B16 Case 23

Alternate rules for bonnet bolting materials with allowable stresses ≥ 25,000 psi (172.4 MPa) in ASME B16.34 Valve Construction

Inquiry: May bolting materials listed in ASME B16.34 with an allowable stress ≥ 25,000 psi (172.4 MPa) use alternate rules for calculating bolt area on bolted bonnets where no stem loading is applied to the bonnet? (ex. ball valve or check valve bonnets)

Reply: It is the opinion of the committee, yes provided the following additional requirements are met:

(a) The construction rules of B16.34 apply except as modified by this B16 Case.
(b) The bolting material shall meet the valve joint rules of Para. 6.4, ASME B16.34 except that bolting with an allowable stress greater than or equal to 25,000 psi (172.4 MPa) the following equations maybe used:

Bolted Bonnet or Cover Joints.

\[ P_c \times \frac{A_g}{A_b} \leq K_1 S_a \leq 11250 \]

where

- \( A_b \) = total effective bolt tensile stress area
- \( A_g \) = area bounded by the effective outside periphery of a gasket or O-ring or other seal-effective periphery, except that in the case of a ring-joint the bounded area is defined by the pitch diameter of the ring
- \( K_1 = 65.26/\text{MPa when } S_a \text{ is expressed in MPa units } (K_1 = 0.45/\text{psi when } S_a \text{ is expressed in psi units})\)
- \( P_c \) = pressure rating class designation (Class 600, 1500 = 600, 1500, etc.)
- \( S_a \) = allowable bolt stress at 38°C (100°F), MPa (psi). For bolting with allowable stress > 25,000 psi, use 172.4 MPa (25,000 psi).

(c) The bolting material strength shall equal or exceed the pressure boundary material (body, bonnet, cover, parts) strength, and have a comparable coefficient of thermal expansion.
(d) The selected bolting shall not place a temperature limit on the pressure-temperature rating.
(e) Repair welding of bolting materials is not permitted.
(f) Nuts may be of the same material or may be of a compatible material of ASTM A194 (i.e., chemical composition and material strength).
(g) Valves constructed under this B16 Case shall have the Case Number shown on the valve nameplate.

These algebraic expressions require that a consistent set of units be used.