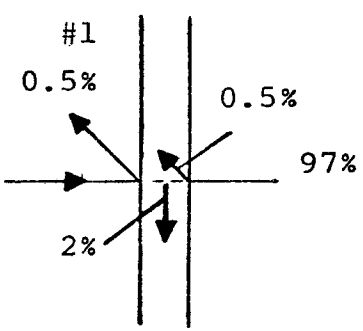
A great number of projection problems are still being generated by the use of inferior glass and in some cases by the improper installation of good glass.

The ideal material would be optical glass, ground and polished on each side and with optical coatings on each side. This would provide the maximum light transmission with the minimum focus problem and discoloration of the projection illuminant.

Optical glass of this type, while highly recommended, is very expensive and in too many cases difficult to obtain. To help with this situation we would like to make several recommendations and to point out several of the things that have been done improperly.

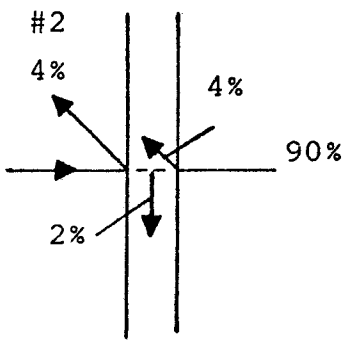
1. The projection porthole glass should always be mounted perpendicular to the line of projection. If the angle of projection is zero degrees, the glass should be vertical and mounted in such a way that it can be easily removed for cleaning. If the projection angle is minus ten degrees the top of the glass should be toward the screen and the tilt at ten degrees so the glass would still be perpendicular to the line of projection. The reason for this is to allow the light to take the shortest path through the glass. We find the glass mounted at many angles for many reasons but recommend the above rule be followed.

2. The following drawings show the efficiency of plate glass as compared to optical glass and how easily a high percentage of the projected light can be lost in the porthole glass.



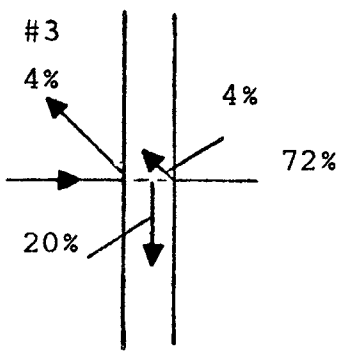
Coated Optical

1/4" THICK



Uncoated Optical

"WATER CLEAR"
1/4" THICK



Ordinary plate glass

NORMAL WINDOW

1. Optical glass. Ground, polished and coated both sides. The internal and external reflection losses total 1%. The absorption is 2% giving a total loss of 3% and transmission of 97%.

2. Optical glass. Ground and polished both sides but no coating. The internal and external reflection losses total 8%. The absorption is still 2% giving a total loss of 10% and transmission of 90%.

3. Ordinary plate glass. Internal and external reflection losses 8% but the absorption loss is 20% (and can be higher) giving a total loss of 28% and a transmission of 72%. In many theatres, this extra loss becomes very important, especially in a drive-in theatre where any loss of light is important.

Any glass should be carefully tested before making a permanent installation. With the white light on the screen, the glass should be carefully moved into the beam of light. If it is good optical glass, very little difference will be noted. If plate glass, the amount of light on the screen will be reduced and the blue-white light will become greenish in appearance. Both of these conditions do much to degrade the quality of the picture. The glass must also be checked to see if it degrades the focus of the projected picture. This is best done by projecting a known good target film. By moving the glass in and out of the projected beam, the focus should not change on any part of the screen. Use of the titles on a feature picture would be second best for this test.

4. Some theatres in an effort to reduce booth noise reaching the audience have used two pieces of glass, optical or plate, separated by about twelve inches. This has the effect of doubling the transmission losses and color problems. If the glass is not perpendicular to the line of projection, other problems such as multiple reflections will occur.

5. The type of glass can be easily determined by placing it in the projected beam of white light and observing the color of the light at any edge. If it is clear, optical glass is indicated. If white, it is "water clear" also recommended. If blue-green it is plate and should be replaced as it is degrading the projection.

Plexiglass is also very good in the one-quarter inch thickness. After our tests are completed, we may recommend its use and possibly supply it with our projection package.

The quality of the glass in the observation port is not as important but could add to the confusion if it made the picture look out of focus to the observer.