

$k_2$  for large  $K'$  as shown in Figure 55.  $p/\sigma_3$  continues to increase with  $k_2$  as shown in Figure 56. Thus, both  $p/\sigma_1$  and  $p/\sigma_3$  increase with large  $K'$  for  $k_2 = 2.0$  and  $k_1 = 1.5$ . For values of  $k_2$  between 2.0 and 4.0, however, computer calculations show that  $p/\sigma_1$  and  $p/\sigma_3$  first continue to increase and then decrease.

The pressure-to-strength ratios can also be increased by increasing the support pressure  $p_3$ . This is shown in Figure 57. With the high ratios shown, it is theoretically possible to have bore pressures as high as 1,000,000 psi in ring-fluid-segment container. However, practicable limitations regarding excessive interference and size requirements, which are discussed later, considerably reduce the pressure capability of this design.

The interferences and residual pressures for outer and inner parts of the ring-fluid-segment container can be calculated using the analysis derived previously for the multiring container and the ring-segment container, respectively.

### Pin-Segment Container

The analysis of the pin-segment container, shown in Figure 39d, also assumes a high-strength liner. It is also assumed that any manufactured interference is taken up during assembly by slack between pins and holes. Therefore, the residual pressure,  $q_1$ , between liner and segments is zero at room temperature and nonzero at temperature only if the coefficient of thermal expansion of the liner,  $\alpha_1$ , is greater than that of the segments,  $\alpha_2$ . In this analysis, it is assumed that  $\alpha_1 \geq \alpha_2$ .

The following radial deformation equation must be satisfied:

$$u_1(r_1) + \alpha_1 \Delta T r_1 = u_2(r_1) + \alpha_2 \Delta T r_2 \quad (64)$$

where

$u_1(r_1)$  = the radial deformation of the liner at  $r_1$  due to  $p$  at  $r_0$  and  $p_1$  at  $r_1$  when  $p \neq 0$ , and due to  $q_1$  at  $r_1$  when  $p = 0$

$u_2(r_1)$  = the radial deformation of the segments at  $r_1$  due to  $p_1$  or  $q_1$  at  $r_1$  and the pin loading at  $r_2$ .

Substituting into Equation (64), Equations (14a) and (23a) for  $u_1$  and  $u_2$ , and solving for  $p_1$ , one gets

$$p_1 = \frac{1}{g_2} \left[ \frac{2p}{k_1^{2-1}} + E_1 \Delta T (\alpha_1 - k_2 \alpha_2) \right] \quad (65)$$

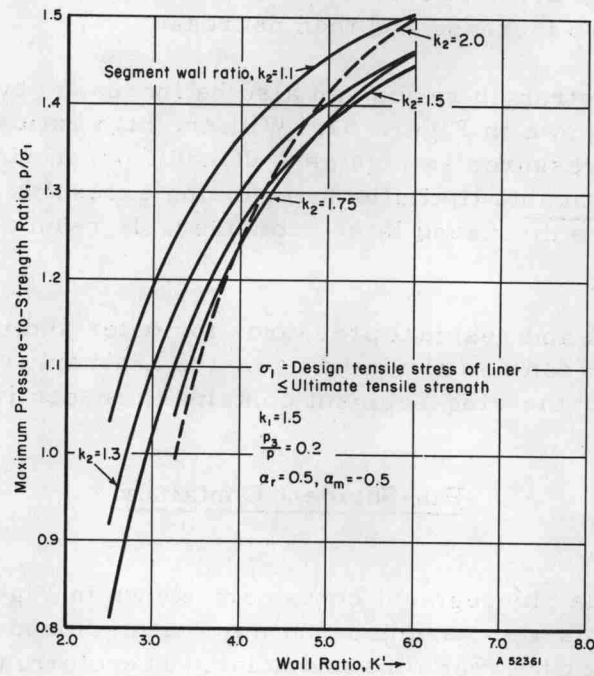


FIGURE 55. EFFECT OF SEGMENT SIZE ON THE PRESSURE-TO-STRENGTH RATIO,  $p/\sigma_1$ , FOR THE RING-FLUID-SEGMENT CONTAINER

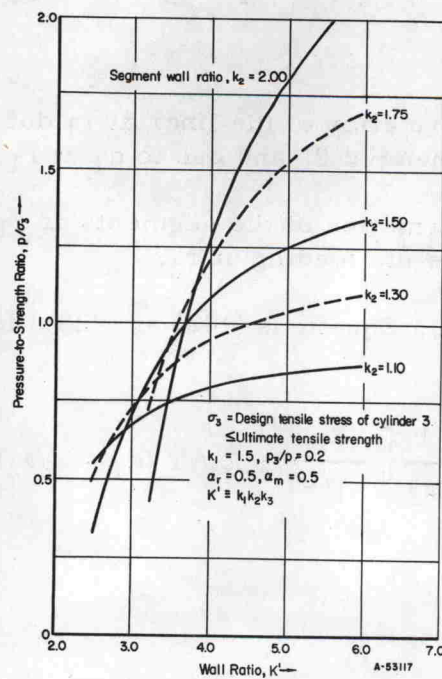


FIGURE 56. EFFECT OF SEGMENT SIZE ON THE PRESSURE-TO-STRENGTH RATIO,  $p/\sigma_3$ , FOR THE RING-FLUID-SEGMENT CONTAINER