Use:

The ANSI Class 150 weld-end ball valves (285 psig Cold Working Pressure “CWP”) are to be used in the City of Mesa’s natural gas systems designed for a maximum allowable operating pressure (MAOP) of 200 psig or less. The ball valve may be utilized for burial, vault and above ground installations.

Standards:

The ANSI Class 150 weld-end ball valves shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- Code of Federal Regulation Title 49, Part 192 – Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.145
- ANSI/API 6D Specification for Pipeline Valves

Material:

Body/Ends	-	ASTM A53
	-	ASTM A106
	-	ASTM A105
	-	API 5L
Ball	-	Stainless Steel
Stem	-	Stainless Steel
Stem Nut	-	Ductile Iron
Seat Seals	-	Carbonized PTFE (Teflon) or polyamide 11 (PA-11)
Stem Seals	-	Buna-N, O-Rings

Finish:

Valves shall be coated with a suitable metal paint. Primer and any subsequent paint shall be applied after pressure testing.

Marking:

Valves markings shall meet ANSI/ API 6D requirements.

Design:

All ball valves shall meet the following design specifications:

- a. 1/4 turn operation from closed position to fully open
- b. Counter clockwise direction to open, Clockwise to close
- c. Non-lubricated
- d. Open/close indicator
- e. 2-inch square nut operating head
- f. Locking plate, to allow valve to be locked in an open or closed position
- g. Ends shall be machined for welding per ANSI B16.25 requirements
- h. ANSI/API 6D Pressure-Temperature rating Class 150
- i. Temperature range: 20 to 150°F
- j. Full-port design

Test Requirements:

The manufacturer shall test valves according to the API 6D valve pressure testing methods.

Packaging/Shipping:

The ANSI Class 150 weld-end ball valves shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

The valves shall be capped at each end.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of ANSI Class 150 weld-end ball valve are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Broen Ballomax	2" – 2BMW285PLFP SB14 S
	4" – 4BMW285PLFP SB14 S
	6" – 6BMW285PLFP SB14 S
• Kerotest	2" – 2WBFP285-W
	4" – 4WBFP285-W
	6" – 6WBFP285-W

- Balon 2" – 2F-US135-BW*
- 4" – 4F-US135-BW*

** Only option with stainless steel ball is approved.*

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

GMS-8.4

ANSI CLASS 300 WELD-END BALL VALVE (740 PSIG MAOP & LESS)

Use:

The ANSI Class 300 weld-end ball valves (740 psig Cold Working Pressure “CWP”) are to be used in the City of Mesa’s natural gas systems designed for a maximum allowable operating pressure (MAOP) of 539 psig or less. The ball valve may be utilized for burial, vault and above ground installations.

Standards:

The ANSI Class 300 weld-end ball valves shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- Code of Federal Regulation Title 49, Part 192 – Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.145
- ANSI/API 6D Specification for Pipeline Valves

Material:

Body/Ends	-	ASTM A53
	-	ASTM A106
	-	ASTM A105
	-	API 5L
Ball	-	Stainless Steel
Stem	-	Stainless Steel
Stem Nut	-	Ductile Iron
Seat Seals	-	Carbonized PTFE (Teflon) or polyamide 11 (PA-11)
Stem Seals	-	Fluorolastomer (Viton FKM) or Buna-N, O-Rings

Finish:

Valves shall be coated with a suitable metal paint. Primer and any subsequent paint shall be applied after pressure testing.

Marking:

Valves markings shall meet ANSI/ API 6D requirements.

Design:

All ball valves shall meet the following design specifications:

- a. 1/4 turn operation from closed position to fully open
- b. Counter clockwise direction to open, Clockwise to close
- c. Non-lubricated
- d. Open/close indicator
- e. 2-inch square nut operating head
- f. Locking plate, to allow valve to be locked in an open or closed position
- g. Ends shall be machined for welding per ANSI B16.25 requirements
- h. ANSI/API 6D Pressure-Temperature rating Class 300
- i. Temperature range: 20 to 150°F
- j. Full-port design

Test Requirements:

The manufacturer shall test valves according to the API 6D valve pressure testing methods.

Packaging/Shipping:

The ANSI Class 300 weld-end ball valves shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

The valves shall be capped at each end.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of ANSI Class 300 weld-end ball valve are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Broen Ballomax	1" – 1BMW740PLRP SB14 S
	2" – 2BMW740PLFP SB14 S
	4" – 4BMW740PLFP SB14 S
	6" – 6BMW740PLFP SB14 S
	8" – 8BMW740BFP TRSB VG14S
	10" – 12BMW740BFP TRSB VG14S

- 12" – 12BMW740BFP TRSB VG14S
- Kerotest
 - 2" – 2WBFP740-W
 - 4" – 4WBFP740-W
 - 6" – 6WBFP740-W-GEAR
 - 8" – 8WBFP740-W-GEAR
- Balon
 - 2" – 2F-US335-BW*
 - 4" – 4F-US335-BW*
- M.T. Deason
 - 10" – HiSeal 10HSWW740TRFPSBVNS
 - 12" – HiSeal 12HSWW740TRFPSBVNS

* Only option with stainless steel ball is approved.

*Note: ProGear is **not** allowed on valve with gear box.*

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

GM-8.5

LUBRICATED PLUG VALVES

Use:

Characteristics of lubricated plug valves for use in gas mains, line regulator installations, services, service regulator installations, and meter installations are specified or defined in succeeding paragraphs. Each valve shall have the characteristics indicated as common to all lubricated plug valves and must meet the minimum requirements or the equivalent and must meet the minimum requirements of API 6D.

Strength and Materials:

- The strength of each valve shall be adequate to withstand, at rated temperature, without showing leaks, internal hydrostatic pressure equal to twice the rated working pressure. The material of each valve shall be cast iron or steel, as prescribed in the purchase order.
- Cast iron valve material shall meet the requirements for higher strength gray iron casting, ASTM Designation A126-42, Class B.
- Cast steel valve material shall meet the requirements for carbon steel casting, ASTM Designation A 216-47T, Grade WCB.

Nominal Pressure Designations:

- 200 lb WOG: 200 psig maximum working pressure for water, oil or gas at 150° F maximum temperature.
- 175 lb WOG: 175 psig maximum working pressure for water, oil or gas at 150° F maximum temperature.
- 120 lb WOG: 120 psig maximum working pressure for water, oil or gas at 150° F maximum temperature.
- ASA 300 lb: 600 psig maximum, non-shock, service pressure rating for water, steam or oil at 100°F. (ANSI B16.5 Latest Edition).

Stem Seals:

- The stem seal shall prevent leakage around the stem without adding materially to the torque required for operation of the valve. It shall be one of the types described below:
 - Standard – gland type, with or without modifications;
 - High Pressure – special type, for valve of nominal pressure designation ASA 300 lb, or greater.

Patterns:

- Regular – port opening approximately equal in cross-sectional area to pipe of the same nominal size as the valve.
- Venturi – principles of streamline flow utilized to permit a port opening smaller in cross-sectional area than pipe of the same nominal size as the valve.

Ends:

- Screwed – American National Internal Taper Pipe Thread (ANSI B2.1 – Latest Edition).
- Flanged – cast iron – American Standard Class 125 (ANSI B16.1 – Latest Edition).
- Welding – butt welding, American Standard 300 lb (ANSI B16.5 – Latest Edition).
- Insofar as practicable, face-to-face dimensions of flanged valves shall conform to American Standard Face-to-Face Dimensions of Ferrous Flanged and Welding End Valves (ANSI B16.10 – Latest Edition).

Operation:

The wrench (or handwheel) shall turn in a clockwise direction to close the valve, and counter-clockwise to open the valve. Operation beyond the open and closed positions shall be prevented by built-in stops. Unless otherwise indicated, each valve shall be equipped with a 2-inch square operating nut, or adapter. When an operating gear is indicated it shall be of simple worm type.

Provision for Lubrication:

The opening for injection of lubricant shall be equipped with button-type grease gun fitting, Alemite part no. 1872A, or an equivalent fitting having a head 7/8 inch in diameter.

Tests:

With a lubricant appropriate to the service, each valve must meet the requirements of the test set forth below:

<u>Designation</u>	<u>Conditions</u>	<u>Requirements</u>
Hydrostatic Shell	rated temperature, internal hydrostatic pressure equal to twice rated working pressure.	no leakage
Air-under-water	rated temperatures, internal air pressure equal to rated working pressure.	no leakage after initial and repeated operation.
Shut-off	air pressure against plug, equal to rated working pressure, unbalanced in each direction.	negligible, or no leakage after initial and repeated operation.
Operational	same as for shut-off test.	open and close smoothly by application of reasonable torque to operating mechanism for initial and repeated operation.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Identifications Marking

Each valve furnished hereunder shall be marked in accordance with the requirements of API-6D.

Warranty

The contractor shall guarantee the products furnished under these specifications against defective materials or faulty workmanship and in all respects satisfactory for the required service.

GM-8.6

LUBRICANT FOR PLUG VALVES

Use:

Lubricant for plug valves must effectively lubricate and seal plug valves of all sizes, without clogging or fouling the lubricant channels. The form of lubricant shall be either stick or bulk, as specified on the purchase order. The workability and consistency of the lubricant must be satisfactory for the form.

Conditions of Service:

Lubricant for plug valves must retain the required properties under conditions as follows:

- (1) Prolonged contact with natural gas, natural gas condensates and water.
- (2) Maximum natural gas pressure equal to pressure rating of valve at temperatures from -20 degrees F to +150 degrees F.

Compatibility:

Kinds and makes of lubricants used by the City of Mesa for plug valves compatible with each other. When any two of these lubricants are in prolonged close contact, each must retain its original properties. This prolonged close contact must not cause the lubricants to react adversely, nor to deteriorate.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-8.7

GAS VALVE SAFETY CAP

Use:

The gas valve safety cap is for use in the City of Mesa natural gas system to prevent unauthorized tampering with City gas valves.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

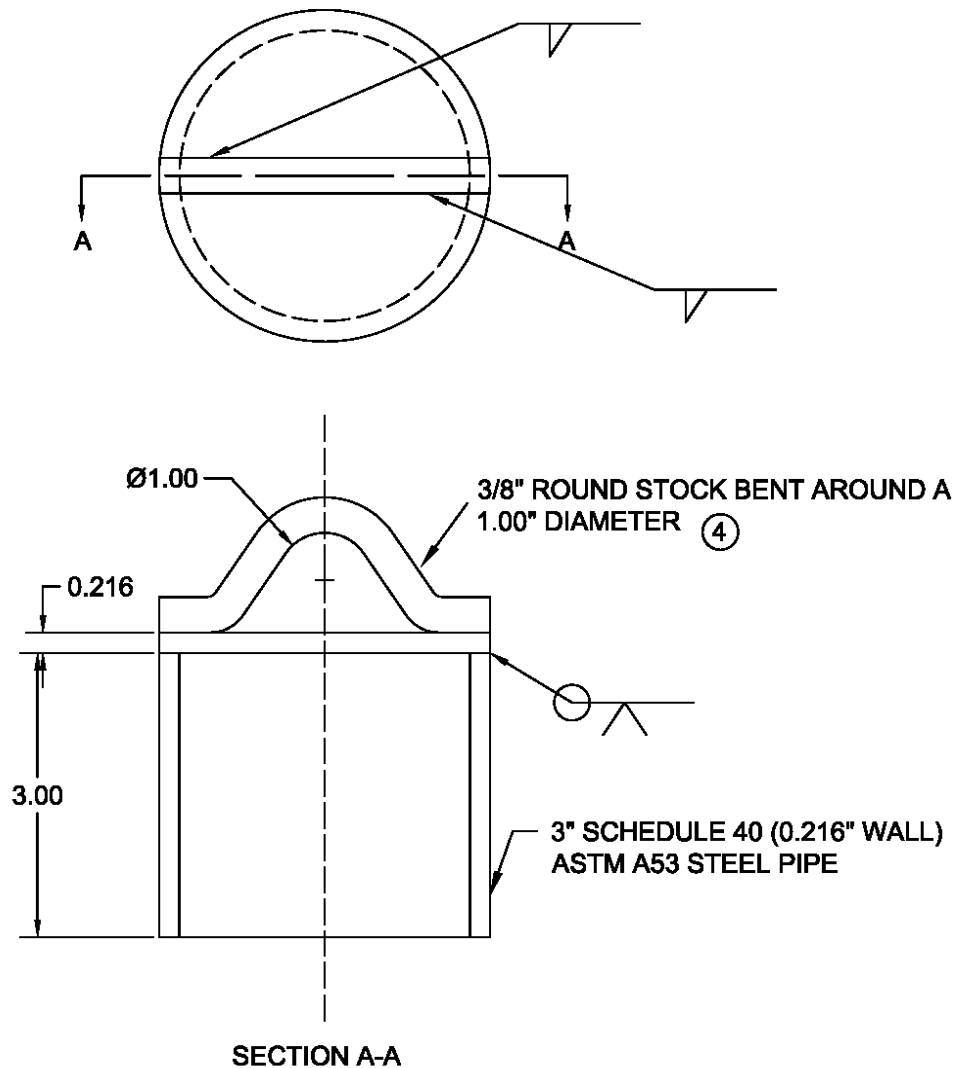
The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification.


Design Drawing:

Gas valve safety cap shall comply with all dimensions shown on page 2 of this specification:



NOTES:

- 1) ALL LINEAR DIMENSIONS ± 0.050 " UNLESS OTHERWISE NOTED
- 2) ALL ANGULAR DIMENSIONS $\pm 5^\circ$ UNLESS OTHERWISE NOTED
- 3) FINISH: YELLOW PAINT
- 4) ALTERNATIVE DESIGNS MAY BE ACCEPTABLE PROVIDED THAT THE HOLE WILL PASS A $\varnothing 0.75$ " HOOK WITHOUT INTERFERENCE. SUBMIT ALTERNATIVE DESIGNS TO THE GAS PLANNING ENGINEER FOR APPROVAL.



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GAS MATERIAL SPECIFICATIONS

GAS VALVE SAFETY CAP

SHEET 1 OF 1	GM-8.7	DRAWN BY: A. CHODIN DATE: 10/17/2008
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GMS-8.8

POLYETHYLENE BALL VALVES

Use:

Medium density polyethylene (PE 2406/2708) ball valves are to be used in the City of Mesa's natural gas systems with design pressures up to 60 psig.

