Design Input Requirements

Size	Material	S_{ab}	Pressure	Temperature	Cycles
3" Nps	ASTM A240-321	20000	0 Psig	0°F	1000

Axial	Lateral	Angular	Bellows PN	Post-form Anneal
+0"/-0"	+0"/-0"	+0°/-0°	3-15-1-SR-HF-B	False

CALCULATIONS IN ACCORDANCE WITH STANDARDS OF THE EXPANSION JOINT MANUFACTURERS ASSOCIATION, INC. TENTH EDITION

4.13.1 DESIGN EQUATIONS FOR UNREINFORCED BELLOWS

Equation	Relevant Values	Result	Limit
$S_1 = \frac{P\left(D_b + nt\right)^2 L_t E_b k}{2\left(ntE_b L_t\left(D_b + nt\right) + t_c k E_c L_c D_c\right)}$	$S_1 = \frac{0(3.5 + 1 \cdot 0.036)^2 \cdot 1.25 \cdot 28588234 \cdot 1}{2(1 \cdot 0.036 \cdot 28588234 \cdot 1.25(3.5 + 1 \cdot 0.036) + 0 \cdot 1 \cdot 0 \cdot 0 \cdot 0}$	$S_1 = 0$	407 Psig
$S_2 = \frac{PD_m K_r q}{2A_c}$	$S_2 = \frac{0 \cdot 5 \cdot 1 \cdot 1.25}{2 \cdot 0.1097}$	$S_2 = 0$	702 Psig
$S_3 = \frac{Pw}{2nt_p}$	$S_3 = \frac{0 \cdot 1.464}{2 \cdot 1 \cdot 0.0301}$	$S_3 = 0$	109 Psig
$S_4 = \frac{P}{2n}\left(\frac{w}{t_p}\right)^2 C_p$	$S_4 = \frac{0}{2 \cdot 1}\left(\frac{1.464}{0.0301}\right)^2 \cdot 0.4434$	$S_4 = 0$	109 Psig
$S_5 = \frac{E_b t_p^2 e}{2w^3 C_f}$	$S_5 = \frac{28299999 \cdot 0.0301^2 \cdot 0}{2 \cdot 1.464^3 \cdot 0.7863}$	$S_5 = 0$	
$S_6 = \frac{5E_b t_p e}{3w^2 C_d}$	$S_6 = \frac{5 \cdot 28299999 \cdot 0.0301 \cdot 0}{3 \cdot 1.464^2 \cdot 1.2438}$	$S_6 = 0$	
$S_t = 0.7\left(S_3 + S_4\right) + \left(S_5 + S_6\right)$	$S_t = 0.7(0 + 0) + (0 + 0)$	$S_t = 0$	
$P_{sc} = \frac{0.34\pi C_\theta f_{iu}}{N^2 q}$	$P_{sc} = \frac{0.34 \cdot \pi \cdot 1 \cdot 2269}{1^2 \cdot 1.25}$	$P_{sc} = 2299$	
$P_{si} = \frac{1.3A_c S_y}{K_r D_m q\sqrt{\alpha}}$	$P_{si} = \frac{1.3 \cdot 0.1097 \cdot 67937}{1 \cdot 5 \cdot 1.25\sqrt{150.7571}}$	$P_{si} = 126$	
$N_c = \left(\frac{c}{\frac{S_t}{f_c} - b}\right)^{3.4}$	$N_c = \left(\frac{1860000}{\frac{0}{1} - 54000}\right)^{3.4}$	$N_c = 10000000$	
$f_{iu} = 1.7\frac{D_m E_b t_p^3 n}{w^3 C_f}$	$f_{iu} = 1.7 \cdot \frac{5 \cdot 28588234 \cdot 0.0301^3 \cdot 1}{1.464^3 \cdot 0.7863}$	$f_{iu} = 2269$ lbf/in	

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