85TH MEETING OF THE CALIFORNIA BOILER INSPECTORS ASSOCIATION CONVENTION 2018

“ANTIQUE AND MODERN INSPECTIONS” SAN DIEGO, CALIFORNIA
• What is the history behind the 275 PSI set point allowed by Title 8 prior to adopting NFPA 58 in 1997?

• What are the requirements of NFPA 58 past and present?

• What are the requirements of the ASME code for LP-Gas safety relief valves?
4951. Safety Valves. (a) All vessels and all vaporizers (except motor fuel vaporizers) shall be provided with one or more spring loaded safety valves set to begin to discharge at not more than 125% of the working pressure of the vessel and to full open at 150% of the working pressure of the vessel.

(b) (1) The total free discharge area of any safety valve, on any vessel other than a vaporizer, shall be not less than that computed by the formula: 

\[ a = \frac{0.77A}{P} \]

Where:
- \( a \) = free discharge area, sq. in.
- \( P \) = working pressure plus 15.
- \( A \) = total outside area of tank, sq. ft.

Note.—The free discharge area of a safety valve is equal to the circumference of the seat multiplied by the lift at the discharge pressure, but it is not more than the smallest clear area of the nozzle or the inlet pipe.

Between 1948 – 1958 Title 8 allowed safety relief valves 125% of working pressure of the vessel.
Most LP-Gas tanks built prior to 1949 had a safety factor or design margin of 5:1.
ASME Code U-68 and U-69 Vessels have a MAWP of 200 PSI, built to a factor of safety of 5 and are allowed safety relief valves set at 250 PSI (200 psi x 125%)

<table>
<thead>
<tr>
<th>Type of Vessel</th>
<th>Minimum Safety Relief Valve Setting</th>
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<tbody>
<tr>
<td>ASME Code, Paragraphs U-68, U-69 1949 Edition; and those tanks built to earlier or later standards with a factor of safety of 5 or more</td>
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<td>125%</td>
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<td>ASME Code, Paragraphs U-200, U-201, 1949 and earlier Editions</td>
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<td>DOT Cylinders</td>
<td>As required by Bureau of Explosives and DOT Regulations</td>
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ASME Code U-200 and U-201 1949 and earlier along with ASME Code 1950 and later, Vessels have a MAWP of 250 PSI, built to a factor of safety of 4 and were allowed safety relief valves set at 275 PSI (250 psi x 110%) from 1958 – 1997.

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Circular Letter from 1957 explained the change in safety factors or design margins. The new maximum relief valve setting was to be 100% of maximum working pressure of the vessel.

How did we end up with 110% of maximum in the 1958 Edition of Title 8?
The 1943 Edition of the ASME Code had limited information regarding relief valves. It stated that you need one to insure safe operation. The Safety Relief valve shall have the capacity to prevent the pressure from rising more than 10% above the MAWP.
The 1963 Edition of NFPA 58 shows the Maximum safety relief valve set point of 100% MAWP. There is a note: “A plus tolerance of 10% is permitted”
Does 100% + 10% (plus tolerance) = 110% Maximum Relief Valve Setting?

Does 250 psi + 10% = 275 psi Safety Relief Valve Set Point?
ASME requirements for LP-Gas relief valves

UG-129 MARKING

(a)(5) certified capacity (as applicable):

(-c) SCFM (standard cubic feet per minute at 60°F and 14.7 psia), of air at an overpressure of 10% or 3 psi (kPa), whichever is greater. Valves that are capacity certified in accordance with UG-131(c)(2) shall be marked "at 20% overpressure."

UG-131 CERTIFICATION OF CAPACITY OF PRESSURE RELIEF DEVICES

(c)(2) Capacity certification tests of pressure relief devices for use in accordance with UG-125(c)(3) may be conducted at a pressure not to exceed 120% of the stamped set pressure of the device.

UG-134 PRESSURE SETTING AND PERFORMANCE REQUIREMENTS

(d)(2) The set pressure tolerance of pressure relief valves which comply with UG-125(c)(3) shall be within -0%, +10%.
The maximum set point of relief valves for 1949 Edition of the ASME Code U-200 and U-201 tanks and all ASME Codes later than 1949 shall be a maximum of 100% of the tank's Maximum Allowable Working Pressure (MAWP). The 10% plus tolerance is determined by the relief valve manufacturer based on the opening and flow characteristics of their valve. The set pressure marked on the valve shall be the same as the MAWP per ASME UG-125.

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<td>All ASME Codes prior to the 1949 edition, and the 1949 edition, paragraphs U-68 and U-69</td>
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*Manufacturers of pressure relief valves are allowed a plus tolerance not exceeding 10 percent of the set pressure marked on the valve.
ASME allows a plus tolerance of up to +10% over the set point marked on the valve. The set point marked on the valve shall not exceed the maximum allowable working pressure of the vessel. 2017 ASME Code Sec. VIII Div. 1, UG-125(-b) and UG-134(d)(2)
Sherwood – Dual Stamped LP-Gas safety relief valve. When inspecting tanks with these valves, record the set point as 250 psi.
2015 Marshall Excelsior Company relief valve set at 275 psi these valve shall be removed from service.
Marshall Excelsior Company – SCFM valve capacity is missing.
Fisher Controls markets safety relief valves in 3 set points, 250, 265 and 275. The set point marked on the valve shall be the same as the MAWP of the tank.
Propane transport tank with MAWP of 265. Safety relief valve can be 265 as long as the manufacturer of the valve recommends it for LP-Gas.
GISO 3328(B) Machinery and equipment in service shall be inspected and maintained as recommended by the manufacturer where such recommendations are available.

GISO 3328(C) Machinery and equipment with defective parts which create a hazard shall not be used.
The state is still allowing relief valves to stay in service up to 30 years provided they are properly maintained and are in good condition. Relief valve manufacturers recommend either 10 or 15 year replacement depending on manufacturer.
1998 NFPA 58 3-2.6.3(a) Rain caps are supposed prevent water or extraneous matter from entering the relief restricting flow or making it inoperative.
1998 NFPA 58 3-2.6.3(a)(b)(e)(f)
Relief valve rain caps are required
Current NFPA requires 7 foot stacks
Discharge terminals located to provide protection against physical damage
Discharge piping sized to provide proper flow rate
Discharge piping shall be metallic and have a melting point over 1500 deg F
In both pictures the outlet of the relief valves is restricted.
3” PVC pipe painted with galvanized paint was going to be installed on bulk LP-Gas tank. Discharge piping shall be metallic and have a melting point over 1500 deg F. 3-2.6.3(e)
1998 NFPA 58 3-2.6.3 any gas released vented away from the container upward and unobstructed to the open air
• Safety relief valve set point marked on valve shall not exceed the Maximum Allowable Working Pressure (MAWP) of the vessel.

• Dual stamped (250 psi / 275 psi) LP-Gas relief valves are acceptable for use. 250psi set point would be recorded on the inspection report.

• Safety relief valves set at 265 psi can be used on bobtails and transport tanks having a MAWP of 265.

• Safety relief valves set at 275 psi are not acceptable for use in California.
Safety Relief valves play an important role in protecting pressure vessels and human lives. It is essential they have the correct set point, relief capacity and are properly installed, inspected and maintained.
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