Purpose and Scope

This gas design standard (GDS) provides specifications and design information for selecting and installing polyethylene (PE) and steel excess flow valves (EFVs).

1 General Information

1.1. EFVs are manufactured in accordance with American Society for Testing and Materials (ASTM International) F2138, “Standard Specification for Excess Flow Valves for Natural Gas Service,” and ASTM F1802, “Standard Test Method for Performance Testing of Excess Flow Valves.”

1.2. Only personnel qualified as described in GDS D-34, “Qualifications for Joining Polyethylene Pipe,” may install a plastic EFV.

1.3. Only personnel qualified as described in applicable welding procedures may install a steel EFV.

1.4. See Appendix C for an EFV installation and replacement matrix.

1.5. Exceptions to the guidelines listed in this GDS may be granted by Standards Engineering.

2 Applications for EFVs

2.1. If an EFV is required, a curb valve **cannot** be substituted for an EFV. Additional work, such as increasing service size or awkward alignments, may be necessary to install an EFV.

2.2. If an EFV is not required per Step 2.3, Step 2.4, and Step 2.5, a curb valve may be required per GDS A-43.2, “Curb Valves.”

2.3. Table 1 describes when EFVs must be installed on new construction, including complete service lines or service stubs.

Table 1. Required EFV Scenarios for New Construction Complete Service Lines Or New Construction Service Stubs

Service Type	Total Connected Load in Standard Cubic Feet per Hour (scfh)
	0–5000
Single or branched service to single-family residence(s) [1]	EFV required
Single or branched service to multifamily building(s) [1]	EFV required
Branched service to single-family residence and multifamily building[1]	EFV required
Single service to single commercial meter	EFV required
Any other service scenario (single or branched) not listed above.	EFV required

1. Step 6.2, “Branched Service Lines,” describes appropriate EFV locations on branches.

2.4. Table 2 describes when an EFV must be installed during work on existing services, including repairs, alterations, replacements, transfers, or stub completions.

Table 2. Required EFV Scenarios for Work on Existing Services

Service Type	Total Connected Load in Standard Cubic Feet per Hour (scfh)	
	0–1400	1401–5000
Single or branched service to single-family residence(s)[1]	EFV required	EFV required
Single or branched service to multifamily building(s)[1]	EFV required	See note 2 below
Branched service to single-family residence and multifamily building[1]	EFV required	See note 2 below
Single service to single commercial meter	EFV required	See note 2 below
Any other service scenario (single or branched) not listed above.	See note 2 below	See note 2 below

1. Step 6.2 describes appropriate EFV locations on branches.
2. It is recommended to install an EFV on existing or replaced services or stub completions, where practical (e.g., installing an EFV would not require upsizing the existing service).

2.5. An EFV is **not** required in the following situations:

A. The EFV is not required, per Table 3.

Table 3. EFV Requirements – System Maximum Allowable Operating Pressure (MAOP)

System MAOP	EFV Required
<10 psig	No
≥10 psig and ≤60 psig	Yes
>60 psig	No

B. The repair or alteration occurs more than 3' from the gas main, except for service stub completions.

C. The repair does not require the service line to be disconnected from the main (e.g., tee cap replacement).

D. The EFV would interfere with necessary operations or maintenance activities, such as using the service line as a planned injection point.

3 EFV Selection Guidelines

3.1. Determine if the service line requires the installation of an EFV, as described in Section 2, “Applications for EFVs,” of this GDS.

3.2. Determine the proposed or existing pipe size and material for the service.

3.3. Determine the load to be served by the EFV. If the EFV is to serve both the mother and branch of a branched service, combine the loads of both meter sets. If the meter badge rating is larger than 1,000 scfh, size the EFV based on meter capacity (not by total connected load). Use either option below:

3.3 (continued)

- **Meter capacity:** Size the EFV based on the maximum continuous capacity of the meter listed in GDS J-10.1, "Diaphragm Meter Capacities," or GDS J-20, "Rotary Meter Capacity – At Standard and Elevated Delivery Pressures." Take metering pressure into account when determining the maximum continuous capacity.

- **Total connected load:** Use the total connected load of all customer appliances. Do not diversify the load. Include anticipated future load.

3.4. Determine the length of the service, as measured from the main to the meter location. If the EFV is to protect both the mother and branch of a branched service, the distance is measured to the farthest meter.

3.5. Determine the normal operating pressure (NOP) of the distribution system. For non-estimate work (such as emergency leak repair), gauge pressure can be used as NOP.

