

LEGIBILITY—ARTWORK TO SCREEN

Projected artwork can help you capture your audience's attention, making communication easier, faster, and occasionally more exciting. Projected artwork, when legible, can reinforce your spoken words or even present your message. But when it is not quickly and easily understood, projected artwork detracts from the spoken words and presents an entirely different message of its own. It says your program was not properly prepared. Fortunately, making artwork legible is a fairly simple matter. This pamphlet will show you how.

Planning Legibility of Projected Artwork

Once the objectives and the strategy of a talk have been planned, consideration can be given to the size of the anticipated audience, as well as to any unusual features of the projection facilities. Only *then*, should the artwork be designed. If a presentation is to be successful, original art must be prepared *with the people in the rear seats in mind!*

Experience has shown that:

1. Artwork can be planned and executed to permit the visuals to be legible when projected.
2. There are worthwhile advantages in establishing uniform sizes for artwork and making these sizes standard.
3. Although the letter height can ordinarily be a *minimum* of 1/50 the height of the information area, the use of a larger letter height (1/25 or larger) is strongly encouraged.
4. The use of a Legibility Calculator provides an easy way to determine the minimum artwork letter height needed for legibility at various viewing distances (see foldout, page 7).

LEGIBILITY REQUIREMENTS

To be legible, lines, letters, and symbols should contrast adequately with the background, there must be distinct separation of tones, and the colors selected should be strong and attractive. Tonal contrast is particularly important when preparing artwork for television where the television receiver

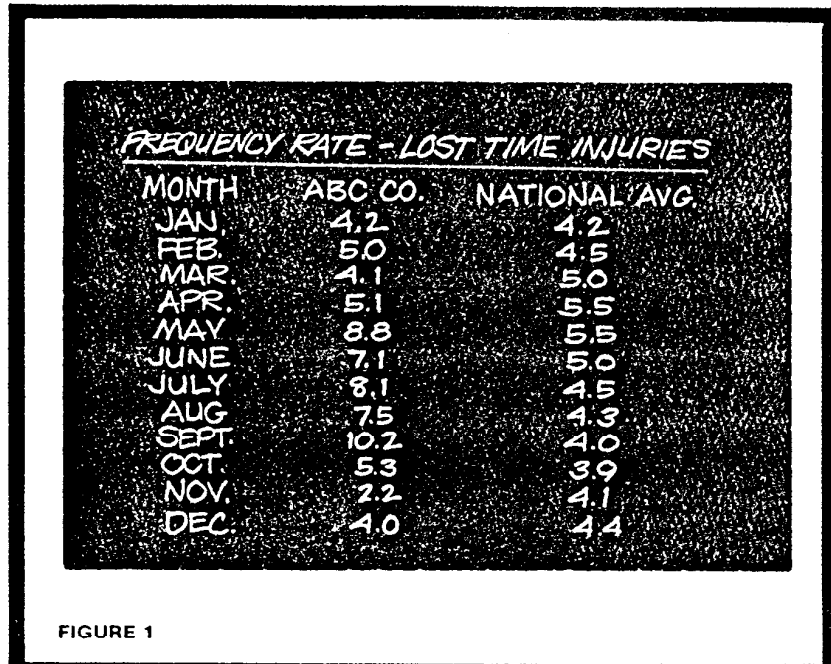


FIGURE 1

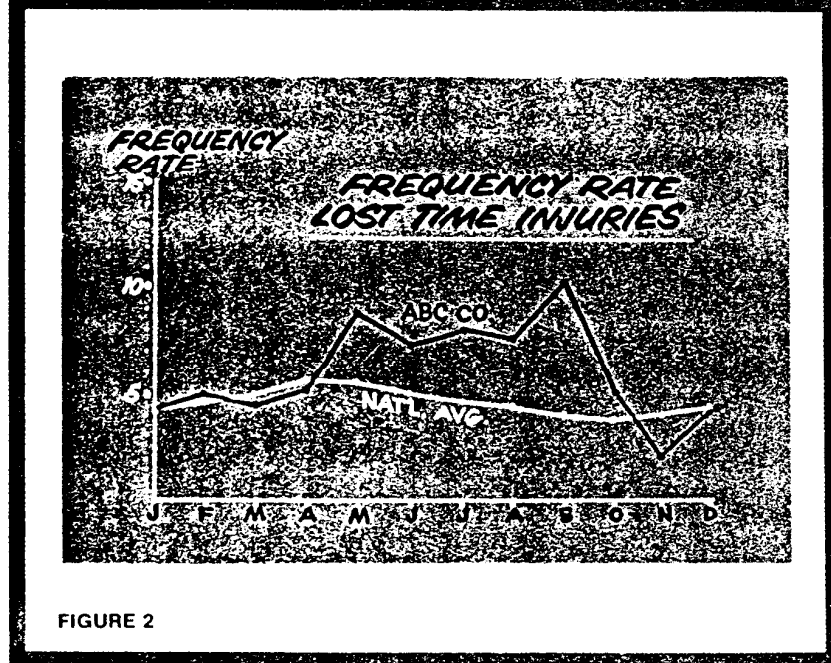


FIGURE 2

may display the colored artwork in a black-and-white mode. Additional comments on this format are in the television section on page 7.

