

● One common denominator to almost all audio-visual systems is the projection screen, true whether the method of image presentation is front or rear projection. This look at some of the different types of screens illustrates one phase of an audio-visual installation — perhaps the weakest link in the entire projection chain.

The purpose of the screen, of course, is to present to the audience a large enough and bright enough picture for all to see clearly under the ambient light conditions in the viewing room. With front projection, the viewer sees only that light reflected from the screen. In rear projection, the audience sees only the light that the screen permits to pass through it. In either case, the efficiency of the material chosen determines the brightness, evenness, contrast, and color intensity of the image.

### **Front Projection**

Several different types of screens are available for use in a front-projection system and each has its particular characteristics and applications.

The matte screen is able to diffuse light evenly in all directions. Thus, images on matte screens appear to be equally bright from almost any viewing angle. Matte screens are not, however, perfectly efficient and cause approximately 15 per cent of the incident light level to be lost. An illumination, therefore, of 100 foot-candles on the screen will provide a screen surface brightness of about 85 foot-lamberts. Although the image will appear to be of equal brightness at almost any viewing angle, it should be realized that seeing the image from too far off to one side will result in distortion to the viewer. The general practice is to keep the seating arrangement so that the end seats are no more than about 35 degrees off the center axis of projection. Another general rule to follow is to place the first row of seats at about twice the width of the screen and the last row no farther away than about six times the width. This may vary, depending on the material to be projected and the method by which the film or slide was prepared, or the size of the lettering or other information depicted on the screen.

### **Lenticular Screens**

The word *lenticulation* is derived from the same root as lens. This fairly accurately describes the surface of the projection material. The surface is made with a regular horizontal and vertical pattern of minute reflective areas shaped as rectangles or diamonds. This pattern is too small to see at the normal viewing distances. By controlling the shape of the tiny reflective surfaces, viewing angles and brightness can be regulated. Those with wider angles usually have less gain while those designed for higher brilliance of image have narrower angles. Lenticular screens are available with the capability of providing images several times brighter than a matte screen.

### **Beaded Screens**

This type of screen can be considered to be an early attempt to lenticulate the screen surface by imbedding or attaching tiny clear glass beads to increase reflection. The advantage gained is that the image is very bright but this is within a narrow viewing angle. As the angle increases, the viewer gets less

reflection until he moves to about 25 degrees from the projection beam axis, when the brightness becomes comparable to that seen from a matte screen. If the angle is increased further, the image brightness will drop below that of a matte screen. A second disadvantage of the beaded screen, inherent in its high reflectivity, is that ambient light is also reflected so that stray light falling on the screen can prove to be a serious problem. This type of screen is very common, however, because of its high brightness, economy and because it can be seamed, if necessary, to increase its size without the seam showing during projection (an inherent characteristic since the beads are placed haphazardly to saturate the screen surface for complete coverage).

### Smooth Metal Surfaced Screens

This type of screen is, perhaps, more efficient than the beaded type for reflective characteristics. It can be made with an aluminum or silver surface. However, this surface does not lend itself to wide-angle viewing, and audiences must be within a 30-degree cone. It does have the advantage of being able to reject stray light and for this reason is used in rooms where other lights have to remain on during the presentation. Smooth metal screens are rare today.

### Lenticular Metal Surfaced Screens

The application of the lenticulation process to the metal surface created a screen with the capability of being used for larger audiences, since the side viewing areas were increased. The lenticulated silver surface can be used in rooms where ambient lighting is a necessity. It has high brightness, high contrast, and good color fidelity. The

fact that it is also available in roll-up size and will not be easily damaged makes it possible to use this screen for portable-type projection systems; thus it has the advantage for providing for wide-angle seating in small projection rooms. The picture on this type of screen will be brighter than on a matte white.

### Rear Projection Screens

Rear projection screens are made chiefly of three different materials: *glass*, *acrylic plastic* and *vinyl-latex plastic*.

**Glass:** This type of rear screen material offers several advantages. It is rigid and can, therefore, be mounted in a manner to take advantage of its permanent flatness. It also offers highest quality pictures and maximum sound isolation. However, being glass, it is breakable and heavy in large sizes. As the screen is made with one surface coated and polished, this surface, when mounted facing the audience, can be used as a blackboard with a wax marker. It can be cleaned easily with a damp cloth.

**Acrylic plastic:** This material has the advantage over glass of being lighter and less breakable. It is less rigid, however, and should be solidly mounted to keep it from bending or vibrating. As with glass, the coated surface can be used as a blackboard. However, sound isolation is not as good with this material as with glass, this must be taken into account if the rear projection is to be a noisy one during presentations.

**Vinyl-latex:** This material, being the most flexible of the three, must be mounted in tension to keep it from losing its flat projection surface. It is, however, suitable for the use of grommet holes at the sides to help in mounting and is thus specially useful as a port-

able screen as it is light and can be rolled easily. It lends itself best to rear projection where the image is to be a background for display set or stage presentation.

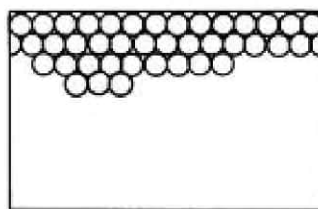
In general, rear-screen projection is used for smaller rooms or audiences than front projection and is better for rooms in which ambient light is a requirement during projection. As rear projection inherently requires that the projectors be located outside the seating area (behind the screen) the proper projection distance must be provided for the size of the image desired. Sometimes, this is not possible and a front-surface (or first surface) mirror must be installed in order to provide the proper distance without requiring a long behind-the-screen distance.

Rear projection screens are available made of dark or light material. The material should always appear black when seen by the audience before or after the presentation as this will result in lower reflection of ambient or stray light. However, if the room is to be used for projection purposes only and will be very dark during presentations, the material can be light. Generally, rear screen projection offers bright pictures, good color quality and a wide viewing angle.

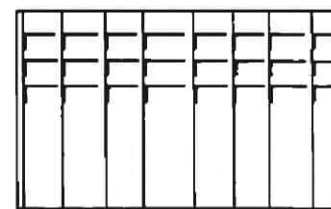
During subsequent discussions, charts of audience capacity, brightness requirements, screen sizes, and other criteria to be considered for a successful projection presentation will be offered for reference. Special devices used in audio-visual displays, different techniques, lenses, room layout requirements will also be discussed. Similar subjects will also be considered for closed circuit tv. However, we still want your letters, questions, comments and reactions to be included in this column. Send them in.



MATTE-LIGHTLY  
TEXTURED SURFACE



BEADED-MICROSCOPIC  
BEAD GRAIN



LENTICULAR-REGULAR  
PATTERN

Figure 1. The three types of front projection screen described in the text.