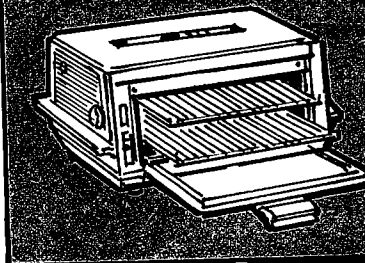
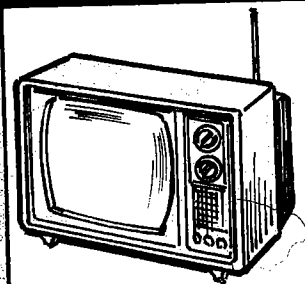
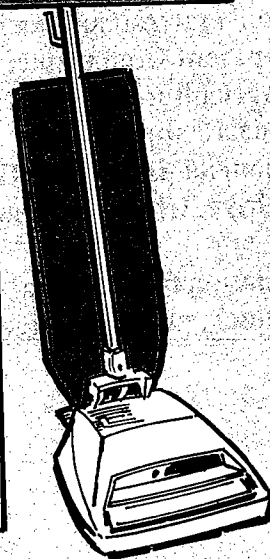
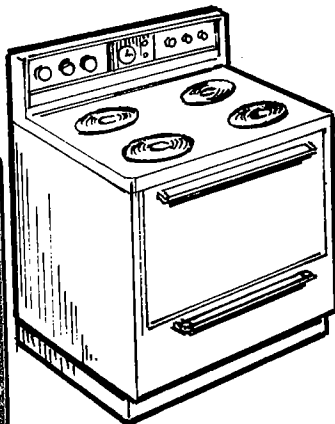
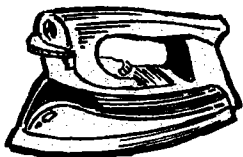
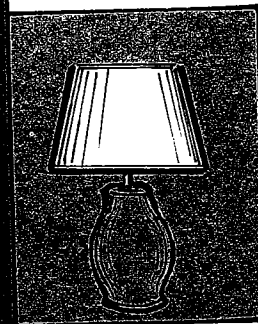
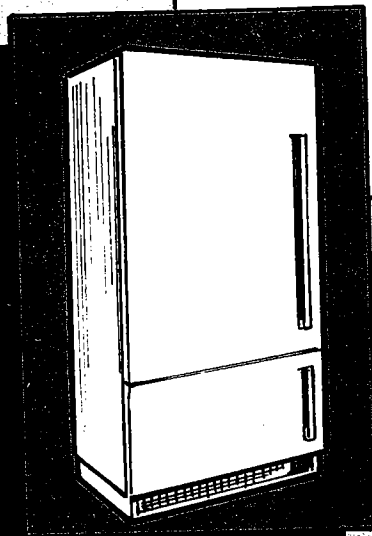
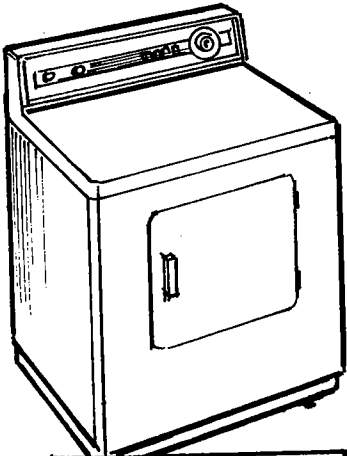
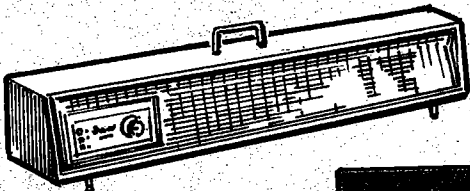


# ELECTRICITY

for

# Family

# Living



# Electricity For Family Living

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## ACKNOWLEDGMENTS

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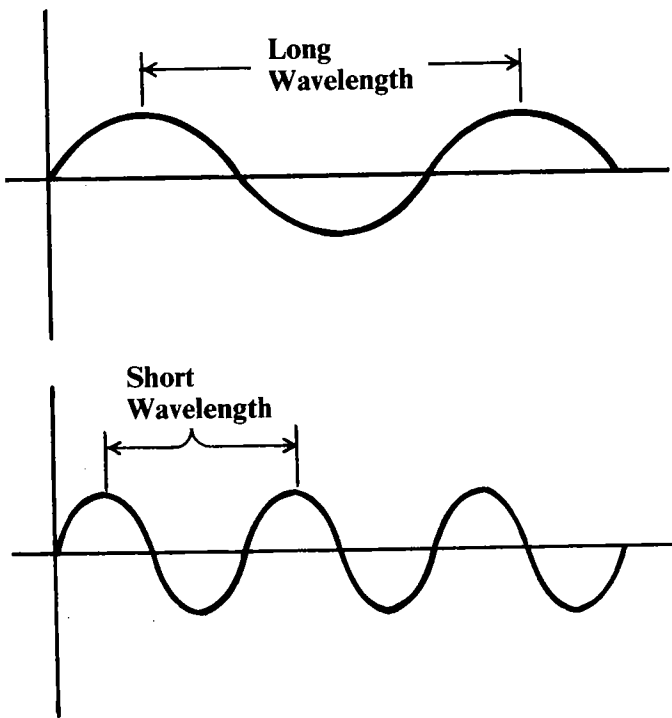


# I. The Nature of Light

Light is a form of energy which travels at the fabulous speed of 186,000 miles (or 297,000 kilometers) per second. At this speed, you could travel completely around the world in the snap of your fingers!

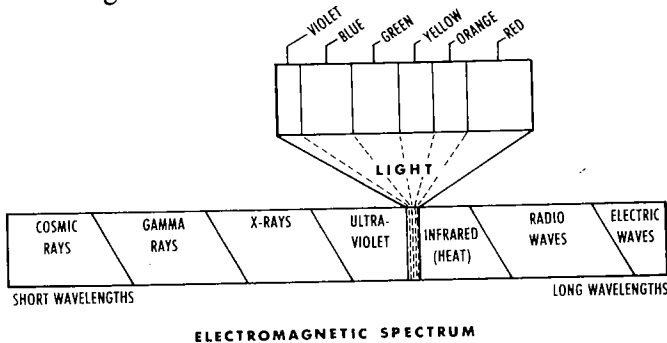
Light, along with radio waves, heat and X-rays, are all forms of "electromagnetic radiation". All travel at the same "super speed". The only difference between them is "wavelength".

We can visualize electromagnetic radiation as traveling in "waves" much like waves on the ocean. "Wavelength" is the distance between wave crests.



In the case of electromagnetic waves, longer or shorter wavelengths determine the characteristic of the electromagnetic energy — that is, whether we call it heat, radio signals, light or X-rays.

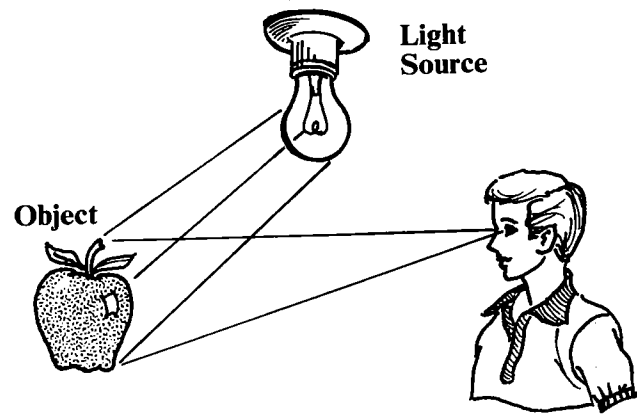
Electromagnetic waves are categorized by their wavelength along a "spectrum" or scale, from long wavelengths to short wavelengths.