3.6. Select the EFV based on the pipe size and material, load, service length, and design pressure as determined above.

A. Refer to one of the following tables:

(1) Table 4, for plastic EFVs with plain ends

(2) Table 5, for plastic EFVs with socket ends

(3) Table 6, for EFVs incorporated into plastic electrofusion couplings

(4) Table 8, for steel Honeywell Perfection EFVs

B. Where more than one EFV would be suitable for the service, it is recommended to choose the EFV with the highest capacity. There is no minimum load for an EFV to function properly.

3.7. For service lines with more than one size of pipe, select one pipe size (to match the proposed EFV size) for the purpose of EFV selection. Convert the length of pipe of any other size to an equivalent length of pipe of the selected size. See Appendix B.

3.8. When sizing an EFV for an existing service line that will not be replaced (i.e., transferred services, repairs, and high-pressure regulator rebuilds) and has no EFV installed, it is acceptable for the service length to exceed the maximum length for the EFV shown in Table 4, Table 5, Table 6, or Table 8. Choose the EFV that provides the greatest length of protection while providing adequate capacity for the load. In the Notes section of the gas service record, note that "the service line is partially protected."

3.9. EFV combo valves (curb valve and EFV combined) listed in Table 7 may be used where EFVs and curb valves would be located close to each other or where space constraints prevent them from being installed separately.

3.10. Refer to Appendix A for data on pressure drop across EFVs.

4 Plastic EFV Specifications and Material Codes

4.1. Specifications and material codes for EFV with plain ends are listed in Table 4.

Table 4. EFV Specifications and Material Codes for Plastic Plain End EFVs

Size (in)	EFV Flow Series	NOP ≥ 10 psig[1]		NOP ≥ 24 psig[2]		Material Code	Part Numbers	
		Maximum Total Connected Load (scfh)	Maximum Service Length (ft)	Maximum Total Connected Load (scfh)	Maximum Service Length (ft)		Honeywell Perfection[3]	GasBreaker Model 51
½ copper tubing size (CTS)	400	385	146	395	296	M022896	51910202PGE	—
	600	595	77	595	164	M022929	51910210PGE	—
	800	700	33	790	76	M022916	51910222PGE	—
1 CTS	800	700	1183	790	2689	M022917	51523PGE	—
	1100	990	261	1085	1000	M022918	51758013PGE	20382GB
	1800	1620	122	1775	437	M022921	51258PGE	20383GB
1¼ iron pipe size (IPS)	2600	2340	560	2340	1697	M022923	51758025PGE	20394GB
	5500	4912	125	5000	390	M026962	—	20395GB
2 IPS	5500[4]	5000	1899	5000	3149	M022928	51950106PGE	20397GB

1. The values in this column are based on a 10 psig design pressure.
2. The values in this column are based on a 20 psig design pressure.
3. Honeywell Perfection EFVs whose part numbers end in PGE are special order for PG&E. The only difference is they come with two metal tags instead of one.
4. 2-inch IPS 5500 EFVs can be used with two reducers and installed on 1¼ IPS service lines. Appendix B provides examples to perform equivalent length calculations, where the maximum service length for NOP ≥ 10 psig is 307 ft and the maximum service length for NOP ≥ 24 psig is 508 ft.

4.2. Specifications and material codes for EFVs with socket ends are listed in Table 5.

Table 5. EFV Specifications and Material Codes for Plastic Socket End EFVs

Size (in)	EFV Flow Series	NOP ≥ 10 psig[1]		NOP ≥ 24 psig[2]		Material Code	Manufacturer	Part Numbers
		Maximum Total Connected Load (scfh)	Maximum Service Length (ft)	Maximum Total Connected Load (scfh)	Maximum Service Length (ft)			
½ CTS	400	357	177	400	341	M025078	Lyall	EFV100-000002-001
	400	385	146	395	296	M020947	Honeywell Perfection	51716
	775	692	30	775	72	M025079	Lyall	EFV100-000011-001
	800	700	33	790	76	M020949	Honeywell Perfection	51713
1 CTS	775	692	1419	775	2916	M025080	Lyall	EFVEC-BB3DT00-004
	800	700	1183	790	2689	M020951	Honeywell Perfection	51715XMD
	1200	1072	523	1200	1196	M025081	Lyall	EFVED-BB3DT00-004
	1800	1584	104	1800	385	M025082	Lyall	EFVEE-BB3DT12-004
	1800	1620	122	1775	437	M020954	Honeywell Perfection	51745XMD
1¼ IPS	2600	2322	952	2600	1897	M025084	Lyall	EFV300-000002-003
2 IPS	5500[3]	4818	1495	5000	2855	M025086	Lyall	EFV300-000008-002

1. The values in this column are based on a 10 psig design pressure.
2. The values in this column are based on a 20 psig design pressure.
3. 2-inch IPS 5500 EFVs can be used with two reducers and installed on 1¼ IPS service lines. Appendix B provides examples to perform equivalent length calculations, where the maximum service length for NOP ≥ 10 psig is 239 ft and the maximum service length for NOP ≥ 24 psig is 456 ft.

