

(f) The relieving capacity of a pressure relief device for compressible fluids may be prorated at any relieving pressure greater than $1.10p$, as permitted under UG-153, by applying a multiplier to the official relieving capacity as follows:

(U.S. Customary Units)

$$\frac{P + 14.7}{1.10p + 14.7}$$

(SI Units)

$$\frac{P + 101}{1.10p + 101}$$

where

P = relieving pressure, psig (kPa gage)

p = set pressure, psig (kPa gage)

For steam pressures above 1,500 psig (10 MPa gage), the above multiplier is not applicable. For steam valves with relieving pressures greater than 1,500 psig (10 MPa gage) and less than or equal to 3,200 psig (22.1 MPa gage), the capacity at relieving pressures greater than $1.10p$ shall be determined using the equation for steam and the correction factor for high pressure steam in Section XIII, 9.7.6.4 with the permitted absolute relieving pressure and the coefficient K for that valve design.

(23) UG-153 OVERPRESSURE LIMITS

(a) Other than unfired steam boilers, when a pressure relief device is provided, it shall prevent the pressure from rising more than 10% or 3 psi (20 kPa), whichever is greater, above the maximum allowable working pressure, except as permitted in (1) and (2) and UG-154(c). (See UG-155 for pressure settings.)

(1) When multiple pressure relief devices are provided and set in accordance with UG-155(a), they shall prevent the pressure from rising more than 16% or 4 psi (30 kPa), whichever is greater, above the maximum allowable working pressure.

(2) When a pressure vessel can be exposed to fire or other unexpected sources of external heat, the pressure relief device(s) shall be capable of preventing the pressure from rising more than 21% above the maximum allowable working pressure. Supplemental pressure relief devices shall be installed to protect against this source of excessive pressure if the pressure relief devices used to satisfy the capacity requirements of (a) and (1) above have insufficient capacity to provide the required protection. See Nonmandatory Appendix MM, M-13 for cases where the metal temperature due to fire or other sources of external heat can cause vessel failure prior to reaching the MAWP.

(3) Pressure relief devices, intended primarily for protection against exposure of a pressure vessel to fire or other unexpected sources of external heat installed

on vessels having no permanent supply connection and used for storage at ambient temperatures of nonrefrigerated liquefied compressed gases,⁴⁰ are excluded from the requirements of (1) and (2), provided

(-a) the pressure relief devices are capable of preventing the pressure from rising more than 20% above the maximum allowable working pressure of the vessels

(-b) the set pressure marked on these devices do not exceed the maximum allowable working pressure of the vessels

(-c) the vessels have sufficient ullage to avoid a liquid-full condition

(-d) the maximum allowable working pressure of the vessels on which these pressure relief devices are installed is greater than the vapor pressure of the stored liquefied compressed gas at the maximum anticipated temperature⁴¹ that the gas will reach under atmospheric conditions

(-e) pressure relief valves used to satisfy these provisions also comply with the requirements of UG-155(e); Section XIII, 3.9(e)(5)(-a); and Section XIII, Table 9.7.2-1 for fire.

(b) For vessels that use overpressure protection by system design, the overpressure limits shall be per UG-154(e).

(c) The aggregate capacity of the open flow paths, or vents, shall be sufficient to prevent overpressure in excess of those specified in (a). When the MAWP is 15 psi (105 kPa) or less, in no case shall the pressure be allowed to rise more than 21% above the MAWP.

UG-154 PERMITTED PRESSURE RELIEF DEVICES AND METHODS

Protection against overpressure shall be provided by pressure relief devices, open flow paths, or system design or a combination thereof in accordance with this paragraph.

(a) Pressure Relief Valves

(1) Pressure relief valves bearing the ASME Certification Mark with the UV Designator in accordance with Section XIII may be used. Pressure relief valves shall be of the direct spring-loaded or pilot-operated type.

(2) Pressure relief valves certified for a steam discharging capacity under the provisions of Section I and bearing the ASME Certification Mark with the V Designator for safety valves may be used on pressure vessels constructed to this Division. The rated capacity in terms of other fluids shall be determined by the method of conversion given in Section XIII, Mandatory Appendix IV. (See Section XIII, 9.2.3.)

(b) Nonreclosing Pressure Relief Devices

(1) Rupture disks bearing the ASME Certification Mark with the UD Designator in accordance with Section XIII may be used as the sole pressure-relieving device for overpressure protection.

M