Notice that visible light is only a relatively small segment of the electromagnetic spectrum. The eye cannot detect, radiation with wavelengths longer or shorter than this narrow band.

Also notice that the color of light depends on wavelength. Within the visible light spectrum, the longest wavelengths are seen as red and the shortest are seen as violet. Light composed of all visible wavelengths (all colors) is seen as white.

We can see many things because they produce light themselves — such as the sun, an incandescent bulb, a candle, etc. Most things we see do not produce light, however. They are visible because they reflect light from another source.



If an object reflects some wavelengths but not others, it appears colored. For example, of the light that strikes a ripe apple, most of that reflected is of such a wavelength that the reflected light striking our eyes makes the apple appear red.

## Measuring Light

How much light is enough? We know that sunlight on a clear day can be very bright — to the point of hurting our eyes. Other light, such as moonlight, is so dim that we have to make up for the dimness by holding the material closer to our eyes.

There is a way we can measure how much light is present. The total amount of light that a light source produces - measured at the surface of the source - is expressed in **lumens**. The number of lumens produced by a general-purpose incandescent bulb increases with the wattage of the bulb, as follows:

| WATTS | LUMENS |
|-------|--------|
| 25    | 235    |
| 40    | 455    |
| 60    | 870    |
| 100   | 1750   |
| 150   | 2880   |
| 200   | 4010   |

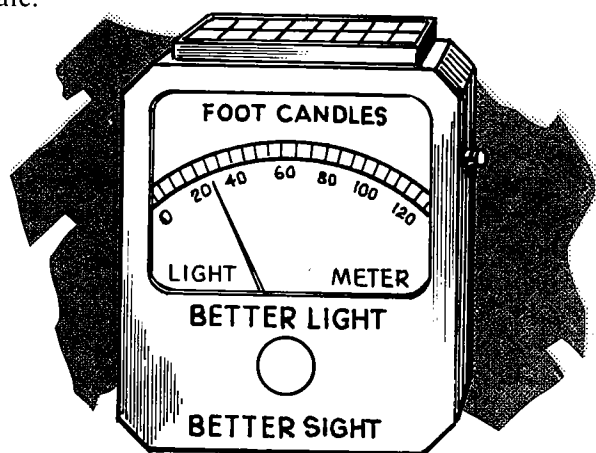
Generally, an incandescent bulb with a lower lumen output will have a longer life of service, but with less efficiency.

Since a fluorescent tube is more efficient than an incandescent bulb it can produce several times as many lumens and will burn much longer, too. A 40 watt fluorescent bulb will produce 3150 lumens and last 20,000 hours. You can see how using fluorescent tubes in place of incandescent bulbs is an important way to conserve energy.

The amount of light that *falls* on a surface from a light source is measured in **footcandles**. For the sake of definition, we can say that a footcandle is the amount of light that falls on a surface one foot square when held one foot away from a standard candle. Footcandles are related to lumens in that, if one lumen falls on one square foot, we have one footcandle of illumination.

The amount of light that falls on a surface decreases sharply as the surface moves away from the source. This is because the light rays fan out as they travel, leaving fewer rays to fall on each given area of surface.

If we want to know the number of footcandles falling on a surface, we can use a "light meter". Simply set the instrument at the point where the illumination is to be measured and read the footcandles directly on the scale.



As we observed earlier, there can be too much light or not enough light to do various tasks.

The quantity of light needed depends on:

1. *The size of the object.* If the print in a book is small, more light is needed to read it.
2. *The amount of "contrast" between the object and its background.* If black letters are printed on white, less light is needed than if the letters are gray.
3. *The time allowed for the eyes to focus on an object.* If an object must be seen quickly, more light is still needed. Dusk, therefore, is a hazardous time for driving, because our eyes cannot focus quickly on other objects.

4. *The strength of the eyes of the user.* For instance, an older person generally needs more light than a younger person.

Lighting experts have arrived at guidelines on how much illumination is needed for various tasks. How does your home rate in areas where these activities are carried on?

**Illumination In Footcandles**

**Visual Task**

|         |  |
|---------|--|
| 10-20   | Card playing, halls and stairway areas, room "background" lighting   |
| 20-30   | Casual reading, easy sewing (such as basting with contrasting thread)  |
| 30-50   | Household activities in kitchen and laundry  |
| 40-70   | Prolonged reading or study; sewing on medium-colored fabric or machine stitching; shaving, facial make-up; work at a workbench |
| 100-200 | Fine sewing; hobbies with small details  |

Now we know how we measure the amount of light put out by a source and the amount of light that falls on a surface. But light is also *reflected* from surfaces.

Different surfaces will reflect different amounts of light than others. The ability of a surface to reflect light is called its "reflectance". If a surface reflects all the light that falls on it, it has 100% reflectance; if it reflects none (that is, absorbs all the light) it has zero reflectance. Of course in the real world, nothing has zero or 100% reflectance — some light is always reflected and some absorbed.

As you can probably imagine, various surface colors reflect light to various degrees. The table below shows the approximate reflectance of various colors on painted surfaces:

| COLOR               | % REFLECTANCE |
|---------------------|---------------|
| White               | 80 to 85%     |
| Pale pink or yellow | 75 to 80%     |
| Ivory               | 70 to 80%     |
| Cream               | 65 to 75%     |
| Buff                | 55 to 65%     |
| Gray                | 35 to 50%     |
| Light Blue          | 35 to 50%     |
| Light Green         | 30 to 40%     |
| Dark Green          | 15 to 25%     |
| Red                 | 15 to 25%     |
| Dark Blue           | 5 to 15%      |
| Brown               | 8 to 12%      |
| Black               | 2 to 5%       |

In a home, it is recommended that ceilings have a high degree of reflectance, walls a high to medium degree and floors a lower degree, but not less than 15%. A high degree of total reflectance in the home means that with a brighter room, less electricity is needed for lighting and more energy is conserved.

**Quality of Light**

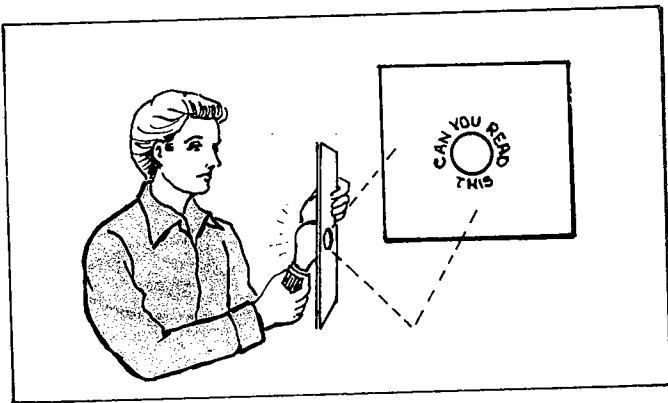
When electricity was first introduced into homes early in the 20th century, many rooms were lighted simply with a bare bulb suspended from the ceiling by its wire. The improvement over candles or lanterns was so great that no one even considered the "quality" of the light. Simply *having* it was important enough!

More recently, we have come to realize that the manner in which light is used — as well as the amount of it — has much to do with our ability to see our work efficiently and even our disposition. Unfortunately, even today not enough care is devoted to designing lighting with the best possible quality.

What are some of the things we should consider in looking for good quality lighting?

**Glare:** One of the most obvious problems in "bad lighting" is glare. Glare is concentrated light rays hitting your eyes in such a way as to make seeing harder and to put a strain on your eyes.

You can demonstrate glare by the following experiment: Cut a hole two inches in diameter in the center of a large piece of white cardboard. Print letters an inch high closely around the hole using a black crayon. Hold a 100-watt light bulb in the hole from the side of the cardboard opposite the lettering. Have a friend stand about 5 feet away and turn on the light. Can your friend read the lettering?

