Prepared by: [redacted]

PRESSURE-RELIEF DEVICES

H-70

Asset Type: Gas Metering

Function: Design and Construction

Issued by: [redacted] Original Signed By

Date: 04-15-10

Rev. #03: This document replaces Revision #02. For a description of the changes, see Page 3.

Purpose and Scope

This numbered document 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 document does not include rupture disks.

Acronyms

CFR:	*Code of Federal Regulations*
DOT:	Department of Transportation
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
Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines	TD-4125S
Establishing Setpoints on Overpressure Protection Devices	TD-4125P-07
District Regulator Station Maintenance	WP4540-01

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%.
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.

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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 TD-4125P-07 and WP4540-01.
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 final stage regulator(s). This may be the MAOP of the line or the regulated pressure from a primary stage in a multi-stage pressure regulator system such as a farm tap. However, there must be adequate assurance that the supply pressure will not increase above that for which the relief valve is sized.
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 gas system integrity or engineering and planning personnel 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 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.

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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 one of 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.
    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 Technical Information Library or from system integrity personnel.
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 area managers, the gas 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 03 has the following changes:

1. Revised Item 10 in the "Sizing Relief Valves" section on Page 2.
2. This document is part of Change 62.

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