

CASE 2901

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

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

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 UG-44(b), (i), and (j) of Section VIII, Division 1, or 4.1.11.1 (a) and (g), and 4.1.11.3 of Section VIII, Division 2, using the following requirements

- (a) The actual assembly bolt load (see Appendix S of Section VIII, Division 1 and 4.11.16 of Section VIII, Division 2) shall comply with ASME PCC-1, Appendix O.
- (b) The bolt material is SA-193 B8 Cl. 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 eq. (1)

$$16M_E + 4F_E G \leq \pi G^3 (P_R - P_D) + F_M P_R \quad (1)$$

- (d) The units of the variables in Equation (1) shall be consistent with the pressure rating
- (e) This Code Case shall be recorded on the Manufacturer's Data Report (UG-120 of Section VIII, Division 1) or Manufacturer's Design Report (2.3.3 of Section VIII, Division 2)
- (f) Nomenclature

M_E = External moment

F_E = External tensile axial force

G = Gasket reaction diameter (see 2-3 of Section VIII, Division 1 and 4.16.12 of Section VIII, Division 2)

P_R = Flange pressure rating at design temperature

P_D = Flange design pressure at design temperature

F_M = Moment factor, in accordance with Table 1

TABLE 1
MOMENT FACTOR, F_M

Standard (<i>Note 5</i>)	Size Range	Flange Pressure Class					
		150	300	600	900	1500	2500
ASME B16.5	\leq NPS 12	1.2	0.5	0.5	0.5	0.5	0.5
ASME B16.5	$>$ NPS 12 and \leq NPS 24	1.2	0.5	0.5	0.3	0.3	-
ASME B16.47 Series A	ALL	0.6	0.1	0.1	0.1	-	-
ASME B16.47 Series B	$<$ NPS 48	<i>Note 1</i>	<i>Note 1</i>	0.13	0.13	-	-
ASME B16.47 Series B	\geq NPS 48	0.1	<i>Note 2</i>	-	-	-	-

Notes:

1. $F_M = 0.1 + (48 - NPS)/56$
2. $F_M = 0.1$ except NPS 60, Class 300, in which case $F_M = 0.03$
3. The combinations of Size Ranges and Flange Pressure Classes for which Table 1 gives no moment factor value, are outside the scope of this Code Case.
4. 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).
5. The acceptable edition of the 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.