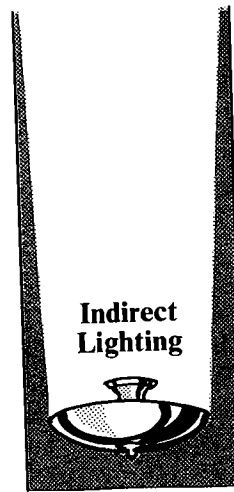


This is an example of direct glare. Other sources of glare are bare light bulbs, lamp shades that do not screen light well and poorly designed light fixtures. Glare can also result from reflected light. Book pages, desk tops and shiny paint, can all cause glare if they do not properly scatter the light striking them.

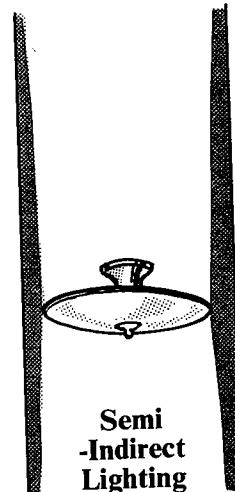
We can reduce glare by "diffusing" or scattering the light. Light can be diffused by using:

1. a *frosted incandescent bulb*
2. *fluorescent lights*
3. *indirect lighting* — that is, shielding the light source so that much of the light reaches the eyes through reflection from another surface. Shielding can produce 5 types of lighting:

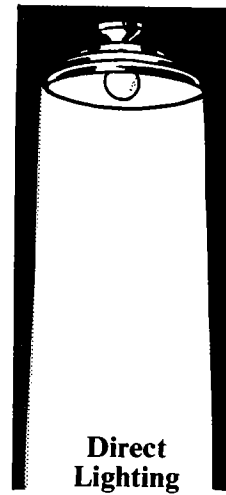
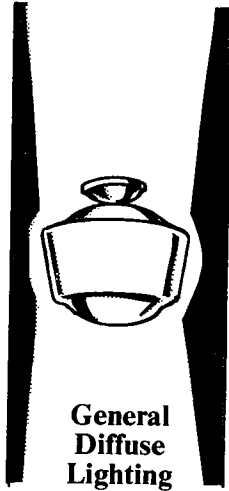
- a. **Indirect Lighting** 90 to 100% of the light is directed upward, 0 to 10% downward. Little glare, with shadows practically eliminated.



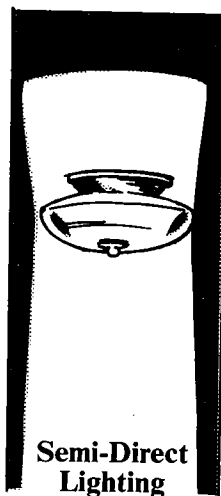
- b. **Semi-indirect Lighting** 60 to 90% of the light goes upward and 40 to 10% downward. Causes a bit more glare and shadow than indirect.



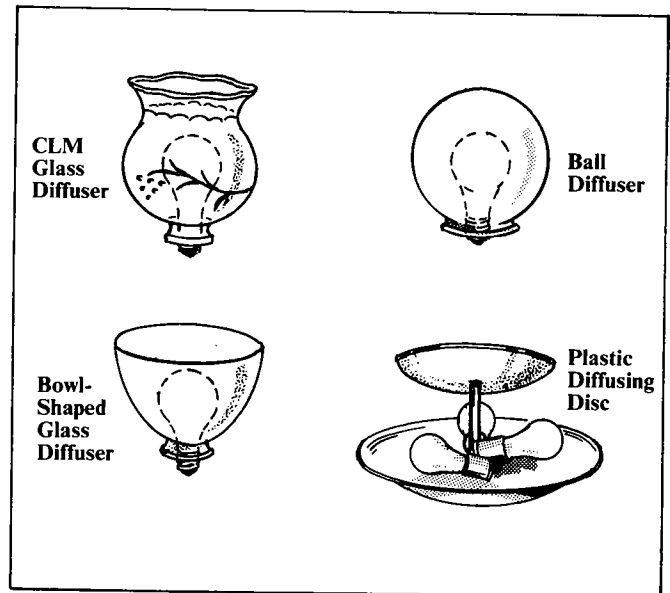
- c. **General Diffuse Lighting** 40 to 60% of the light goes upward, 60 to 40% downward. Throws light in all directions.



- d. **Semi-Direct Lighting** 10 to 40% of the light goes upward, 90 to 60% downward. Most of the light is directly on the work surface, with some glare and shadows as a result.

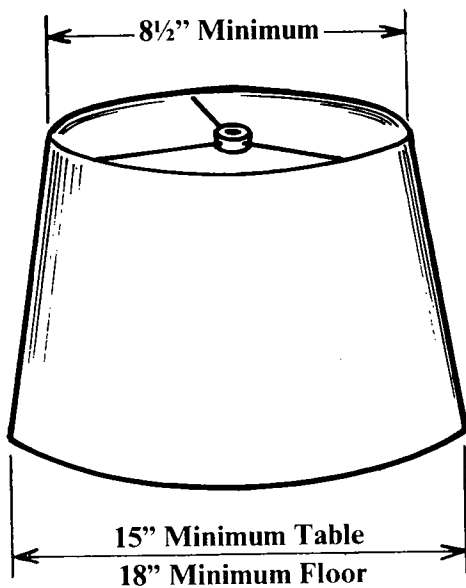


4. A diffusing screen or "diffuser" placed around the light source. A diffuser is usually made of "translucent" (allowing light to pass through, but scattering it as it does so) material such as plastic or glass. There should be at least 1/2-inch to 3/4-inch clearance between bulb and diffuser to avoid "hot spots". You have likely seen these types of diffusers around the home:

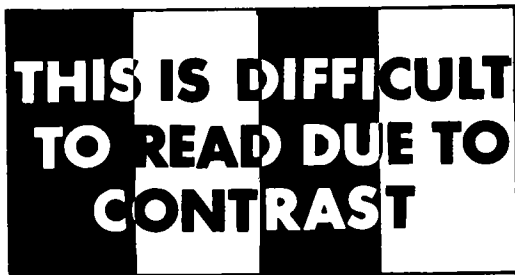


- e. **Direct Lighting** 0 to 10% of the light goes upward, 100 to 90% downward. Maximum light is on the working surface, causing excessive contrast between light and shadow. This lighting causes the most glare.

5. A good lamp shade. A good shade should have a wide opening at the top (at least 8 1/2 inches), with a minimum diameter of 15 inches (table lamps) or 18 inches (floor lamps) at the bottom.



**Contrast** Sharp differences in light and dark cause "contrast". Too much contrast may cause eye strain because the eyes must adjust constantly from light to dark. The figure below shows an example of too much contrast.



Using only one light source in one part of a room causes contrast because some areas of the room are dark and others are bright. Reading a book on a dark desk with only one light in the room is tiring to the eyes because of the contrast between the book and its surroundings.

Watching TV without any lights on in the room is equally tiring.

Like glare, contrast can be reduced by diffusing the light source, especially by using indirect lighting. The area is more evenly illuminated this way. Using additional light sources also helps.

**Direction** Be sure the light comes from the proper direction when you are studying, writing or using your hands for other jobs. If you are right-handed, most of the light should come from the left. If you are left-handed, most of the light should come from the right. This is so that your hand won't throw a shadow across your work. Place lamps in the room so the light is well directed from one side or the other. If light falls directly in front of you, it may cause glare and when it falls directly behind you, your shadow may fall on your work!