4.3. Specifications and material codes for electrofusion couplings with an incorporated EFV are listed in Table 6.

Table 6. EFV Specifications and Material Codes for Plastic Electrofusion Couplings With Incorporated EFV

Size (in)	EFV Flow Series	NOP ≥ 10 psig[1]		NOP ≥ 24 psig[2]		Material Code	Part Numbers
		Maximum Total Connected Load (scfh)	Maximum Service Length (ft)	Maximum Total Connected Load (scfh)	Maximum Service Length (ft)		MAXITROL
1 CTS x ½ CTS	500	510	119	571	225	M026396	128240
1 CTS	680	696	2565	779	4873	M026397	128238
1¼ IPS	1700	1789	3101	2003	5854	M026398	128241
2 IPS	4800	4960	2913	5554	5520	M026399	128257

1. The values in this column are based on a 10 psig design pressure.
2. The values in this column are based on a 20 psig design pressure.

4.4. Honeywell Perfection combination EFV and curb valve comes with plain pipe pups. Material codes and specifications are listed in Table 7.

Table 7. EFV Specifications and Material Codes for Plastic EFV / Curb Valve Combos With Plain Ends

Size (in)	EFV Flow Series	NOP ≥ 10 psig[1]		NOP ≥ 24 psig[2]		Material Code	Part Numbers
		Maximum Total Connected Load (scfh)	Maximum Service Length (ft)	Maximum Total Connected Load (scfh)	Maximum Service Length (ft)		Honeywell Perfection
½ CTS	400	385	146	395	296	M038509	45130140PGE
	600	595	77	595	164	M038510	45130141PGE
	800	700	33	790	76	M038513	45130142PGE
1 CTS	800	700	1183	790	2689	M038514	45130145PGE
	1100	990	261	1085	1000	M038529	45130146PGE
	1800	1620	122	1775	437	M038530	45130147PGE

1. The values in this column are based on a 10 psig design pressure.
2. The values in this column are based on a 20 psig design pressure.

4.5. Extra metal tags may be purchased using material code M020957.

5 Steel EFV Specifications and Material Codes

5.1. Steel service lines requiring an EFV are to be replaced with plastic, if practical, per Utility Standard TD-4801S, “Service Replacement Criteria.” If a plastic replacement is not practical, install a steel EFV per Table 8.

5.2. When welded into a steel service, a steel EFV provides electrical continuity for cathodic protection.

5.3. Steel EFVs are intended for 3/4" steel service lines and have the following specifications:

A. Series 800 and 1100 steel EFVs are contained in a stick of 3/4" NPS Schedule 40 pipe with ends beveled for welding.

B. Series 1800 steel EFV is contained in a stick of 1" NPS Schedule 40 pipe with a 1" × 3/4" reducer at each end.

C. Pipe is Grade B and conforms to ASTM A53, “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.”

5.4. Steel EFV specifications and material codes are listed in Table 8.

Table 8. EFV Specifications and Material Codes for Steel Weld End EFVs

Size (in.)	EFV Flow Series	NOP ≥ 10 psig[1]		NOP ≥ 24 psig[2]		Material Code	Part Numbers
		Maximum Total Connected Load (scfh)	Maximum Service Length (ft)	Maximum Total Connected Load (scfh)	Maximum Service Length (ft)		Honeywell Perfection
3/4 NPS	800	665	329	790	787	M032155	51733011
	1100	915	92	1085	336	M032168	51733012
	1800	1495	51	1775	151	M032169	51733013

1. The values in this column are based on a 10 psig design pressure.
2. The values in this column are based on a 20 psig design pressure.

6 EFV Installation Locations Guidelines

6.1. New or Fully Replaced Service Lines

A. For new or fully replaced services, install the EFV as close as practical to the gas main.

B. For services fed by farm tap regulator sets, install the plastic EFV approximately 3' from the steel-to-plastic transition fitting downstream of the farm tap regulator set.

(1) Include an electronic marker system (EMS) marker with the EFV to allow for future locating in the event the EFV must be replaced or removed.

