calculation is based on the requirements of this Program, and the results represent the author's recommendations for a quick pressure-release mechanism to be used in conjunction with the piezoelectric gage calibration system employed in the NOL Reactor-Vessel Containment Program.

The system requirements and physical dimensions are as follows:

$T \leq 10$ msec
$V = 12.80$ in^3
$L = 5.00$ in
$P \leq 50{,}000$ psi
$\mu_o \approx 68$ centipoises $= 95.8 \times 10^{-7}$ lb-sec/in^2
(SAE 10 or SAE 20 oil)

From equation (5)

$$\Theta_1 = \frac{(10.0)}{3} = 3.33 \text{ msec}$$

Since the required pressure-release time is less than 15 msec, the prospect of using a 0.062-inch I.D. tube is eliminated. An examination of Figures 25 and 26 indicates that a 0.125-inch I.D. tube is the smallest tube that will satisfy all of the system requirements. Thus the bore diameter required in this Program is 0.125-inch.

Commercial, 3/8-inch O.D. (1/8-inch I.D.), annealed, AISI No. 4340 steel tubing is sufficient for pressures up to 60,000 psi, thus the knock-off tube dimensions are determined. For a casehardened depth of 0.010-inch and a 1-lb dynamically applied weight (impact velocity = 68 in/sec; moment arm from notch to point of application = 2 inches), the curve shown in Figure 20 indicates that a 0.030-inch notch-wall thickness is appropriate. As prescribed previously, the notch has an included angle of 90° and a 0.005-inch radius at the apex.

SUMMARY AND CONCLUSIONS

A pressure system capable of delivering pressures in the range of 0 - 100,000 psi has been developed, designed, fabricated, and employed for calibrating piezoelectric gages. This pressure system also has the desirable features of speed, simplicity, and high efficiency.

A theoretical equation relating the pressure-release time of the pressurized fluid with the system parameters has been derived, and with a plausible modification, it has been written in a form that is in excellent agreement with the experimental results.

The experimental results, in conjunction with the pressure-release time equation, have been utilized to obtain a procedure for selecting a knock-off tube that will give prescribed pressure-release times. The importance of knowing the pressure-release time is manifest once it is realized that the magnitude and the time duration of the static pressure pulse applied to the piezoelectric gage must be known before an accurate calibration can be made.

It is shown that if a 50,000-psi static pressure pulse, prevailing for 10 msec or less, is applied to the piezoelectric gages to be used in this Program, then their output, measured on the instrumentation system described herein, would be accurate to within 1 percent. A universal knock-off tube that would cause the required static pressure pulse to be applied to the gages has been determined from the procedure described above, and it will be used in future calibration work for this Program.

The general conclusion to be drawn from this work is that a knock-off tube is an excellent quick pressure-release mechanism for pressure-release times in the range of 5 - 100 msec.