

The logo for LED is rendered in a large, stylized, 3D font. The letters are filled with a gradient from light green at the top to yellow at the bottom, and have a black outline. The background of the entire slide is a faded photograph of a busy office or factory floor with people working at desks.

LED

LIGHTING SOLUTIONS TODAY FOR A BRIGHTER TOMORROW

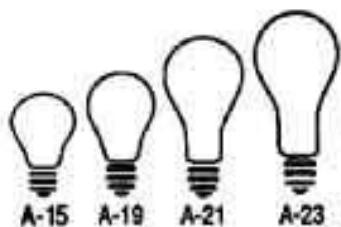
LED Lighting Technical Data and Information

Watt-Smart

Incandescent Bulb Data

Bulb Shapes

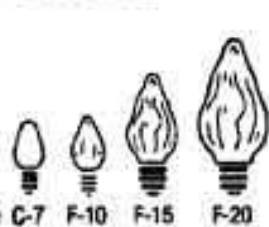
A SERIES



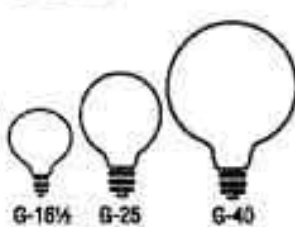
B SERIES



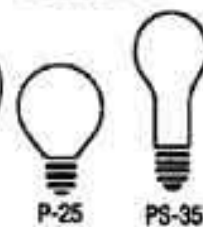
C-7/F SERIES



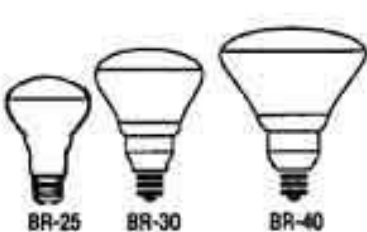
G SERIES



P-25/PS-35



BR SERIES



R SERIES



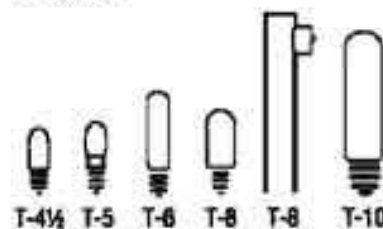