(2) See GDS H-10, “High-Pressure Regulator-Type Stations and Farm Tap Regulator Sets.”

6.2. Branched Service Lines

A. For a new or fully replaced mother and branch service installation:

(1) Install one EFV on the mother service as close as practical to the gas main, having designed the EFV with adequate capacity and protected length for both mother and branch. See Figure 1.

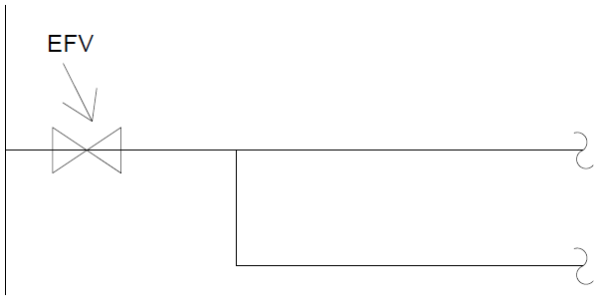

Figure 1: Branched Service Line

B. For a new branch being added to an existing single service line that has an existing EFV:

(1) If existing EFV on mother service protects entire length of new branch service and has adequate capacity for both meter sets, leave the existing EFV in place.

(2) If existing EFV on mother service does **not** protect entire length of new branch service or has inadequate capacity, select a new EFV with adequate capacity to protect both mother and branch, and replace the existing EFV.

a) If this cannot be achieved, run a new single service instead of a branch.

C. For a new branch being added to an existing single service line that does not currently have an EFV:

(1) Select a new EFV with adequate capacity to protect both mother and branch, and install EFV at the main or the nearest non-paved point.

a) If this cannot be achieved, run a new single service instead of a branch.

6.3. Stub Completions

A. For an existing stub on a single service or a branched service where neither side has been completed:

(1) When completing an existing stub that is missing an EFV, install the EFV at the nearest non-paved point to the gas main or at the main. See Figure 2 and Figure 3 for EFV locations on common installation scenarios.

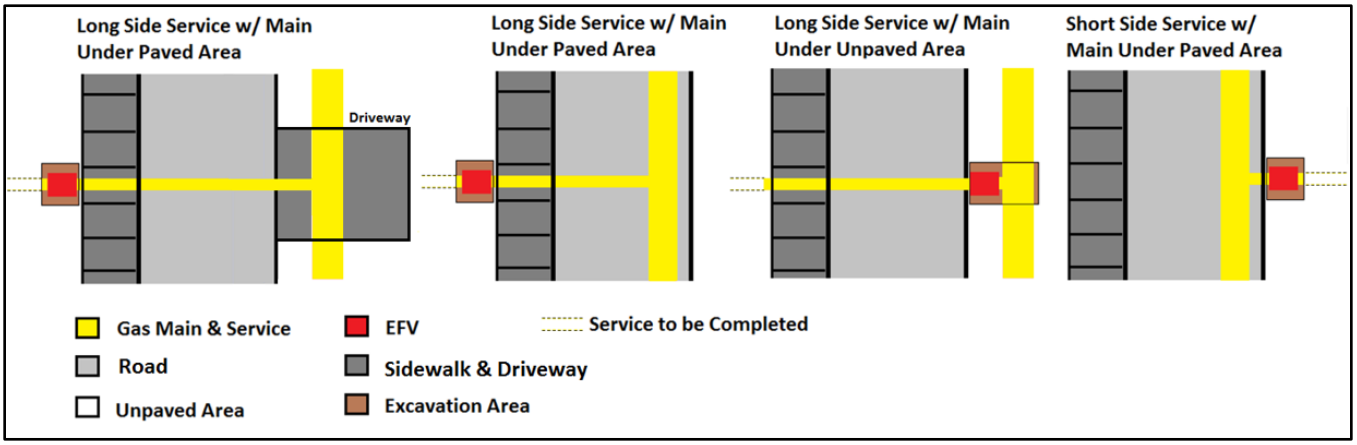

Figure 2. EFV Locations on Common Installation Scenarios

B. For an existing stub that is part of a branched service line where the other side has already been completed:

(1) If there is **no** EFV upstream of the branching point, install an EFV at the non-paved point nearest to the branching point.

(2) If there is an existing EFV upstream of the branching point, ensure it will protect the entire length of the completed service and it has adequate capacity for both meter sets.

(3) See Figure 3 for EFV locations on common branch installation scenarios.