Standards:

PE 2406/2708 ball valves shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- ASTM D2513 Standard Specifications for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings
- ANSI/ASME B16.40 Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
- ASTM F2897 Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)

Size:

The following are the City of Mesa's standard PE valve sizes and shall apply in all instances. Other sizes may be authorized by the Gas Planning Engineer.

SIZE (IPS)	ENDS SDR	ENDS OD	ENDS Min Wall	END "Pup" Length Minimum
1"	11	1.315"	0.119"	4"
2"	11	2.375"	0.216"	6"
4"	11	4.500"	0.409"	6"
4"	11.5	4.500"	0.391"	6"

Resin Material:

Valve body and end material shall conform to the requirements in ASTM D2513. The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI) and maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2406/2708 material. Material shall have a cell classification of 234373E per ASTM Standard D3350. The manufacturer shall not change the resin without written permission from the Gas Planning Engineer. The resin color shall be YELLOW. The yellow color shall match or be similar to the standard color in ANSI Z53.1. Acceptable resin manufacturers are Ineos Olefins & Polymers USA and Chevron Phillips Chemical Company.

Marking:

Valves shall be marked according to ASTM D2513 and contain at least the following information:

- a. ASTM D2513
- b. Manufacturer's name or trademark
- c. Nominal pipe or tubing size and SDR number
- d. Material designation (PE 2406/2708)
- e. Temperature/Pressure Rating (minimum rating of CE)
- f. Base resin material
- g. Year and month of manufacture
- h. Rotation direction to close
- i. Tracking and traceability information per ASTM F2893 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

Pressure Rating:

All PE 2406/2708 ball valves shall have a design pressure of no less than 60 psig at a design temperature of 140° F.

Test Requirements:

The manufacturer shall test valves according to ANSI B16.40 standards.

Design:

All valves shall meet the following design specifications:

- Full Port Ball Valve design
- ¼ turn operation from closed position to full open
- Open/close indicator
- 2-inch square nut operating head
- Butt fusion valve ends
- Stops for torque protection

Packaging/Shipping:

The PE 2406/2708 ball valves shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of PE ball valves are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Kerotest	1"IPS – 99041111 2"IPS – 99042011 4"IPS – 99044011
• Elster-Perfection	2"IPS – 46000XMD-PSVB,MBV 2IPS SDR11 XMD
• Broen	1"IPS – PEB1"I MD80 .120 25 2"IPS – PEB2I-MD80-DR1114 4"IPS – PEB4I-MD80-DR1114
• R.W. Lyall	1"IPS – BV0070Y-TFN0-000 2"IPS – BV0200Y-TFN0-000 4"IPS – BV0400Y-TFN0-000
• Andronaco Polyvalve	1"IPS – 1-84111 2"IPS – 2-84111 4"IPS – 4-84111

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse stock description:

____[1,2,4] inch PE ball valve

GM-8.9

THREADED BALL VALVES FOR REGULATOR STATIONS AND LARGE METER SETS

Use:

Threaded Ball Valves for Regulator Stations and Large Meter Sets are to be used in the City's natural gas distribution system with design pressures up to 600 psig. They are to be used at pressure regulating stations and large meter sets to bypass or shut down the normal flow of gas.

Standards:

All valves shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished.

Design and Features:

All valves shall meet the following specifications:

- Non-Lubricated
- Ball valve design
- Temperature Rating of 0° F to 150° F
- Flat head with locking ability
- 1/4 turn from fully open to fully closed position.
- In the closed position, the longitudinal axis of the flat head shall be perpendicular to the longitudinal axis of the valve.
- Valve shall have tamperproof design and be constructed to minimize the possibility of removal of the plug or core with other than specialized tools.
- Valve shall have a built-in minimum torque, capable of not being operated by hand without the use of a mechanical advantage such as a wrench or other non-permanent affixed operating device.
- Minimum of 1000-psig working pressure rating.

Design and Features (continued):

- Full-port Valve

Inlet, Outlet and Style:

Valves shall be threaded at both ends with NPT threads of the same size as the nominal valve size.

Working Pressure:

Only valves with a working pressure greater than or equal to 1000 psig are acceptable for use in the City of Mesa's Natural Gas Distribution System

Coating of Valves:

All valves shall be coated with a suitable metal paint to prevent corrosion during shipping and storage.

Packaging/Shipping:

Valve shall be capped at each end. The valve shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5, as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of valves may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of meter valves are approved for use in the City of Mesa Natural Gas Distribution System:

<u>Manufacturer:</u>	<u>Model:</u>	<u>Size:</u>
• Balon Corporation	Series S - 2F-S42-SE	2"
• Balon Corporation	Series S - 3F-S42-SE	3"

Manufacturers may submit products not identified above but meeting all qualifications set forth in this specification to City for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer at (480) 644-4851.

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Gas Material Specifications



GMS-9 Excess Flow Valves

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GMS-9

EXCESS FLOW VALVE

Use:

Excess Flow Valves (EFVs) shall be used in those City of Mesa's natural gas distribution systems with an MAOP not to exceed 60 psig and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

EFVs shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- 49 CFR 192.381 Service lines: Excess flow valve performance standards.
- ASTM F1802 Standard Test Method for Performance Testing of Excess Flow Valves.
- ASTM F2138 Standard Specification for Excess Flow Valves for Natural Gas Service.

Design:

All EFVs shall meet the following specifications:

- a. Automatic reset with gas bleed-by feature
- b. Normal operating pressures up to 60 psig
- c. Minimum operating pressure of 10 psig or lower
- d. Minimum temperature/pressure rating of CE per ASTM D2513 or equivalent.

Sizes:

The following are the City of Mesa's commonly used EFV sizes. Other sizes, styles and configurations may be authorized by the City of Mesa Gas Planning Engineer or Senior Gas Engineer (minimum and maximum performances will be specified on the purchase order).

EFV Series	Minimum capacity (no less than, at 10 psig inlet pressure)	Maximum Trip Rate (not to exceed, at 10 psig inlet pressure)
600	600 Scfh	900 Scfh
800	775 Scfh	1200 Scfh
1100*	1100 Scfh	1400 Scfh
1800	1800 Scfh	2700 Scfh
2600	2600 Scfh	3900 Scfh

* Note: This EFV must be designed **and tested** to trip within the lower and upper flowrate limits specified at 10 psig of inlet pressure. GasBreaker was consulted and the UMAC 1100 series does not meet the requirement at the time of this revision.

Technical Specifications:

Manufacturer must submit technical information regarding the hydraulic performance of the Excess Flow Valve at the City's request. This information may include:

- Equivalent length of the fitting
- Flow coefficient of the fitting (Cv)
- Discharge coefficient of the fitting at choke flow (Cd)
- Minimum pressure at which the valve will trip
- Pressure drop at minimum and maximum trip flow
- EFV/Service Line sizing software

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

IF THE FLOW CHARACTERISTICS OR DESIGN OF THE EXCESS FLOW VALVE ARE ALTERED AT ANY TIME, MANUFACTURER MUST PROVIDE WRITTEN NOTICE TO THE CITY OF MESA OF SUCH DESIGN CHANGES. IF NOT NOTIFIED OF THESE CHANGES, MANUFACTURER MAY BE HELD ACCOUNTABLE FOR DAMAGES OF MESA IMPROPERLY SIZING SERVICE LINES TO ACCOMMODATE THE EFV.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturer of EFVs are approved for use in the City of Mesa's natural gas distribution systems:

<u>Manufacturer:</u>	<u>Model:</u>
• Elster-Perfection	Perfection EFV
• R.W. Lyall	EFVI Series
	EFVII Series
	CEFV Series
• GasBreaker	UMAC Series EFV*

*Note: GasBreaker UMAC 1100 series is not approved.

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GMS-9.1

MECHANICAL COUPLING WITH EXCESS FLOW VALVE

Use:

Mechanical Couplings with Excess Flow Valves (EFV) shall be used in those City of Mesa natural gas distribution systems with an MAOP not to exceed 60 psig and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

Mechanical Couplings with EFVs shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|------------------|--|
| • 49 CFR 192.381 | Service lines: Excess flow valve performance standards. |
| • ASTM D2513 | Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings. |
| • ASTM F1802 | Standard Test Method for Performance Testing of Excess Flow Valves. |
| • ASTM F1924 | Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter controlled Polyethylene Gas Distribution Pipe and Tubing. |
| • ASTM F2138 | Standard Specification for Excess Flow Valves for Natural Gas Service. |
| • ASTM F2897 | Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances). |

Design:

All Mechanical couplings with EFVs shall meet the following specifications:

- a. Automatic reset with gas bleed-by feature;
- b. Operate at 60 psig and 140°F simultaneously in natural gas distribution systems;
- c. Minimum operating pressure of 10 psig or lower;
- d. City of Mesa Gas Material Specification 9 – Excess Flow Valve;
- e. City of Mesa Gas Material Specification 4.2.1 – Lycofit Mechanical Fittings or;
- f. City of Mesa Gas Material Specification 4.2.2 – Permasert Mechanical Fittings.

The coupling service line attachment point shall be either of a Permasert® or Lycofit® design for fusionless attachment of the service lines to the coupling. The coupling joint shall be designed to fail during the leak test in the event that the coupling is improperly installed.

Sizes:

The following are the City of Mesa’s commonly used Mechanical Coupling with EFV sizes. Other sizes and configurations may be authorized by the City of Mesa Gas Planning Engineer or Senior Gas Engineer (minimum and maximum EFV performances will be specified on the purchase order).

Nominal Pipe Size	Standard EFV Options
1" IPS – DR 11	Perfection 2600 R.W. Lyall EFVI – 2600 Perfection 1800 R.W. Lyall EFVI – 1800
¾" IPS – DR 11	Perfection 800 R.W. Lyall EFVI 775 (to be considered as 800 series EFV for the City of Mesa) Perfection 1100* R.W. Lyall EFVI - 1100*
½" IPS – DR 9.3	Perfection 800 R.W. Lyall EFVI 775 (to be considered as 800 series EFV for the City of Mesa) Perfection 1100* R.W. Lyall EFVI - 1100*
½" CTS – DR 7	Perfection 600

* EFV must be designed and tested to trip at a flowrate of 1100-1400 Scfh at 10 psig of inlet pressure per GMS-9.

Markings:

Each Mechanical Coupling with EFV shall be marked on their outermost surface with at least the following:

- a. Manufacturer's identification and part number
- b. Bypass (EFVB)
- c. Flow direction arrow
- d. ASTM F2138
- e. Nominal pipe size and DR number
- f. Material designation for polyethylene couplings
- g. Temperature and Pressure rating designation (minimum rating of CE) for polyethylene couplings
- h. Lot identification
- i. EFV model (800 series, etc.)
- j. ASTM D2513 or ASTM F1924 CAT1
- k. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

EFV Identification Marker:

An EFV identification marker shall be included with every EFV mechanical coupling. The markers shall be of a metallic washer design and manufactured according to the following specifications:

EFV Series	Stamped Markings*	Inner Diameter (nominal)	Coating
600	600	1-3/8"	Zinc Coated
800	800 or 775 (as applicable)		
1100	1100		
1800	1800		
2600	2600		

* Additional stamped markings ("EFVB" or similar) are acceptable only when no cost increase occurs as a result of the additional markings.

NOTE: Metal riser tags are not acceptable EFV identification markers.

EFV identification washers with inner diameter of 1-3/8" are designed to slip fit over NPS 1" steel nipple with polyester powder coating. If needed, other washer sizes may be specified on the purchase order per approval by the Gas Planning Engineer or Senior Gas Engineer

Packaging/Shipping:

Each Mechanical Coupling with EFV shall come in a sealed plastic bag that includes the following:

- a. EFV pre-installed in a double-ended mechanical coupling
- b. EFV identification marker
- c. Instructions on installation of fitting
- d. Statement of compliance to 49 CFR 192.283 – Plastic pipe: Qualifying joining procedures
 - Statement of compliance included on the material certification or with every shipment is also acceptable.

The Mechanical Couplings with EFVs shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturers of mechanical couplings with EFVs are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- Elster-Perfection
- R.W. Lyall

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

_____ [Perfection, RW Lyall] Mechanical coupling w. _____ [EFV series] EFV, _____ [Size]
_____ [IPS, CTS]

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GMS-9.2

MECHANICAL TAPPING TEE WITH MECHANICAL OUTLET AND EXCESS FLOW VALVE

Use:

Mechanical Tapping Tees with Mechanical Outlets and Excess Flow Valves (EFVs) shall be used in those City of Mesa natural gas distribution systems with an MAOP not to exceed 60 psig and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

Mechanical Tapping Tees with Mechanical Outlets and EFVs shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|--|--|
| <ul style="list-style-type: none">• 49 CFR 192.381 | Service lines: Excess flow valve performance standards. |
| <ul style="list-style-type: none">• ASTM D2513 | Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings. |
| <ul style="list-style-type: none">• ASTM F1802 | Standard Test Method for Performance Testing of Excess Flow Valves. |
| <ul style="list-style-type: none">• ASTM F1924 | Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter controlled Polyethylene Gas Distribution Pipe and Tubing. |
| <ul style="list-style-type: none">• ASTM F2138 | Standard Specification for Excess Flow Valves for Natural Gas Service. |
| <ul style="list-style-type: none">• ASTM F2897 | Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances). |

Design:

All Mechanical Tapping Tees with Mechanical Outlets and EFVs shall meet the following specifications:

- a. Automatic reset with gas bleed-by feature;
- b. Operate at 60 psig and 140°F simultaneously in natural gas distribution systems;
- c. Minimum operating pressure of 10 psig or lower;
- d. Bolt-on design that does not require fusion to attach the tee to the main line;
- e. Mechanical means of keeping the tapping tee from rotating around the main if a torque is applied to the tee about the axis of the pipe;
- f. City of Mesa Gas Material Specification 9 – Excess Flow Valve;
- g. City of Mesa Gas Material Specification 4.2.1 – Lycofit Mechanical Fittings; or
- h. City of Mesa Gas Material Specification 4.2.2 – Permasert Mechanical Fittings.

The outlet of the tapping tee shall either be of a Permasert® or Lycofit® design for fusionless attachment of the service line to the tee. The mechanical joint shall be designed to fail during the leak test in the event of an improper installation.

