SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE RECOMMENDED PRACTICE

SAE ARP711

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ILLUMINATED SIGNS

1. SCOPE:

This Aerospace Recommended Practice (ARP) covers the general design and performance characteristics of illuminated information signs for service in the passenger compartment of passenger transport aircraft.

"Illuminated information signs" are lighted signs used to inform occupants of the passenger compartment.

This ARP does not apply to "EXIT" signs which are the subject of ARP503.

2. REFERENCES:

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE ARP503 Emergency Evacuation Illumination

2.2 Other Documents:

FAR Part 25

3. SPECIFIC RECOMMENDATIONS:

Generally, illuminated information signs are classified into three categories.

a. Illuminated translucent characters (letter or symbol) on a nonilluminated or opaque background

b. Nonilluminated or opaque characters on an illuminated background

c. Illuminated translucent characters on an illuminated translucent background

3.1 Legend Display Characteristics:

Depending on the sign's intended use, three types of legend displays are commonly used: (1) readable, (2) essentially unreadable, and (3) unreadable. These characteristics apply to the sign while in the unenergized or nonilluminated condition.

3.1.1 Readable: This legend is always visible; typically this type of sign is designed with maximum contrast between the legend and background.

3.1.2 Essentially Unreadable: This legend is somewhat obscured; usually oversprayed to match the sign background. The legend may be visible under certain conditions, however, it is clearly obvious when the sign is energized or unenergized.

3.1.3 Unreadable: This legend is totally invisible until the sign is energized.

3.2 Readability:

Readability of an illuminated panel sign depends to a great extent on three factors.

a. The size and proportions of characters as well as the character design configuration

b. Character spacing

c. Luminance, luminance ratios, and luminance contrast ratios between character and background

3.2.1 Size and Proportions of Letters: The minimum character size (letter or symbol) may be as determined by Equation 1:

$$H = 0.00407 \times D \qquad \text{(Eq.1)}$$

where:

H = minimum character height
D = maximum viewing distance

NOTE: The recommended character height is twice the minimum height.

3.2.1 (Continued):

The proportions of a character designed for maximum readability are as follows:

a. Width: 60% of height

b. Stroke: The stroke width of the letter should be 0.125 x H with illuminated characters and 0.20 x H with an illuminated background.

3.2.2 Spacing of Characters/Symbolic Legends: For maximum viewing distance, the spacing between characters shall be balanced between approximately 15% of letter height and visual equalization or spacing of one letter to another, e.g., certain letters such as "D," "O" etc., should be positioned closer to adjacent letters.

Letters and symbolic illustrations of bold silhouette rather than fine detail are preferable for long distance legibility.

3.2.2.1 Luminance and Readability of Sign Face: The brightness of the sign has a significant influence on the readability.

A sign that is too bright can suffer loss of readability from halo effect around the letters while insufficient brightness will reduce distance of legibility.

In some cases where high background brightness is required, elimination of this halo effect is achieved by applying a black opaque stripe around the outline of the letter.

3.2.2.2 Uniformity:

a. Increasing the distance from the sign face/diffuser to the light source is the major factor in obtaining uniform light distribution.

b. Where depth is limited, it is possible to improve the lighting uniformity with special reflectors at the light source.

3.2.3 Luminance and Luminance Ratios:

3.2.3.1 Luminance: The illuminated areas of signs should not have a luminance of less than 154 cd/m^2 (45 fL). Signs installed in areas of high ambient light may require a much higher luminance. To minimize annoyance to cabin occupants at night, 222 cd/m^2 (65 fL) is the practical maximum. Consider dimming the sign at night when it is necessary to exceed 222 cd/m^2 (65 fL) for daytime use.

3.2.3.2 Luminance Ratios: The illuminated areas of the sign should be as uniform as practical.

3.2.3.3 For Signs With Illuminated Legends: The luminance ratio between any and all letters or symbols or parts thereof should not exceed 1.0 (2 to 1 max) where contrast is defined in Equation 2:

$$C = \frac{B_2 - B_1}{B_1} \qquad \text{(Eq.2)}$$

3.2.3.4 For Signs With Illuminated Background: The luminance ratio between any area of the background should not exceed 2.0 (3 to 1 max) where contrast is defined in Equation 3:

$$C = \frac{B_2 - B_1}{B_1} \qquad \text{(Eq.3)}$$

3.2.3.5 For Signs With Illuminated Letters and Background: For signs with both the legend characters and background illuminated, the minimum luminance contrast between the legend characters and background should be 10.0 (10 to 1 minimum) as shown in Equation 4:

$$C = \frac{B_2 - B_1}{B_1} \qquad \text{(Eq.4)}$$

where:

C = Contrast
B_1 = Lowest Luminance Level
B_2 = Highest Luminance Level

3.3 Light Sources:

Many different light sources are suitable for use in illuminated signs. Fluorescent, incandescent, electroluminescent, and light emitting diodes are examples of suitable light sources. The advantages and disadvantages of each source should be taken into consideration relative to each section of this document before making a final choice. Some applications require that the sign accommodate many different legends. To accommodate different legends, the light source selected should limit the required changes to the faceplate.

3.4 Installation Location:

When passenger information signs are installed in an aircraft, the location selected should minimize the affects of ambient and/or sunlight on the sign face. No smoking and fasten seat belt signs should be located so that when illuminated they are legible to each of the occupants they are required to serve.