RP-11/S SERIES



PAR SERIES

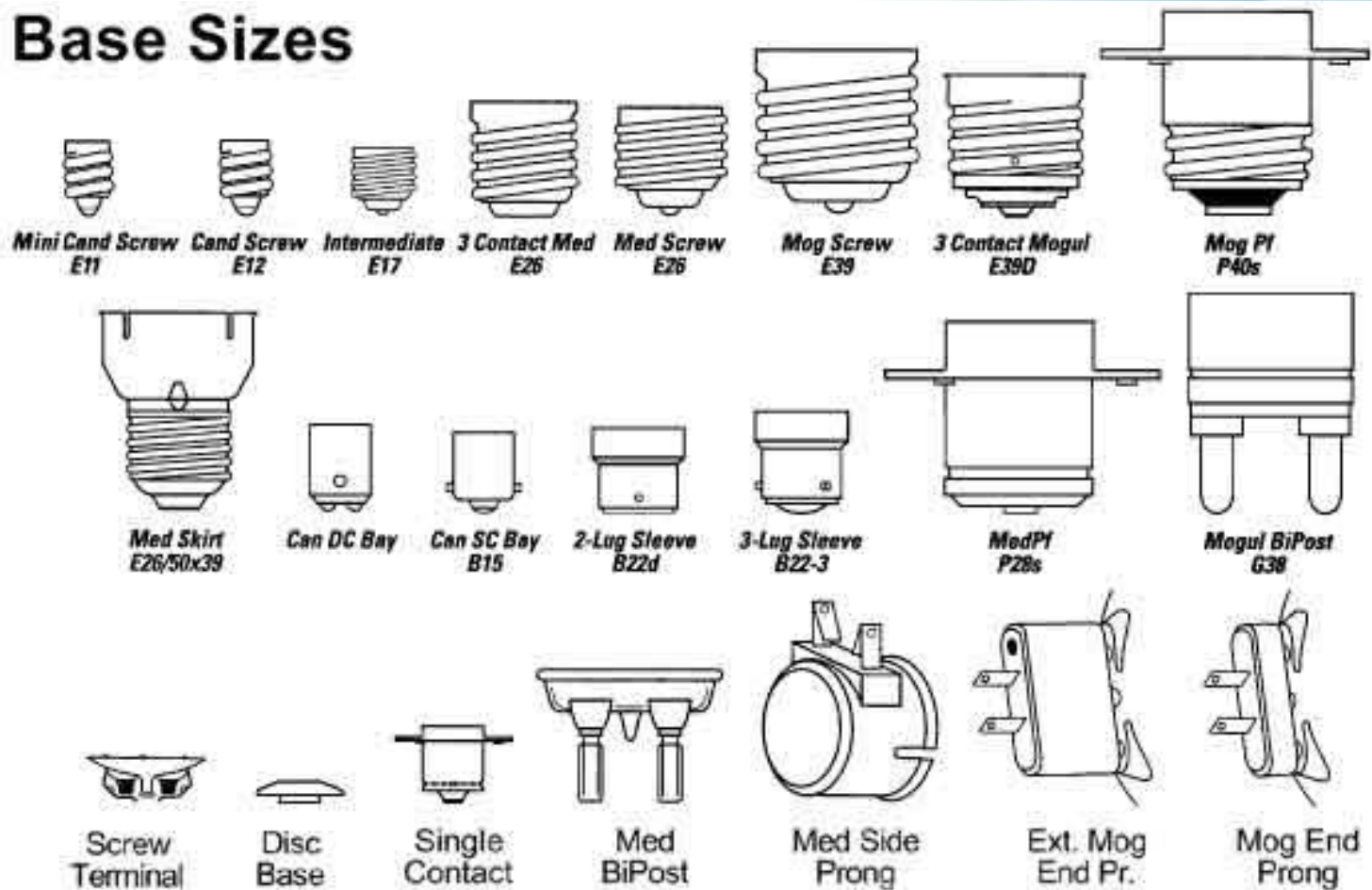


T SERIES



Incandescent Bulb Data

Base Sizes





2-Pin (Round)
GX5.3



2-Pin (Round)
GY6.35



Recessed
Single Contact
R7S



2-Pin
GU-4



2-Pin
GU-5.3



2-Pin
G4



Twist & Lock
GU-7



2-Pin
P1



Mini Screw
E10



Mini Cond
E11



4" Leads



1" Ribbon
Leads



6" Flex
Leads



E27
Export Only



Skirted

12V Bayonet Base Data



BA15s



BAU15s

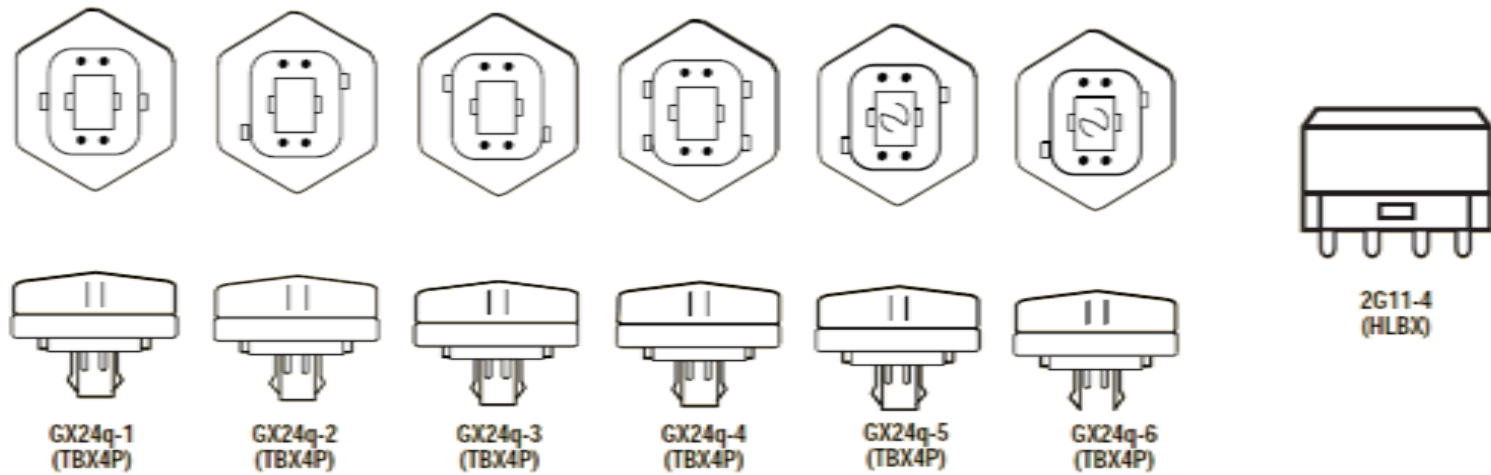


BA15d



BAY15d

Plug In CFL Base Data



ALL ABOUT COLOR OF LIGHT

COLOR TEMPERATURE AND COLOR RENDERING

There are two standard measurements for the color characteristics of light: “color rendering index” (CRI), a term used to describe the extent to which an artificial light