Sizes:

The following are the City of Mesa’s commonly used Mechanical Tapping Tee with Mechanical Outlet and EFV sizes. Other sizes and configurations may be authorized by the City of Mesa Gas Planning Engineer or Senior Gas Engineer (maximum and minimum EFV performances will be specified on the purchase order).

Nominal Inlet Pipe Size	Nominal Outlet Pipe Size	Standard EFV Options
2" IPS - DR 11	½" IPS – DR 9.3 ¾" IPS – DR 11	Perfection 800
4" IPS - DR 11/11.5		R.W. Lyall EFVI 775 (to be considered as 800 series EFV for the City of Mesa)
6" IPS - DR 11		Perfection 1100* R.W. Lyall EFVI 1100*

* EFV must be designed and tested to trip at a flowrate of 1100-1400 Scfh at 10 psig of inlet pressure per GMS-9.

Markings:

Each Mechanical Tapping Tee with Mechanical Outlet and EFV shall be marked on their outermost surface with at least the following:

- a. Manufacturer's identification and part number
- b. Bypass (EFVB)
- c. Flow direction arrow
- d. ASTM F2138
- e. Nominal pipe size and DR number
- f. Material designation for polyethylene mechanical tapping tee
- g. Temperature and Pressure rating designation (minimum rating of CE) for polyethylene mechanical tapping tee
- h. Lot identification
- i. EFV model (800 series, etc.)
- j. ASTM D2513 or ASTM F1924 CAT1
- k. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

EFV Identification Marker:

An EFV Identification Marker shall be included with every Mechanical Tapping Tee with Mechanical Outlet and EFV. The markers shall be of a metallic washer design and manufactured according to the following specifications:

EFV Series	Stamped Markings*	Inner Diameter (nominal)	Coating
800	800 or 775	1-3/8"	Zinc Coated
1100	1100		

* Additional stamped markings ("EFVB" or similar) are acceptable only when no cost increase occurs as a result of the additional markings

NOTE: Metal riser tags are not acceptable EFV identification markers.

EFV identification washers with inner diameter of 1-3/8" are designed to slip fit over NPS 1" steel nipple with polyester powder coating. If needed, other washer sizes may be specified on the purchase order per approval by the Gas Planning Engineer or Senior Gas Engineer

Packaging/Shipping:

Each Mechanical Tapping Tee with Mechanical Outlet and EFV shall come in a sealed plastic bag that includes the following:

- a. EFV pre-installed in a mechanical tapping tee with a mechanical outlet
- b. EFV identification marker
- c. Instructions on installation of fitting
- d. Statement of compliance to 49 CFR 192.283 – Plastic pipe: Qualifying joining procedures
 - Statement of compliance included on the material certification or with every shipment is also acceptable.

The Mechanical Tapping Tees with Mechanical Outlets and EFVs shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturer of Mechanical Tapping Tees with Mechanical Outlets and EFVs are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- Elster-Perfection
- R.W. Lyall

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

_____ [Perfection, RW Lyall] Mechanical Tapping Tee w. _____ [EFV series] EFV, _____ [Size]
_____ [IPS, CTS] x _____ [Size] _____ [IPS, CTS]

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GMS-9.3

FUSION TAPPING TEE WITH EXCESS FLOW VALVE

Use:

Fusion Tapping Tees with Excess Flow Valves (EFVs) shall be used in those City of Mesa natural gas distribution systems with an MAOP not to exceed 60 psig and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

Fusion Tapping Tees with EFVs shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- | | |
|------------------|--|
| • 49 CFR 192.283 | Plastic pipe: Qualifying joining procedures |
| • 49 CFR 192.381 | Service lines: Excess flow valve performance standards. |
| • ASTM D2513 | Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings. |
| • ASTM D2683 | Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing. |
| • ASTM F1802 | Standard Test Method for Performance Testing of Excess Flow Valves. |
| • ASTM F2138 | Standard Specification for Excess Flow Valves for Natural Gas Service. |
| • ASTM F2897 | Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances). |

Resin Material:

Fusion Tapping Tees with EFVs shall conform to the requirements in ASTM D2513. The resin manufacturer shall be a current member of the Plastics Pipe Institute (PPI), maintain a current resin listing in the latest version of PPI TR-4 where the material shall be classified as a PE 2708 material and meet the resin requirements under City of Mesa's GMS-3.1 – Medium Density Polyethylene Pipe (MDPE). Only resin manufacturers approved under GMS-3.1 are acceptable. All tapping tees and fittings shall not contain reworked resin.

Design:

All heat Fusion Tapping Tees with EFVs shall meet the following specifications:

- a. Automatic reset with gas bleed-by feature
- b. Operate at 60 psig and 140°F simultaneously in natural gas distribution systems.
- c. Minimum operating pressure of 10 psig or lower
- d. Minimum temperature/pressure rating of CE per ASTM D2513*
- e. City of Mesa Gas Material Specification 9 – Excess Flow Valve
- f. City of Mesa Gas Material Specification 4.1.2 – Medium Density Polyethylene Fusion Tapping Tees & Branch Saddles

*NOTE: Temperature rating of CD per ASTM D2513 is allowed if the tapping tees and fittings were manufactured after January 22, 2019.

Sizes:

The following are the City of Mesa's commonly used Fusion Tapping Tees with EFVs sizes. Other sizes and configurations may be authorized by the City of Mesa Gas Planning Engineer or Senior Gas Engineer (maximum and minimum EFV performances may be specified on the purchase order).

Nominal Inlet Pipe Size	Nominal Outlet Pipe Size	Standard EFV Options
2" IPS - DR 11	½" IPS – DR 9.3 ¾" IPS – DR 11	Perfection 800
4" IPS - DR 11/11.5		R.W. Lyall EFVI 775 (to be considered as 800 series EFV for the City of Mesa)
6" IPS - DR 11		Perfection 1100* R.W. Lyall EFVI 1100*

* EFV must be designed and tested to trip at a flowrate of 1100-1400 Scfh at 10 psig of inlet pressure per GMS-9.

Markings:

Each Fusion Tapping Tee with EFV shall be marked on their outermost surface with at least the following:

- a. Manufacturer's identification and part number
- b. Bypass (EFVB)
- c. Flow direction arrow
- d. ASTM F2138
- e. Nominal pipe size and DR number
- f. Material designation (PE2708)
- g. Temperature and Pressure rating designation (CD or CE, as applicable)
- h. Lot identification
- i. EFV model (800 series, etc.)
- j. Tracking and traceability information per ASTM F2897 standard

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Planning Engineer prior to payment.

EFV Identification Marker:

An EFV Identification Marker shall be included with every Mechanical Tapping Tee with Mechanical Outlet and EFV. The markers shall be of a metallic washer design and manufactured according to the following specifications:

EFV Series	Stamped Markings*	Inner Diameter (nominal)	Coating
800	800 or 775	1-3/8"	Zinc Coated
1100	1100		

* - Additional stamped markings ("EFVB" or similar) are acceptable only when no cost increase occurs as a result of the additional markings

NOTE: Metal riser tags are not acceptable EFV identification markers.

EFV identification washers with inner diameter of 1-3/8" are designed to slip fit over NPS 1" steel nipple with polyester powder coating. Other washer sizes may be specified on the purchase order.

Packaging/Shipping:

Each Fusion Tapping Tee with EFV shall come in a sealed plastic bag that includes the following:

- a. EFV pre-installed in a fusion tapping tee
- b. EFV identification marker
- c. Instructions on installation of fitting

The Fusion Tapping Tee with EFV shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this Specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Approved Manufacturers:

The following manufacturer of Fusion Tapping Tee with EFV are approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- Elster-Perfection
- R.W. Lyall
- Georg Fischer – Central Plastics

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

Warehouse Stock Descriptions:

Fusion Tapping Tee w. _____ [EFV series] EFV, _____ [Size] _____ [IPS, CTS] x _____ [Size] _____ [IPS, CTS]

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Gas Material Specifications



GM-10 Misc. Gas Fittings

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GM-10.1

TRANSITION FITTING

POLYETHYLENE TO STEEL

Use:

Transition fittings are to be used between PE and steel pipe in the City's natural gas system with design pressures up to 60 psig.

Standards:

The transition fittings shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished.

Polyethylene Material:

Polyethylene material shall conform to the requirements in City of Mesa Gas Material Specification GM-3.

Steel Material:

Steel portions of fittings shall conform to the requirements in City of Mesa Gas Material Specification GM-1.1.

Finish:

The steel portion of the transition fitting shall be coated with a minimum of 10 mills of fusion bonded epoxy.

Marking:

Transition fittings furnished under this specification shall be legibly marked as follows:

1. Manufacturer's name or trademark.
2. Size and wall thickness (SDR) of each end.
3. Material designation.
4. Date of manufacture.
5. Specification/Standard to which it was manufactured.

If any of the above information is coded, key to such coding shall be furnished in writing to the City of Mesa Gas Planning Engineer prior to payment.

Size:

The following list is the City's standard transition fitting sizes. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa Gas Planning Engineer.

Pipe Size		Avg. O.D. PE & Stl	Minimum Length		Min. Wall Thickness		SDR P.E.
PE	To Steel		PE	Stl	PE	Stl.	
1" IPS	1" IPS	1.315"	12"	12"	0.119	0.133	11
2" IPS	2" IPS	2.375"	12"	12"	0.216	0.154	11
4" IPS	4" IPS	4.500"	12"	12"	0.395	0.156	11.5

Ends:

The PE pipe end of the fitting shall be furnished with a square-cut end.

The steel pipe end of the fitting shall be beveled at an angle of 30 degrees, +5 degrees, -0 degrees, with a 1/16" root face as shown in API 5L: Specification for Line Pipe.

Performance Requirements:

This section of the specification defines the minimum performance requirements for which metal-to-plastic transition fittings will be tested in order to qualify for listing as an approved product.

Air Pressure Leakage Test: The fitting under test, with appropriate end closures, shall have an internal air pressure of 100 psig applied for 15 minutes while being submerged in a water bath. The test procedure shall be conducted at

Performance Requirements (continued):

temperatures of 75 degrees Fahrenheit (24 degrees Celsius) and 140 degrees Fahrenheit (60 degrees Celsius). Any leakage shall be cause for rejection.

The Pull-Out Test: Resistance of this transition fitting, when subjected to an axial tensile load at the plastic/steel junction, shall be such that the plastic pipe shall neck down and elongate 100% without any separation of the two parts at the jointed area. These tests shall be conducted after fittings are temperature conditioned to -15 degrees Fahrenheit (-26.1 degree Celsius).

Packaging/Shipping:

All transition fittings shall be packaged to prevent damage in shipping and warehousing. The supplier shall exercise extreme care in the shipping of all transition fittings to protect them from damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

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GM-10.2

GAS REPAIR CLAMP

Use:

The gas repair clamp will be used in the City's natural gas system with design pressures up to 150 psig. Repair clamps will be used for temporary repair to stop natural gas leaks from pinholes, splits or circumferential breaks until permanent repairs can be made. Repair clamps are for use on steel pipe only, do not use on Polyethylene Gas Pipe.

Standards:

The repair clamps shall comply with the requirements of the Code of Federal Regulations (CFR) Title 49 Part 192 – Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards.

Design:

All repair clamps shall meet the following criteria:

- Full 360° sealing capability
- Lug: Ductile iron per ASTM A-536
- Band: 304 stainless steel
- Bolt, nut and washer: Carbon steel with corrosion resistive plating or stainless steel
- Gasket: Rubber compound for use with natural gas
- Maximum working pressure: 150 psig

Sizes:

Nominal Pipe Size	Steel Pipe O.D.	Clamp Length	Number of Bolts	
			<u>3"</u>	<u>6"</u>
3/4"	1.05"	3" and 6"	1	2
1"	1.315"	3" and 6"	1	2
1 1/2"	1.90"	3" and 6"	1	2
2"	2.375"	3" and 6"	1	2

Packaging/Shipping:

Clamps shall be shipped in boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Approved Manufacturers:

The following manufacturers of repair clamps are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- The Ford Meter Box Company, Inc.

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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Gas Material Specifications



GM-11 Misc. Construction Fittings

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GM-11.1

MAGNESIUM ANODES

Use:

Magnesium anodes (1 and 32 pound) will be used in the City's natural gas distribution system. One (1) pound anodes shall be used for isolated service lines and fittings. Thirty-two (32) pound anodes shall be used for coated steel pipe. These anodes will be used in the City's systems to protect against galvanic corrosion of steel pipe.

Standards:

The magnesium anodes shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

- ASTM G97 Standard Test Method for Laboratory Evaluation of Magnesium Sacrificial Anode Test Specimens for Underground Applications
- ASTM B843 Standard Specification for Magnesium Alloy Anodes for Cathodic Protection

Anode Efficiency:

Anodes shipped on a specific purchase order shall have an average efficiency of 50% as determined by testing per ASTM G97.

Material:

One and thirty-two pound magnesium anodes shall be High Potential Magnesium anodes. Anode composition shall meet or exceed the ASTM B 843 grade M1C - "High Potential". The analytical specifications for High Potential Magnesium anode materials are as follows:

Aluminum	0.010
Manganese	0.50-1.30
Zinc	-0-
Silicon	0.05
Copper	0.02
Nickel	0.001
Iron	0.03
Other	0.05 each
	0.30 total
Magnesium	Balance

Limits are given as maximum weight percent unless shown as a range

Size:

Anodes shall be 1 and 32 pound (bagged only).

Core:

The core shall be of a size and shape that will insure an adequate electrical and physical bond to the magnesium anode. The core shall be positioned in the center of the anode along its entire length.

Lead Wire:

The lead wire shall be 4-foot long on 1-pound anodes and 10-foot long on 32-pound anodes. The wire shall be #12 TW or THHN solid copper insulated lead wire. The lead wire is connected by looping it through the core as far down into the anode cavity as possible. The insulation on lead wire should extend down into the anode cavity far enough so that no bare wire will be exposed when the cavity is potted. The wire shall be bent so that both sides are in contact with the core. The wire shall be brazed with silver or brass to both sides of the core. The cavity shall be filled with an electrical potting compound.

