

Engineering Procedure

SAEP-1027

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Pressure Relief Valve

Conventional and Balanced Types

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Saudi Aramco DeskTop Standards

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1 Scope

Saudi Aramco Engineering Procedures (SAEPs) establish instructions and responsibilities associated with various engineering activities. This document contains the instructions for entering data into Form [8020-611-ENG](#), Instrumentation Specification Sheet, Pressure Relief Valve Conventional and Balanced Types.

2 Applicable Documents

2.1 Saudi Aramco Documents

Saudi Aramco Engineering Standards

[SAES-J-600](#) *Pressure Relief Devices*

SAES-L-043 Thermal Expansion Relief in Piping

Saudi Aramco Engineering Form

[8020-611-ENG](#) *Instrument Specification Sheet, Safety Relief Valves*

2.2 Industry Standards and Codes

American Petroleum Institute

*API RP 520 Sizing, Selection and Installation of Pressure -
Relieving Devices in Refineries*

API RP 526 Flanged Steel Pressure Relief Valves

American Society of Mechanical Engineers

ASME B31.3 Process Piping

*ASME B31.4 Pipeline Transportation Systems for Liquid
Hydrocarbons and Other Liquids*

*ASME B31.8 Gas Transmission and Distribution Piping
Systems*

ASME SEC I Rules for Construction of Power Boilers

ASME SEC VIII Rules for Construction of Pressure Valves

American Society for Testing and Materials

*ASTM A216 Standard Specification for Steel Castings, Carbon,
Suitable for Fusion Welding, for High-
Temperature Service*

Crane Co.

Technical Paper No. 410 Flow of Fluids through Valves, Fittings, and Pipe

3 Detailed Instructions for Saudi Aramco Form [8020-611-ENG](#)

- Line 1 **Instrument Tag Number** for the PZV. This number is found on the P&ID. For new PZV's a new Instrument Tag Number must be assigned.
- Line 2 **Service** - Location: Enter the Equipment Number, Line or Process System the PZV is protecting. On line below specify the service as Liquid, Gas or Vapor.
- Line 3 **Serial Number** – The Serial Number of the PZV to be used as a future reference by the manufacturer to trace all of the original specifications on the PZV.
- Line 4 **P&ID Number**
- Line 5 **Manufacturer** - Enter the PZV Manufacturer Name if known.
- Line 6 **Model Number** - Enter the PZV Manufacturer's Complete Model Number (Vendor to Verify).
- Line 7 **Material Source** - Requisition Number (If known, Enter)
- Line 8 **Material Source** - SAMS Stock No. (If known, Enter)
- Line 9 **Design Type** - (e.g., - Conventional, Balanced Bellows, Balanced Bellows w/ Aux. Piston)
- Line 10 **Body Material** - Refer to API RP 526 "Flange Safety Relief Valves" and [SAES-J-600](#) materials. Generic Carbon Steel, Stainless Steel, etc., is sufficient until the valve is bought, then more detail should be substituted such as (ASTM A216 grade WCB).
- Line 11 **Body Size** - Refer to API RP 526 "Flange Safety Relief Valves" for standard body sizes. (e.g., 4" inlet, 6" outlet, ¾" FNPT inlet, 1" MNPT outlet). F = female and M = male. NPT is National Pipe Thread.
- Line 12 **Body Connection Rating** - (e.g., - 300# ANSI Flanged, 3000# Threaded) Refer to API RP526 "Flange Safety Relief Valves" for standard PZV connection sizes. Per [SAES-J-600](#) minimum inlet flange rating is 300# ANSI.
- Line 13 **Flange Face Type** - (e.g., - RF for Raised Face, RTJ, for Ring Joint, FF - for Flat Faced, N/A if threaded)