source is able to render the true color of objects as seen by natural outdoor sunlight which has a CRI of 100, and “color temperature”, which expresses the color appearance of the light itself.

Color Rendering Index: Incandescent is used as the base reference of 100 CRI. Compact fluorescent lamps are graded at 82-86 CRI, which is considered high quality color rendering. CRI is a more important consideration for retail lighting design than it is for office lighting.

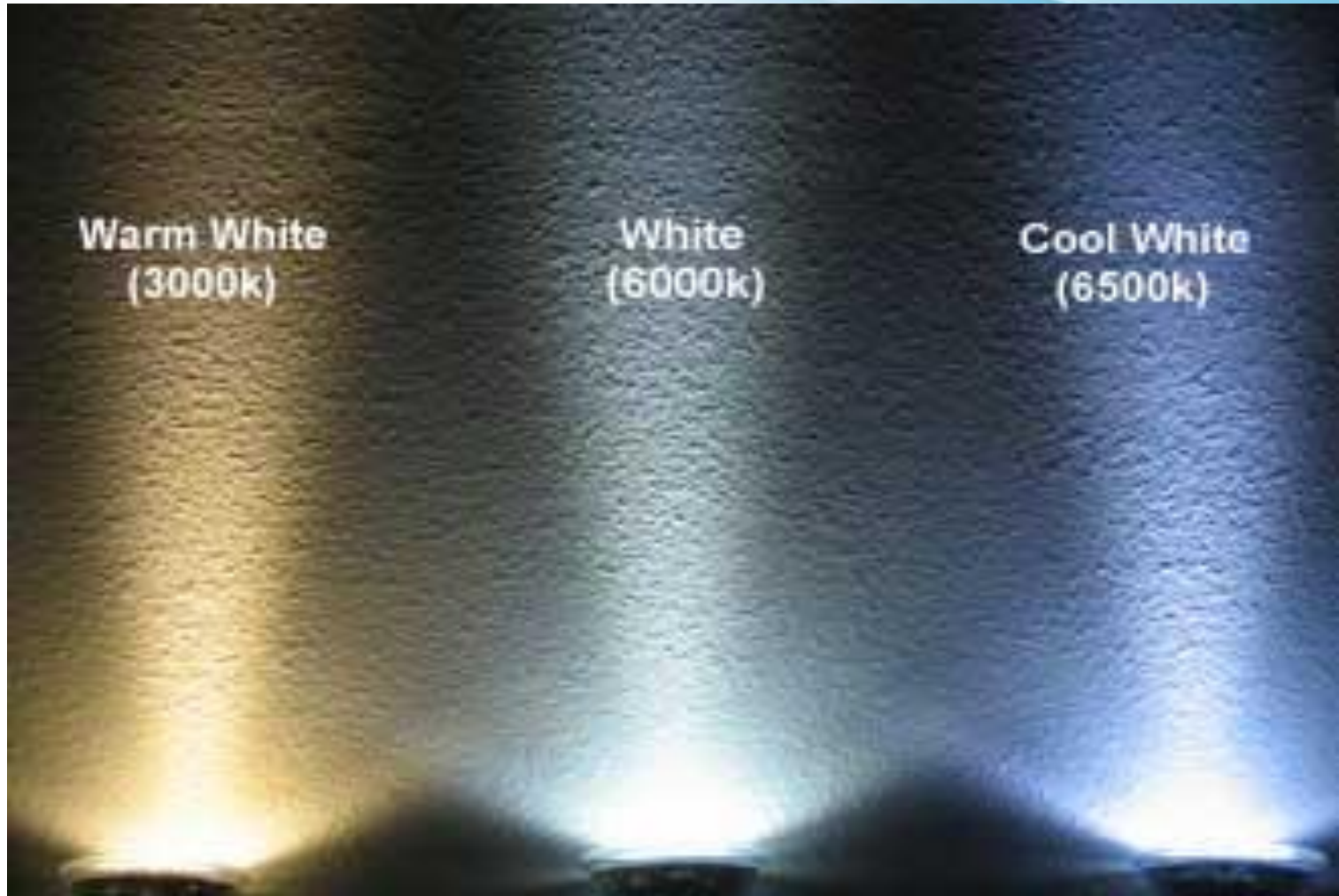
Any CRI rating of 80 or above is considered high and indicates that the source has good color properties. Incandescent lamps and daylight have a CRI of 100, the highest possible CRI. The higher the CRI of the light source, the “truer” it renders color.