### Things To Do

#### 1. Light Measurement

Obtain a light meter and check the light levels (in footcandles) falling on various important work surfaces around your home. Examples are: desks, kitchen counters, tables, laundry counter, workbench and sewing table. Record the light levels on a chart, discuss with the club whether the light levels measure up to standards.

#### 2. Experiment with Reflectance

Find several samples of wallpaper, each about two feet square, in as wide a range of colors (from light to dark) as possible. Mount one of the paper samples on a wall using masking tape. Select a wall with as much light falling on it as possible (natural sunlight plus room lighting).

Take incident and reflected light meter readings by aiming your meter first at the light source, then at the color sample. Compute the reflectance. Record the readings, the paper color and the reflectance in the following table:

| COLOR | INCIDENT LIGHT | REFLECTED LIGHT | % REFLECTANCE |
|-------|----------------|-----------------|---------------|
|       |                |                 |               |
|       |                |                 |               |
|       |                |                 |               |

Repeat, using different colors. Place the pieces in the same place and take measurements only when light conditions are the same.

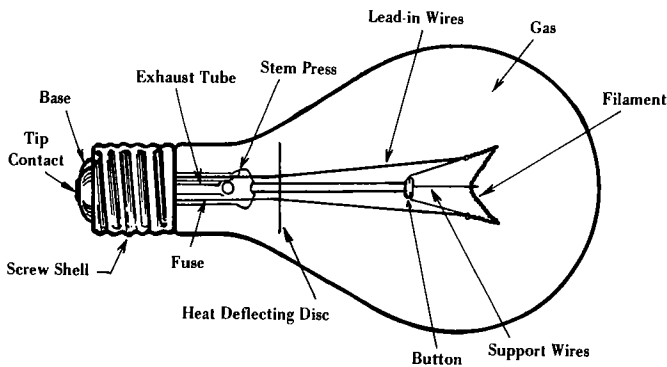
Which color reflects more light?

3. Demonstrate "glare", "contrast" and "direction" in poor lighting situations and describe how to correct them.

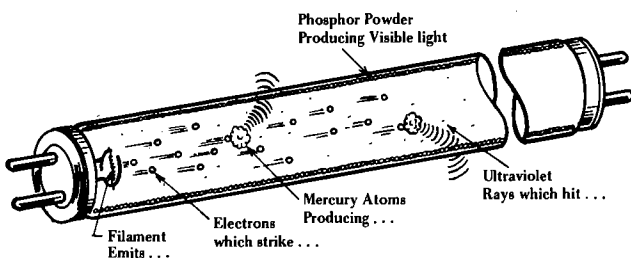
## II. Types of Light Sources and Fixtures

In an earlier unit of the Electric Energy program we learned about how electricity produces light.

In the case of the incandescent bulb, we learned that a fine piece of wire, called the "filament," which has very high resistance to the passage of electricity, is made to heat up to the point of glowing with white-hot radiance. In such bulbs some 90% of the energy released is in the form of heat — only 10% is in the form of light. The construction of a typical bulb is shown below:



In the case of fluorescent tubes we saw how electrons released from a heated filament strike mercury atoms, causing them to release ultraviolet rays which in turn strike phosphor crystals coating the inside of the tube, producing visible light.

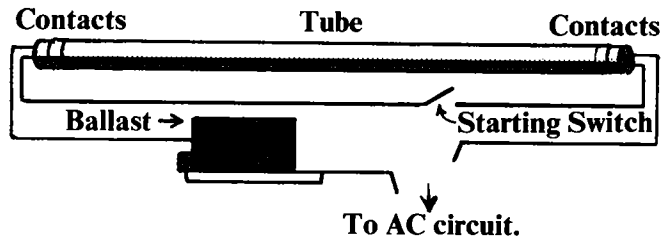


Fluorescent tubes cannot be connected directly to 120-volt circuits. Unless they are rapid start or instant start tubes, they must use a "ballast" to get them going. The ballast, a type of transformer, does two major things:

1. It supplies the correct operating voltage to the lamp.
2. It limits the amount of current provided to the lamp. (Without the ballast the lamp would draw more and more current until it destroyed itself.)

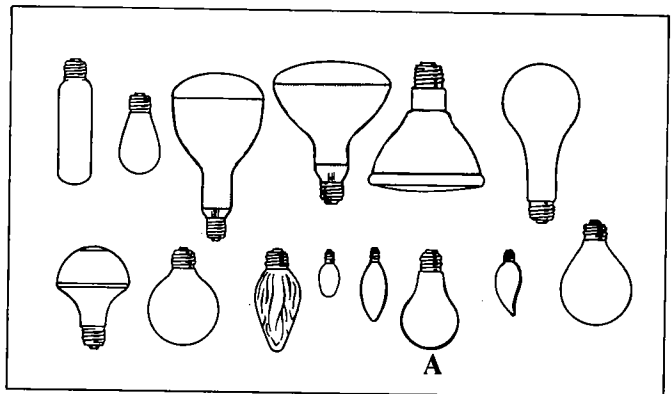
Fluorescent tubes must use some method of starting the arc (stream of electrons) flowing in them. Earlier

lamps required a separate starter, but newer ones have the starting mechanism built into the tube and ballast. The starter is basically a switch that provides a complete circuit for current to flow through the filaments in the end of the tube. This causes the filaments to heat up. The starter then automatically opens to remove the filaments from the circuit when they have become hot enough to start the electrons flowing in the tube.



Let's now take a look at the many different shapes and sizes in which these two basic types of light sources are found and their uses.

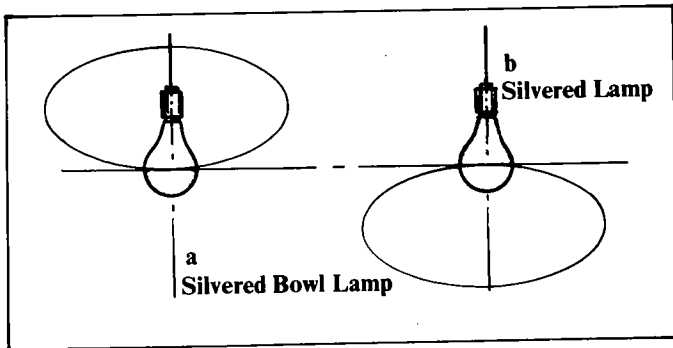
**Incandescent Lamps** come in many shapes and sizes with different letter designations, as the diagram below shows. Type "A" is the most common.



Many special lamps are available in many of the above shapes and sizes, but with special features for special tasks:

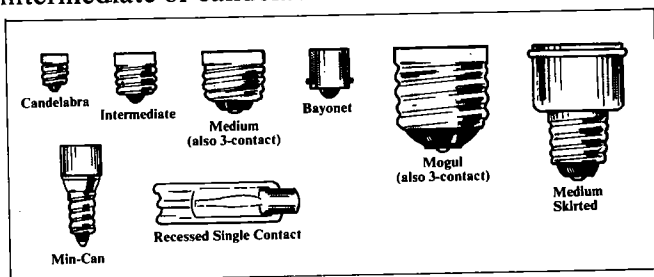
1. **Frosted Bulbs** These bulbs are "frosted" or have a special chemical coating on the inside which diffuses the light emitted by the filament. Frosted bulbs should be used wherever glare could be a problem.
2. **Silvered Bulbs** Some bulbs have silvered bowls to reflect light upward or silvered sides to reflect light downward. Cone-shaped bulbs with silvered sides are used as floodlights or spotlights.