Line 14	Seat Type - (e.g. - Metal, Soft (O-ring), or manufacturer specific, i.e., Thermoflex®, Flex-disc®, etc.)
Line 15	Bonnet Generally steam service valves are specified with an OPEN bonnet to reduce the temperature effects on the spring. All others are normally CLOSED. With Open Bonnets, the spring is completely visible. A Bellows Valves is normally specified as a Closed Bonnet even though it is vented.
Line 18	Nozzle and Disc Material - Enter Nozzle and Disc Material.
Line 19	Guide Material - Enter the Stem Guide Material
Line 20	Spring Material - Enter the material of the spring (e.g., - carbon steel, 316 S.S., Monel, Hastelloy C, Inconel, Tungsten).
Line 21	Spring Coating - (If any - e.g., Nickel Plated, Painted, Aluminum Metalized)
Line 22	Bellows Material - Enter the bellows material (e.g., - 316 SS, Monel, 316L SS, Hastelloy Inconel).
Line 24	Cap - (This is the cap that covers the setpoint adjustment). Indicate whether it is Screwed or Bolted. Standard configuration is screwed.
Line 25	Lifting Lever - The purpose of the lifting lever is to enable the user to open the valve when the pressure under the valve disc is lower than the set pressure. The lifting lever is required for Air, Steam and Hot Water. ASME SEC VIII UG-136 (a) (3). The Plain or Open lever assembly is not pressure-tight and may leak to the atmosphere. Typically used on air and steam applications. Packed levers ensure leakage does not occur either when the valve is open or when backpressure is present.
Line 26	Test Gag - The test gag is used to prevent the safety valve from lifting. This is normally only specified for in-place testing of multiple steam valve installations or where hydrotesting the system is required.
Line 27	Vent with Bug Screen - Vents the Bonnet of the PZV. Yes, for Bellows Valves. No, for Conventional Valves.
Line 28	Auxiliary Piston - Auxiliary Balance Piston - Required for Bellows valves where a bellows failure may cause an unacceptable increase in setpressure or decrease in flowing capacity from built-up backpressure.

- Line 29 **Liquid Trim** - Yes, if the valve is in liquid service. Yes, if the valve is in two-phase flow and greater than 50% of the total MASS flowrate is liquid.
- Line 31 **ASME Code** - Choose whether the PZV will be installed as ASME SEC VIII (Pressure Vessels - Stamped UV) or ASME SEC I (Steam Boiler - Stamped V). ASME SEC VIII stamped valves are required for PZVs installed on ASME B31.3 "In-plant piping", ASME B31.4 "Liquid Transport Pipelines", or ASME B31.8 " Gas Transmission Pipelines". Enter "n/a" for relief valves used in service below 15 PSIG such as on API 2000 tanks.
- Line 32 **Fire or Blocked Discharge** - Choose whether the worst case relieving scenario is either Block Discharge or Fire. If other, then enter n/a and go to Line 33.
- Line 33 **Other** - (Basis of Selection), Other than Line 32 worst case relief (e.g., - Thermal Relief, Exchanger Tube Failure, Loss of Reflux, Loss of Cooling Fans, etc.)
- Line 35 **Process Fluid** - (e.g., Hydrocarbon, Water, Gasoline, Oil, etc.)
- Line 36 **Corrosive Compounds** - Name any significant corrosive compounds such as H₂S, Sour water, etc.
- Line 37 **Required Capacity** - This capacity is given at standard conditions. It is the maximum (worst case) relieving scenario for the basis of selection.
- Line 38 **MW or SG @ Relieving Temperature** - The molecular weight of the gas or vapor or the Specific Gravity (referenced to water). The specific gravity is stated at the flowing (relieving) conditions.
- Line 39 **Viscosity @ Relieving Temperature** in Centipoise.
- Line 40 **Weight % Flashing / Molecular Weight of the Vapor**
- Applicable to liquids only. Flashing liquids require special consideration. The correct relief valve size lies between that obtained from the liquid formula and that obtained from the vapor formula, usually closer to the liquid. Flashing probably occurs at the throat, where velocity is sonic. The most reasonable approach is to determine the liquid portion and the vapor portion separately, compute the area required for each quantity, and add them together.