Letters and symbols should be bold and simple, with no small openings that will tend to fill in when projected. All

elements such as lines, letters, symbols, and figures should be big enough to be seen easily by everyone in the audience. Therefore, these elements have to be at least a certain minimum size on the screen, the size depending on the height of the artwork area in relation to its distance from the farthest viewer.

In typical viewing situations—screen-to-viewer distances ranging from short (in small conference rooms or in homes), through medium (in class and meeting rooms), to long (in large auditoriums and theaters)—the maximum viewing distance should be about 8 times the height of the projected image. To put it another way, if the projected material is legible for the farthest viewer, who is seated 8 times the projected image height from the screen, it will be legible for all other members of the audience. This maximum viewing distance (expressed as 8H) can be used in determining the minimum size of significant detail in the material to be projected.

Testing Existing Material for Legibility

When material that was not designed for projection (printed graphs, charts, etc.)

is to be converted to a projected visual, remember that contrast, colors, and viewing distance may change, but the requirements for legibility will remain the same.

Note that 8H viewing is a generally accepted standard. If the letter size suggested for 8H viewing is doubled, the projected image will be legible from twice the distance or 16H. The 8H concept also assumes average or slightly lower than average eyesight of the viewer. For 8H viewing, legibility can be judged by an average viewer by looking at the material to be copied from a distance 8 times its height. For example, consider a printed table that is to be photographed for projection. If the table is 3½ inches (88 mm) high, it should be viewed from 8 times that height (28 inches or 0.7 m) to see if it is readable. If it is, the type size will be suitable for copying and projection.

The same principle applies to larger work. A wall chart or a map 4 feet (1.2 m) high requires legibility at a distance of 32 feet (9.6 m) if it is to be acceptable as a projected image for 8H viewing (4 feet x 8H = 32 feet). If the material is not legible at the test distance, it should either be redrawn or discarded.

Subject content as well as image size affects legibility. If the work you are photographing is complex, reduce the information to the essential elements, limit the text, and enlarge the letter size. Rearranging the information can help define the point you are making for the audience. Notice how much more quickly you see the comparison in Figure 2 than you do in Figure 1, yet it's the same information.

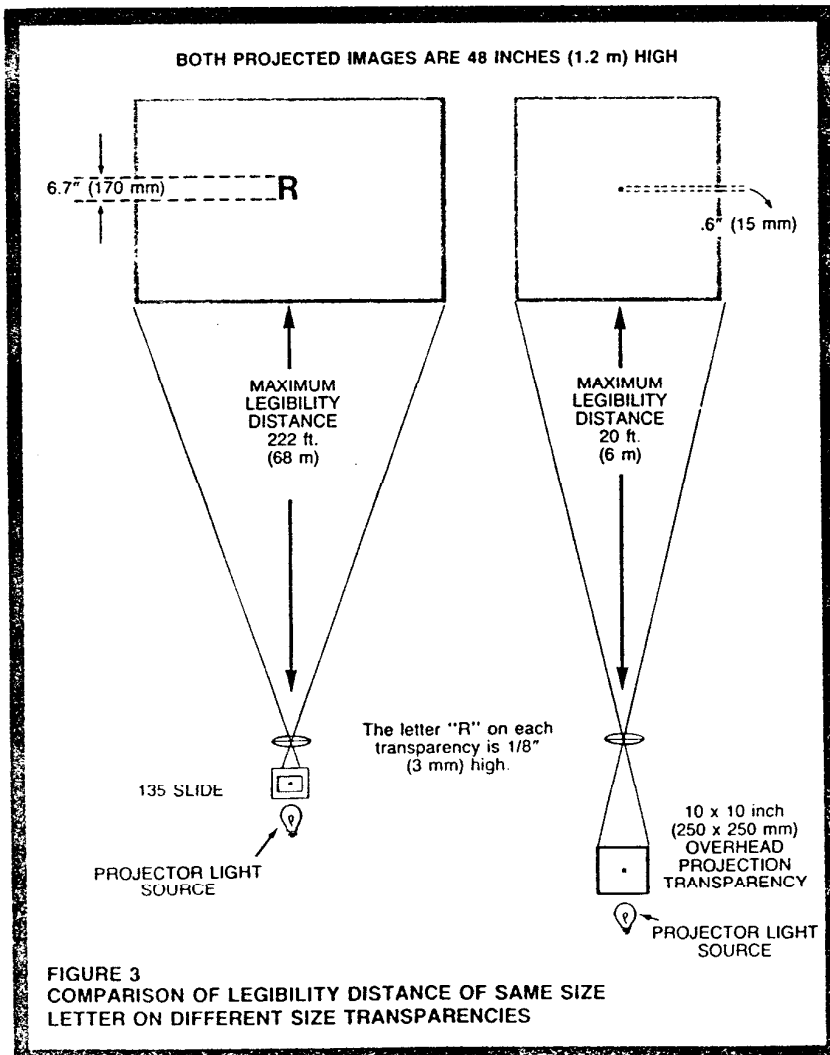
It is a mistake to believe that enlarging the physical dimensions of a transparency improves legibility at practical viewing distances. Transparency size is not a determining factor; it is the size of the detail on the screen that is significant. This is shown in Figure 3.