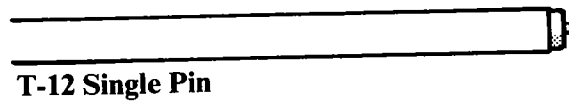
3. *Rough-service Bulbs* These have heavier filaments so they can withstand vibration and shocks. Some have a plastic outer coating to keep them from shattering.
4. *Colored Bulbs* Bulbs which give off colored light will have a colored bulb. The glass itself may be colored by adding chemicals when the glass is made, or the bulb may be coated with a colored enamel on the inside or outside. "Bug-away" bulbs are yellow-orange in color and are used where attracting insects is undesirable, such as around doors to home. Bugs are not attracted to light whose wavelength is yellow or red because they cannot see it.
5. *Infrared Bulbs* Some incandescent bulbs are designed to give off a high amount of light in the "infrared" region of the electromagnetic spectrum. Such bulbs are usually called "heat lamps" and are used to keep small animals warm (as in a chick brooder), to keep food warm prior to serving and to give "heat treatments" to sore, stiff muscles.

Incandescent bulbs also come with a variety of bases, as shown in the figure below. Medium bases are used most often for general lighting. Large bulbs will use the "mogul" base and decorative lamps may use intermediate or candelabra bases.

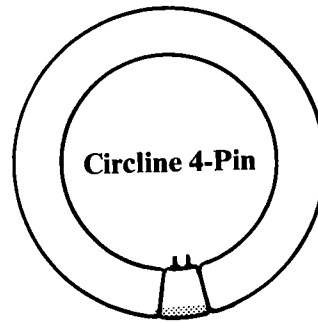


**Fluorescent Tubes** also come in a number of shapes and sizes just as do incandescent bulbs.

Most fluorescent tubes are straight, but may also be bent into a "U" or a circle. The tubes come in different lengths and diameters. Several different bases are used with fluorescent tubes. Also, fluorescent tubes are available to fit into a regular incandescent bulb socket.



T-12 Single Pin



Circline 4-Pin

T-9

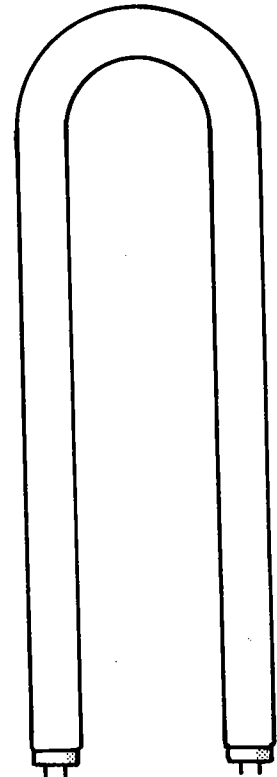
8 1/4" Outside Diameter

T-10

12" Outside Diameter

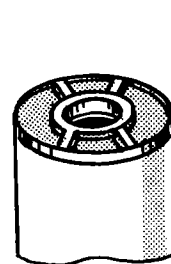
T-10

16" Outside Diameter

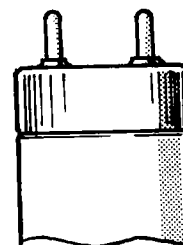


"U" Bent Lamp

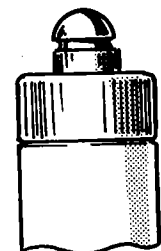
### Types of Tube Endings



Recessed



Bipin



Single Pin

Fluorescent tubes are specifically built for the ballast they are to be used with. When replacing fluorescent bulbs (which you should do when you see one flickering or, of course, when one is burned out), the replacement should always be matched to the ballast. One type of lamp should not be replaced with another type.

Fluorescent lamps also come in different colors — not in the sense of yellow, red or green colors, but different tones of white light. The color of a tube depends upon the kind of phosphor which is used to coat the inside.

Lamps, which produce ultraviolet radiation, are also available. The light from these can be used to produce the common “black light” effect, to tan skin or to kill germs.

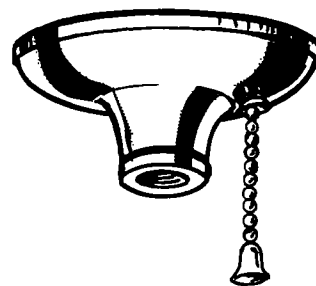
Some of the different types of fluorescent tubes according to color are:

| Name of Tube                         | Color Characteristics   |
|--------------------------------------|---|
| Standard Cool White                  | Gives a bluish-white light. Very efficient. Used for color matching or for laundry to show up spots and stains. Gives an unpleasant bluish cast to food and skin.                       |
| White                                | Not as blue as the above; a good general-purpose light for kitchens, workrooms, shop areas.   |
| Deluxe warm light                    | Most nearly like incandescent lighting in color, preferred for pleasant appearance of food and skin. Not quite as efficient as above types. Preferred for most living and eating areas. |
| Deluxe cool white, deluxe soft white | The deluxe versions give slightly less light per watt than the standard types, but the light gives people and food a more pleasant appearance. Preferred for office areas.              |

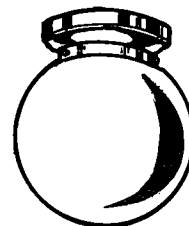
**Lighting Fixtures**

There are many different types of fixtures which can be used to house light sources — either incandescent or fluorescent.

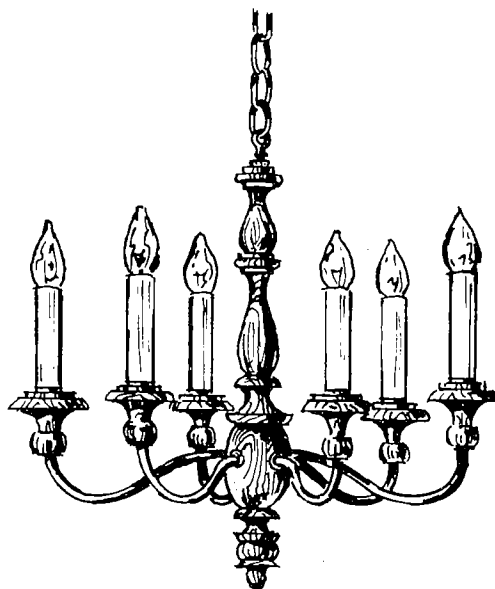
**Incandescent ceiling fixtures** One common incandescent fixture is the simple ceiling-mounted socket which can be controlled by a pull-chain or wall switch. This type of fixture can be used where bare bulbs are not objectionable, as in closets, garages and workshops.

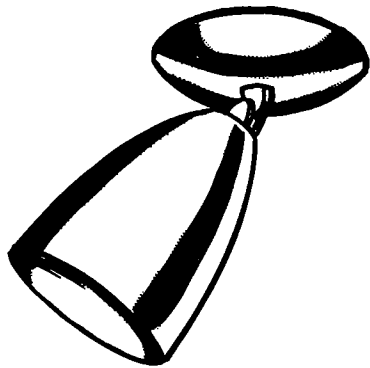


If we add a simple diffuser, of the types discussed earlier, our ceiling fixture becomes useful in other rooms. A common type uses a simple globe diffuser and is used for general lighting in kitchens, bedrooms, hallways, etc.



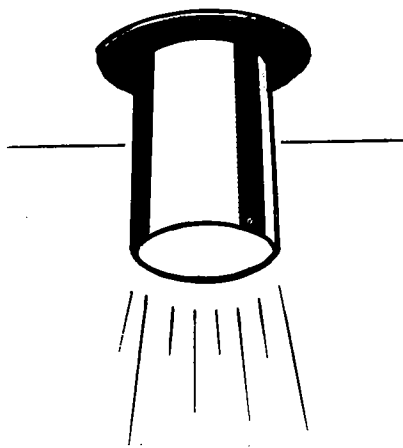
Of course, ceiling fixtures can be very elaborate, such as the fine chandeliers we sometimes see in home dining rooms, hotel or business lobbies, etc.