Assume an isenthalpic (adiabatic) process.

$$\% \text{ Flashing} = H_1 - H_2 / H_{LV}$$

where:

H_1 = Enthalpy in BTU/lb of saturated liquid at upstream temperature.

H_2 = Enthalpy in BTU/lb of saturated liquid at downstream pressure.

H_{LV} = Latent Heat of Vaporization BTU/lb at downstream pressure.

An alternative to the above is to use a process simulation package to perform the flash calculation. Saudi Aramco approved simulation packages are HYSYS and Pro2 by Simulation Sciences.

Balanced Bellows valves may be necessary as a safety precaution when the increased downstream PZV body pressure, due to flashing flow conditions, is excessive or cannot be predicted with certainty.

Line 41 **Temperature** at Normal Conditions and at Relief.

For Blocked discharge of liquids, the relief temperature is typically the normal temperature. For blocked discharge of gas on the outlet of a compressor, consider the increased temperature due to the increased relieving pressure. For the fire case, the relief temperature of the vapor is the boiling point of the liquid at the relieving pressure.

Line 42 **Pressure** at Normal Conditions and Design Pressure.

Design Pressure refers to (at least) the most severe conditions of coincident temperature and pressure expected during operation. Design pressure is always equal to or less than the MAWP. Used to determine the minimum permissible thickness or physical characteristics of different parts of the vessel. Typically, a corrosion allowance is then added to the calculated thickness. If the MAWP is greater than the design pressure then this usually means the thickness calculated for the design pressure was not commercially available and the next larger rolled plate or pipe was used.

Line 43 **Set Pressure**

The set pressure for a single relief valve installation on a vessel or protected vessel system may not exceed 100% of the MAWP.

Set pressure staggering is allowed for Multiple PZV installations as follows:

- First Valve - The maximum allowable set pressure shall not exceed 100% of the MAWP

- Additional Valve(s) - Set pressures may be staggered but shall not exceed 105% of the MAWP.
- Supplemental Valves - (For additional hazard created by exposure to fire or heat). The set pressure shall not exceed 110% of the MAWP.

Set pressure shall not exceed 110% for thermal relief valves on piping. (SAES-L-043).

Line 44 **Superimposed Back-Pressure** (See Definition).

Line 45 **Built-up Back-Pressure** (See Definition).

Line 46 **Total Maximum Backpressure** = Superimposed plus Built-up backpressure.

Line 47 **Cold Differential Set Pressure (CDSP)**

CDSP = Set Pressure - Superimposed Back Pressure + Pressure Adjustment for Temperature.

The Pressure adjustment for temperature is specific to the Manufacturer and PZV Model. Consult the manufacturer for discharge temperatures above 150 °F.

Line 48 **Accumulation in Percent** = (Relieving Pressure - MAWP) / MAWP] *100

Overpressure in PSI = Relieving Pressure – Set Pressure

Example:

Set Pressure = 95 PSIG

MAWP = 100 PSIG

Relieving Pressure in Vessel = 110 PSIG

Accumulation = [(110 -100) / 100] *100 = 10%

Overpressure = 110 PSIG - 95 PSIG = 15 PSIG

Line 49 **Blowdown** in Percent = (Set Pressure - P_{closed}) / Set Pressure) * 100

Where P_{closed} = Pressure at which the relief valve closes after opening

Example:

Setpressure = 100 PSIG

Relief Valve Closes at 96 PSIG after opening.

$$\text{Blowdown} = [(100 \text{ PSIG} - 96 \text{ PSIG}) / 100 \text{ PSIG}] * 100 = 4\%$$

Blowdown should be specified as 2-4% for PZV's in ASME SEC I steam service. For other valves 7-9% is generally acceptable.

Line 50 **Discharges To:**

Examples:

Atmosphere, Grade, Open Funnel, Closed Sewer, Relief Header, Flare Header, Storage Tank, Pump Suction, etc.