Backfill:

All 1 and 32 pound anodes shall be bagged. Bagged anodes shall be packaged in permeable bags containing backfill of the following composition:

Ground Hydrated Gypsum -	75%
Powdered Bentonite -	20%
Sodium Sulfate -	5%

The backfill material shall weigh a minimum of 4 pounds for the 1-pound anode and 28 to 38 pounds for the 32-pound anode. Hydrated Gypsum and Sodium Sulfate material grain size shall be such that 100% of it shall pass through a 100 mesh screen.

Powdered Bentonite material grain size shall be such that 100% of it shall pass through a 200 mesh screen. Backfill material shall be packed FIRMLY around the anode by means of vibration. There shall be a MINIMUM of ½" of backfill on all sides and ends of the anode.

Packaging/Shipping:

Anodes shall be protected from moisture. All anodes shall be packaged and shipped to protect them from damage in shipping and warehousing.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.



Gas Material Specifications

GM-11.2 Vaults for Regulator Stations

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GM-11.2.1

CONCRETE UTILITY VAULTS FOR REGULATOR STATIONS

Use:

Utility vaults are to be used to house and protect underground regulator stations and the accompanied gas facilities therein.

Standards:

The vaults shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192

Design:

Vaults shall feature the following:

- Open bottom design
- (1) Mouse hole type opening (knockouts) on each side
- Double weather tight torsion assisted doors with 180 degree range
- Skid resistant cover with a minimum coefficient of friction of 0.5
- Lifting slots in covers with recessed stainless steel lifting pins
- The City of Mesa name/logo shall be permanently marked in the cover
- Recessed pentahead locking bolts

Sizes:

Vaults shall have a minimum height of 48" and a base measuring a minimum of 56" by 84" and shall not have a total volume greater than 200 cubic feet. The mouse hole openings found on the vault body shall have a minimum opening of 24" high by 6" wide.

Materials:

Vault base shall be of concrete manufactured to the load specifications listed above. Rebar material shall be of grade 60 mild steel conforming to ASTM A-615. Mesh material shall be of grade 65 mild steel conforming to ASMT A-185. Vault cover door shall be made of aluminum.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. Any materials that fail to meet the requirements listed in this Material Specification; are physically or visually damaged; or do not function correctly may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the products do not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Approved Manufacturers:

The following manufacturers of concrete utility vaults are approved for use in the City of Mesa Natural Gas Distribution System:

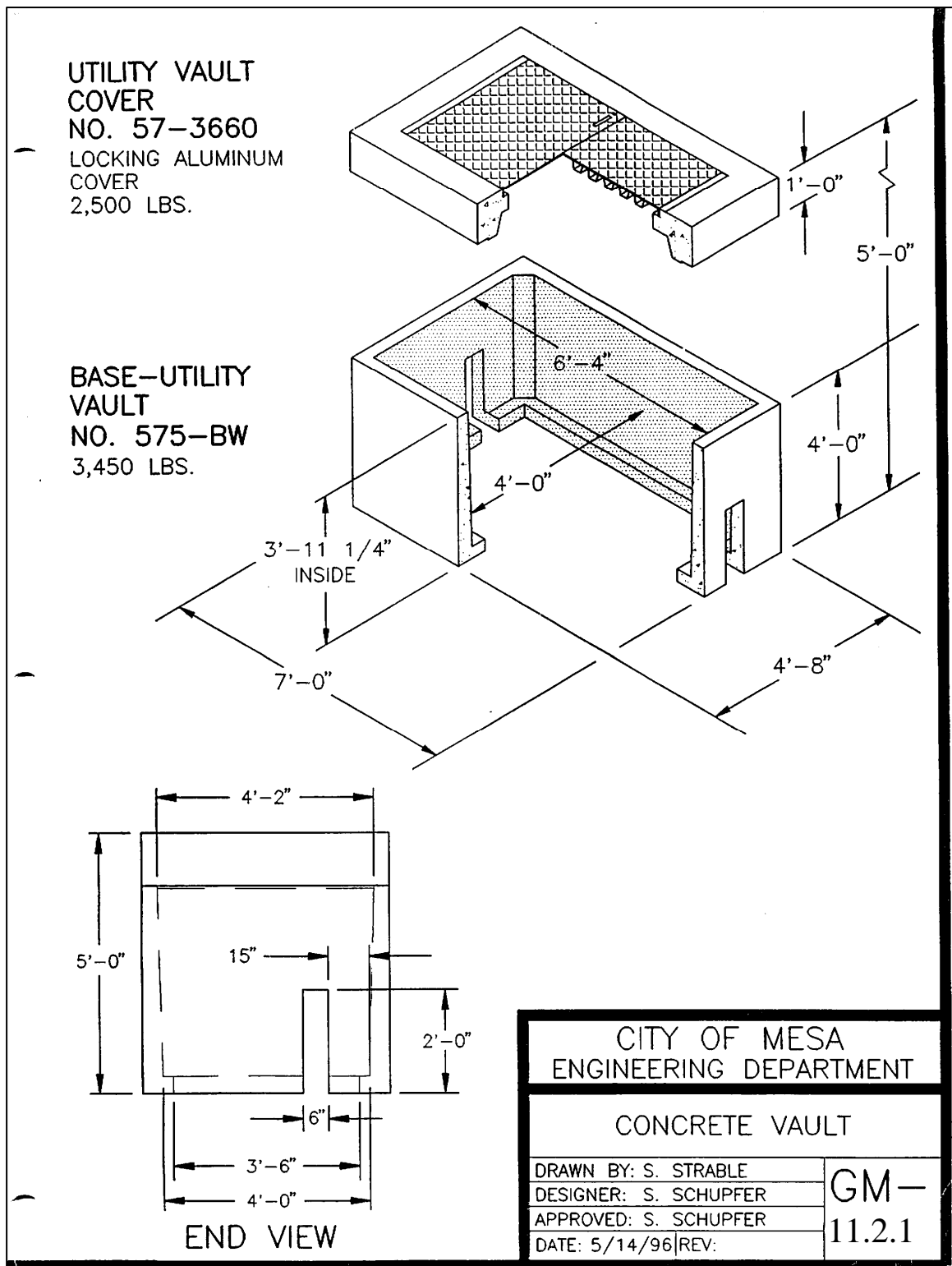
Manufacturer:

- Utility Vault Company

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

Design Drawing:

The utility vault shall comply with all design sizes and dimensions shown:



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GM-11.2.2

FIBERGLASS UTILITY VAULTS FOR REGULATOR STATIONS

Use:

Fiberglass utility vaults are to be used to house and protect underground regulator stations and the accompanied gas facilities therein.

Standards:

The vaults shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192 at the time the material is furnished.

Design:

Vaults shall feature the following:

- Open bottom design
- (1) Mouse hole type opening on each side
- Double, weather tight, torsion assisted doors with 180 degree range
- Skid resistant cover with a minimum coefficient of friction of 0.5
- Lifting slots in covers with recessed stainless steel lifting pins
- The City of Mesa name/logo shall be permanently marked in the cover.
- Recessed pentahead locking bolts.

Sizes:

Vaults shall have a minimum height of 48" and a base measuring a minimum of 48" by 78" and shall not have a total volume greater than 200 cubic feet. The mouse hole opening found on the vault body shall have a minimum opening of 24" high by 6" wide.

Materials:

Vaults shall be manufactured from fiberglass-reinforced plastic. The torsion frame assembly shall be manufactured of Hot-Dipped Galvanized Steel. The covers shall be manufactured of polymer concrete. The polymer concrete and fiberglass reinforced plastic material shall be tested and meet the material qualification requirements of Western Underground Committee's Recommended Guide No. 3.6.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. Any materials that fail to meet the requirements listed in this Material Specification; are physically or visually damaged; or do not function correctly may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the products do not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order are in compliance with this specification and conform to the requirements in 49 CFR 192 prior to payment by the City of Mesa. Certifications shall arrive prior to or with the product shipment for approval by the City of Mesa Gas Planning Engineer.

Approved Manufacturers:

The following manufacturers of fiberglass utility vaults are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

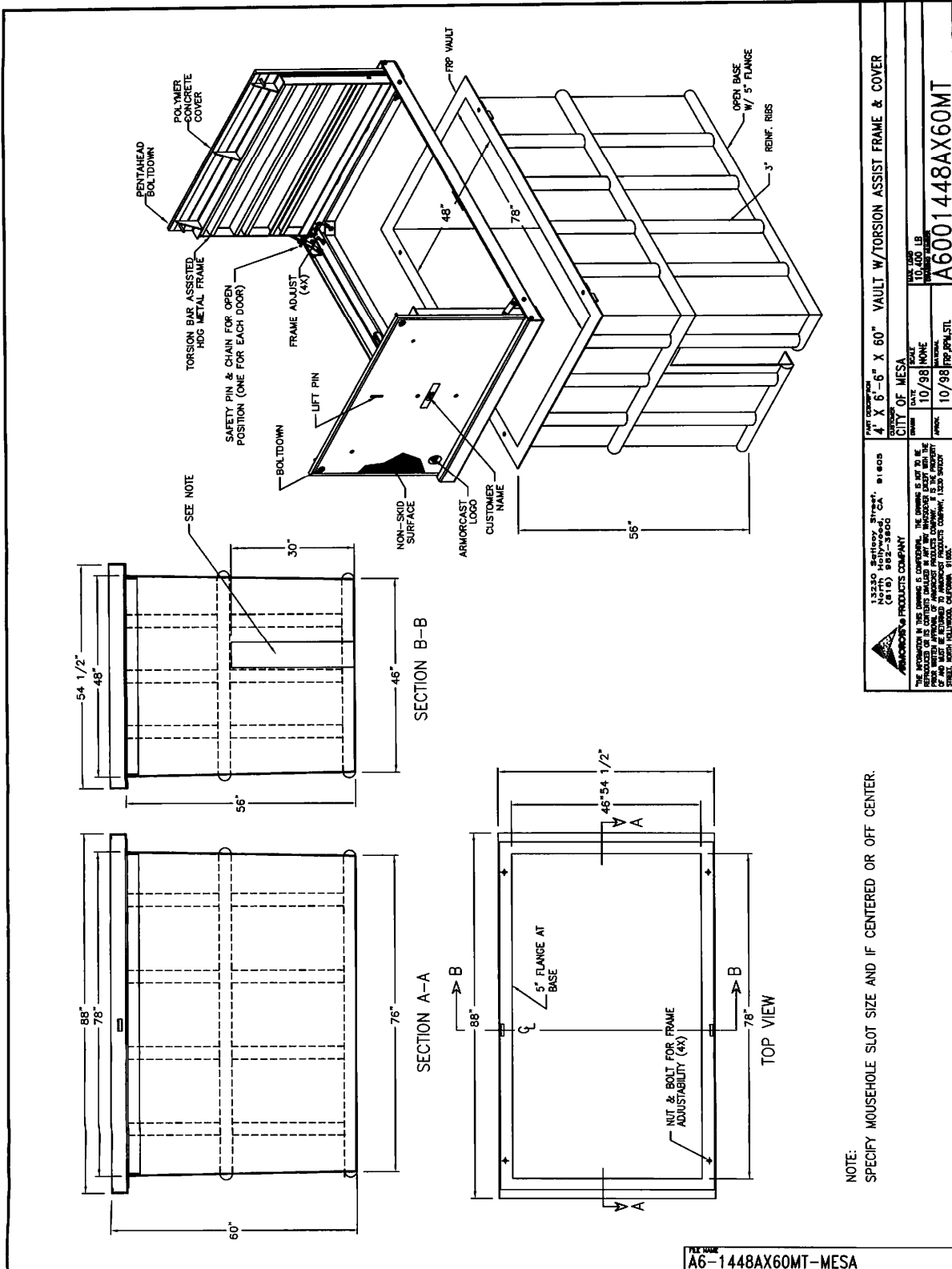
- Armorcast Products Company

Manufacturers not listed above may submit products that meet all qualifications set forth in this specification to the City for review, examination and testing for approval. The City hereby gives notice that completion of the approval process may take up to ninety (90) days. The City therefore advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa's Purchasing Department's web site) for the purposes of timely ascertaining product eligibility.

Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer at (480) 644-4851.

Design Drawing:

The utility vault shall comply with all design sizes and dimensions shown on page 4 of this specification.



13240 Redwood Street, #100 North Hollywood, CA (818) 982-3800		13240 Redwood Street, #100 North Hollywood, CA (818) 982-3800	
ARMORCAST PRODUCTS COMPANY		ARMORCAST PRODUCTS COMPANY	
THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL. THE DRAWING IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF ARMORCAST PRODUCTS COMPANY. IF THE INFORMATION IS NOT TO BE REPRODUCED OR COPIED, IT IS THE PROPERTY OF ARMORCAST PRODUCTS COMPANY. 13240 Redwood Street, North Hollywood, California 91605.		THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL. THE DRAWING IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF ARMORCAST PRODUCTS COMPANY. IF THE INFORMATION IS NOT TO BE REPRODUCED OR COPIED, IT IS THE PROPERTY OF ARMORCAST PRODUCTS COMPANY. 13240 Redwood Street, North Hollywood, California 91605.	
4' X 6'-6" X 60" VAULT W/TORSION ASSIST FRAME & COVER		4' X 6'-6" X 60" VAULT W/TORSION ASSIST FRAME & COVER	
CITY OF MESA		CITY OF MESA	
DATE: 10/98		DATE: 10/98	
BY: JPL/STL		BY: JPL/STL	
A6001448AX60MT		A6001448AX60MT	

GM-11.3

SPECIFICATION FOR COLD APPLIED COATING TAPE

Use:

Cold-applied coating shall be in a tape form produced by an organization experienced and regularly engaged in the manufacturing of cold-applied tape. This tape shall be designed to protect buried metal surfaces from corrosion and electrolysis. It is used for coating pipe, pipe joints, fittings, conduit, cable and other metal surfaces. Tape shall not have a paper interliner.

