

Table P15-2 Data for Problems 15-23 through 15-25

Use Only Data Relevant to the Particular Problem—Lengths in mm, Forces in N

Row	l	a	t	h	F	OD	ID	E
a	100	400	10	20	50	10	4	steel
b	70	200	6	80	85	12	6	steel
c	300	100	4	50	95	15	7	steel
d	800	500	6	65	250	25	15	alum
e	85	350	5	96	900	40	30	alum
f	50	180	4	45	950	30	25	alum
g	160	280	5	25	850	45	40	steel
h	200	100	2	10	800	40	35	steel
i	400	150	3	50	950	45	38	steel
j	200	100	3	10	600	30	20	alum
k	120	180	3	70	880	60	55	alum
l	150	250	8	90	750	45	30	alum
m	70	100	6	80	500	20	12	steel
n	85	150	7	60	820	25	15	steel

to maximum. The tank diameter is 0.5 m and its length is 1 m. The hemispherical ends are attached by some number of bolts through mating flanges on each part of the tank. A 0.5-mm-thick, compressed asbestos, unconfined gasket is used between the 10-mm-thick steel flanges. Determine a suitable number, class, preload for, and size of bolts to fasten the ends to the tank. Specify the bolt circle and outside diameter of the flange needed to prevent leakage. A minimum safety factor of 2 is desired against leakage and a safety factor of 1.5 against bolt failure for infinite life.[‡]

- 15-27** Repeat Problem 15-26 using a confined O-ring gasket.[‡]
- 15-28 Calculate the proof load (load that causes a tensile stress equal to the proof strength) for 1/2-13 UNC bolts in each SAE grade listed in Table 15-6.
- 15-29 Calculate the proof load (load that causes a tensile stress equal to the proof strength) for M20 x 2.50 bolts in each class listed in Table 15-7.
- 15-30 Determine the joint stiffness constant for the bolt and members in Problem 15-7.[‡]
- 15-31 Determine the joint stiffness constant for the bolt and members in Problem 15-8.[‡]
- 15-32 Determine the joint stiffness constant for the bolt and members in Problem 15-9.[‡]
- 15-33 Determine the joint stiffness constant for the bolt and members in Problem 15-10.[‡]
- 15-34 Figure P15-3 shows a bolted and doweled joint eccentrically loaded in shear. The shear loads are taken by the dowel pins, the number and size of which are given in Table P15-3. Though the figure shows 5 dowel pins, that is not the case for every row in the table. For $a = 4$ in, $b = 4$ in, $l = 10$ in, $P = 2500$ lb, and the data in the row(s) assigned from Table P15-3, find the magnitude and direction of the total shear force acting on each dowel.
- 15-35 Figure P15-3 shows a bolted and doweled joint eccentrically loaded in shear. The shear loads are taken by the dowel pins, the number and size of which are given in Table P15-3. Though the figure shows 5 dowel pins, that is not the case for every row in the

[†] Problem numbers in *italics* are design problems. Problem numbers in **boldface** are extended from similar problems in earlier chapters with the same dash number.

[‡] For these problems, assume that the nut and washer, together, have a thickness equal to the bolt diameter, and assume that bolts are available in length increments of either 0.25 in or 5 mm.