Line 51 **Maximum Allowable Bellows Back Pressure**

To prevent damage to, or rupture of, the bellows. This information is to be supplied by the selected Vendor.

Check that the sum of the Superimposed and Built-up Backpressure is not greater than Line 51.

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Line 55 **Instrument Tag Number** - Required on every ISS individual sheet.

Line 56 **Calculated Maximum Tail Pipe Velocity**

This is derived by dividing the Maximum Required Flowrate by the cross-sectional area of the discharge flange. (Ft/Sec) "N/A" if Line 56 is "N/A".

Line 57 **Design Limit on Tail Pipe Velocity**

Relief System Evaluation for stress on the discharge flare header. For Line 56 choose either Yes or N/A to indicate whether detailed flare header sound pressure level calculations are required.

Input "No" for Line 57 if any of the following items 1-3 are True.

1. The PZV does not discharge to a closed system.
2. The PZV is for liquid relief.
3. The Screening Process indicates obvious safe sound pressure levels.

Screening Process

Perform either Test I, II or III depending on the PZV downstream piping configuration.

If the test result is False, then N/A may be entered into Line 57. If the test results is True, then a Yes is entered into Line 57 to indicate that further downstream piping sound pressure levels are necessary.

The calculation sound pressure levels are outside of the scope of the [8020-611-ENG](#) specification sheet. The Process Engineering Division may be consulted for help with the detailed sound pressure level calculations.

Test I - PZV Downstream line size 16 in. and greater:

Screening Test: The Mass Flow Rate is greater than 91,000 kg/hr (200,000 lb/hr) **OR** the pressure ratio is greater than 3? (True / False)

Test II - PZV Downstream line sizes 8 in. to 14 in.

Screening Test: The downstream line velocity is greater than 50% sonic (0.5 Mach) **AND** the pressure ratio is greater than 3. (True / False)

Test III - PZV Downstream line size less than 8 in. **AND** is swaged up **OR** "Teed" to an 8 in. or larger line size.

Screening Test: The downstream line velocity is greater than 50% sonic (0.5 Mach) **AND** the pressure ratio is greater than 3. (True / False)

Screening Process Definitions:

Line Velocity = $\frac{(\text{Maximum PZV Discharge Flowrate})}{(\text{Cross-sectional area of downstream PZV piping})}$

Sonic Velocity = $\text{SQRT}(kqRT)$
(See Crane - "Flow of Fluids" Chapter 1 Equation 1 - 10.)

Pressure Ratio = $\frac{(\text{Built-up Pressure} + \text{Normal Flare Header Pressure} + 14.7)}{(\text{Normal Flare Header Pressure} + 14.7)}$

Built-up Pressure = See Definitions of Terms

Line 58 **Calculated Line Piping Pressure Loss**

Calculate the Inlet Pressure drop at the maximum rated relief capacity of the PZV. (The stamped rated capacity of the valve).

The inlet pressure losses are the accumulative pressure drops due to friction (as a function of pipe size and length and fluid velocity), entrance and exit losses where they exist, and losses due to valves and fittings. (See Crane "Flow of Fluids" Chapter 1 for more details.)

Line 59 **Inlet Pressure Loss Limit (3% Set Pressure)**

Verify that inlet piping pressure loss does not exceed 3% of the set pressure limit (the inlet piping should be as short as possible to minimize the pressure drop).

$$\text{Inlet Pressure Loss Limit} = (\text{Set Pressure} * .03)$$

An engineering analysis of the valve performance at higher inlet losses may permit increasing the allowable pressure loss above 3%, however, this would require a waiver.

Line 63 **Spring Range** in PSIG (e.g., 80-150 PSIG)

This is supplied by the vendor. For existing springs, the range may be found by supplying the stamped part number to Supervisor, Operations Inspection Engineering Unit, Dhahran.

Some manufacturers consider spring Codes and Ranges confidential.

Line 64 **Manufacturers Spring Number** (Manufacturers Part Number)

Line 66 **Calculated Orifice Area** (Square Inches) - Obtained from the API formulas used on [8020-611-ENG](#) Sheet 3 Lines 98-101.