Abbreviations:

“mil” – One thousandth of an inch

“lb/in” – Pound per inch

“oz/in” – Ounce per inch

“V/mil” – Volt per mil

“MΩ/in” – Megaohm per inch

“g/100 in²/24 hours” – Gram per 100 square inches per 24 hour period

Specifications:

Width of tape: One (1) inch or two (2) inch

Backing: Polyethylene, low density

Color: Black

Adhesive: Butyl Rubber, Synthetic Resin

The following minimums shall apply in all instances:

Physical Properties:

Total Thickness:	34 mils
Backing Thickness:	6 mils
Adhesive Thickness:	28 mils
Tensile Strength:	15 lb/in width
Elongation:	170 %
Adhesion to Primed Steel:	200 oz/in width

Specifications (continued):

Electrical and Moisture Resistance:

Dielectric Strength: 1000 V/mil

Insulation Resistance: 1,000,000 MΩ/in

Water Vapor Transmission Rate: 0.01-0.2 g/100 in²/24 hr

Temperature Range:

Application Temperature Range: -30 - 160 degrees F

Operating Temperature Range: -30 - 185 degrees F

Test Methods:

1. ASTM D-1000
2. ASTM E-96 and E398
3. ASTM D-257, sample area is 1 square inch.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.



Approved Manufacturers:

The following manufacturers of coating tape are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- Covalence Adhesives

Model:

Polyken – 930-35 Black

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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GM-11.4

CAUTION SIGNS

Standards:

The caution sign shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety.

Material:

Signs shall be mounted on aluminum, galvanized steel or a polycarbon plastic. The aluminum-mounted signs shall have a minimum thickness of .050". The steel mounted signs shall be galvanized and have a minimum thickness of 20 gauge. The polycarbon plastic mounted signs shall meet the following requirements:

- A minimum thickness of .080".
- Will withstand 200 ft. pounds of impact.
- A minimal tensile strength of 9,000 lbs per square inch.
- Tear and shatterproof.
- It shall not fade, warp or discolor.

Properties:

Signs shall be able to withstand a temperature range between 0 degrees to +160 degrees F for a long period of time. Signs shall also be able to withstand the long term effects of hail, rain and sunlight.

Design:

1. The word "CAUTION" shall be 3-inches in height with a 3/8-inch stroke.
2. The words "GAS PIPELINE" shall be 2-inches in height with a 1/4-inch stroke.
3. The remainder of the lettering shall be 3/4-inch in height with 1/8-inch stroke.
4. All letters shall be white color.
5. The word "CAUTION" shall have a red background around it.
6. The remainder of the lettering shall have a blue background around it.
7. The border strip shall be white color and 3/8-inch wide.

Design (continued):

8. All signs shall have rounded or blunt corners. The signs shall be free of sharp edges, burrs, splinters or other sharp projections.
9. See design example for additional information and requirements.

Holes:

Two 3/8-inch holes shall be made in each sign as shown in design example so as not to interfere with the lettering.

Finish:

The sign shall have a finish as to prevent corrosion.

Printing:

All copies shall be reproduced by the silk screen method (using gloss enamel paint) and bake dried. The printings shall adhere or be part of the sign and not flake or peel off.

Packaging/Shipping:

All signs shall be packaged to protect them from damage in shipping and warehousing. The supplier shall exercise extreme care in shipping of all signs to protect them from damage.

Design Changes:

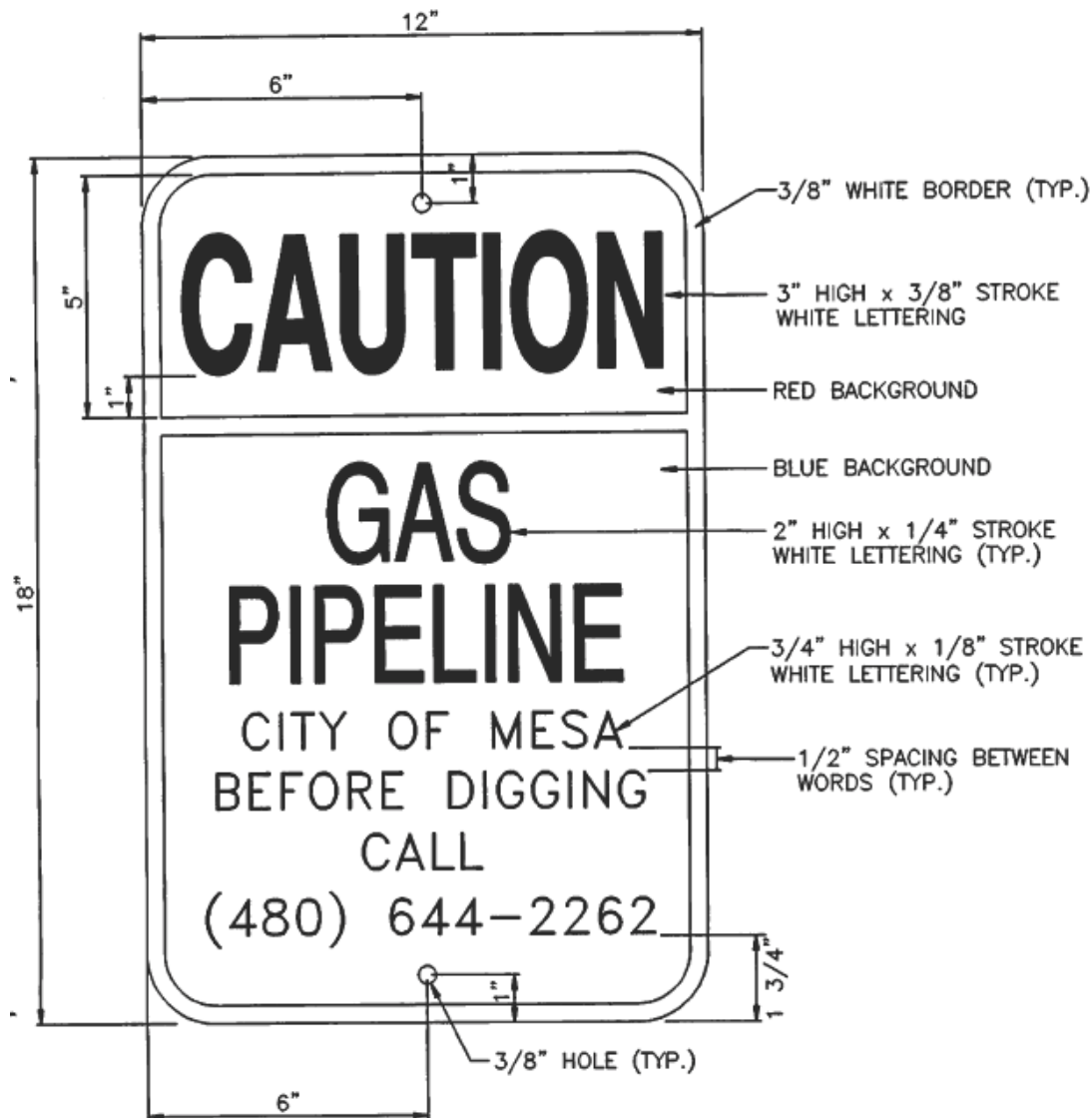
Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Design Example: Caution Sign


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GMS-11.5.1

LINE MARKERS

Use:

Line Markers shall be used for identification of buried natural gas pipelines in the City of Mesa natural gas system and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

Line Markers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- 49 CFR 192.707 Line markers for mains and transmission lines.

Design:

Line Marker is expected to, at minimum, meet the following:

- a. Flexible and manufactured from fiberglass composite.
- b. Yellow in color.
- c. Length: 66 inches or 18 inches.
- d. Width: Approximately 4 Inches.
- e. Minimum of one flat side and with ribbed edges.

There shall be no deviations from this specification unless reviewed and approved by the Energy Resources Gas Construction and Technical Services Administrator (or designee).

Packaging/Shipping:

Line Markers shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any design changes or deviation from this specification must be approved by the Energy Resources Gas Construction and Technical Services Administrator (or designee) prior to implementation.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer does not need to submit material certification at this time.

Approved Manufacturers:

The following manufacturers of Line Marker is approved for use in the City of Mesa's natural gas distribution systems:

Manufacturer:

- Valmont – Carsonite
- Rhino Markers

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for



the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GMS-11.5.2

“TRIVIEW” LINE MARKERS

Use:

“Triview” Line Markers shall be used for identification of buried natural gas pipelines in the City of Mesa natural gas system and in accordance with the City of Mesa’s Operations and Maintenance Manual.

Note that “TriView” is a registered trademark of Rhino Markers.

Standards:

“Triview” Line Markers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- 49 CFR 192.707 Line markers for mains and transmission lines.

Design:

““Triview” Line Markers are expected to, at minimum, meet the following:

For retro fitting installation:

- a. Flexible and extruded from UV stabilized virgin polypropylene material.
- b. Triangular in shape.
- c. Yellow in color with a cap. The cap shall be fused or stapled to the top of the marker post. The cap color will be specified on the purchase order.
- d. Length: 54 inches or 66 inches.
- e. Width: Approximately 4 Inches.

For new installation:

- a. Flexible and extruded from UV stabilized virgin polypropylene material.
- b. Triangular in shape.
- c. Yellow in color with a cap. The cap shall be fused or stapled to the top of the marker post. The cap color will be specified on the purchase order.
- d. Length: 72 inches.
- e. Width: Approximately 3 Inches.
- f. Flexible 3/8"D x 42"L fiberglass rod shall be included for added strength.
- g. Integrated anchor system for direct burial.

There shall be no deviations from this specification unless reviewed and approved by the Energy Resources Gas Construction and Technical Services Administrator (or designee).

Packaging/Shipping:

Triview Line Markers shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

When the Triview Lines Markers are ordered as a kit, each kit shall contain the following:

Retrofit Installation Kit:

One (1) TV454YU or TV466YU – Rhino TriView LX retrofit series in 54" or 66" length with a cap. The length of the marker post and the cap color will be specified on the purchase order.

Three (3) GMS-11.6– City of Mesa Gas Marker Decals. When specified on the purchase order, one (1) City of Mesa Gas Marker Decal can be replaced with a Spanish version with similar size and style.

Installation instructions

New Installation Kit:

One (1) TVF72YU Rhino Triview Flex yellow marker with blue cap and pre-inserted fiberglass rod.

Three (3) GMS-11.6– City of Mesa Gas Marker Decal. When specified on the purchase order, one (1) City of Mesa Gas Marker Decal can be replaced with a Spanish version with similar size and style.

Installation instructions.

Design Changes:

Any design changes or deviation from this specification must be approved by the Energy Resources Gas Construction and Technical Services Administrator (or designee) prior to implementation.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer does not need to submit material certification at this time.

Approved Manufacturers:

Triview Line Marker is a registered trademark and patented product of Rhino Markers. The products are only manufactured by Rhino Markers.

Manufacturers may submit products not identified above but meeting all qualifications set forth in this Specification to the City of Mesa for review, examination and testing for approval. The City of Mesa advises manufacturers to be aware of the expiration date of any applicable contracts currently in effect (as listed on the City of Mesa Purchasing Department's website) for the purposes of timely ascertaining product eligibility. Products not approved prior to the close of bidding shall not be considered during the competitive process for replacement contracts. For any further questions regarding the approval process please contact the City of Mesa Gas Planning Engineer.

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GMS-11.6

CITY OF MESA GAS MARKER DECAL

Use:

City of Mesa Gas Marker Decal is used in conjunction with utility line marker posts found in GMS-11.5.1 or GMS-11.5.2 and in accordance with the City of Mesa's Operations and Maintenance Manual.

Standards:

City of Mesa Gas Marker Decal shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in 49 CFR 192 at the time the material is furnished:

- 49 CFR 192.707 Line markers for mains and transmission lines.

Design:

City of Mesa Gas Marker Decal is expected to, at minimum, meet the following:

- a. Fade resistant and designed for outdoor environments.
- b. Printed inks must be UV stable and laminated to drastically reduce fading, and provide chemical resistance including middle acids, alkalis, salts and occasional fuel spills.
- c. Letters and graphics are printed on flexible retroreflective graphic film with equivalent performance to 3M Scotchlite Flexible Reflective Films.
- d. Similar daytime and nighttime appearance that retains most of its reflectivity when wet.
- e. Service temperature range of -30°F to +200°F
- f. The length of the decals is approximately 17-inches.

The width of the decal is between 2-7/8 inches to 3 inches.

Marking:

City of Mesa Gas Marker Decals shall meet the following marking specifications:

- a. The words “**CAUTION GAS PIPELINE**” shall be one-inch (1”) in height with a one-fourth inch ($\frac{1}{4}$ ”) stroke.
- b. All lettering shall be black color, except for the word “**CAUTION**”, which will be yellow with a black background around it.
- c. The remainder of lettering shall have a yellow background behind it.
- d. Decals shall be identical in style and appearance to the visual illustration on page 4 of this Specification.

Except for the word “**CAUTION**”, which can be replaced with “**DANGER**” or “**WARNING**”, there shall be no deviations from this specification unless reviewed and approved by the City of Mesa Gas Planning Engineer.

Packaging/Shipping:

City of Mesa Gas Marker Decal shall be shipped via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Damaged shipments will be rejected. The vendor shall be responsible for all cost for shipments rejected due to damage.

Design Changes:

Any revisions or design changes must be approved prior to implementation. Please contact the City of Mesa Gas Planning Engineer to coordinate submittal of any design changes. At a minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQ Z1.4-2003 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot of shipment may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer does not need to submit material certification at this time.

Approved Manufacturers:

All manufacturers with products meeting the requirements set forth in this Specification are approved at this time.



Note: The word "CAUTION" can be replaced with "DANGER" or "WARNING" on the City of Mesa Gas Marker Decals

GM-11.7

POLYETHYLENE (P.E.) SLEEVING

Use:

The 2406 polyethylene (PE) sleeving will be used in the City's natural gas system with design pressures up to 60 psig.

Standards:

The PE sleeving (2406) shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Sleeving shall conform to ASTM D2513: THERMOPLASTIC GAS PRESSURE PIPE, TUBING AND FITTINGS.

Resin Material:

Material shall conform to the requirements in the ASTM Standard D2513, D1248 and D3350 for a PE-2406 Type II medium density polyethylene. The type of resin used shall be Chevron Phillips Chemical Company CPC-TR-418Q or Soltex Fortiflex K38-20-160. The manufacturer shall not change the resin without written permission from the City of Mesa Gas Engineering Department. The resin color shall be YELLOW. The yellow color shall match or be similar to the standard color in ANSI Z53.1.

