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PRESSURE RELIEF DEVICES

H-70

Department: Gas System Maintenance and Technical Support	Section: System Integrity	Date: 12-15-04
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Rev. #02: This document replaces Revision #01. For a description of the changes, see Page 4.

Purpose and Scope

This gas standard provides basic design requirements and sets inspection and testing requirements for gas pressure relief devices used for natural gas service at compressor, pressure limiting, and regulator stations. This standard does not cover rupture disks.

Acronyms

- CFR: Code of Federal Regulations
- CGT: California Gas Transmission (organization within PG&E)
- DOT: Department of Transportation
- GSM&TS: Gas System Maintenance and Technical Support
- MAOP: maximum allowable operating pressure
- MOP: maximum operating pressure
- psig: pounds per square inch gauge
- SMYS: specified minimum yield strength
- UO: Utility Operations
- WC: water column

References

	Document
49 CFR Part 192. "Pipeline Safety Regulations. Natural Gas"	Section 192.199
49 CFR Part 192. "Pipeline Safety Regulations. Natural Gas"	Section 192.201
49 CFR Part 192. "Pipeline Safety Regulations. Natural Gas"	Section 192.731
49 CFR Part 192. "Pipeline Safety Regulations. Natural Gas"	Section 192.739
49 CFR Part 192. "Pipeline Safety Regulations. Natural Gas"	Section 192.743
CGT Standard. "Gas Pressure Relief Devices – Responsibility for Annual Inspection and Verification of Capacity"	S4433
UO/CGT Standard. "Maximum Allowable Operating Pressure, Requirements for Distribution Systems and Transmission and Gathering Lines"	D-S0430/S4125
CGT Standard. "Establishing Setpoints on Overpressure Protection Devices"	4125.2
UO Standard. "District Regulator Station Maintenance"	S5351

Design Requirements

1. Do not use relief valves unless it has been determined that monitor valves are impractical.
2. A pressure relief device shall have the capacity, and shall be set, to limit the pressure in a system to the appropriate maximum pressure shown below, under any possible operating conditions.
 - A. In a low-pressure distribution system, the pressure may not exceed 14" WC.
 - B. In pipelines other than a low pressure distribution system:
 - (1) If the MAOP is 60 psig or more, the pressure may not exceed the MAOP plus 10%, or the pressure that produces a hoop stress of 75% of SMYS, whichever is lower.
 - (2) If the MAOP is 12 psig or more, but less than 60 psig, the pressure may not exceed the MAOP plus 6 psig.
 - (3) If the MAOP is less than 12 psig, the pressure may not exceed the MAOP plus 50%.

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3. The pressure at which the relief valve is set to open will depend on its operating characteristics. The setpoint of the relief valve must take into consideration the pressure buildup above the setpoint that is necessary to achieve full relief capacity and the pressure at which the system is to be operated under normal conditions.
Taking into account the pressure buildup required for the relief valve to reach its full capacity, the setpoint of the relief valve must not, at any time, permit the downstream piping pressure to exceed the pressure specified in Item 2.
4. Set the relief valve or other overpressure protection just sufficiently above the MOP of the system being protected to permit the system to be operated at the MOP without causing the relief valve to leak or vent gas. This pressure shall be determined by considering the operating characteristics and operating tolerances of the valve being used. The pressure shall **not** be any higher than necessary to accomplish this. For further information, see CGI Standard 4125.2 and UO Standard S5351.
5. When more than one pressure regulating run or compressor discharge merge and feed into a pipeline, relief valves or other protective devices shall be installed at each station to ensure that the complete failure of the largest capacity regulator or compressor, or any single run of lesser capacity regulators or compressors in that station, will not impose pressure on any part of the downstream pipeline system in excess of the pressure permitted by Item 2.
6. For stations built after July 3, 1972, that have multiple runs of pressure regulating devices and where simultaneous failure of multiple regulating devices is possible (i.e., diaphragm/boot-type regulators that could be subject to fire damage), the pressure relief device must have sufficient capacity to relieve for the simultaneous failure of all the supply devices in the final stage of pressure regulation.
7. When there are multiple stages of regulation and there is no overpressure protection provided between the stages of regulation, the capacity of the pressure relief device should be based on the failure of the last stage of regulation and should not include any increased capacity due to failure of earlier stage(s) of regulation.
8. The discharge piping of pressure relief valves shall be designed to prevent an accumulation of water, ice, or snow and to discharge gas to nonhazardous locations. To prevent injury to personnel, the vent exhaust shall be located at or above 8' from ground level.

Sizing Relief Valves

9. Ensure the relief valve has adequate capacity and operating characteristics to prevent the pressure from exceeding the limits specified in Item 2. Take into account the set pressure, the operating tolerance of the valve, and the pressure buildup required to achieve full capacity.
10. Base the capacity of the relief valve on the highest anticipated supply pressure in the line feeding the regulator. This may be the MOP rather than the MAOP of the line. However, there must be adequate assurance that the supply pressure will not increase above that for which the relief valve is sized. If it is necessary to increase the MOP of the system supplying the regulator(s), the capacity of all relief valves protecting it must first be checked to verify that there is adequate relief capacity for the new conditions. Where the relief capacity is not adequate, provide additional capacity before increasing the MOP.
11. Consider the minimum demand on a system when sizing the relief valve, provided there is assurance that this minimum demand will always be present.
12. Use the manufacturer's capacity rating to determine the adequacy of the relief valve (subject to the precautions outlined in Item 14). Before using the manufacturer's capacity rating, verify with GSM&TS System Integrity or Utility Operations Engineering and Planning that the latest available information is being used.
13. When selecting and sizing a relief valve, consider the following characteristics:
 - A. The pressure buildup above the point where the valve first opens, which is necessary to obtain full capacity. This must be compared to the maximum pressure permitted by Item 2.
 - B. The repeatability of operation. How close can the relief valve be set to the MOP of the downstream piping system without operating or leaking gas unintentionally?
 - C. The pressure to which the system must drop before the relief valve will close after it operates.
 - D. The potential hammering or excessive vibration effects. The relief valve should be sized small enough to prevent hammering or excessive vibration.
14. The regulator capacity against which the relief valve must protect is the **failed wide open** capacity. This can be calculated using the valve coefficient (Cv) for a wide-open valve. Do not use the tabulated capacity for the