If letters are to be legible at an 8H viewing distance of 32 feet, a projected image 1 inch (25 mm) high on the screen is required whether projection is from a 2 x 2-inch (50 x 50 mm) slide or a 10-inch (250 mm) wide transparency on an overhead projector, regardless of the overall projected image size.

ADVANTAGES OF STANDARDIZATION

Layout and Preparation

We have indicated that a minimum size for lettering has been established to meet legibility requirements. But legibility is not the only requirement for effective communication; flexibility to allow emphasis and pleasing design is also important. Therefore, it is wise to standardize on at least three letter sizes to provide proper treatment and a variety of titles—primary, secondary, and tertiary. The use of more than three sizes, all larger than the recommended minimum, allows even greater variety in artistic freedom. Of course, standardization of letter sizes is practical only when the format and overall size of the artwork are also standardized.



Cost Reduction

The cost per hour of skilled professionals, such as artists and photographers, far outweighs the cost of materials. Therefore, the largest savings to be realized in the preparation of a visual presentation lies in reducing the time required to complete it. The standardization of format and size of artwork will pay the greatest dividends toward reducing costs. There are other benefits to standardization. One advantage is that the artist can work with a few standard, readily available pens, brushes, guides, and sizes of type. A feel for the size of lettering and artwork elements that will produce legibility can quickly be developed. Therefore, standard-size artwork becomes easier and faster to prepare than the alternative—an assortment of various sizes and shapes. Standard sizes simplify the stocking of mounting boards and paper stock. Making the artist's and photographer's jobs less time-consuming can increase productivity without increasing cost.

A standard field size for artwork and a specified location for the working area on the artwork can speed the photography and consequently increase the photographer's output. When working with artwork of random sizes and formats, the photographer must repeatedly adjust the camera-to-artwork distance, the focus, and the exposure settings. Conversely, it will be possible for the photographer to set lights, camera distance, focus, and exposure, only *once* for each complete *assignment* rather than once for each individual piece of artwork if the following conditions are met:

1. The artwork is all the same size.
2. The working area of the artwork is of the same dimensions on every piece of art.
3. The working area is in an identical location on each piece of art.
4. Provision is made for placing each piece of artwork in the same position on the copy stand.

Storage and Retrieval

Adopting a uniform 10 x 12-inch (250 x 300 mm) artwork size—see next column—offers savings in cost and

time. Storage of this size requires no expensive equipment of odd dimensions; letter-size office filing cabinets or desk drawers will serve. Artwork can be stored on edge, and segregated into categories with standard separators. The material is readily accessible; the possibility of damage or loss is reduced.

ARTWORK SIZES AND FORMATS

It is possible to specify a single standard size for most artwork. If it is necessary to produce a larger or smaller piece of artwork, a different working area or "field size" will be needed. For example, if an existing drawing is to be used in a piece of art and it is too large to fit into the standard 6 x 9-inch (150 x 225 mm) working area, it is suggested that a larger working area be selected having the same height-to-width ratio as indicated in the format chart. The lettering will also have to be enlarged to meet the 1/50 rule. For example, if the working area is enlarged to 8 x 12 inches (200 x 300 mm), the letter size should be a minimum of 5/32 (4 mm) of an inch. For more unusual enlargements, consult the legibility calculator on the foldout attached to page 7.

Mount Size

The recommended primary standard for the artwork is 10 x 12 inches (250 x 300 mm). The working area sizes suggested in this pamphlet and the formats we suggest for typewritten copy (page 5) will fit this size mount. It accepts the common 8 x 10-inch (200 x 250 mm) photographic print. The mount allows a margin outside of the suggested working area to provide for safe handling, pin registration holes or field marks for camera alignment, production notations, and attachment of acetate cels or other types of overlays.