Marking:

Pipe shall be marked and contain at least the following information:

- a. Manufacturer's name or trademark
- b. Nominal pipe or tubing size
- c. Material designation (PE2406)
- e. Base resin (CPC-TR-418Q or Soltex Fortiflex K38-20-160)
- g. Year and month of manufacture
- h. The words "Gas Sleeving" at maximum spacing intervals every 5-feet.

Sizes and Lengths:

The following are the City's standard sleeving sizes and lengths and shall apply in all instances. Only the City of Mesa Gas Engineering Department may authorize other sizes and lengths.

Size	O.D.-MIN	O.D.-MAX	Min. Wall	Max. Wall	Coil Length	Joint Length
1-1/4" IPS	1.637"	1.642"	.141"	.191"	N/A	20'
3" IPS	3.245"	3.255"	.125"	.187"	N/A	20'

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

The supplier shall furnish the manufacturer's certification that the sleeving shipped was inspected and met all of the requirements of this specification prior to payment by the City of Mesa. The manufacturer's certification shall arrive prior to or with the shipment of sleeving. Manufacturer's certification reports shall be delivered to:

City of Mesa
Gas Division
PO Box 1466
Mesa, AZ 85211-1466

Approved Manufacturers:

The following manufacturers of PE Sleeving are approved for use in the City of Mesa Natural Gas Distribution System:

Manufacturer:

- CPChem-Performance Pipe
- USPoly Company

For manufacturer and vendor contact information see Appendix A. Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Planning Engineer prior to bidding.

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Gas Material Specifications



GM-12 Polyvinyl Chloride

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GM-12

POLYVINYL CHLORIDE (PVC) PIPE

Use:

The Polyvinyl Chloride (PVC) pipe, $\frac{3}{4}$ ", 1", and 2" (Iron Pipe Size), may be used in the City's natural gas system with design pressures up to 60 psig for repairs only to existing PVC pipe. Use for new installation is prohibited.

Standards:

The PVC pipe shall comply with requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Pipe shall conform to ASTM D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

Material:

Material shall conform to the requirements in the ASTM Standard D2513 for PVC pipe 1120 (Type I, Grade 1) and 1220 (Type I, Grade 2), Schedule 40.

Marking:

The pipe shall be marked according to ASTM Standard D2513 (Section 9.1).

Size:

The following are the City's standard pipe sizes. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa, Engineering Department.

Size (IPS)	Schedule	O.D. (Inches)	Nominal Wall Thickness (Inches)	Length
3/4" IPS	40	1.050"	.113	20'
1" IPS	40	1.315"	.133	20'
2" IPS	40	2.375"	.154	20'

Ends:

The PVC pipe ends will be plain or belled. Suitable protective caps shall cover each end.

Shipping:

All PVC pipe strapping shall be made of a plastic or non-metallic material. All PVC pipe shall be wrapped with a sufficient number of straps. All pipe ends shall be capped.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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GM-12.1

POLYVINYL CHLORIDE (PVC)

SOLVENT CEMENTED FITTINGS

Use:

Polyvinyl Chloride (PVC) fittings, in sizes ¾" to 2" IPS (Iron Pipe Size), may be used in the City's natural gas system with design pressures up to 60 psig for repairs only to existing PVC pipe. Principal fitting types purchased are elbows, tees, caps, couplings, reducers and service tees.

Standards:

The PVC pipe shall comply with requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Fittings shall conform to ASTM D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

Material:

Material shall conform to the requirements in the ASTM Standard D2513 for PVC 2466 (Schedule 40) fittings.

Marking:

The pipe shall be marked according to ASTM Standard D2513 (Section 9.3). In addition, identification shall be on the outside of the fitting's box or carton.

Size:

The following are the City's standard fitting sizes. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa, Engineering Department.

PVC Fitting Sizes (3/4", 1", and 2" IPS)

	Elbows	Tees	Service Tees	Caps	Couplings	Reducers
Schedule 40	X	X	X	X	X	X

Packaging/Shipping:

All fittings shall be packaged in boxes or cartons. All fittings shall be packed to protect them from damage during shipping and warehousing.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-12.2

PRIMER AND SOLVENT CEMENT

Use:

Primer and Solvent Cement shall be used on PVC pipe and fittings in the City's natural gas system.

Standards:

All PVC Primer and Solvent Cement shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the materials are furnished.

Marking:

All Primer and Solvent container labels shall be marked ASTM D2564.

Sizes:

Primer and Solvent cement shall be put into airtight pint containers. The container's materials shall not affect the quality of the primer or solvent cement. All Primer and Solvent Cement containers shall include an applicator suitable for applying the primer and cement.

Shipping:

All Primer and Solvent Cement shall be suitably packed to protect them from damage during shipping and warehousing.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-12.3

POLYVINYL CHLORIDE (PVC)

SOLVENT CEMENTED FITTINGS

Use:

The PVC punch valve saddle tee will be used on PVC mains to install Polyethylene (PE) service lines. The tee may be used in the City's natural gas system with design pressures up to 60 psig, it shall provide a leak-proof connection.

Standards:

All saddle tees shall comply with requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. The saddle tees shall conform to ASTM D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

Materials:

Material shall conform to the requirements in the ASTM Standard D2513.

TEE: All service punch tees furnished under these specifications shall provide a gas tight seal on all pipe with dimensional tolerances conforming to ASTM D2513; for PVC 1120 and 1220 (Schedule 40) and for service lines with dimensional tolerances conforming to ASTM D2513 for PE 2306/2406 pipe.

OUTLET: The outlet shall be a compression fitting. The compression fitting shall form a gas tight seal between the PE service line and the PVC service tee.

STIFFENER: A rigid internal tubular stiffener to control cold flow shall be an integral part of each compression fitting. The stiffener shall have sufficient length to extend under the entire compressed area. The ends shall be free of rough edges and the ends shall

Stiffener (continued):

be tapered and rounded. The stiffener shall be capable of withstanding the compression forces exerted by the wedging action of the ring. Split tubular stiffeners are prohibited.

COMPONENT PARTS: All component parts of the service tee shall have sufficient strength, thickness and elasticity to insure against the possibility of breakage or permanent distortion during normal handling, installation and operation at its rated pressure. All component parts of the service tee, which are to be exposed to gas flow, when properly installed and assembled, shall be resistant to the effects of all constituents of natural gas and odorants.

TAPPING TEE ASSEMBLY: The tapping tee shall function as a hot tapping tee and as a service line shut-off valve. The assembly shall provide a gas tight seal when the tee is fully opened or closed. The tapping tee's punch shall retain the coupon.

GASKET: The gasket shall be made of an Elastomer that shall not change or deteriorate when exposed to methanol, odorants, water or other constituents commonly found in natural gas pipelines. The gasket shall pass the ASTM Standard D2000: Rubber Products in Automotive Applications.

316 BOLTS: There shall be at least four bolts that clamp the service tee to the main. The bolts shall be made of stainless steel that conforms to ASTM Standard A193: Alloy-steel Stainless Steel Bolting Materials for High Temperature Service.

Instructions:

The punch valve saddle tee shall be furnished with a set of installation instructions.

Marking:

All saddle tees shall be marked according to ASTM Standard D2513 (Section 9.3). Identification shall be on the outside of the tee. In addition, identification shall be on the outside of the fitting's box or carton.

Size:

The following are the City's standard size saddle tees. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa, Gas Engineering Department.

Standard Saddle Tee Sizes

Plastic (PE) Outlet Size	SDR	Wall Thickness	Coupon Punch Size	IPS Plastic (PVC) Main Size
½" CTS	7	.090"	½"	1", 2"
½" IPS	9.3	.090"	½"	1", 2"
1" IPS	11	.119"	½"	1", 2"

Test Requirements:

The compression coupling shall be designed to resist a tensile pull, that will fail the pipe, before the pipe pulls out of the coupling according to ASTM D638: Tensile Properties of Plastics.

Packaging/Shipping:

All saddle tees shall be individually packaged in dust tight bags, then packaged in boxes or cartons. All saddle tees shall be packed to protect them from damage during shipping and warehousing.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

GM-12.4

TRANSITION FITTING

POLYVINYL CHLORIDE TO POLYETHYLENE

Use:

These transition fittings, in sizes of 1" IPS to 2" IPS, will be used between PVC and PE pipe in the City's natural gas system with design pressure to 60 psig.

Standards:

The transition fittings shall comply with requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Material:

The PVC portions of fittings shall conform to the requirements for Polyvinyl Chloride pipe in the ASTM Standard D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings for PVC Pipe 1120 (Type I, Grade 1) and 1220 pipe (Type I, Grade 2), Schedule 40. The PE portions of fittings shall conform to the requirements for Polyethylene pipe in the ASTM Standard D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings for PE Pipe. The type of resin used shall be made from Phillips Marlex TR 418, Plexco P23 BC, Chevron 9300 or Soltex Fortiflex K38-20-138 medium density polyethylene resin which shall meet all requirements of ASTM D1248 and D3350 for a PE-2406/2708 material. The resin color shall be yellow. The yellow color shall match or be similar to the standard color in ANSI Z53.1. Steel portions of fittings shall conform to the requirements of API Specification 5L: For Line Pipe, Grade A25 Class 1 (seamless, electric resistance weld, or butt weld continuous weld process).

Finish:

The steel portion of the transition fitting shall be coated with a minimum of 10 mills of heat-fused epoxy.

Marking:

Transition fittings furnished under this specification shall be legibly marked as follows:

1. Manufacturer's name or trademark.
2. Size and wall thickness of each end.
3. Material designation.
4. Date of manufacture.
5. Specification/Standard to which it was manufactured.

If any of the above information is coded, key to such coding shall be furnished in writing to the City of Mesa, Gas Engineering Department prior to payment.

Size:

The following list is the City's standard transition fitting sizes. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa, Gas Engineering Department.

Pipe Size		Avg. O.D. PVC & PE	Minimum Length		Min. Wall Thickness		PVC Schedule	PE SDR
PVC	To Steel		PVC	PE	PVC	PE		
1" IPS	1" IPS	1.315"	12"	12"	.133	.119	40	11
2" IPS	2" IPS	2.375"	12"	12"	.154	.216	40	11

Ends:

The PE and PVC pipe end of the fitting shall be furnished with a square-cut end.

Performance Requirements:

This section of the specification defines the minimum performance requirements for which metal-to-plastic transition fittings will be tested in order to qualify for listing as an approved product.

Air Pressure Leakage Test: The fitting under test, with appropriate end closures, shall have an internal air pressure of 100 psig applied for 15 minutes while being submerged in a water bath. The test procedure shall be conducted at temperatures of 75 degrees Fahrenheit (24 degrees Celsius) and 140 degrees Fahrenheit (60 degrees Celsius). Any leakage shall be cause for rejection.

The Pull-Out Test: Resistance of this transition fitting, when subjected to an axial tensile load at the plastic/steel junction, shall be such that the plastic pipe shall neck down and elongate 100% without any separation of the two parts at the jointed area. These tests shall be conducted after fittings are temperature conditioned to -15 degrees Fahrenheit (-26.1 degree Celsius).

Packaging/Shipping:

All transition fittings shall be packaged to prevent damage in shipping and warehousing. The supplier shall exercise extreme care in the shipping of all transition fittings to protect them from damage.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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GM-12.5

TRANSITION FITTING

POLYVINYL CHLORIDE TO STEEL

Use:

These transition fittings, in sizes of 1" IPS to 2" IPS, will be used between PVC and steel pipe in the City's natural gas system with design pressure to 60 psig.

Standards:

The transition fittings shall comply with requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished.

Material:

Plastic portions of fittings shall conform to the requirements for Polyvinyl Chloride pipe in the ASTM Standard D2513: Thermoplastic Gas Pressure Pipe, Tubing, and Fittings for PVC Pipe 1120 (Type I, Grade 1) and 1220 pipe (Type I, Grade 2), Schedule 40. Steel portions of fittings shall conform to the requirements of API Specification 5L: For Line Pipe, Grade A25 Class 1 (seamless, electric resistance weld, or butt weld continuous weld process).

Finish:

The steel portion of the transition fitting shall be coated with a minimum of 10 mills of heat-fused epoxy.

Marking:

Transition fittings furnished under this specification shall be legibly marked as follows:

1. Manufacturer's name or trademark.
2. Size and wall thickness of each end.

Marking (continued):

3. Material designation.
4. Date of manufacture.
5. Specification/Standard to which it was manufactured.

If any of the above information is coded, key to such coding shall be furnished in writing to the City of Mesa, Gas Engineering Department prior to payment.

Size:

The following list is the City's standard transition fitting sizes. This specification shall apply in all instances, although other pipe dimensions may be authorized through the City of Mesa, Gas Engineering Department.

Pipe Size		Avg. O.D. PVC & Stl	Minimum Length		Min. Wall Thickness		PVC Schedule
PVC	To Steel		PVC	Stl	PVC	Stl.	
1" IPS	1" IPS	1.315"	12"	12"	.133	.133	40
2" IPS	2" IPS	2.375"	12"	12"	.154	.154	40

Ends:

The PVC pipe end of the fitting shall be furnished with a square-cut end. The steel pipe end of the fitting shall be beveled at an angle of 30 degrees, +5 degrees, -0 degrees, with a 1/16" root face as shown in API 5L: Specification for Line Pipe.

Performance Requirements:

This section of the specification defines the minimum performance requirements for which metal-to-plastic transition fittings will be tested in order to qualify for listing as an approved product.

Air Pressure Leakage Test: The fitting under test, with appropriate end closures, shall have an internal air pressure of 100 psig applied for 15 minutes while being submerged in a water bath. The test procedure shall be conducted at temperatures of 75 degrees Fahrenheit (24 degrees Celsius) and 140 degrees Fahrenheit (60 degrees Celsius). Any leakage shall be cause for rejection.

Packaging/Shipping:

All transition fittings shall be packaged to prevent damage in shipping and warehousing. The supplier shall exercise extreme care in the shipping of all transition fittings to protect them from damage.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

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Gas Material Specifications



GM-13 Polyamide (PA-11)

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GM-13

POLYAMIDE 11 (PA 11) PIPE

Use:

The Polyamide 11 (PA11) pipe will be used in the City of Mesa natural gas system.

Standards:

The PA11 pipe shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Pipe shall conform to ASTM D2513 and Annex A5: THERMOPLASTIC GAS PRESSURE PIPE, TUBING AND FITTINGS.