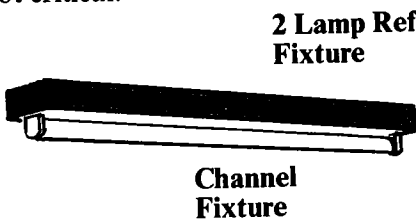


“Bullet” type ceiling fixtures (which can also be used on walls) are used where concentrated light is needed for a task or for decorative lighting.

Some ceiling fixtures are simply cylinders designed to direct the light downward in a narrow concentration. These are often used for decorative effect in hallways, along one wall of a room, etc.



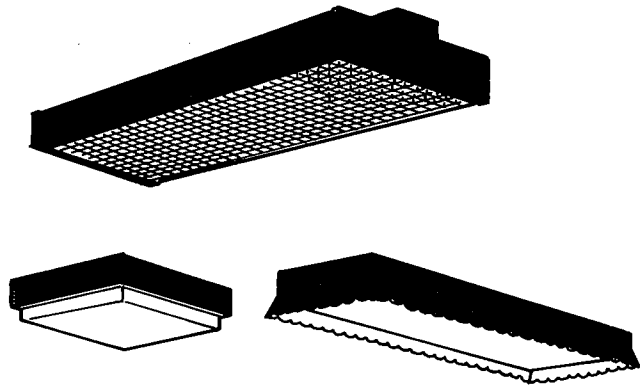
Fluorescent ceiling fixtures come in many styles. Exposed tubes are used in many places where light direction is not critical.



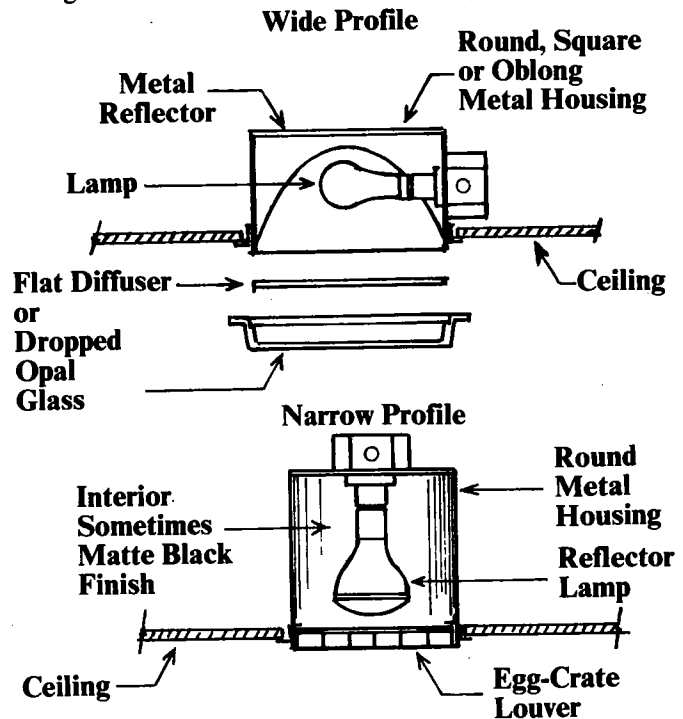
Fluorescent Reflecting Equipment



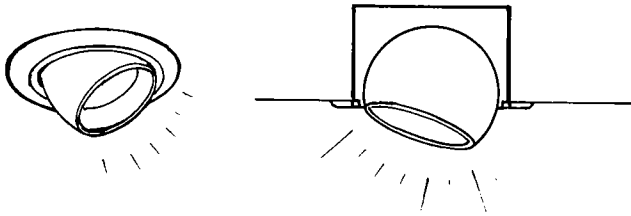
Louvers or lenses can be added where light must be directed for good light quality, such as in offices or classrooms. Decorative touches can be added when the fixture is to be used in homes.



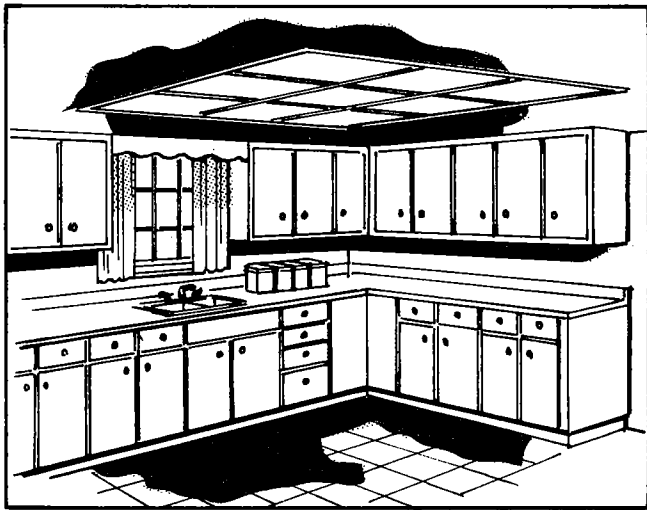
Some ceiling fixtures are “recessed”, or partially hidden in the ceiling. Some will distribute light over a wide area, while others concentrate it in a small beam. Sometimes these are called “top hat” fixtures because the metal housing resembles a gentleman’s formal headgear!



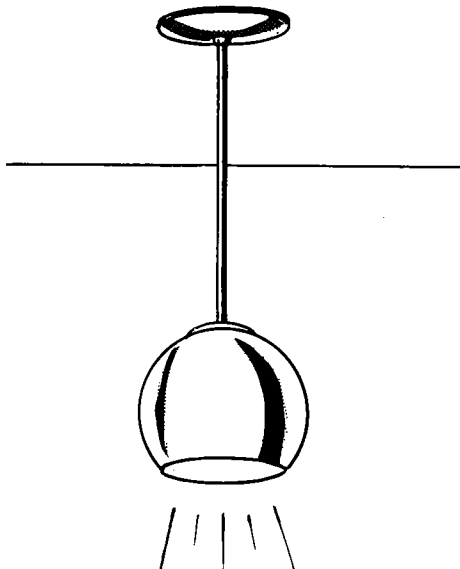
Some recessed fixtures contain a rotating ball-shaped element that may be turned to project light in any direction below the ceiling line. These are called “eyeball” fixtures. Some include a reflector to guide the light “sideways” toward a nearby vertical plane and are called “wall-washers”.



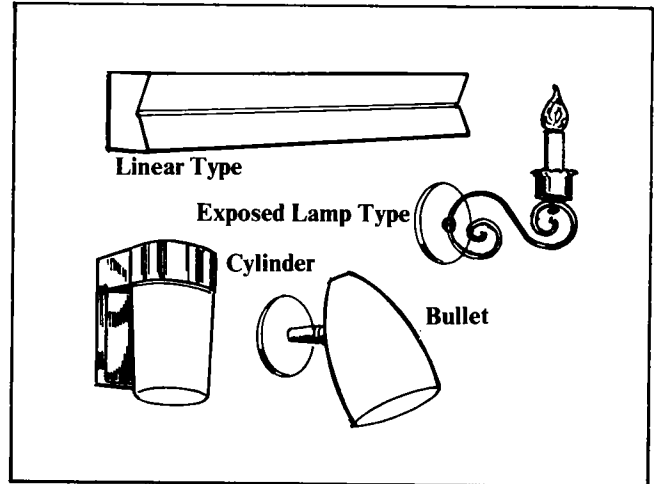
Another form of recessed light is the “luminous ceiling”. In this case, fluorescent lamps are fixed on the ceiling and a false ceiling of louvers or translucent panels is suspended below. This lighting is suitable for kitchens, bath and laundries. Dimming controls should be included with luminous ceilings.