Line 67 Selected **API Orifice and Area** - The standard effective orifice areas and the corresponding letter designations are listed below as defined by API RP 526 Section 3.1 Table 1.

Orifice Designation	Effective Area (square inches)
D	0.110
E	0.196
F	0.307
G	0.503
H	0.785
J	1.287
K	1.838
L	2.853
M	3.60
N	4.34
P	6.38
Q	11.05

R	16.0
T	26.0

Line 68 **Actual Orifice Area** - This information is the actual orifice area and is supplied by the vendor or may be found in the vendor product literature.

Lines 70-73 **Multiple Relief Valves**

Check whether multiple valves better serve the application. ([SAES-J-600](#) Paragraph 8.14).

Check whether a spare valve is needed for maintenance ([SAES-J-600](#) Paragraph 8.15).

Line 70 **Set Pressure of Low Valve** - (No higher than the MAWP) (Exception: Thermal reliefs may be set up to 110% of MAWP per SAES-L-043).

Line 71 **Set Pressure of Intermediate Valve** - (No higher than the 1.05 * MAWP)

Line 72 **Set Pressure of High Valve** - (No higher than the 1.05 * MAWP)

Line 73 **Set Pressure of Spare Valve** - (The Spare Valve is normally set at the set pressure of the low valve.)

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Sheet 3 Note: The Required Orifice Area is to be calculated. Select an appropriate equation. Equation 98 is used for all Gas and Vapor Calculations except for a Fire Case on a Dry Gas Filled Vessel, in which case Equation 101 is used. Equation 99 is used for all steam PZVs and Equation 100 is used for Certified Liquid Service. Certified means that the valve is Code stamped and has liquid trim. See API RP 520 Part I for any further clarifications.

Line 77 Instrument Tag Number - Required on every ISS individual sheet.

Line 78 **Required Orifice Area (A) in Square Inches** - This is the area required to flow the worst case relieving scenario. The value A is determined by the appropriate equation chosen from line 98-101.

Commentary Note:

For lines 77-95, enter data only for the variables that are specific for the sizing equation selected. All other variable may be left blank.

Line 79 **Exposed Surface Area of Vessel (A') in Square Feet** - For Gas Expansion in dry vessels during a fire case only (Line 101). Calculate the entire surface area of the vessel. (No credit given for insulation).

Line 80 **Specific Heat Coefficient (C)** - This factor is used required to calculate the Valve Factor in Line 79. Table 9 in API RP 520 Part I shows this value as a function of the ratio of specific heats $C_p/C_v = k$. The value of C may be calculated directly from the Specific Heat Ratio (k).

$$C = 520 \sqrt{k \left(\frac{2}{k+1} \right)^{\frac{k+1}{k-1}}}$$

Example: For Air $k = 1.40$, $C = 356$

Line 81 **Valve Factor (F')**

$$F' = \frac{0.1406 (T_w - T_1)^{1.25}}{CK_b T_1^{0.6506}}$$

Where: T_w = vessel wall temperature, in (°R) and

T_1 = gas temperature, absolute, in (°R), at the upstream pressure, determined from the following relationship:

$$T_1 = \frac{P_1}{P_\eta} T_\eta$$

Where: P_η = Normal operating gas pressure, in PSIA and

T_η = Normal operating gas temperature, in (°R).

Line 82 **Specific Gravity (G)** - The specific gravity of the liquid at the flowing temperature referred to water = 1.00 at 70 °F. Used for liquid sizing.

Line 83 **Coefficient of Discharge (K_D)**- This is the effective coefficient of discharge when using the API sizing equations. If the Manufacturer's actual Coefficient of Discharge is unknown, then use .975 for gas/vapor sizing calculations or .650 for liquid sizing.

Line 84 **Back Pressure Correction Factor (K_b)** - This is the capacity correction factor due to back pressure. The back pressure correction factor applies to balanced-bellows valves only. K_b values can be determined from Figure 27 of API RP 520 Part I. ($K_b = 1$ for back pressure less than 30% of the set pressure.)