6.3 (continued)

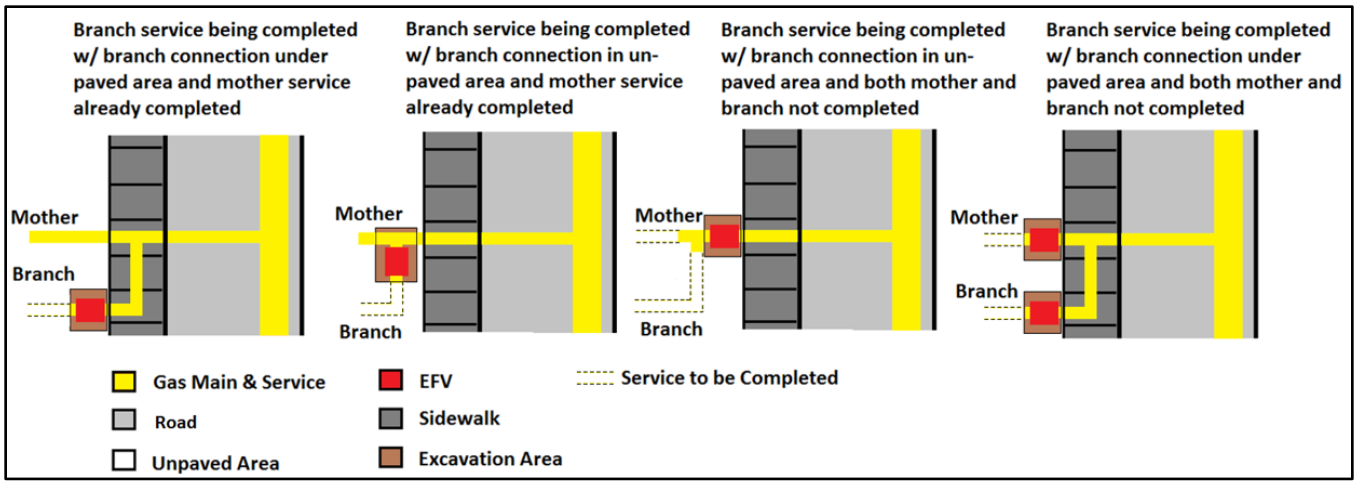

Figure 3. EFV Locations on Common Branch Installation Scenarios

C. To complete a ½" stub service:

(1) Select a ½" EFV per Table 9, and install the EFV at the appropriate location per Figure 2 and Figure 3. Use 1" plastic pipe for the remainder of the service completion.

(2) If a ½" EFV series does not meet the customer loads as described in Table 9, upsize the stub, EFV, and service completion to 1" plastic and size the EFV accordingly.

(3) If the stub completion requires more than 150' of 1" piping, contact standards engineering personnel for guidance or variance options.

Table 9. EFV Selection for ½" Stub Completions

	Length of ½" Stub[1] (ft)	Total Connected Load (scfh)		
		0–385	386–595	595–700
NOP <24 psig	0–23	1" or ½" – Honeywell Perfection 800	1" or ½" – 800	1" or ½" – 800
	24–40	½" – 600	½" – 600	Replace all with 1"
	41–117	½" – 400	Replace all with 1"	
NOP ≥24 psig	0–60	1" or ½" – 800	1" or ½" – 800	1" or ½" – 800
	61–100	½" – 600	½" – 600	Replace all with 1"
	101–245	½" – 400	Replace all with 1"	

1. Stub length is measured from gas main to the end of the longest stub.

7 General EFV Installation Instructions

7.1. Do **not** squeeze an EFV.

7.2. Plastic EFVs with factory-installed pipe pups may be cut on the pup ends as needed for proper installation; however, steel EFVs may not be cut to reduce their length.

7.3. In most cases, an EFV with plain pipe ends may be connected directly to the service tee, but a short piece of pipe may be installed between the service tee and EFV as needed.

7.4. Remove debris from the service line before installing an EFV.

CAUTION

An EFV installed with the flow direction going the wrong way will flow normally but will not activate.

7.5. When installing the EFV, ensure the directional arrow is in line with the flow of the gas and pointing toward the gas meter.

7.6. Use an appropriate welding procedure when installing a steel EFV. When welding a steel EFV, place a wet rag over the center of the steel EFV stick while it is being welded in place. Keep welding heat away from the center of the EFV stick.

7.7. The EFV is supplied with metal identification tags, while some models are also supplied with an adhesive sticker.

A. Use the supplied nylon tie to install the metal tag.

B. Install the metal tag on the gas service riser at the gas service valve location.

C. Install the adhesive sticker (if supplied) on the pressure regulator.

D. For a branch service line, place a metal tag on the riser for each meter set. Extra metal tags may be purchased using material code M020957. Follow GDS A-42, “Standard Branch Service Installation,” for additional branch marking requirements.