The usable area of the artwork, including the background, must fill a space somewhat larger than the information areas, if background edges are not to show when the visual is photographed. It is good practice to extend the usable area *at least* 1/2 inch (13 mm) beyond the information area on all sides. A better practice is to extend the usable area 1 inch (25 mm) beyond the information area.

Construction and Use of the Artwork Template

To prepare the template, which will be used for each format, start with a 10 x 12-inch (250 x 300 mm) piece of lightweight card stock or heavy paper. Keeping the area centered within this card stock, mark off the dimensions of the section to be removed for the particular format that will be used, i.e., 6 x 9 inches (150 x 225 mm) for 35 mm slides. If artwork for more than one format is to be created, this is a good time to make a template for each one. To consistently align the artwork in the proper position for photography, construct an L-shaped guide against which the artwork can be placed. See Figures 4, 5, and 6. If these format/size recommendations are adopted, it is necessary to observe only one minimum size requirement: for legibility of letters and of any significant artwork detail at 8H viewing distance, the letter or detail within the format area should have a minimum size of 1/50 of the information area.

IMPORTANT: When using certain types of equipment such as the KODAK EKTAGRAPHIC Visualmaker, use the artwork area dimensions suggested for the apparatus at hand. The principles of legibility mentioned in this pamphlet, *Legibility—Artwork to Screen*, will still be valid



Typical materials for the three formats:

Figure 4 (height/width ratio 1:1)—2 x 2 slides with a square mask opening (26.5 mm, 30 mm, 38 mm, etc.); 2 3/4-inch square slides for 2 1/4-inch square transparencies; and 3 1/4 x 4-inch slides with a 2 1/4 or 3-inch square mask opening.

Figure 5 (height/weight ratio 2:3)—2 x 2 slides in a horizontal format made with a conventional camera, using 135 film (22.9 x 34.2 mm slide mask opening).

Figure 6 (height/weight ratio 3:4)—motion pictures (super 8, 8 mm, 16 mm); size 110 slides (30 x 30 mm outside dimension and a 12 x 15.8 mm mask opening).

