

reasonable that a more general test program for cylindrical models might also produce data that would adequately predict the results of tests made with prototype cylindrical casks.

5. The model of the prismatic cask used in the test program is sufficiently accurate, but until the range of the test parameters for the cylindrical cask is expanded, the adequacy of the model of the cylindrical cask cannot be determined.

### III. RECOMMENDATIONS

In view of the close correlation between the test data for the prototype of the prismatic cask and the equation

$$t = (W/S)^{0.71} , \quad (28)$$

it is recommended that this equation be used to select the thickness of the cask jacket when the material is to be steel backed by lead. If structural features that will affect the flexibility of the cask jacket are within approximately 9 inches of the center of the impact region, an allowance must be made for the effect of these features upon the results predicted by Equation 28.

For cylindrical casks with diameters between 18 and 30 inches, selection of the jacket thickness by using Equation 28 with a modified weight equal to 1.3 times the actual weight is recommended. For cylindrical casks with diameters greater than 30 inches, selection of the jacket thickness by using Equation 28 without a modifying weight factor appears to be reasonable. If structural features that would affect

the flexibility of the jacket are within about 9 inches of the center of impact, the effects of these features must also be provided for in making the final selection of the thickness of the jacket for cylindrical casks.

There are a number of parameters that have not been evaluated and some general areas that are in need of additional data. A number of topics that should be investigated are listed below.

1. Very little test data are available for both prismatic and cylindrical prototype casks. Additional tests of this type planned so that their results can be compared with the results of model tests would be useful in verifying the results of the model tests.

2. Additional tests with cylindrical models are needed to evaluate the effect on puncture resistance of

- (a)  $D/d$  ratios of less than 7.75,

- (b) length-to-diameter ratios (this also applies to prismatic casks),  
and

- (c)  $D/t$  ratios of less than 55 and, in particular, where  $t$  is varied.

3. Several factors that may influence the results of the punch impact tests that have not been investigated are

- (a) the effect on puncture resistance of restraints, such as handling brackets, internal structural members, and relatively rigid sections near the ends of a cask, that are generally necessary for proper closure;

- (b) the effect on puncture resistance of impact at a point such that the line of action of the punch does not pass through the center of gravity of the cask; and
- (c) the effect of impact on or near a closure where the seal of the closure might be severely impaired without puncturing the shell of the cask.

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