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- Line 86 **Superheated Steam Correction Factor (K_{SH})** - For saturated steam at any pressure, $K_{SH} = 1$. For Superheated steam, K_{SH} values can be determined from Table 10 of API RP 520 Part I.
- Line 87 **Napier Correction Factor (K_N)** = 1 where $P_1 \leq 1515$ PSIA.
 $K_N = (0.1906P_1 - 1000) / (0.2292P_1 - 1061)$, where $P_1 > 1515$ PSIA and ≤ 3215 PSIA.
- Line 88 **Back Pressure Correction Factor (K_W)** - This is for balanced-bellows valves in liquid service with back pressure. For atmospheric back pressure, $K_W = 1$. Conventional valves require no special correction. K_W values can be determined from Figure 31 of API RP 520 Part I.
- Line 89 **Viscosity Correction Factor (K_V)** - This is the correction factor due to viscosity. K_V values can be determined from Figure 32 of API RP 520 Part I.
- Line 90 **Molecular Weight (M)** - This is the molecular weight of the gas or vapor. This value should be obtained from the process data.
- Line 91 **Relieving Pressure (P_1)** - This is the upstream relieving pressure, in PSIA. It consists of the set pressure (P) plus the allowable overpressure plus atmospheric pressure.
- Line 92 **Set Pressure (P)** - See the definition of set pressure.
- Line 93 **Back Pressure (P_b)** - See the definition of back pressure.
- Line 94 **Relieving Temperature (T)** - This is the relieving temperature of the inlet gas or vapor in °R. (Degrees Rankine = Degrees Fahrenheit + 459.67).
- Line 95 **Liquid Flow (Q)** - This is the flow rate at the flowing temperature, in U.S. gallons per minute (GPM).
- Line 96 **Gas/Vapor/Steam Flow (W)** - This is the required flow through the valve, in pounds per hour (LB/HR).
- Line 97 **Compressibility Factor (Z)** - This is the compressibility factor for the deviation of the actual gas from a perfect gas, a ratio evaluated at inlet conditions.
- Lines 98-101 **Area Equations**

Select the appropriate equation. Write the equation vertically in the space provided showing the value for each variable and the resultant

calculated area. For Electronically filled in sheets, it is permissible to show the end calculation result.

4 Responsibilities

4.1 Instrumentation Unit

The Instrumentation Unit is responsible for keeping this document and the ISS Form [8020-611-ENG](#) current and accurate.

4.2 Originating Engineer

It is the responsibility of the Originating Engineer to complete ISS Form [8020-611-ENG](#) for conventional and bellows operated relief valves before the PZV is entered into the Relief Valve Program for testing and inspection.

5 Definition of Terms

Accumulation: the pressure increase in the vessel over the maximum allowable working pressure with the valve, or valves, open and at required relieving capacity; it is expressed as a percentage of Maximum Allowable Working Pressure, or in kPa(ga) or (psig). The permissible accumulation for various conditions is specified in the ASME Codes.

Commentary Note:

Accumulation is the same as overpressure when the PZV is set at the Maximum Allowable Working Pressure of the vessel.

Back Pressure: the pressure on the discharge side of a relief valve. Different types of back pressures are:

- a) **Superimposed Back Pressure:** the pressure on the discharge side of a relief valve, against which the valve must begin to open. It may be constant or variable.
- b) **Built-up Back Pressure:** the pressure on the discharge side of a relief valve developed as a result of flow due to the valve in question relieving into the discharge header system. Where multiple valves relieve under a single contingency, the back pressure increase in the discharge system as a result of all involved valves relieving, determines the built up back pressure.

Built-up Back Pressure is calculated by adding all of the discharge header pressure drops. The pressure losses are the accumulative pressure drops due to friction (as a function of pipe size and length and fluid velocity), entrance and exit losses where they exist, and losses due to valves and fittings. (See Crane "Technical Paper No. 410" Chapter 1 for more details.)