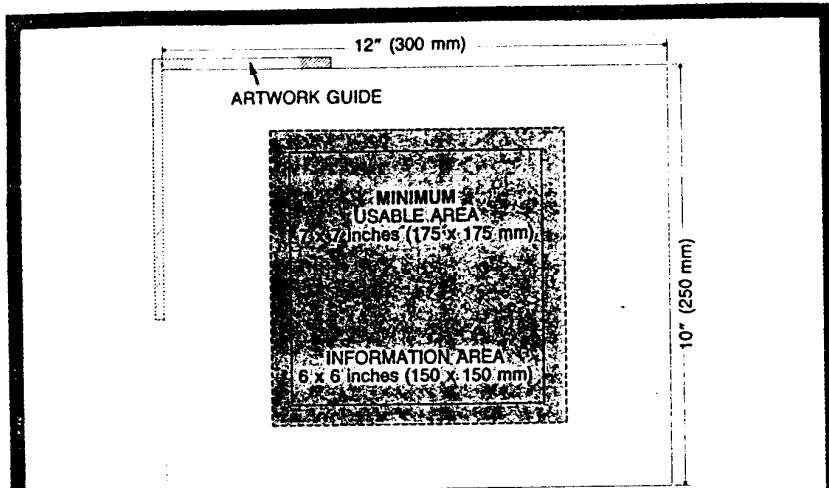


FIGURE 4
ARTWORK TEMPLATE FOR A FORMAT
WITH A HEIGHT/WIDTH RATIO OF 1:1

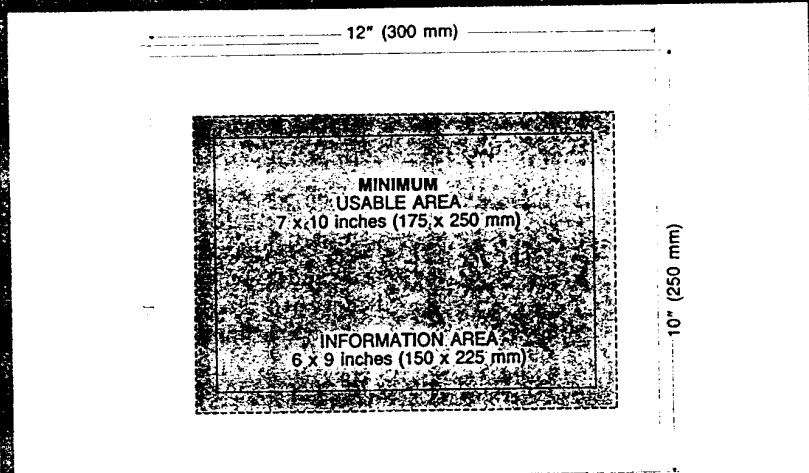


FIGURE 5
ARTWORK TEMPLATE FOR A FORMAT
WITH A HEIGHT/WIDTH RATIO OF 2:3

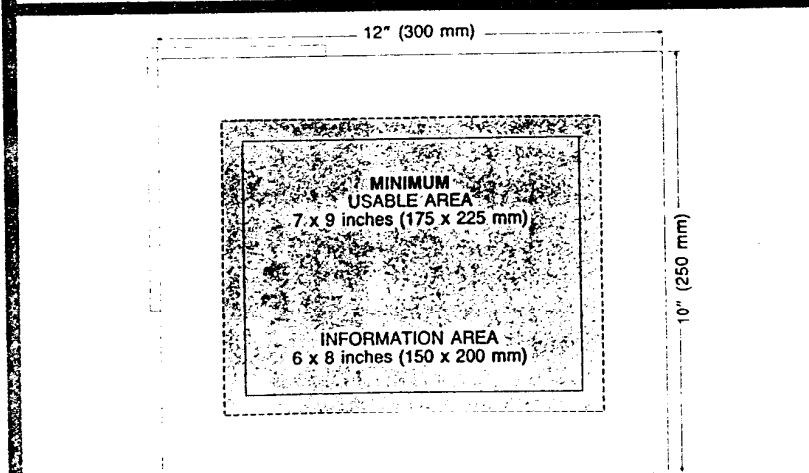


FIGURE 6
ARTWORK TEMPLATE FOR A FORMAT
WITH A HEIGHT/WIDTH RATIO OF 3:4

Sizes of Letters, Symbols, and Lines

Letter size of lowercase characters is specified as the height of the letter excluding ascenders or descenders (the "tails" on p's, q's, b's, etc.). When determining letter size or specifying it for artwork, measure the smallest letter to be used. Since the artwork height in Figures 4, 5, and 6 is 6 inches, letter height for 4H viewing is 1/16 inch (1.5 mm), for 8H viewing 1/8 inch (3 mm), and for 16H viewing 1/4 inch (6 mm).

In no case should the specified minimum size be construed as a restriction on the use of larger sizes. Bolder or bigger treatment is often advantageous, e.g., to increase emphasis and strengthen impact.

When printer's type is being considered or specified, characters on a printed proof should be measured. Point sizes can be misleading; 18-point type may be suitable for capital-letter copy, but the same copy in lowercase can require the use of 24-point type. Type-faces also vary; 9-point might be suitable in one style, but not in another. Different point sizes of one type style are shown in Figure 7.

Dry-transfer lettering systems (Deca-Dry, Letraset, Prestype, etc.) are sheets of letters that can be transferred to the artwork by burnishing. A wide selection of type styles is available in different point sizes, and most art supply stores have catalogs showing the letters in actual size.

Legibility of Typewritten Copy

A typewriter offers one of the simplest and quickest means for producing legible copy. All that is required is the use of a smaller information area and close-up photography to include only this area. If the artwork information area to be used is 3 inches (75 mm) high and the legibility requirement is for 8H viewing, elite type in all capital letters is the smallest acceptable size. It is recommended that typewritten copy be restricted to the information areas shown in Figure 8. As with other types of artwork the minimum usable area should extend somewhat beyond the information area. In the case of typewritten material a minimum usable area of at least an additional 1/4 inch (shown with dotted lines in Figure 8) on all four sides can be obtained by simply

8 POINT

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FIGURE 7

including more of the paper on which the message is typed. The 3-inch height provides 8H legibility for all copy from standard typewriters, including elite and pica type; yet it offers a large enough area for direct artwork for simple charts, graphs, and diagrams.

For the 3-inch-high (75 mm) format, copy should be limited to 9 double-spaced lines.

SPECIAL APPLICATIONS

Long-Distance Viewing (Large H Factors)

Material for small rear-projection cabinets, used in exhibits or point-of-sale situations, often is viewed from greater than normal distances. For applications of this type, a projected image as small as 8 inches (200 mm) in height may need to be readable at distances up to 20 or 25 feet (6 or 7.5 m), approximately 30H. It may be necessary to enlarge the size of lettering proportionally. In such a case, lettering should be at least four times larger than the minimum for 8H viewing. For an artwork information area 6 inches (150 mm) high, the minimum letter height should be 1/2 inch (13 mm). Remember, however, that rear-projection cabinets used in study carrels may be viewed at only two or three times the screen height and that artwork for these situations can be sized to 2H or 3H requirements.

