Safety Manual > Illumination for Occupational Tasks

E. Illumination for Occupational Tasks

1. Background

Glare, diffusion, direction, uniformity, brightness, color, and brightness ratios affect visibility and the ability to see easily, accurately, and quickly. Poor lighting is uncomfortable and possibly hazardous. The desirable quantity of light for any particular installation depends primarily upon the work that is being done. As the illumination of the task is increased, the ease, speed, and accuracy of accomplishing it are also increased.

Following are two tables of levels of illumination for industrial areas as recommended by the American National Standard A11.1 “Practice for Industrial Lighting.” The Office of Environmental Health and Safety will perform lighting measurements upon request.

2. Definitions

Footcandle – A unit of illuminance on a surface that is everywhere 1 foot from a point source of light of one candle and equal to one lumen per square foot.

Illumination Level – The quantity or amount of light falling on a surface usually expressed in foot candles.

Intensity (Luminous Intensity) – The quantity of light a source gives off in a given direction expressed in candela (formerly “candle”).

Lamp – any man-made light source.

Lumen – The flux falling on a surface of one square foot in area, every part of which is one foot from a point source having a luminous intensity of one candela (candlepower) in all directions.

Luminaire – A complete lighting device consisting of lamps and parts to distribute the light.

Luminance (Photometric Brightness) – The amount of light emitted and reflected from an area of a surface measured in footlamberts. A surface emitting one lumen per square foot has a luminance of one footlambert.

Reflectance – A measure of how much light is reflected from a surface. It is the ratio of luminance to illumination.
### Recommended Maximum Luminance Ratios

<table>
<thead>
<tr>
<th>Environmental Classification</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Between task and adjacent darker surroundings</td>
<td>3 to 1</td>
<td>3 to 1</td>
<td>5 to 1</td>
</tr>
<tr>
<td>2 Between tasks and adjacent lighter surroundings</td>
<td>1 to 3</td>
<td>1 to 3</td>
<td>1 to 5</td>
</tr>
<tr>
<td>3 Between tasks and more remote darker surfaces</td>
<td>10 to 1</td>
<td>20 to 1</td>
<td>*</td>
</tr>
<tr>
<td>4 Between tasks and more remote lighter surfaces</td>
<td>1 to 10</td>
<td>1 to 20</td>
<td>*</td>
</tr>
<tr>
<td>5 Between luminaires (or windows, skylights, etc.) and surfaces adjacent to them</td>
<td>20 to 1</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>6 Anywhere within normal field of view</td>
<td>40 to 1</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

*Brightness Ratio control not practical.

A — Interior Areas where reflectances of entire space can be controlled in line with recommendations for optimum seeing conditions.

B — Areas where reflectances of immediate work area can be controlled, but control of remote surroundings is limited.

C — Areas (indoor and outdoor) where it is completely impractical to control reflectances and difficult to alter environmental conditions.

Note: From the normal view point, brightness ratios of areas of appreciable size in industrial areas shall not exceed those in the above table.

### Recommended Reflectance Values Applying to Environmental Classifications A and B

<table>
<thead>
<tr>
<th>Reflectance (%)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling</td>
</tr>
<tr>
<td>Walls</td>
</tr>
<tr>
<td>Desk and bench tops, machines and equipment</td>
</tr>
<tr>
<td>Floors</td>
</tr>
</tbody>
</table>

** Reflectance should be maintained as near as practical to recommended values.

Levels of Illumination Recommended for Sample Occupational Tasks
Area Foot-Candles
Assembly-rough, easy seeing 30
Assembly-medium 100
Building construction-general 10
Corridors 20
Drafting Rooms-detailed 200
Electrical equipment, testing 100
Elevators 20
Garages-repair areas 100
Garages-traffic areas 20
Inspection, ordinary 50
Inspection, highly difficult 200
Loading platforms 20
Machine shops-medium work 100
Materials-loading, trucking 20
Offices-general areas 100
Paint dipping, spraying 50
Service spaces-wash rooms, etc. 30
Sheet metal-presses, shears 50
Storage rooms-inactive 5
Storage rooms-active, medium 20
Welding-general 50
Woodworking-rough sawing 30

1 foot-candle=10.76 lux.