7.8. Install EFVs on new stub service lines as close as possible to the gas main.

A. Leave the metal tag and adhesive sticker (if supplied) in the EFV plastic bag.

B. Wrap the bag around the buried stub.

C. Attach the metal tag on the riser and sticker (if supplied) to the pressure regulator when the service line is completed.

D. Ensure a properly sized EFV is present when performing a stub completion, if required.

7.9. Leak Testing

A. When leak-testing a service line that has an EFV, as required in GDS A-34, “Piping Test Design Requirements,” increase the air pressure slowly. A high flow may cause the EFV to trip. For example, take 15 seconds to pressurize a typical 50"–100" service line of ½" or 1" CTS.

B. Depressurize the service at a slow flow rate to avoid tripping the EFV.

7.10. Purging

A. Gas service lines with an EFV require a slower purge velocity than the normal gas purge procedure described in GDS A-38, “Purging Gas Facilities.”

B. Do not attempt to purge a gas main through a service that has an EFV.

C. Confirm there is an EFV identification tag on the gas service valve, service riser, riser sun shield, or pressure regulator. If the tag is present, an EFV has already been installed on the service.

D. Open the gas service valve very slowly and only partially.

- If the valve is fully opened, the resulting rapid flow of gas will activate and trip the EFV.
- The EFV may activate when purging to atmosphere even if the gas valve is opened slowly.
- If the EFV activates during purging, shut off the gas service valve and wait until the pressure equalizes before attempting to continue purge.

E. When performing service work downstream of the regulator at the meter set, avoid removing a plug or associated piping too quickly because doing so can activate the EFV.

F. If the EFV activates, shut off the service valve and wait for the pressure to equalize. A typical EFV takes approximately 5 minutes to equalize.

8 Customer Notification

8.1. If a customer's service line operates at a pressure of 10 psig or greater throughout the year, PG&E must provide written or electronic notification to the customer of their right to request the installation of an EFV as specified in Code of Federal Regulations (CFR) Title 49, Transportation, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Section (§) 192.383, "Excess flow valve installation."

Target Audience

Gas distribution engineering and estimating personnel, maintenance and construction personnel, general construction personnel, contractors, applicant designers, and inspectors.

Definitions

Branch service line	A gas service line that is not directly connected to a gas main but has another service line as its source of supply.
Farm tap regulator set	A pressure regulator set, including both single and multiple stages of pressure regulation, that controls pressure to a service line.
Nominal operating pressure (NOP)	The operating pressure of a system that is generally the set point of the working regulator.
Total connected load	Total demand of all gas appliances operating simultaneously and at full capacity.

Compliance Requirement / Regulatory Commitment

Code of Federal Regulations (CFR) Title 49, Transportation, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.381, “Service lines: Excess flow valve performance standards.”

Code of Federal Regulations (CFR) Title 49, Transportation, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Section 192.383, “Excess flow valve installation.”

Records and Information Management:

Information or records generated by this procedure must be managed in accordance with the Enterprise Records and Information (ERIM) Policy, Standards and Enterprise Records Retention Schedule (ERRS). Refer to GOV-7101S, “Enterprise Records and Information Management Standard,” and related standards. Management of records includes, but is not limited to:

- Integrity
- Storage
- Retention and Disposition
- Classification and Protection

References

American Society for Testing and Materials (ASTM International) A53, “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”

American Society for Testing and Materials (ASTM International) F1802, “Standard Test Method for Performance Testing of Excess Flow Valves”

American Society for Testing and Materials (ASTM International) F2138, “Standard Specification for Excess Flow Valves for Natural Gas Service”

Gas Design Standard A-34, “Piping Test Design Requirements”

Gas Design Standard A-38, “Purging Gas Facilities”

Gas Design Standard A-42, “Standard Branch Service Installation”

Gas Design Standard A-43.2, “Curb Valves”

Gas Design Standard D-34, “Qualifications for Joining Polyethylene Pipe”

Gas Design Standard H-10, “High-Pressure Regulator-Type Stations and Farm Tap Regulator Sets”

Gas Design Standard J-10.1, “Diaphragm Meter Capacities”

Gas Design Standard J-20, “Rotary Meter Capacity – At Standard and Elevated Delivery Pressures”

Utility Standard TD-4801S, “Service Replacement Criteria”

Appendices

Appendix A, “Pressure Drop Across EFVs”

Appendix B, “Calculating Equivalent Lengths of Plastic Pipe”

Appendix C, “EFV Installation and Replacement Matrix”

Attachments

Attachment 1, "Excess Flow Valve (EFV) Calculator"

Revision Notes

Revision 9d has the following changes:

1. Replaced Step 2.1.
2. Completely replaced existing Step 2.2 with wording from previous Step 2.3.
3. Added new Step 2.3 and new Table 1.
4. Added new Step 2.4 and new Table 2.
5. Added new Step 2.5.D.
6. Updated Maximum Service Length in Tables 4, 5, and 7.