Still another form of ceiling fixtures are “pendant” fixtures, which are suspended by wire or decorative chain to get closer to their use. Many chandeliers and work lights are of this type. Pendant fixtures may be used as decorative lighting in many instances.

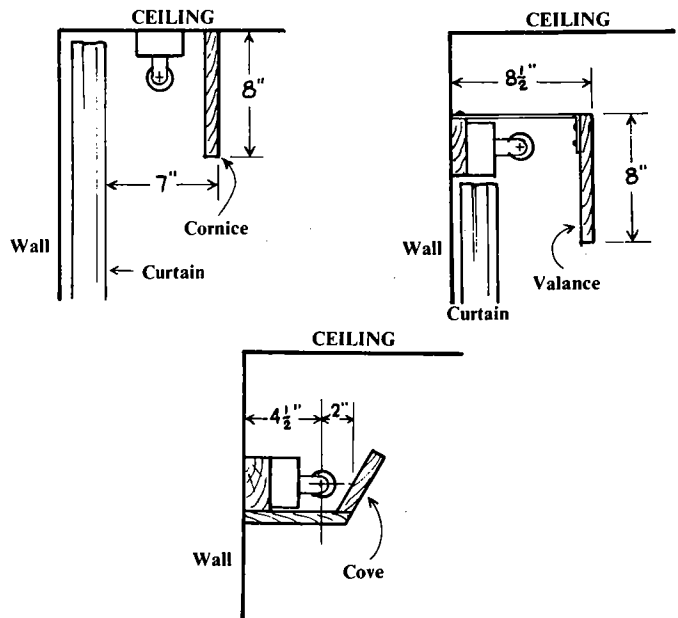


**Wall-Mounted Fixtures** Several wall-mounted fixtures are shown below. The linear type may be used in either horizontal or vertical positions. These may use either a series of incandescent bulbs or fluorescent tubes, and are typically found in bathrooms or above beds. The exposed-lamp type is usually for decorative purposes. The cylinder lamp holder is often used for lighting walkways or building entrances.



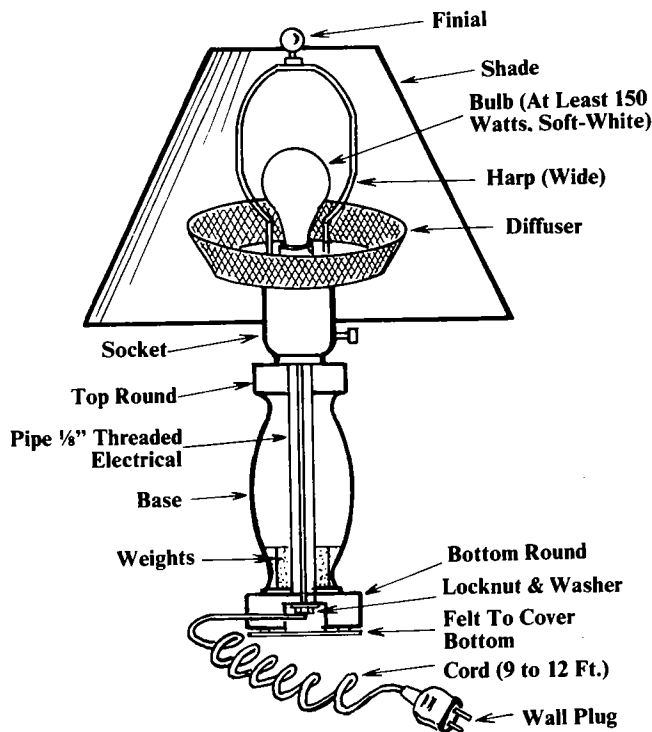
**Structural Lighting** Structural lighting must be planned and “built-in” when a room is built or remodeled. These installations provide special indirect lighting effects or supplement room lighting.

Cornice lighting can be used to accent wall coverings and draperies. Valance lighting is usually used over windows, providing upward light to add to the general room lighting as well as downward light to accent the draperies. Cove lighting can be used to add to general lighting in rooms with near-white ceilings.

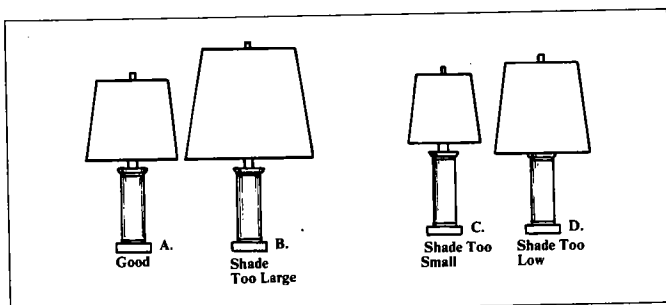


**Portable Lamps** Portable lamps, often called table lamps, are used for their decorative appeal as well as for their light. They must be designed and purchased carefully to provide a good light source as well as to be attractive. They can be made to use on a desk or table, or to set on the floor.

Lamps can be considered as having five main parts: a bulb, a socket, a shade, a diffuser and a base.



The lamp shade should be chosen carefully, with more thought given to it than just its decorative value. The shade should be wide enough at the base to spread the light over a wide area, with the bottom diameter wider than the top. About a third of the light should be directed upward. The shade should be large enough to cover the bulb and socket parts, yet proportioned to be attractive in appearance.



Shades may be “translucent” or “opaque”. Translucent shades let the light shine through, but cannot be seen through. Opaque shades will not let any light shine through at all. The inside of lamp shades should always be white and never shiny. The material of the lamp shade should be suited to the use of the lamp, such as moderately transparent to opaque (white vinyl, parchment or white-lined fabric) for study or reading lamps or highly translucent (thin plastic, fiberglass or silk) for make-up lamps.

Lamps should use diffusers to spread the light evenly — especially when they are to be used for studying.

### Things To Do

1. Show different types of incandescent and fluorescent bulbs and tell how they are used.
2. Compare clear, inside frosted and white bulbs and how each affects glare. Show the use of shades or indirect lighting to reduce glare.

### 3. Conduct a Home Lighting Survey

Make an information chart of the structural lighting in your home. Name the locations, type, use, wattage and whether the light quality is good or poor for the purpose intended. Did you do anything to improve the lighting along the way? Keep a record of the improvements you made or suggested.

| ROOM    | LIGHT LOCATION | TYPE   | WATTAGE | USE               | QUALITY | IMPROVE |
|---------|----------------|--------|---------|-------------------|---------|---------|
| LR      | end tbl. lamp  | Inc.   | 150     | Gen Purp.<br>Read | good    |         |
| Kitchen | ceiling        | Fluor. | 60      | Gen. Purp.        | good    |         |

You may wish to sketch the “floor plan” or layout of your home showing where light fixtures or lamps are located.

### 4. Take a Lighting Field Trip

Visit a lighting equipment dealer or the lighting department of a good department store. Notice all of the many different kinds of fixtures, lamps and bulbs. Look for the wide variety of bulbs offered, and how they are different in appearance and output.

## III Lighting with a Purpose

Three kinds of lighting are generally required for an all-around well-planned lighting system for the home: general lighting, task lighting and decorative lighting. We've looked at some of the various types of light sources and fixtures available for home use. Now let's see how we can use these different sources and fixtures for different lighting needs.

**General Lighting** Some of the purposes of general lighting are:

1. In living areas, to reduce the contrast in brightness between task lighting and other areas of the room.
2. In utility areas, to light work surfaces and create a pleasant working environment.
3. In bedrooms, for dressing, housekeeping chores, care of children and invalids and ease of seeing into drawers and shallow closets.
4. In entrance halls for a cheerful welcome and in passageways and stairways for visibility.