Color Temperature: Refers to the way color groups are perceived – the psychological impact of lighting. Color temperature is how cool or warm the light source appears.

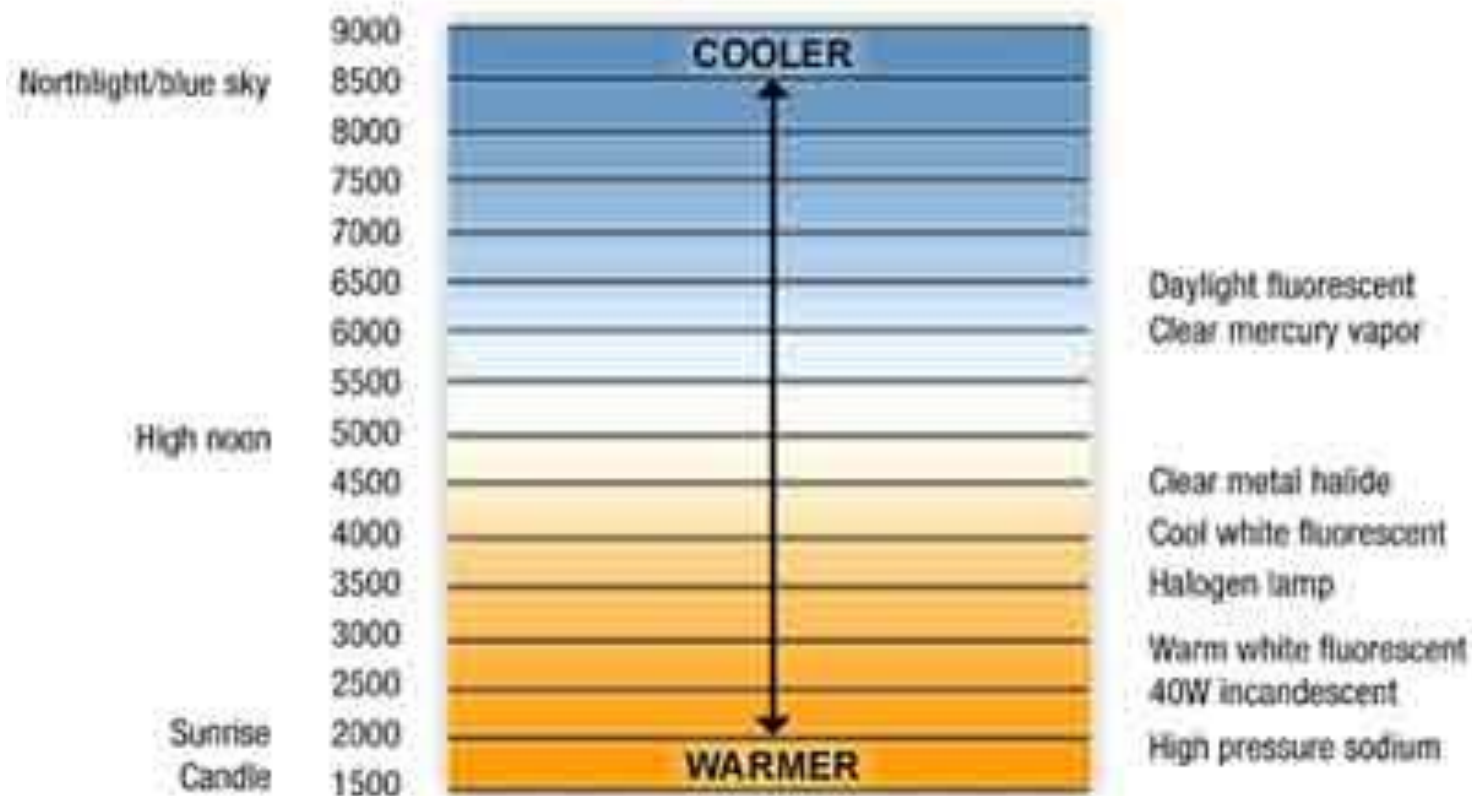
The color temperature of a light source is a numerical measurement of its color appearance. This temperature is based on the principle that any object will emit light if it is heated to a high enough temperature and that the color of that light will shift in a predictable manner as the temperature is increased. This system is based on the color changes of a black metal as it is heated from a cold black to a white hot state. As the temperature increases, the color would shift gradually from red to orange to yellow to white and finally to a blue white. Color temperature is measured in degrees Kelvin (K). Colors and light sources from the red/orange/yellow side of the spectrum are described as warm (incandescents) and those toward the blue end are referred to as cool (natural daylight).

The sun, for example, rises at approximately 1800 Kelvin and changes from red to orange to yellow and to white as it rises to over 5000 Kelvin at high noon. It then goes back down the scale as it sets.

ALL ABOUT COLOR OF LIGHT



Color Temperature Chart



Understanding Lighting Levels

- **Terminology:**

- Luminance should not be confused with illuminance
- Illuminance is the measure of light falling on a surface (lumens per square meter or lux)
- whereas ...
- Luminance refers to light reflected from it or emitted by it (candela per square meter or alternatively a possible illuminance x reflection factor).

- **Units of measurement:**

- Proper illumination depends on the location and design of windows, light sources, the type of light fixtures, the selection of the light source, the intensity and distribution of the source and fixture combination, and the room environment.
- Illuminance or illumination is measured by the units fc (lx) ; fc being the symbol for foot candles and (lx) the symbol for lux in the International System (SI).
- Luminance or brightness is measured by the units fL(cd/m²); fL being the symbol for foot Lamberts and (cd/m²) the symbol for candela per square meter.
- Luminaire is the name given to a complete light source and the light fixture.

- **Issues of Room Lighting**

- The following factors are involved: room proportions, ceiling height, reflectance from various walls and ceiling, color of surfaces, type of reflection from surfaces, type of work or how the room is used, type of fixtures, pattern of fixture installation, output of fixtures, efficiency of fixtures, light losses due to lamp aging, and allowance for dirt conditions.

