During the tests, the delay or "stabilization" period for the measurement of the increment of strain produced by a pressure change was maintained at approximately 30 sec per reading. Some specimens were tested, however, allowing complete strain "stabilization" at each pressure increment. As shown in Fig. 5, the use of the 30 sec "stabilization" period did not significantly change the results as derived from the pressure-strain data and it allowed the testing of a large number of cylinders in a limited period of time.

RESULTS AND DISCUSSION

End condition Analysis

In the pressure seal configuration [illegible]d, the seal was not mechanically fixed to the tube or cylinder. However, since the steel ring moves up the inclined plane of the seal head, there is a tensile longitudinal stress induced in the cylinder from the frictional forces between the ring and the inner cylinder wall. As will be shown, however, this stress is of low enough magnitude that the results obtained more closely approximated the open end than closed end condition.

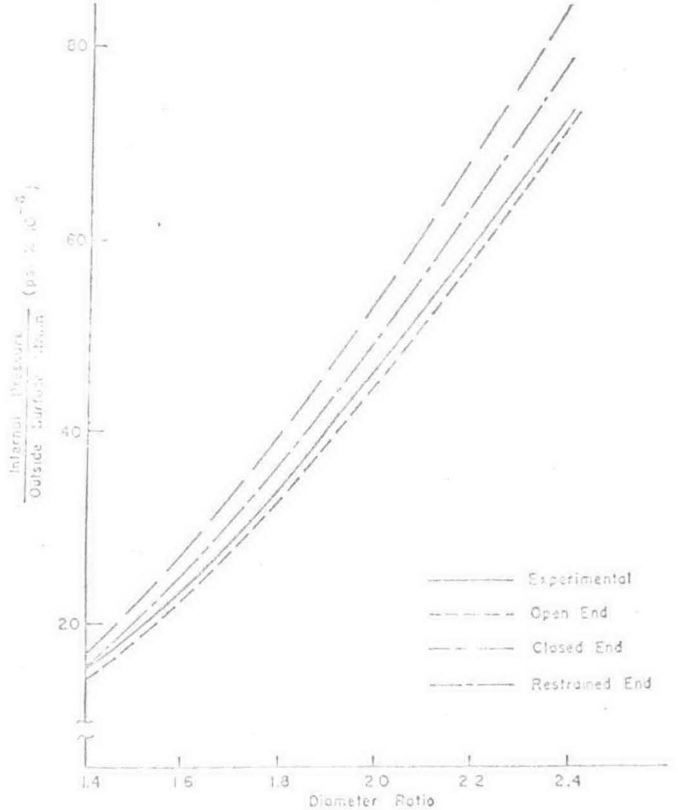

FIG. 6. Slope in the elastic range of internal pressure—outside surface strain curve vs. diameter ratio.

Using Hookes' Law and the Lamé equations for elastic stresses in thick-walled cylinders, it can be shown that the slopes of the pressure—outside surface strain curve in the elastic region for the various end conditions are:

1. Closed end $$\frac{P}{\epsilon_{tb}} = \frac{W^2 - 1}{2 - \mu}$$

2. Open end $$\frac{P}{\epsilon_{tb}} = \frac{W^2 - 1}{2}$$

3. Restrained end $$\frac{P}{\epsilon_{tb}} = \frac{W^2 - 1}{2(1 - \mu^2)}$$

Figure 6 shows a plot of these equations plus a curve showing the average values obtained experimentally. From the figure it is seen that the physical condition encountered in this experimental program correlates closely with the open end condition.

Elastic Breakdown

The plot of internal pressure versus outside surface strain is linear up to initial yield or elastic breakdown at the bore. The experimental values for the elastic breakdown pressure were averaged for each diameter ratio and plotted in Fig. 7 as a function of pressure factor vs. diameter ratio. For

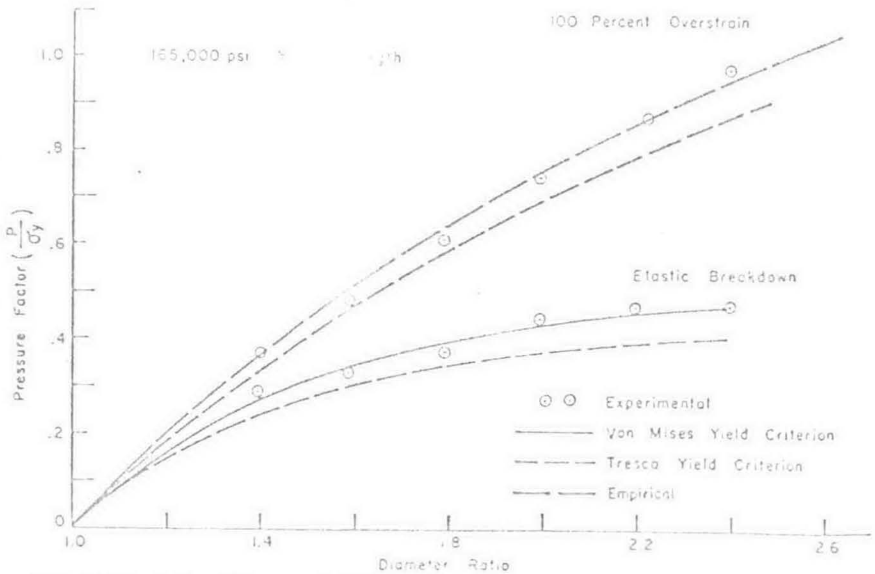

FIG. 7. Elastic breakdown and 100 percent overstrain pressure factor vs. diameter ratio.