

Approval Date: December 11, 2017

Code Cases will remain available for use until annulled by the applicable Standards Committee.

Case 2901
Evaluation of External Loads on Welding Neck Flanges
Covered by Section VIII, Division 1, UG-44(b), (i), and (j);
or Section VIII, Division 2, 4.1.11.1(a) and (g), and
4.1.11.3
Section VIII, Division 1; Section VIII, Division 2

Inquiry: Under what requirements may external loads (forces and bending moments) be evaluated for welding neck flanges chosen in accordance with Section VIII, Division 1, UG-44(b), (i), and (j); or Section VIII, Division 2, 4.1.11.1(a) and (g), and 4.1.11.3?

Reply: It is the opinion of the Committee that external loads (forces and bending moments) may be evaluated for welding neck flanges chosen in accordance with Section VIII, Division 1, UG-44(b), (i), and (j); or Section VIII, Division 2, 4.1.11.1 (a) and (g), and 4.1.11.3, provided the following requirements are met:

(a) The actual assembly bolt load (see Section VIII, Division 1, Mandatory Appendix S and Section VIII, Division 2, 4.11.16) shall comply with ASME PCC-1, Appendix O.

(b) The bolt material is SA-193, B8, Class 2 or has a higher allowable stress at the specified bolt size.

(c) The combination of flange design pressure with external moment and external axial tensile force shall satisfy the following equation, and the units of the variables shall be consistent with the pressure rating.

$$16M_E + 4F_E G \leq \pi G^3 \left[(P_R - P_D) + F_M P_R \right]$$

(d) This Case number shall be recorded on the Manufacturer's Data Report (Section VIII, Division 1, UG-120) or Manufacturer's Design Report (Section VIII, Division 2, 2.3.3).

(e) Nomenclature

F_E = external tensile axial force

F_M = moment factor in accordance with [Table 1](#)

G = gasket reaction diameter (see Section VIII, Division 1, Mandatory Appendix 2, 2-3 and Section VIII, Division 2, 4.16.12)

M_E = external moment

P_D = flange design pressure at design temperature

P_R = flange pressure rating at design temperature

The Committee's function is to establish rules of safety, relating only to pressure integrity, governing the construction of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations or other relevant documents.

Table 1
Moment Factor, F_M

ASME Standard	Size Range, NPS	Flange Pressure Class					
		150	300	600	900	1500	2500
B16.5	≤ 12	1.2	0.5	0.5	0.5	0.5	0.5
	> 12 and ≤ 24	1.2	0.5	0.5	0.3	0.3	...
B16.47, Series A	All	0.6	0.1	0.1	0.1
B16.47, Series B	< 48	[Note (2)]	[Note (2)]	0.13	0.13
	≥ 48	0.1	[Note (3)]

GENERAL NOTES:

- (a) The combinations of size ranges and flange pressure classes for which this table gives no moment factor value are outside the scope of this Case.
- (b) The designer should consider reducing the allowable factor if the loading is primarily sustained in nature, and the bolted flange joint operates at a temperature where gasket creep/relaxation will be significant [typically above 450°F (232°C) metal temperature].

NOTES:

- (1) The acceptable edition of the ASME Standard shall be as shown in Table U-3 for Section VIII, Division 1 construction and Table 1.1 for Section VIII, Division 2 construction.
- (2) The following value for F_M applies:

$$F_M = 0.1 + \frac{(48 - \text{NPS})}{56}$$

- (3) $F_M = 0.1$ except NPS 60, Class 300, in which case $F_M = 0.03$.