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regulator shown in the *Gas Standards and Specifications* or the manufacturer's literature unless it is known to be the **wide open** capacity.

15. Piping between the system being protected and the relief valve must be sized so that it will not restrict the capacity of the relief valve.
16. Any valve between the system being protected and the relief valve must be locked open to prevent unauthorized operation that would isolate the relief valve from the piping being protected.
17. The vent stack represents a restriction against which the relief valve must discharge. Consider the pressure drop in the vent stack when sizing the relief valve and the vent stack piping.

Inspecting and Testing Pressure Relief Devices

18. All pressure relief devices shall be inspected, tested, and the capacity reviewed at intervals not exceeding 15 months, but at least once each calendar year as required by [49 CFR 192.739](#) and [49 CFR 192.743](#).
19. The relief valves that were purchased as an integral part of a piece of equipment do not require capacity calculations, but still must be inspected and tested annually.
20. The relief devices shall be **inspected** and **tested** to determine that they are:
 - A. In good operating condition;
 - B. Set to function at the correct pressure (Note: the setpoint must be verified by physically testing that the relief valve begins to operate at the proper pressure setting. The relief valve setpoint shall never exceed the relief pressure setting shown on the Capacity Review form for the valve [See Attachment A, Attachment B, and Attachment C]); and
 - C. Properly installed and protected from dirt, liquids, and other conditions that might prevent proper operation.
21. Verify that the relief valve has sufficient **capacity** to limit pressure to the level required in Item 2 by performing the following actions:
 - A. Make an office review and calculation to verify that under operating conditions the relief valve has the proper setting and capacity to limit pressure to the required level; or
 - B. Physically test the relief valve(s) in place to verify that the relief valve(s) has sufficient capacity to limit pressure to the required level.
22. The capacity shall be considered satisfactory if the maximum downstream system pressure will not exceed the maximum pressure specified in Item 2. If the capacity at the maximum system pressure is not adequate, immediate steps shall be taken to provide adequate capacity.
23. The capacity of the relief devices at **pressure limiting and regulating stations** shall be recorded using [Form FH-70-A, "Capacity Review of Relief Devices at Pressure Limiting and Regulating Stations,"](#) Attachment A. The capacity of the relief devices protecting against overpressure due to **gas compression** shall be recorded using [Form FH-70-B, "Capacity Review of Relief Devices at Compressor Stations,"](#) Attachment B. The capacity of the relief devices protecting against overpressure due to **gas gathering meter sites** shall be recorded using [Form FH-70-C, "Capacity Review of Relief Devices at Gas Gathering Receipt Points,"](#) Attachment C. All three forms are available in the [UO Technical Information Library](#) or from System Integrity.
24. In addition to annual capacity testing, the capacity of relief devices shall be verified immediately when changes are made which could affect the ability of the relief valve to protect the system.

Responsibility

25. The Utility Operations area managers, the GSM&TS district superintendents, or their designated representatives are responsible for performing inspections, testing, operation, and maintenance of the subject facilities, within their assigned areas of responsibility.

Attachments

- [Attachment A](#) [Form FH-70-A, "Capacity Review of Relief Devices at Pressure Limiting and Regulating Stations"](#)
[Attachment B](#) [Form FH-70-B, "Capacity Review of Relief Devices at Compressor Stations"](#)
[Attachment C](#) [Form FH-70-C, "Capacity Review of Relief Devices at Gas Gathering Receipt Points"](#)

Revision Notes

Revision 02 has the following changes:

1. In Item 2A, in the "Design Requirements" section on Page 1, specified that the pressure in a low-pressure distribution system may not cause the unsafe operation of any connected and properly adjusted gas utilization equipment.
2. Expanded Item 3 on Page 2 to require taking into account the pressure buildup necessary to achieve full relief capacity while determining the setpoint of a relief valve. This setpoint must not permit the downstream piping pressure to exceed the pressure specified in Item 2 on Page 1 in the event of a pressure control failure.
3. Expanded Item 5 on Page 2 to clarify why protective devices shall be installed at each station when more than one pressure regulating or compressor station feeds into pipeline.
4. Added Items 6 and 7 on Page 2.
5. Added a note to Item 20B on Page 3 that the setpoint must be verified by physically testing that the relief valve begins to operate at the proper pressure setting.
6. Added a new form (as Attachment C) to be used for recording the capacity of the relief devices protecting against overpressure at gas gathering meter sites. See expanded Item 23 on Page 3.
7. Revised Item 25 on Page 3 to replace the GSM&TS manager with the GSM&TS district superintendents as employees responsible for performing inspections, testing, operation, and maintenance of the subject facilities, within their assigned areas of responsibility.
8. Converted Exhibits 1 and 2 to Forms FH-70-A and FH-70-B (Attachment A and Attachment B, respectively). They are now independent MS Word documents available in the UQ Technical Information Library or from System Integrity.
9. This document is part of Change 55.