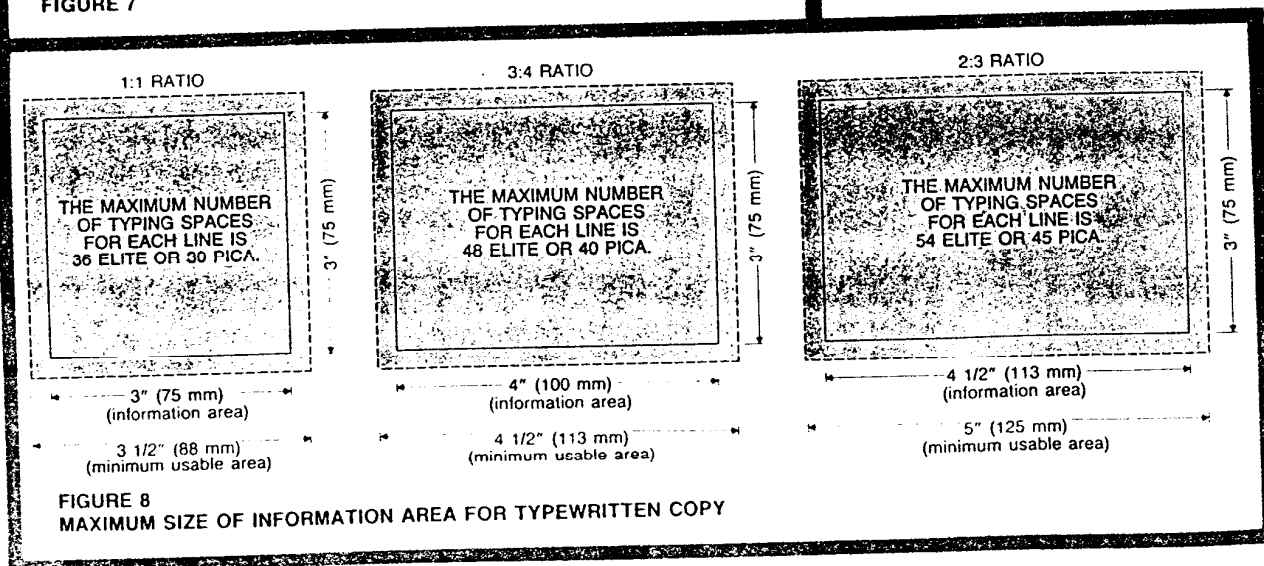
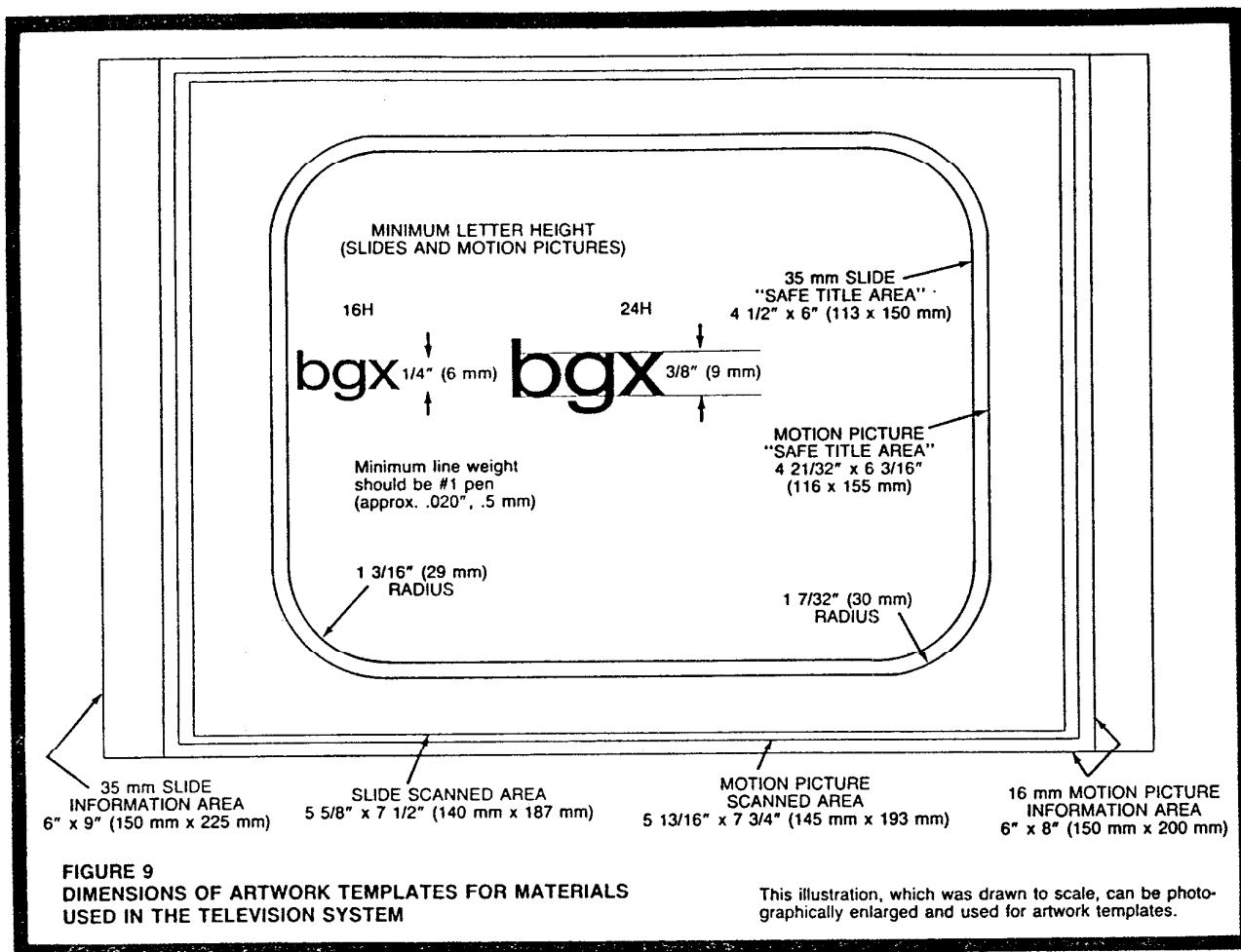