Resin Material:

Material shall conform to the requirements in the ASTM Standard D2513 and D4066 for PA11 pipe. The type of resin used shall be ATOFINA PA323. The manufacturer shall not change the resin without written permission from the City of Mesa Gas Engineering Department. The pipe color shall be YELLOW. The yellow color shall match or be similar to the standard color in ANSI Z53.1.

Marking:

Pipe shall be marked in according to ASTM D2513 and contain at least the following information:

- a. Manufacturer's name or trademark
- b. Nominal pipe or tubing size
- c. Material designation (PA11)
- d. Temperature rating (CG)
- e. Base resin (PA323)
- f. SDR number
- g. Year and month of manufacture
- h. ASTM-D2513

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa, Gas Engineering Department prior to payment.

Length:

Purchase order shall specify the length of pipe.

Sizes:

The following are the City's standard pipe sizes and shall apply in all instances. Only the City of Mesa Gas Engineering Department may authorize other sizes.

Size	SDR	O.D.	I.D.	Min. Wall	Coil Length	Joint Length
½" CTS	7	.625"	.445"	.090"	1,000'	
½" IPS	9.3	.840"	.660"	.090"	1,000'	
1" IPS	11	1.315"	1.077"	.119"	500'	
2" IPS	11	2.375"	1.943"	.216"	500'	20'/40'
4" IPS	11.5	4.500"	3.710"	.395"	N/A	40'

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

The supplier shall furnish the manufacturer's certification that the pipe shipped was inspected and met all of the requirements of this specification prior to payment by the City of Mesa. The manufacturer's certification shall arrive prior to or with the shipment of pipe. Manufacturer's certification reports shall be delivered to:

City of Mesa
Gas Engineering Department
PO Box 1466
Mesa, AZ 85211-1466

Approved Manufacturers:

All PA11 gas pipe will only be purchased from:

- a. KWH Pipe

Pipe manufacturers not listed above must be reviewed and approved by the City of Mesa, Gas Engineering Department prior to bidding.

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GM-13.1

POLYAMIDE 11 (PA11) MECHANICAL TAPPING TEES AND BRANCH SADDLES

Use:

The Polyamide 11 (PA11) mechanical tapping tees and branch saddles will be used to connect PA11 services lines to PA11 distribution mains. The tapping tees and branch saddles shall be designed to be mechanically connected to the main and butt heat fused to the service line. The Polyamide 11 mechanical tapping tees and branch saddles will be used in the City of Mesa natural gas system.

Standards:

The tapping tees and branch saddles (PA11) shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety. When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Tapping tees and branch saddles shall conform to:

- A. ASTM D-2513: STANDARD SPECIFICATIONS FOR THERMOPLASTIC GAS PRESSURE PIPE, TUBING AND FITTINGS.
- B. ASTM F-2145: POLYAMIDE 11 MECHANICAL FITTINGS FOR USE ON OUTSIDE DIAMETER CONTROLLED PA11 GAS DISTRIBUTION PIPE AND TUBING

Resin Material:

Material shall conform to the requirements in the ASTM Standard D-2513 and D-4066 for PA11. The type of resin used shall be ATOFINA PA323. The manufacturer shall not change the resin without written permission from the City of Mesa Gas Engineering Department. The color of the pipe and fittings shall be YELLOW OR BLACK. The yellow color shall match or be similar to the standard color in ANSI Z53.1.

Marking:

Tapping tees and branch saddles shall be marked in according to ASTM D-2513 (Section 7.3) and contain at least the following information:

- a. Manufacturer's name or trademark
- b. Nominal pipe or tubing size
- c. Material designation (PA11)
- d. Base resin (PA323)
- e. Year and month of manufacture

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa, Gas Engineering Department prior to payment.

Sizes:

The following are the City's standard tapping tees and branch saddle sizes and shall apply in all instances. Only the City of Mesa Gas Engineering Department may authorize other sizes.

PA11 TAPPING TEE SIZES

MAIN/SADDLE SIZE		OUTLET SIZE	COUPON PUNCH SIZE	OUTLET MIN. WALL SIZE	OUTLET END SDR
2" IPS	x	1" IPS	.50"	.119"	11
2" IPS	x	2" IPS	1.50"	.216"	11

PA11 BRANCH SADDLE SIZES

MAIN/SADDLE SIZE		OUTLET SIZE	OUTLET MIN. WALL SIZE	OUTLET END SDR
* 2" IPS	x	1" IPS	.119"	11
2" IPS	x	2" IPS	.216"	11

* NOTE: This saddle also commonly referred to as a service saddle.

Design:

The tapping tee assembly shall function as a hot tapping tee and a service line shut-off valve. The assembly shall provide a gas tight seal when the tee is fully opened or closed. The tapping tee's punch shall retain the coupon. The top of the fitting shall be provided with a cap. The cap shall provide a gas-tight seal.

Protective Sleeve:

The tapping tees and branch saddles shall be provided with a protective sleeve. The protective sleeve shall be manufactured from plastic having the same physical properties as specified in ASTM Standard D-2513 for PA11. The sleeve's ID shall be just big enough as to slip snugly over the OD of the tee's outlet. The sleeve sizes shall be:

OUTLET OR PIPE SIZE	SLEEVE I.D.	SLEEVE LENGTH
1" IPS	1.875"	12"
2" IPS	4.250"	24"

Packaging:

All tapping tees and branch saddles shall be individually packaged in dust tight plastic bags, with recommended manufacturers installation procedures, then packaged in boxes or cartons.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

The supplier shall furnish the manufacturer's certification that the tapping tees and branch saddles shipped were inspected and met all of the requirements of this specification prior to payment by the City of Mesa. The manufacturer's certification shall arrive prior to or with the shipment of tapping tees and branch saddles. Manufacturer's certification reports shall be delivered to:

City of Mesa
Gas Engineering Department
PO Box 1466
Mesa, AZ 85211-1466

Approved Manufacturers:

All PA11 mechanical gas tapping tees and branch saddles will only be purchased from:

- a. Continental Industries

Manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Engineering Department.

GM-13.2

POLYAMIDE 11 (PA11) BUTT HEAT FUSION FITTINGS

Use:

The Polyamide 11 (PA11) fittings will be used in the City of Mesa natural gas system. This specification shall be used for butt fusion fittings including couplings, tees, elbows, caps and reducers.

Standards:

The PA11 fittings shall comply with the requirements of the Pipeline and Hazardous Materials Safety Administration and the State of Arizona Office of Pipeline Safety.

Design:

When national or industry standards are referred to, they shall be the latest published editions at the time the material is furnished. Fittings shall conform to:

- A. ASTM D-2513: STANDARD SPECIFICATIONS FOR THERMOPLASTIC GAS PRESSURE PIPE, TUBING AND FITTINGS
- B. ASTM F-1733: BUTT HEAT FUSION POLYAMIDE (PA) PLASTIC FITTING FOR POLYAMIDE (PA) PLASTIC PIPE AND TUBING

Resin Material:

Material shall conform to the requirements in the ASTM Standard D-2513 and D-4066 for PA11. The type of resin used shall be ATOFINA PA323. The manufacturer shall not change the resin without written permission from the City of Mesa Gas Engineering Department. The pipe and fittings color shall be YELLOW. The yellow color shall match or be similar to the standard color in ANSI Z53.1.

Marking:

Fittings shall be marked in according to ASTM D-2513 (Section 7.3) and contain at least the following information:

- a. Manufacturer's name or trademark
- b. Nominal pipe or tubing size
- c. Material designation (PA11)
- d. Base resin (PA323)
- e. Year and month of manufacture

If any of the above information is coded, key to such coding shall be furnished to the City of Mesa Gas Engineering Department prior to payment.

Sizes:

Fittings up to 2" IPS shall be used with SDR 11 pipe. Only the City of Mesa Gas Engineering Department may authorize other sizes.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

The supplier shall furnish the manufacturer's certification that the fittings shipped was inspected and met all of the requirements of this specification prior to payment by the City of Mesa. The manufacturer's certification shall arrive prior to or with the shipment of fittings. Manufacturer's certification reports shall be delivered to:

City of Mesa
Gas Engineering Department
PO Box 1466
Mesa, AZ 85211-1466

Approved Manufacturers:

All PA11 gas fittings shall only be purchased from:

- a. Central Plastics

Fitting manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Engineering Department prior to bidding.

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GM-13.3

POLYAMIDE 11 (PA11) 1" ANODELESS SERVICE RISERS

Use:

This specification covers Polyamide 11 (PA11) (anodeless) risers used in the City of Mesa gas distribution system.

Standards:

The PA11 risers shall comply with the requirements of 49 CFR 192 and the requirements set forth in this Specification. All national and industry standards referred to in this Specification shall be the latest published editions listed in Appendix A of 49 CFR 192.

- CFR 49 PART 192 Transportation of Natural and other Gas by Pipeline;
Minimum Federal Safety Standards
- ANSI B1.20.1 Pipe Treads, General Purpose (INCH)
- ANSI/ASQC Z1.4 Single Sampling Plan, General Inspection Level II
- ASTM A-53 Specification for Pipe, Steel, Black and Hot Dipped
Zinc-Coated Welded and Seamless
- ASTM A-513 Electric – Resistance Welded Carbon and Alloy Steel
Mechanical Tubing
- ASTM D-368 Test Methods for Tensile Properties of Plastic
- ASTM D-2000 Rubber Products in Automotive Applications
- ASTM D-2513 Thermoplastic Gas Pressure Pipe, Tubing and
Fittings

Materials:

STEEL PIPE: The gas-carrying pipe used to fabricate the upper portion of the riser shall be Schedule 40, steel pipe, manufactured in accordance with ASTM A-53.

CASING: The casing shall be Schedule 10 or greater steel pipe in accordance with ASTM A-53 or .075 minimum wall thickness tubing flash controlled to .0010 of an inch in accordance with ASTM A-513.

MOISTURE SEAL/SHEAR PROTECTOR: All risers shall be supplied with a watertight moisture seal/shear protector located on the below ground inlet to the casing. The seal shall be an elastomer compatible with the constituents of natural gas and odorant in accordance with ASTM-D-2000. The watertight seal shall be between the PA11 pigtail and casing. The moisture seal/shear protector may be threaded; the threaded portion of the casing shall be epoxy coated. The moisture seal/shear protector shall be designed to redirect anticipated shearing forces away from the PA11 to steel interface.

PA11 PIPE: The riser shall be supplied with yellow PA11 Pipe manufactured by KWH Pipe conforming to ASTM D-2513 and D-4066. The PA11 pipe size shall be 1-inch I.P.S. with an SDR of 11. The pipe shall be installed in the casing in the coil direction; reverse bending of the PA11 shall not be permitted.

CENTERING INSULATOR(S): Centering insulator(s) on the above ground portion of the PA11 shall be installed to prevent the PA11 from contacting the steel casing.

Finish:

The casing and carrier pipe shall be coated with a gray or green thin film fusion bonded epoxy coating 7 to 10 mils thick.

Markings:

Each riser shall be marked with a label on the above ground portion of the riser with unique identification to allow the riser to be traced to the manufacturer's name, manufactured materials and lot number. A ground level indicator shall be installed, below the PA11 transition and the gas carrying portion of the steel pipe, indicating the maximum buried depth of the riser. No riser shall be buried in the ground above the level indicator.

Threads:

Pipe threads shall be NPT (National Pipe Thread) in accordance with ANSI B1-20.1.

PA11 to Steel Transition:

The PA11 to steel transition area shall provide a pressure seal to secure the gas area in the upper portion of the riser casing. The transition shall be assembled to the PA11 pipe pigtail and comply with all applicable pipe joint standards. The PA11 to steel transition shall be designed to resist a tensile pull that will fail the pipe before the pipe pulls out of the coupling as per ASTM D-638.

Packaging/Shipping:

Risers shall be shipped in palletted shrink-wrapped boxes via a suitable carrier and sufficient care shall be taken to prevent damage during shipping and handling. Both ends of the riser shall be capped. Damaged shipments will be rejected at the vendor's expense.

Design Changes:

Any revisions or design changes must be approved by The City of Mesa Gas Engineering Department prior to implementation. Please contact the Gas Planning Engineer at (480) 644-4851 to coordinate submittal of any design changes. At minimum, detailed descriptions of the changes will be required with each revision.

Sampling/Testing:

The City of Mesa reserves the right to perform any inspection or tests to assure conformance to this Specification. If a representative sample does not meet the Acceptable Quality Level of 2.5 as presented in ANSI/ASQC Z1.4 for a Single Sampling Plan using Normal Inspections and the General Inspection Level II, the entire lot may be rejected and returned at vendor expense. When it is determined that outside laboratory testing is necessary and such tests reveal that the representative sample does not conform to this Specification, the vendor shall be invoiced for these costs. All unacceptable material shall be returned to the vendor.

Certification:

Manufacturer shall submit certification that the products shipped on a specific purchase order, are in compliance with the Pipeline and Hazardous Materials Safety Administration Minimum Federal Safety Standards Part 192 and all other applicable standards.