Built-up back pressure may be taken as zero for PZV's that discharge to atmosphere through a full size elbow and short discharge pipe leg.

Balanced Safety Relief Valve: a pressure relief valve which incorporates means of minimizing the effect of back pressure on the operational characteristics (opening pressure, closing pressure, and relieving capacity).

Blowdown: the difference between the set pressure and the resetting pressure of a relief valve, expressed as a percentage of the set pressure or in kPa (psig).

"Cold" Differential Test Pressure: the pressure in kPa (psig) at which a relief valve is adjusted to open on the test stand. This pressure includes the correction for maximum superimposed back pressure (for conventional non-bellows valve only) and/or temperature service conditions.

Conventional Safety Relief Valve: a pressure relief valve which has its spring housing vented to the discharge side of the valve. The operational characteristics (opening pressure, closing pressure, and relieving capacity) are directly affected by changes of the back pressure on the valves.

Design Pressure: the pressure, exclusive of any static heads, used to determine the minimum permissible thickness or physical characteristics of the different parts of the vessel.

Disc: the pressure containing movable element of a pressure relief valve which effects closure.

Lift: the amount the disc rises above the seat in pressure relief valves.

Maximum Allowable Working Pressure (MAWP): the maximum pressure in kPa (psig) permissible at the top of a completed vessel in its operating position for a designated temperature. It is the highest pressure at which a relief valve may be set to begin to open.

Nozzle: a pressure containing element which constitutes the inlet flow passage and includes the fixed portion of the seat closure.

Operating Pressure: the pressure at the top of a pressure vessel at which the vessels normally operates.

Overpressure: the pressure increase over the set pressure of the primary relief valve. It is the same as accumulation when the relief valve is set at the maximum allowable working pressure of the vessel.

Rated Capacity: the percentage of measured flow at an authorized percent overpressure permitted by the applicable code. Rated capacity is generally expressed in

pounds per hour (lbs/hr) for vapors; standard cubic feet per minute (SCFM) for gases; and in gallons per minute (GPM) for liquids.

Relief Valve: an automatic pressure-relieving device actuated by the static pressure upstream of the valve, and which opens in proportion to the increase in pressure above set pressure. It is used primarily for liquid service.

Commentary Note:

For the sake of simplicity all pressure relief devices (valves) referred to in this procedure are called "PZV".

Relieving Pressure: the pressure in the protected vessel with the relieving devices full open. It is the set pressure plus the actual overpressure. Relief valves shall be sized to prevent the relieving pressure from exceeding the Maximum Allowable Working Pressure plus the allowable accumulation.

Safety Relief Valve: an automatic pressure-relieving device suitable for use as either a safety or relief valve. It is used in gas or vapor service or for liquid.

Safety Valve: an automatic pressure relieving device actuated by the static pressure upstream of the valve and characterized by rapid full opening or pop action. It is used for gas or vapor service. In the petroleum industry it is used also for steam and air.

Seat: the pressure containing contact between the fixed and moving portions of the pressure containing elements of a valve.

Set Pressure: the pressure in kPa(ga) (psig) at the inlet of the relief valve at which it is adjusted to open under service conditions. Set pressure shall be expressed in Pa(ga) or (inches of water column) for low pressure and vacuum applications. In liquid service, set pressure is determined by the inlet pressure at which the valve starts to discharge under service conditions. In gas or vapor service, the set pressure is determined by the inlet pressure at which the valve will "pop" under service conditions.

Single Contingency: a single abnormal event causing an emergency.

Single Risk: the equipment affected by a single contingency.

Spring Pressure: the pressure equal to set pressure minus maximum superimposed back pressure for a conventional relief valve. For a balanced bellows valve, the spring pressure equals the set pressure.

Valve Trim: includes the nozzle and disc. Standard trim material is 316 stainless steel.

Revision Summary

31 July, 2002

Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with minor changes.