FIGURE 8
MAXIMUM SIZE OF INFORMATION AREA FOR TYPEWRITTEN COPY



Television

Television images are frequently viewed at distances greater than 8H. For example, an image only 12½ inches high (315 mm) on a 21-inch (533 mm) picture tube may often be viewed from 20—30 feet (7—9 m) in the home or in a classroom. Therefore, when material is being prepared for such use, legibility requirements for comparatively great viewing distances must be considered as shown in Figure 9.*

In addition, some area of the original transparency will be lost in the television chain and in the receiver. Figure 10 illustrates the 6 x 9-inch (150 x 225 mm) artwork area of a 35 mm slide with a safe title area mask for television placed

over it. From this illustration it is clear how much visual area (shaded portion) may be lost in the television system. The amount lost is not always the same; it will vary with such things as receiver adjustment and line voltage. To help provide minimum loss, any essential information must be confined to a central area, as indicated in Figure 10. Even so, the usable portion of the art should extend to a minimum area of 7 x 10 inches (175 x 250 mm). Minimum letter height (lowercase character less ascender or descender) can be 1/4—3/8 inch (6—9 mm) shown in Figure 9. These letter heights allow 16H—24H viewing and provide legibility at distances of 18—24 feet (5.5—7.3 m), 21—27 feet (6.4—8.2 m), and 23—30 feet (7—9.1 m) respectively from a 17-, 21-, or 25-inch (432, 533, or 635 mm) picture tube.

Where possible, it is recommended that the finished artwork be reviewed

both in color and black-and-white on the telecine chain before being broadcast. This procedure will indicate any changes in the artwork (contrast, separation of tones, letter height, and color) needed to make it acceptable for broadcasting. If it is not practical, the artwork must be created to take these elements (of the artwork) into account. One color that reflects or transmits the same amount of light as another color will cause the two colors to appear as the same neutral tone on a black-and-white television receiver.

