TABLE 14. STRESSES AND DEFLECTIONS IN A RING SEGMENT, $k_2 = 2.0$, $\alpha = 60°$, $\nu = 0.3$

r/r_1	σ_r/p_1	σ_θ/p_1	$\frac{Eu}{rp_1}$ at $\theta = 0°$	$\frac{Ev}{rp_1}$ at $\theta = 30°$
1.0	-1.0000	0.0394	0.6324	-0.1301
1.1	-0.9068	0.0123	0.4877	-0.0853
1.2	-0.8310	-0.0033	0.3747	-0.0480
1.3	-0.7676	-0.0112	0.2846	-0.0164
1.4	-0.7137	-0.0137	0.2117	0.0107
1.5	-0.6670	-0.0126	0.1519	0.0341
1.6	-0.6260	-0.0089	0.1022	0.0547
1.7	-0.5896	-0.0033	0.0606	0.0728
1.8	-0.5568	0.0035	0.0254	0.0890
1.9	-0.5271	0.0113	-0.0046	0.1034
2.0	-0.5000	0.0197	-0.0303	0.1163

Appreciable bending, displacement v, is also noted. The bending increases with segment size and angle α as shown in Table 15. This bending would tend to cause the segments to dig into the liner as shown in Figure 30(a). Therefore, it is recommended that segments be designed with radii larger than the radii of mating cylinders in order to compensate for the change in radii due to bending. This is illustrated in Figure 30(b).

Note that the deflection u in Table 14 can have an arbitrary translational component; i.e., the segment is free to move radially a constant amount. In calculating interferences, the difference in deflection $u(r_1) - u(r_2)$ at $\theta = 0°$ is used and the constant amount drops out.

ELASTICITY SOLUTION FOR A PIN SEGMENT

A pin segment is shown in Figure 31. Its geometry is defined by the radii r_1 and r_2 and the angle α. r_2 is taken to the inside of the pin holes as indicated. The loading of the pin segment is more complicated than that of the ring segment as shown in Figure 32. A constant pressure p_1 is assumed to act at the inside. A variable pressure is assumed to act at the outside, i.e.,

$$\sigma_r = -p_1, \text{ at } r_1$$
$$\sigma_r = -p_2 (1 + \cos m\theta), \text{ at } r_2 \qquad \text{(A.7a, b)}$$

In addition, a shear acts at r_2:

$$\tau_{r\theta} = -\tau \sin m\theta, \text{ at } r_2 \qquad \text{(A.7c)}$$

TABLE 15. DEFLECTIONS IN RING SEGMENTS, $\nu = 0.3$

(a) $\alpha = 60°$

k_2	$\frac{Eu}{rp_1}$ at $\theta = 0°$, $r = r_1$	$\frac{Eu}{rp_1}$ at $\theta = 0°$, $r = r_2$	$\frac{Ev}{rp_1}$ at $\theta = \alpha$, $r = r_1$	$\frac{Ev}{rp_1}$ at $\theta = \alpha$, $r = r_2$
1.1	0.3463	0.2291	-0.0008	0.0447
1.2	0.3899	0.1730	-0.0221	0.0612
1.3	0.4287	0.1494	-0.0408	0.0652
1.4	0.4642	0.1153	-0.0576	0.0743
1.5	0.4970	0.0611	-0.0726	0.0931
2.0	0.6324	-0.0303	-0.1301	0.1163
3.0	0.8251	-0.0905	-0.2013	0.1243

(b) $k_2 = 2.0$

α	$\frac{Eu}{rp_1}$ at $\theta = 0°$, $r = r_1$	$\frac{Eu}{rp_1}$ at $\theta = 0°$, $r = r_2$	$\frac{Ev}{rp_1}$ at $\theta = \alpha/2$, $r = r_1$	$\frac{Ev}{rp_1}$ at $\theta = \alpha/2$, $r = r_2$
45°	0.6324	-0.0303	-0.1052	0.0835
60°	0.6324	-0.0303	-0.1301	0.1163
90°	0.6324	-0.0303	-0.1529	0.1957