

# Isofootcandle Distribution Curves vs. Actual Lighting Conditions

The NFPA 101 code requires even illuminance, over a specified area, of 1 footcandle average with a minimum illuminance of 0.1 footcandle at any point with a ratio of not more than 40 to 1 maximum to minimum illuminance. To meet this requirement, for Emergency Lighting, several considerations must be taken into account when using Isofootcandle Distribution Curves to determine distances between units.

Isofootcandle Distribution Curves show the illuminance for specified footcandle values at various distances. These curves reflect measurements in ideal conditions with the measuring device normal (90 degrees) to the incoming light. (See Fig. 1)

**Fig. 2** shows a 3D illustration of Isofootcandle Distribution Curve No. 25 for a 50 Watt, 12 degree MR16 Lamp. The light pattern for this lamp is symmetrical in horizontal and vertical planes. This curve shows a distance of 112 ft for an illuminance of 1 footcandle. However, when this lamp is lighting a Path of Egress, three factors must be taken into account to determine the number of and spacing of Emergency Lighting Units and the illumination "E" at any point on the floor.

1. The distance "d" from the lamp (the Inverse Square Law)
2. The cosine of angle "θ" that the light strikes the floor (Lambert's Cosine Law)
3. The distance from the center of the beam (Lamps with narrow Beam Angles will fall off rapidly in intensity as the distance increases from the center of the beam)

In **Fig. 3** a typical two unit configuration is shown lighting a 3 ft. wide by 65 ft. Long Path of Egress. The lamps are arranged so that the beams overlap producing light under opposite units. This is generally necessary to provide even illumination along the whole length of the path. Small areas can be covered with a single lamp. In this example the large angle "θ" results in a cosine of 75 degrees that cuts the illuminance "E" at beam center by 74%. Because of these factors the maximum spacing for this type of lamp to meet NFPA 101 without the benefit of ceiling, wall, or floor reflections is 65 feet or about 30 feet per lamp.

For more information consult the Illuminating Engineering Society of North America **Lighting Handbook**.