- **Illumination Values for Interior Lighting**

- New research has indicated the desirability of modifying recommended levels of artificial illumination by use of weighting factors. It is possible to design illumination accurately to include the age of the user, to include the light reflecting value of walls, floors and ceilings,
- and to allow for the legibility of reading material and various kinds of visual tasks. The previous method for determining artificial illumination values consisted of tables of single-value recommendations.

- Both systems are included. The new way is described first as simply as possible. Fractional modifiers have been chosen to provide a means for increase or decrease ratios in lieu of tabulating three values of many digits. The earlier standards are included as a generalized guide to give a relative feeling for some common applications.

- **Levels of Artificial Illumination**

- An accurate method for determining the amount of artificial illumination needed is described here.

- Three lighting conditions are included:; general lighting throughout the room ;illumination on the task , and
- illumination on task, obtained by combining general and local (supplement) lighting

- **Values are in lux (lx) which are the units used in the SI metric system.**
 - **Divide values in lux by 10 for approximate footcandles.**

- **General Lighting throughout Room**

- **Three categories are included for various types of activities:**
 - **A Use 30 lux for public areas with dark surroundings.**
 - **B Use 75 lux for simple orientation for short temporary visits.**
 - **C Use 150 lux for working spaces where visual tasks are only occasionally performed.**
- **Adjustments to these values are made by selecting two weighting factors**
 - **Age of user is important (e.g. +40 years of age require more light)**
 - **Wall, floor and ceiling reflectance will vary, influencing the illumination**
- **Select one of the following conditions and obtain factor.**
 - **User age: under 40 (factor -1)**
 - **40-55 (factor 0)**
 - **over 55 (factor +1)**
- **Select one of the following conditions and obtain factor.**
 - **Average room reflectance is: over 70% (factor 1)**
 - **30% to 70% (factor 0)**
 - **under 30% (factor -1)**
- **Add the 2 factors algebraically for weight of influence.**
 - **If total weight is (-1), 0, or (+1) use a, b and c values.**
 - **If total weight is (-2) decrease a, b and c values by 1/3**
 - **If total weight is (+2) increase a value by 2/3 and b and c values by 1/3**

- **Illumination on the Task**

- **Three categories are included for various types of tasks:**

- **D Use 300 lx for performance of visual tasks of high contrast or large size such as reading printed matter, typed originals, handwriting in ink and good xerography. Use also for rough bench and machine work, ordinary inspection and rough assembly.**
- **E Use 750 lx for performance of visual tasks of medium contrast or small size such as reading medium-pencil handwriting, and poorly printed or reproduced matter. Use also for medium bench and machine work, difficult inspection and medium assembly.**
- **F Use 1500 lx for performance of visual tasks of low contrast or very small size such as reading handwriting in hard pencil on poor quality paper and very poorly reproduced matter. Use also for very difficult inspection.**

- **Illumination on Task, Obtained by Combining General and Local (Supplement) Lighting**

- **G Use 3000 lx for performance of visual tasks of low contrast and very small size over a prolonged period such as fine assembly, very difficult inspection, fine bench and machine work.**
- **H Use 7500 lx for performance of very prolonged and exacting visual tasks such as the most difficult inspection, extra fine assembly, bench and machine work.**
- **I Use 15000 lx for performance of very special visual tasks of extremely low contrast and small size.**

- **Adjustments to D, E, F, G, H and I values are made by selecting 3 weighting factors.**
-
- **Select one of the following conditions and obtain factor.**
 - User age: under 40 (factor -1), 40-55 (factor 0), over 55 (factor +1)
- **Select one of the following conditions and obtain factor.**
 - Task background reflectance (e.g. a page)
 - 17 over 75% (factor -1), 30% to 70% (factor 0) under 30% (factor +1)
- **Select one of the following conditions and obtain factor**
 - Speed and/or accuracy of task performance:
 - not important (factor -1), important (factor 0) critical (factor +1).
- **Add the 3 factors algebraically for weight of influence.**
 - If total weight is (-1), 0, or (+1) use D, E, F, G, H and I values.
 - If total weight is (-3) or (-2) decrease D, E, F, G, H and I values 1
 - If total weight is (+2) or (+3) increase E, F, hand I values 1/3 and D, G, values 2/3