Approved Manufacturers:

All PA11 anodeless service risers will only be purchased from:

- a. Continental Industries

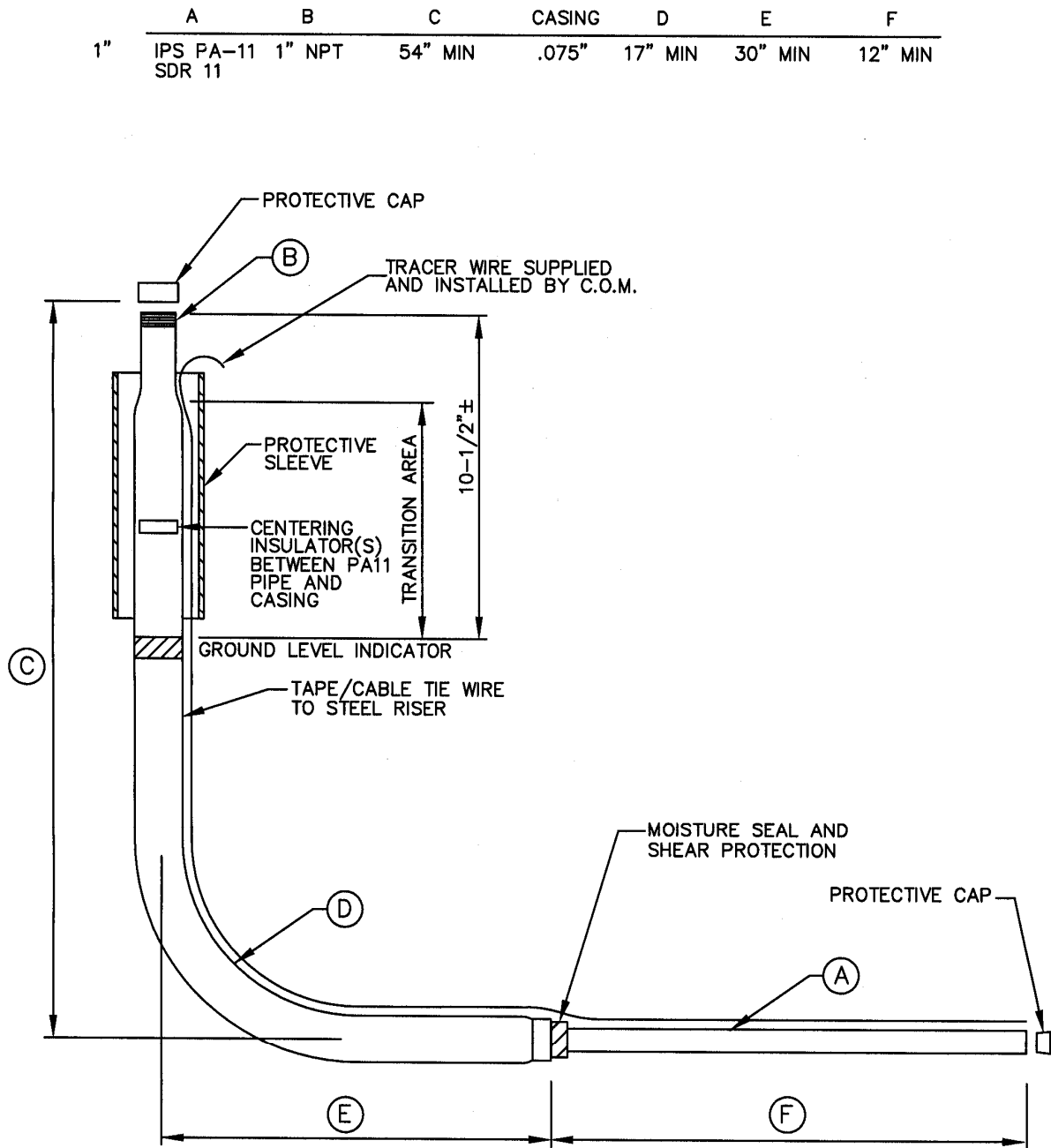
Riser manufacturers not listed above must be reviewed and approved by the City of Mesa Gas Engineering Department prior to bidding.

Design Drawing:

The service riser shall also comply with all design sizes and dimensions shown per attached design drawing:



FILE: GROUP6/GAS DETAILS/MISC/PA-11RISER



CITY OF MESA
ENGINEERING DEPARTMENT

PA-11 1" ANODELESS RISER
COM SPEC. GM-13.3

DRAWN BY: E. SURCHIK
DESIGNER: S. SHERWOOD
APPROVED: S. SHERWOOD
DATE: 5/14/02 REV: 4/9/03

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Gas Material Specifications



Appendix

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GAS MATERIAL SPECIFICATIONS

Appendix A: Manufacturer/Vendor Contact List

Approved by: K. Kent

Revised 4/4/2008

A.Y. McDonald

P.O. Box 508
Dubuque, IA 52004-0508
Phone: (563) 583-7311
Fax: (563) 588-0720

Vendor: Tri-Pacific Supply Inc.
4345 Pacific St.
Rocklin, CA 95677
Phone: (916) 630-2323
Fax: (916) 630-3959

Actaris Metering Systems

970 Highway 127 North
Owenton, KY 40359-9303
Phone: (800) 490-0657
Fax: (502) 484-6223

Armorcast Products Company

13230 Saticoy St.
North Hollywood, CA 91605
Phone: (818) 982-3600
Fax: (818) 982-7742

Broen, Inc (Ballomax)

2820 Commerce Blvd.
Birmingham, AL 35210
Phone: (800) 446-7326
Fax: (205) 956-2537

Central Plastics Company

P.O. Box 3129
39605 Independence St.
Shawnee, OK USA 74801
Phone: (800) 654-3872
Fax: (405) 878-5986

Continental Industries, Inc

P.O. Box 994
Tulsa, OK 74101-0994
Phone: (800) 558-1373
Fax: (800) 788-1668

Vendor: Tri-Pacific Supply Inc.
4345 Pacific St.
Rocklin, CA 95677
Phone: (916) 630-2323
Fax: (916) 630-3959

Covalence Adhesives

25 Forge Parkway
Franklin, MA 02038
Phone: (508) 918-1600
Fax: (800) 328-4822

Cpchem-Performance Pipe

5592 Gonzalez Ct.
Concord, CA 94521
Phone: (925) 524-0657
Fax: (925) 524-0670

Dresser, Inc.

15455 Dallas Parkway
Addison, TX 75001
Phone: (972) 361-9800
Fax: (972) 361-9903
Vendor: Western Gas Technologies
4610 Odessa Ct.
Rocklin, CA 95667

Elster-American Meter Company

1350 Bayshore Highway, Suite 200
Burlingame, CA 94010
Phone: (970) 586-1610
Fax: (970) 586-1609
Vendor: Measurement Control
Systems, Inc.
1331 S. Lyon St.
Santa Ana, CA 92705
Phone: (800) 826-1682
Fax: (714) 835-1103



GAS MATERIAL SPECIFICATIONS

Appendix A: Manufacturer/Vendor Contact List

Elster-Perfection Corporation

222 Lake St.
Madison, OH 44057
Phone: (480) 607-1606
Fax: (440) 428-7325

Emerson-Fisher Regulators

P.O. Box 8004
Mckinney, TX 75069-8004
Phone: (800) 558-5853
Fax: (972) 547-3712
Vendor: Caltrol
1855 W. Baseline Rd. Ste. 255
Mesa, AZ 85201
Phone: (480) 456-6600
Fax: (480) 456-3305

Flowserve-Nordstrom Valves, Inc

5215 N. O'Connor Blvd., Suite 2300
Irving, TX 75039
Phone: (972) 443-6500
Fax: (972) 443-6800

Genlyte-Carsonite Composites LLC

605 Bob Gifford Blvd.
Early Branch, SC 29916
Phone: (800) 648-7916
Fax: (803) 943-3375

Global Metering Systems

240 Baldwin Dr.
Lancaster, OH 43130
Phone: (800) 799-6941
Fax: (740) 653-4359

Kerotest Manufacturing Corporation

5500 2nd Ave.
Pittsburgh, PA 15207
Phone: (412) 521-5942
Fax: (412) 521-5990
Vendor: Tri-Pacific Supply Inc.
4345 Pacific St.
Rocklin, CA 95677
Phone: (916) 630-2323
Fax: (916) 630-3959

Mueller Water Products

1200 Abernathy Rd., N.E.
Suite 1200
Atlanta, GA 30328
Phone: (800) 423-1323
Vendor: HD Supply Waterworks
115 W Baseline Rd.
Gilbert, AZ 85233
Phone: (480) 926-0979
Fax: (480) 926-3332

R.W. Lyall And Co.

2665 Research Dr.
Corona, CA 92882-6918
Phone: (800) 535-9255
Fax: (951) 270-1600
Vendor: Border Marketing
5959 E. Baseline Rd.
Mesa, AZ 85206
Phone: (800) 433-0878
Fax (480) 947-9831

Sensus Metering Systems

805 Liberty Blvd.
Dubois, PA 15801
Phone: (800) 375-8875
Fax: (814) 375-8460
Vendor: Crow Company
2901 W. Fairmount
Phoenix, AZ 85017
Phone: (602) 248-7835
Fax: (602) 248-7860
Vendor: Tri-Pacific Supply Inc.
4345 Pacific St.
Rocklin, CA 95677
Phone: (916) 630-2323
Fax: (916) 630-3959

The Ford Meter Box Company, Inc.

P.O. Box 443, 775 Manchester Ave.
Wabash, IN 46992-0443
Phone: (260) 563-3171
Fax: (800) 826-3487

Uspoly Company

4501 W 49th St.
Tulsa, OK 74107
Phone: (800) 962-1514
Fax: (918) 445-8709



GAS MATERIAL SPECIFICATIONS

Appendix A: Manufacturer/Vendor Contact List

Utility Vault Company

411 East Frye Rd.

P.O. Box 610

Chandler, AZ 85244-0610

Phone: (480) 963-2678

Fax: (480) 899-1937

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Appendix B

REGULATORS

1) General

The regulator shall meet or exceed all of the requirements of Paragraph (a) Section 192.197, Office of Pipeline Safety Minimum Federal Safety Standards.

For pressure control, the $\frac{3}{4}$ inch by $\frac{3}{4}$ inch service regulator shall be loaded by spring. The exterior of the regulator shall resist corrosion and be painted gray.

2) Design

The regulator shall be made of metal in waterproof construction without lead gaskets and shall include the features set forth below:

- Inlet connection shall be $\frac{3}{4}$ inch pipe size and outlet connection $\frac{3}{4}$ inch pipe size. Connections shall be American Standard tapered pipe threads (ANSI B2.1 Latest Edition) and be located so that piping will require the minimum number of fittings.
- Vent connection shall have $\frac{3}{4}$ inch American Standard tapered pipe threads (ANSI B2.1 Latest Edition) and be common to both high-pressure relief and upper diaphragm chamber. Means shall be provided to prevent insects or foreign materials from entering the vent. Insect barrier shall be sufficiently recessed to prevent being wetted by external water drainage, and should be constructed of a corrosion resistant material.
- Passages for gas shall be so constructed as to prevent accumulations of dust that will interfere with operation of regulator.
- Pressure relieving device, of mechanical type, shall be integral with regulator, and have operating characteristics shown in Section 6. Pressure relieving device shall function even though the regulator linkage should fail. The pressure relieving device shall be either non-adjustable or shall be provided with a means to seal the relief pressure adjustment. (Lock wire, loc-tite, etc.)

Design (continued)

- A regulator with mechanical pressure-relieving device shall provide for drainage of moisture from the regulator diaphragm.
- Valve seats shall be of ample resilience to resist cutting action when forced against the orifice in the normal operation of the regulator. They shall be resistant to odorized natural gas and to liquefied petroleum gas-air mixtures. They shall be securely held in place, and shall be replaceable without removing the regulator from the line.
- Orifice shall be made of metal that is resistant to erosion and unaffected by water or the constituents of odorized natural gas. The diameter shall be the minimum that will produce the operating characteristics of sections 5 and 6. The orifice shall be removable.
- Mechanical strength of the regulator shall be as follows:
 - The portion normally exposed to inlet pressure shall withstand 150 psig hydrostatic pressure
 - Both the inlet and outlet connections of the regulator shall withstand a piping strain of 350 foot-pounds applied in any direction.
 - The vent connection shall withstand a piping strain of 250 foot-pounds applied in any direction, with the inlet and outlet connections of the regulator firmly supported.

3) Moving Parts:

- The valve linkage and pivot pins shall operate freely and be durably constructed of corrosion-resistant metal, or metal suitably protected against corrosion, so designed that the pins cannot work loose in the assembled regulator.
- The loading spring for a spring-loaded regulator shall be made of corrosion-resistant metal, or metal suitably protected against corrosion, and have proportions required to produce operating characteristics set forth in Section 5. At inlet pressure of 20 psig, it shall be incapable of adjustment to deliver a pressure greater than 9 ½ inches water column. Adequate provisions shall be made for centering the spring on diaphragm place and adjusting screw, for maintaining spring adjustment during handling and operation of the regulator, and for interchanging springs without dismantling the regulator.

4) Diaphragm

The diaphragm shall be made of reinforced synthetic material not affected by natural gas, oil gas, propane, odorant, water or temperature between 0 degrees F and +140 degrees F. Bolt holes and center hole shall be punched accurately in size and position. The diaphragm as installed in the regulator shall withstand a pressure of 3 psig without leakage. The diaphragm material shall withstand at least 100 lbs. (Net) Mullen burst test.

5) Pressure Regulating Characteristics

The regulator shall be tested on natural gas or air and converted to approximately .6 specific gravity natural gas. Regulator shall be adjusted to deliver 50 cubic feet of gas per hour at an inlet pressure of 25 psig (or at an inlet as specified by manufacturer that will give best performance over full operational range of regulator) and an outlet pressure of 7.0 inches of water column. Test for pressure regulating characteristics shall be performed with the diaphragm in a vertical position. Standard test equipment for determining the operating characteristics of regulators will be in accordance with AGA-GAMA, Service-type regulators, Specifications X-50865, Appendix A1.18. With the regulator set at set flow conditions (selected inlet pressure, 50 cu. Ft. flow and 7.0" W.C. outlet) and inlet pressure varying from 2 to 30 psig, and loads from lock-up to 250 cfh, in any combination, the regulator shall meet all of the requirements set forth below.

- Lock-up not greater than 1.5" W.C. above outlet set pressure of 7.0" W.C.
- Shall not elevate more than 2.0" W.C. above outlet set pressure of 7.0" W.C.
- Shall not drop more than 1.0" W.C. below outlet set pressure of 7.0" W.C.
- The regulator shall not pulsate or chatter when installed in any of the positions as recommended by the manufacturer while being subjected to all of the tests required by these specifications.
- Total hysteresis shall not exceed .5" W.C., either under varying load with constant inlet, or under varying inlet pressure with constant load.

Not less than ten samples shall be tested and the average performance of all samples shall be used on a basis for determination of compliance with the above requirements.

6) Pressure Relieving Characteristics

- With regulator valve held in full open position, downstream system will be held to 56" W.C. or less with an inlet pressure of 30 psig.
- Initial relieving pressure shall not exceed 12" W.C. above initial outlet pressure setting.
- The mechanical relief valve shall reseal, "bubble-tight" at no less than 12 inches water column after the above capacity test.

The number of samples tested and the degree of compliance with the requirements shall be the same as prescribed under Section 5.