Revision 9c (Publication Date: 10/20/2021 Effective Date: 01/01/2022) has the following changes:

1. Updated Section 3 as follows:
    a. In Step 3.6.A, deleted any mention of Honeywell Perfection EFVs (except in Step 3.6.A.4), GasBreaker, and plastic Lyall. Added “with plain ends,” “with socket ends,” and “incorporated into plastic electrofusion couplings.”
    b. Added new step (Step 3.10) to refer to Appendix A.
2. Completely revised Section 4, including the following:
    a. Grouped plastic EFVs by connection type rather than by manufacturer.
    b. Added manufacturer's part numbers to the tables.
    c. Added three additional GasBreaker EFVs with plain ends.
    d. Merged GasBreaker EFVs with plain ends with Honeywell Perfection EFVs with plain ends under one material code for the same size and flow series. Maximum protected length of 1¼″ IPS 2600 and 2 IPS 5000 Honeywells were reduced to align with GasBreaker.
    e. Added MAXITROL as a new EFV manufacturer.
3. Added to Step 7.7 and Step 7.8 that adhesive stickers are not required if not supplied in the bag with the EFV.
4. Removed option to keep original EFV in place if or when transferring a service to a new main.
5. Merged cells in Appendix C (row 11, columns 3 and 4).

Revision Notes (continued)

6. Added new Attachment 1 (Excel) to assist in sizing the EFVs.

Revision 9b (Publication Date: 04/01/2021 Effective Date: 06/15/2021) has the following changes:

1. Added GasBreaker Model 51 plastic EFVs now approved for use.

2. Advanced table numbering throughout for new Table 4.

Revision 9a (Publication Date 03/17/2021 Effective Date 06/15/2021) has the following changes:

1. Added new Step 2.1.A to clarify what is meant by a new service line in Table 1.

2. In Table 1, added Step 2.1.A reference to expand on footnote 2.

3. Revised Step 3.3, adding meter badge rating larger than 1,000 scfh (CAPn 120228322).

4. Revised Step 3.5, removing converting from NOP to design pressure and adding that non-estimated work can use gauge pressure for NOP.

5. In Table 3, Table 4, and Table 6, replaced “design pressure” with “NOP” in the header and removed conversion from NOP to design pressure in the footer.

6. In Table 3 and Table 4, added using 2″ 5500 EFV with two 2″×1¼″ reducers.

7. Added new Section 8, “Customer Notification.”

Revision 9 (Publication Date: 07/27/2020 Effective Date: 10/27/2020) has the following changes:

1. Rearranged entire GDS, added new sections for better usability, and incorporated previous attachments into the body of the GDS.

2. Clarified that there is no minimum load requirement on EFVs.

3. Updated Table 1 to clarify when EFVs are required.

4. Updated Table 3, Table 4, Table 5, and Table 6 to incorporate maximum service length of EFVs at 10 pounds per square inch gauge (psig) and 20 psig design pressure.

5. Updated load capacity and maximum protected length for Lyall EFVs that have socket fusion ends.

6. Clarified if multiple EFV models can be used for a certain scenario, it is recommended to choose the EFV with the highest capacity.

Revision Notes (continued)

7. Added new guidance for EFV installation location guidelines on branched service lines.
8. Added new Appendix A.
9. Added new Appendix B.
10. Moved “EFV Installation and Replacement Matrix” to new Appendix C.
11. Developed a “Frequently Asked Questions” (FAQ) document (stored in the Technical Information Library) to address commonly asked EFV questions.

Asset Type: Distribution Services

Function: Design, Construction, Maintenance

Document Contact: Gas Design Standard Responsibility List

Appendix A, Pressure Drop Across EFVs

See Table A-1 for data on maximum pressure drop values across EFVs, and use these values as references, if needed.

