PART PVG

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PART PVG
REQUIREMENTS FOR ORGANIC FLUID VAPORIZERS

GENERAL

PVG-1 GENERAL

The rules in Part PVG are applicable to organic fluid vaporizers and parts thereof and shall be used in conjunction with the general requirements in Part PG as well as with the special requirements in the applicable Parts of this Section that apply to the method of fabrication used.

MATERIALS

PVG-5 GENERAL

PVG-5.1 Materials used in the construction of pressure parts for organic fluid vaporizers shall conform to one of the specifications in Section II and shall be limited to those for which allowable stress values are given in Tables 1A and 1B of Section II, Part D. Safety valve materials shall conform to PG-73.2.3.

PVG-5.2 The requirements for materials given in Part PG shall apply in all respects to organic fluid vaporizers.

DESIGN

PVG-8 GENERAL

The rules in the following paragraphs apply specifically to the design of organic fluid vaporizers and parts thereof and shall be used in conjunction with the general requirements for design in Part PG as well as with the specific requirements for design in the applicable Parts of this Section that apply to the method of fabrication used.

PVG-9 GENERAL REQUIREMENTS

The Manufacturer shall be responsible for providing in the design the limited heat absorption rates, proper furnace proportions, etc., which will permit satisfactory and safe operation of the vaporizers under all conditions of operation.

PVG-10 GAGE GLASSES

Gage glasses shall be of the flat glass type with forged steel frames. Gage cocks shall not be used.

PVG-11 DRAIN VALVES

Suitable drain valves of the globe or angle type may be used in lieu of the blowoff valve required in ASME B31.1.

PVG-12 SAFETY VALVES

PVG-12.1 Safety valves shall be of a totally enclosed type so designed that vapors escaping beyond the valve seat shall not discharge into the atmosphere, except through an escape pipe that will carry such vapors to a safe point of discharge outside of the building. A suitable condenser that will condense all the vapors discharged from the safety valve may be used in lieu of piping the vapors to the atmosphere. The safety valve shall not have a lifting lever. The vaporizer shall be designed in accordance with the rules in this Code for a working pressure of at least 40 psi (256 kPa) above the operating pressure at which it will be used. Valve body drains are not mandatory.

PVG-12.2 Safety valves shall be disconnected from the vaporizer at least once yearly, when they shall be inspected, repaired if necessary, tested, and then replaced on the vaporizer.

PVG-12.3 In order to minimize the loss by leakage of material through the safety valve, a rupture disk may be installed between the safety valve and the vaporizer provided the following requirements are met.

PVG-12.3.1 The cross-sectional area of the connection to a vaporizer shall be not less than the required relief area of the rupture disk.

PVG-12.3.2 Every rupture disk shall have a specified bursting pressure at a specified temperature, shall be marked with a lot number, and shall be guaranteed by its manufacturer to burst within 5% (plus or minus) of its specified bursting pressure.

PVG-12.3.3 The specified bursting pressure at the coincident specified temperature shall be determined by bursting two or more specimens from a lot of the same material and of the same size as those to be used. The tests shall be made in a holder of the same form and pressure area dimensions as that with which the disk is to be used.

PVG-12.3.4 A rupture disk may be installed between a safety valve and the vaporizer provided:

PVG-12.3.4.1 The maximum pressure of the range for which the disk is designed to rupture does not exceed the opening pressure for which the safety valve is set or the maximum allowable working pressure of the vessel.

PVG-12.3.4.2 The opening provided through the rupture disk, after breakage, is sufficient to permit a flow equal to the capacity of the attached valve and there is no chance of interference with the proper functioning of the valve; but in no case shall this area be less than the inlet area of the valve.

PVG-12.3.4.3 The space between a rupture disk and the valve should be provided with a pressure gage, try cock, free vent, or a suitable telltale indicator. This arrangement permits the detection of disk rupture or leakage.[1]

PVG-12.4 Safety valve discharge capacity shall be determined from the formula:

Customary Units

$$W = CKAP\sqrt{M/T}$$

SI Units

$$W = 0.051CKAP\sqrt{M/T}$$

[1] Users are warned that a rupture disk will not burst at its designed pressure if back pressure builds up in the space between the disk and the safety valve, which will occur should leakage develop in the rupture disk due to corrosion or other cause.

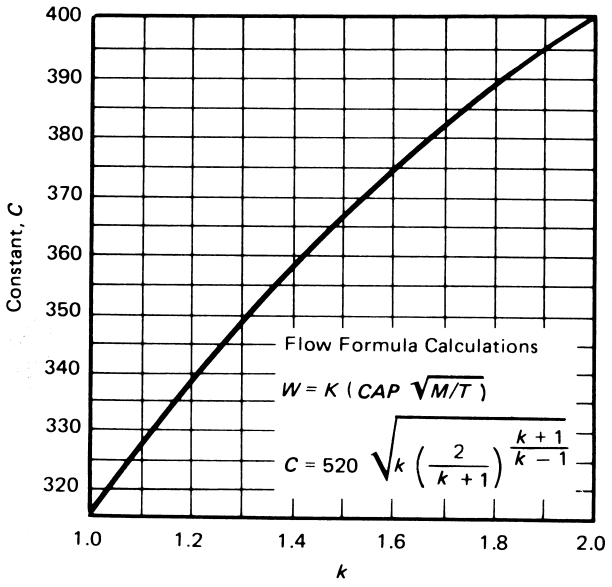


FIG. PVG-12 CONSTANT *C* FOR VAPOR RELATED TO RATIO OF SPECIFIC HEATS ($k = c_p/c_v$)

where

W = flow of vapor, lb/hr (kg/hr)
C = constant for vapor that is a function of the ratio of Specific Heats $k = c_p/c_v$ (see Fig. PVG-12) Note: Where k is not known, $k = 1.001$.
K = coefficient of discharge for the design
A = discharge area of safety valve, sq in. (mm^2)
P = (set pressure × 1.03) + Atmosphere Pressure, psia (kPa.abs)
M = molecular weight
T = absolute temperature at inlet, °F + 460 (°C + 273)

PVG-12.5 Safety valves for organic fluid vaporizers shall be tested and certified under PG-69, and they shall be stamped with the rated relieving capacity in pounds per hour at coincident temperature as determined in PVG-12.4. The fluid identification shall be stamped on the nameplate.

PVG-12.6 The required minimum safety valve relieving capacity shall be determined from the formula:

$$W = \frac{C \times H \times 0.75}{h}$$

where

h = latent heat of heat transfer fluid at relieving pressure, Btu/lb (J/kg)
W = weight of organic fluid vapor generated per hour, lb (kg)

C = maximum total weight or volume of fuel burned per hour, lb (kg) or cu ft (m^3)

H = heat of combustion of fuel, Btu/lb (J/kg) or Btu/cu ft (J/m^3) (see A-17)

The sum of the safety valve capacities marked on the valves shall be equal to or greater than W.