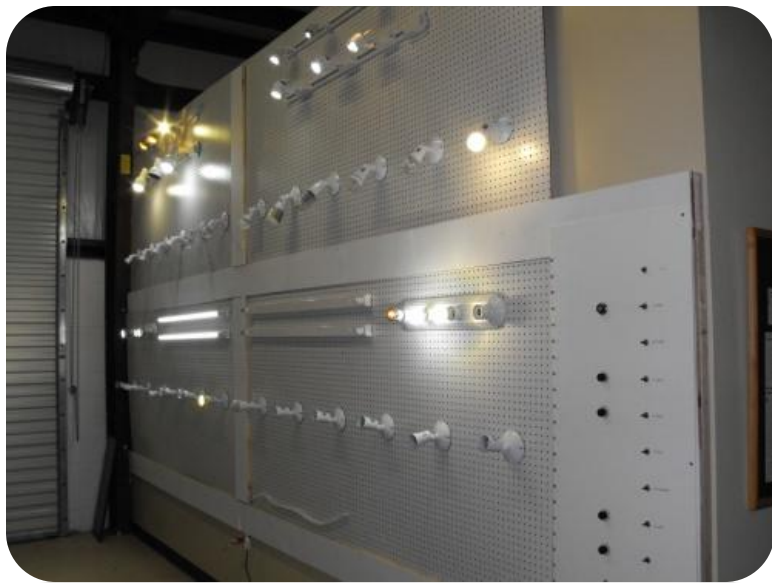
- **An example of illuminance categories for various activities or areas is listed.**
- **01 Dining / C**
- **03 Food preparation / E**
- **05 Laundry / D**
- **07 Reading books, magazines, newspapers / D**
- **09 Reading advanced piano scores / F**
- **11 Sewing Dark Fabrics (hand machine) / F**
- **13 Sewing high contrast / D**
- **15 Table games / D**
- **17 General lighting for passage areas and for safety / B**
- **02 Grooming, shaving, make-up / D**
- **04 Serving and other non-critical tasks / D**
- **06 Ironing / D**
- **08 Reading advanced piano scores / E**
- **10 Reading simple piano scores / D**
- **12 Sewing medium fabrics / E**
- **14 Study / E**
- **16 General lighting for relaxation / B**

- **Illumination levels and limiting glare indices for various functions**

- The table following lists illumination levels suitable for a range of situations: the quality of these levels could be influenced by glare and an acceptable limiting index is also shown. The glare index is calculated by considering the light source location, the luminances of the source, the effect of surroundings and the size of the source.
- Glare indices for artificial light range from about 10 for a shaded light fitting having low output to about 30 for an un shaded lamp.

<u>Location</u>	<u>Illuminance (lux or lrn/m')</u>	<u>Location</u>	<u>Illuminance (lux or lrn/m')</u>
• Entrance hall	150	• Stairs	150
• Corridors	100	• Outdoor entrances	30
• Casual assembly work	200	• Rough/heavy work	300
• Medium assembly work	500	• Fine assembly work	1000
• Precision work	1500	• General office work	500
• Computer room	750	• Drawing office	750
• Filing room	300	• Shop counter	500
• Supermarket	500	• Classroom	300
• Laboratory	500	• Public house bar	150
• Restaurant	100	• Kitchen	500
• Living room	50	• Reading room	150
• Study	300	• Kitchen	300
• Bedroom	50	• Hall/landing	150
• Library :Reading area	200	• Library: Tables	600
• Library: Counter	600		

Testing and Showroom



Watt-Smart