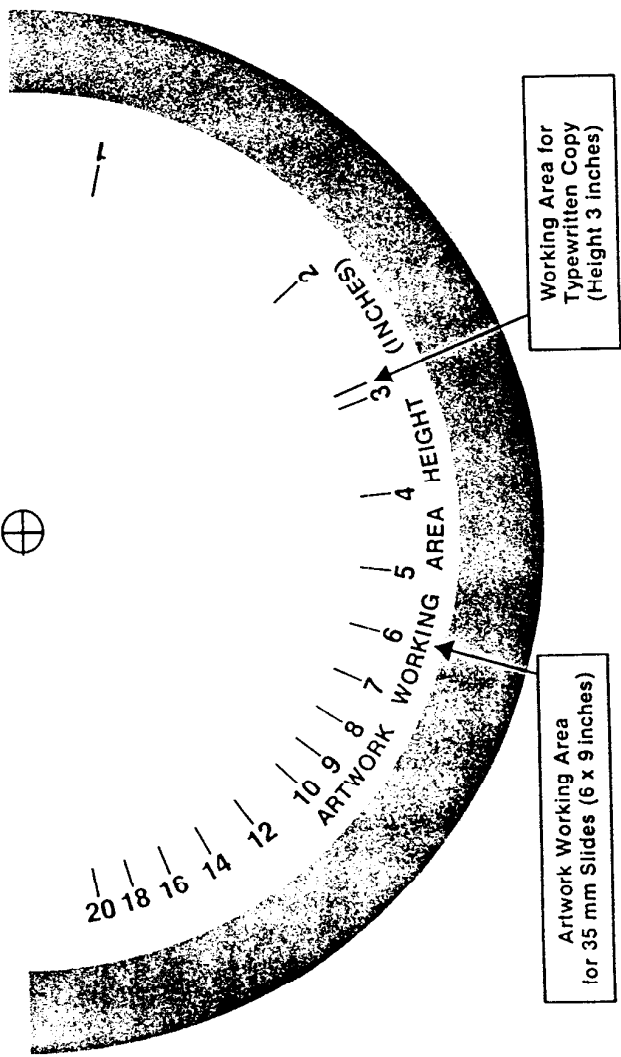
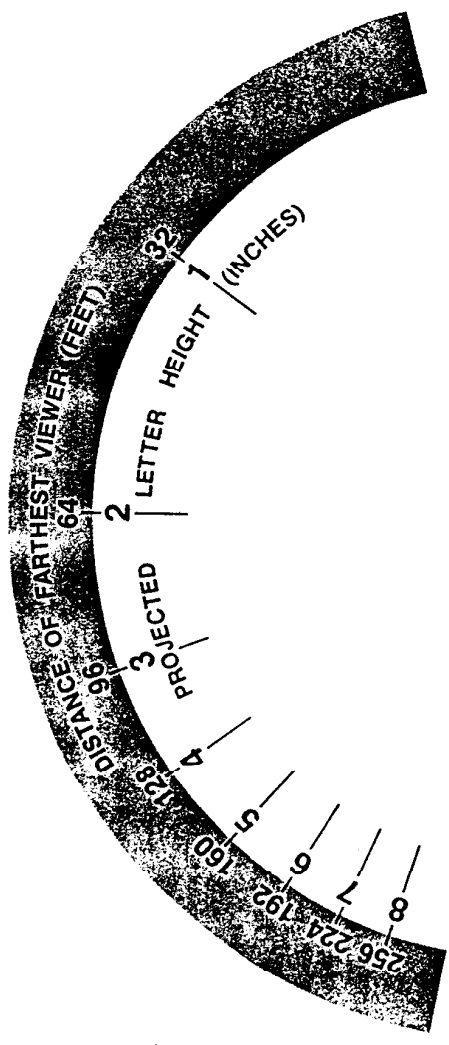
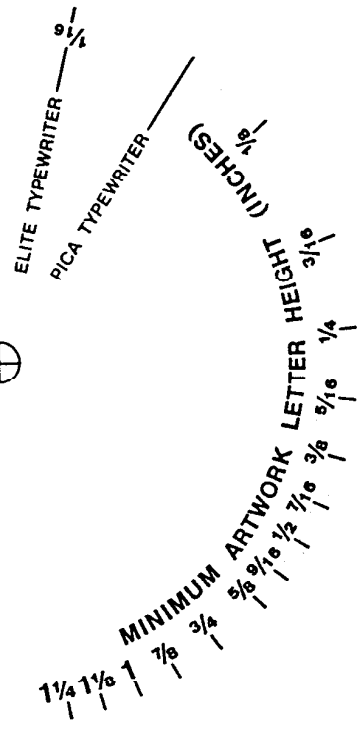
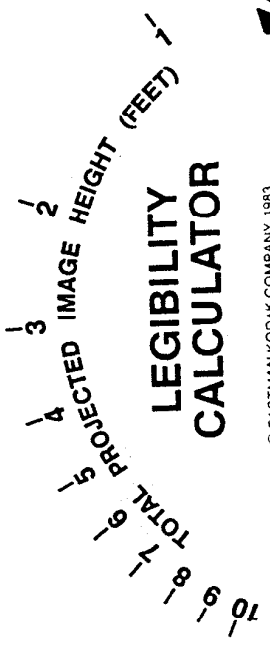
If the artwork is to be used for both TV transmission and regular projection, the lettering and title area should be designed to meet the TV requirements. When the material is being photographed for a projection slide, an extreme close-up can be made so that unnecessary background will be eliminated.

*SMPTE Recommended Practice RP 27.3-1972, "Specifications for Safe Action and Safe Title Areas Test Pattern for Television Systems."



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LEGIBILITY CALCULATOR



Working Area for
Typewritten Copy
(Height 3 inches)

Artwork Working Area
for 35 mm Slides (6 x 9 inches)