Table A-1. Maximum Pressure Drop Values Across EFVs

Plastic EFVs		
Size (in.)	**Type and EFV Flow Series**	**Maximum Pressure Drop (psig)**
½ CTS	Perfection 400	0.75
	Perfection 600	1.90
	Perfection 800	1.40
	Lyall 400	0.41
	Lyall 775	1.53
1 CTS	Perfection 800	1.40
	Perfection 1100	3.00
	Perfection 1800	3.20
	Lyall 775	0.76
	Lyall 1200	1.35
	Lyall 1800	3.00
1¼ IPS	Perfection 2600	4.90
	Lyall 2600	0.56
2 IPS	Perfection 5500	0.50
	Lyall 5500	0.67
Steel EFVs		
Size (in.)	**Type and EFV Flow Series**	**Maximum Pressure Drop (psig)**
3/4 NPS	Perfection 800	1.40
	Perfection 1100	3.00
	Perfection 1800	3.20

Appendix B, Calculating Equivalent Lengths of Plastic Pipe

For flows governed by the Mueller formula (typically high-pressure gas flow in plastic pipe), a length (L_1) of pipe of one internal diameter (D_1) can be converted to an equivalent length (L_2) of pipe of a second internal diameter (D_2) by applying the following formula:

$$L_2 = L_1 \times \left[\frac{D_2}{D_1}\right]^{4.73913}$$

See Table B-1 for the minimum inside diameter (ID) of PE pipe sizes ½" CTS through 2" IPS.

Table B-1. Minimum ID of Plastic Pipe

Nominal Pipe Size (in.)	Minimum ID
½ CTS	0.423
1 CTS	0.898
1¼ IPS	1.283
2 IPS	1.885

Example 1: Converting 100' of ½" plastic (PL) to 1" PL

Minimum ID ½" CTS = 0.423";

Minimum ID 1" CTS = 0.898".

In this scenario, 100' of ½" plastic would be equivalent to $100 \times (0.898/0.423)^{4.73913}$ = 3543.2' of 1" plastic.

Example 2: Converting 100' of 1" PL to ½" PL

Minimum ID 1" CTS = 0.898";

Minimum ID ½" CTS = 0.423"

In this scenario, 100' of 1" plastic would be equivalent to $100 \times (0.423/0.898)^{4.73913}$ = 2.8' of ½" plastic.

Appendix C, EFV Installation and Replacement Matrix

See Table C-1 for EFV installation scenarios and their recommended actions.

Table C-1. EFV Installation and Replacement Matrix

Scenario	EFV Installed	Action	Charge To
Customer requests new gas service. A new single service line is installed.	No	Engineered job: Install a new EFV that has the appropriate capacity.	New Business
Customer adds load to a single service line. The service is completely replaced.	Yes		
	No		
Customer adds load to a single service. The service line is altered to accommodate the load.	Yes	Check the EFV's capacity, and replace it if the capacity is inadequate.	WRO
	No	Install a new EFV if the alteration is within 3' of the service tee/saddle.	WRO
Customer adds load, but no service line reinforcement work is performed.	Yes	Check the EFV's capacity, and replace it if the capacity is inadequate[1].	New Business
	No	No EFV installation is required.	NA
Customer requests service line to serve new or existing load. A new service is branched off an existing service.	Yes	Check the EFV's capacity, and replace it if the capacity is inadequate.	New Business
	No	Engineered job: Install a new EFV. See the "EFV Installation Locations Guidelines" section for details.	New Business
Customer requests additional meter on manifold.	Yes	Check the EFV's capacity, and replace it if the capacity is inadequate.	New Business
	No	No EFV installation is required.	NA
Developer does a lot flop. PG&E deactivates the old stub and installs new service at the new service point.	Yes	Engineered job: Install a new EFV that has the appropriate capacity.	WRO[2]
	No		
Customer requests an EFV on an existing service line.	No	Engineered job (service alteration): Install a new EFV[1].	WRO[2]
The EFV is leaking or has failed.	Yes	Replace the EFV.	Maintenance
The service is replaced as part of a gas pipeline replacement program (GPRP), reliability, or capacity job.	Yes	Engineered job: Install a new EFV that has the appropriate capacity.	Capital Job
	No		Capital Job
The service is transferred as part of a GPRP, reliability, or capacity job.	Yes	Engineered job: Install a new EFV that has the appropriate capacity.	Capital Job
	No		
Existing service line is cut off at property line by PG&E to facilitate work by customer and is reconnected later.	Yes	Same load: Leave current EFV.	NA
		Added load: Check EFV capacity, and replace it if the capacity is inadequate.	WRO[2]
	No	Install EFV at time or reconnection.	NA

1. If the service line size is increased to meet the EFV maximum protected service limitation, bill the applicant under New Business or WRO, as appropriate.
2. Reimbursable WRO.