General lighting requires light levels less intense than those needed for special purposes such as reading, sewing and other tasks.

You can use table lamps, floor lamps and pole lamps as well as permanent fixtures to provide general lighting. Light-colored walls and ceilings will reflect more light and add to the general lighting level in the room. With dark-colored walls, the room will need more light sources to achieve the same general lighting level, and more energy will be required.

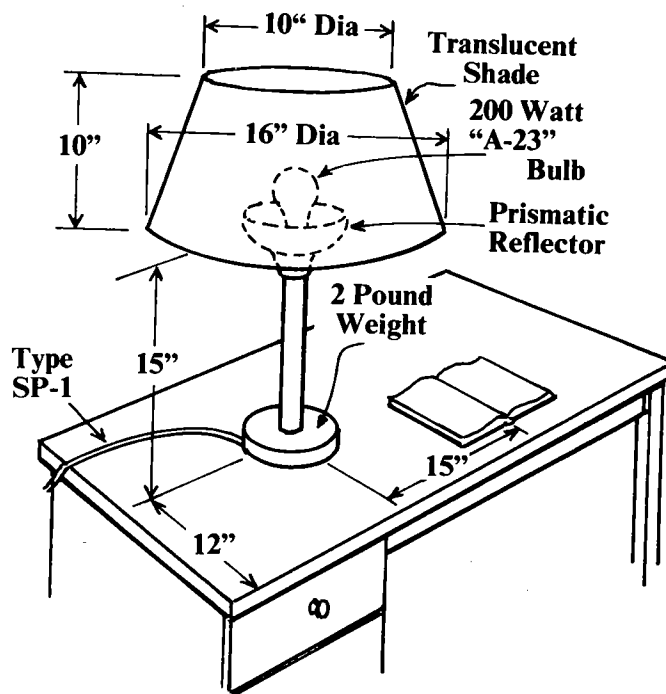
**Task Lighting** Providing lighting for specific tasks means selecting the correct light source and making sure it is properly placed. Let's look at some well-planned lighting for some common tasks around the home.

1. *Light for Study* We know that good lighting is very important for study as it can affect our concentration. We should start with a desk that has a light-colored, non-glossy top. If yours has a dark or glossy top, add a light-colored blotter. The desk should be placed away from family activities and conversation, and not in front of a window. The wall behind the desk should be painted a light color and be non-glossy. The wall covering should be plain or simply patterned.

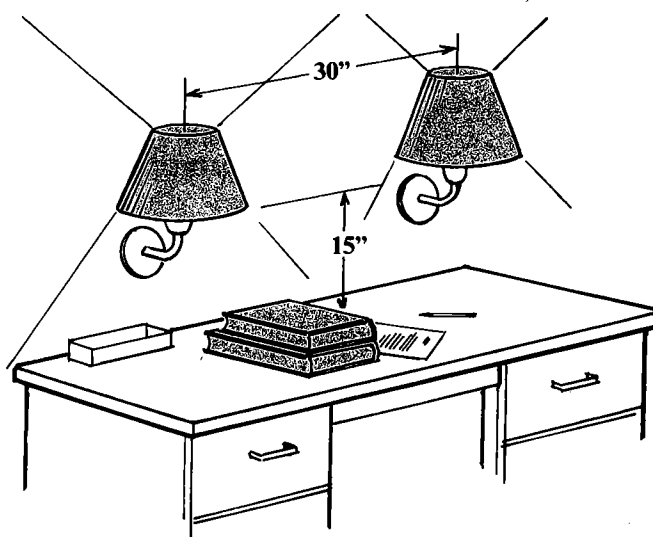
The light itself for your study center may come from one of several sources. You can use a desk lamp, floor lamp, a pendant lamp or a pair of small wall lamps. If you use a single lamp, it should be placed close to the task and in such a position that

the light comes from the side opposite your work hand. You should use a light bulb or bulbs totaling at least 150 watts in a single study lamp.

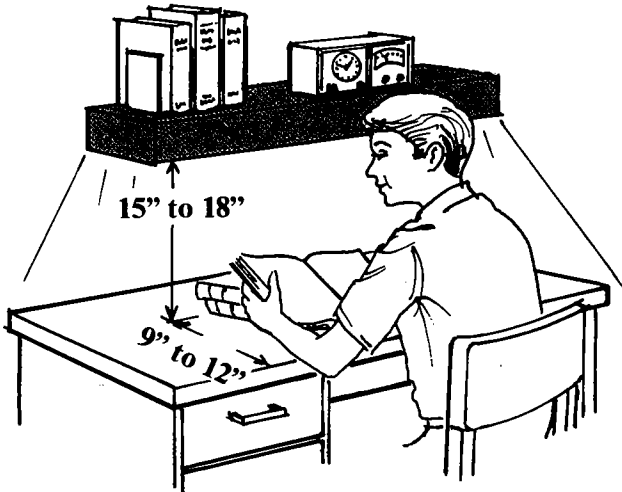
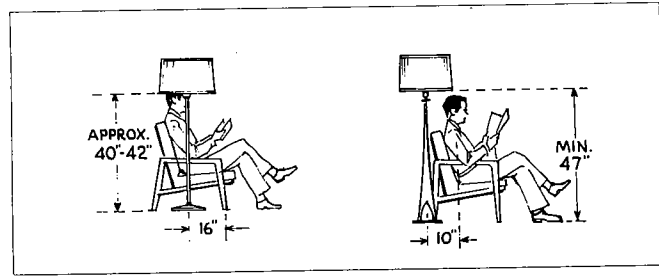
The diagram below shows the proper dimensions for a study lamp, as well as for its proper placement on your desk.



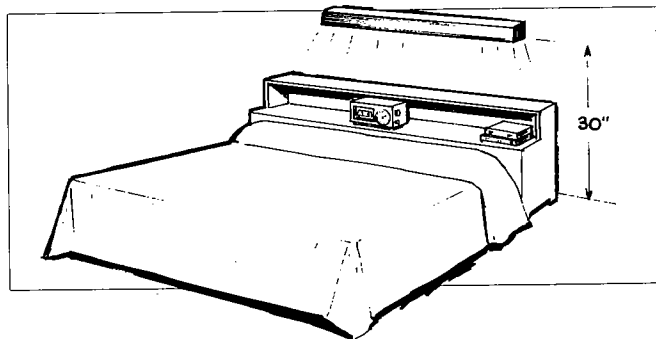
If you use a pair of small wall lamps, they should have diffusers and at least 100-watt light bulbs. Their shades should be at least 9 inches across the bottom.



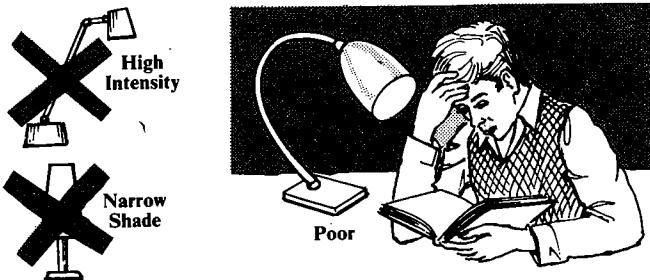
Fluorescent-lighted shelves also work well for study. They should have an opening at the top so heat and some of the light can be directed upward. A frosted glass diffuser under the light will help reduce glare and will spread the light over the entire desk surface. One or two 30- or 40-watt fluorescent tubes should be ample. The diagram below illustrates the best position for a shelf light.



Sometimes you may want to do some casual reading in bed. The requirements are the same, and the same types of lamps can be used. The lamp should be placed so that the bottom of the shade is about 20 inches above the surface of the bed. A fluorescent wall bracket also provides excellent lighting for reading in bed.



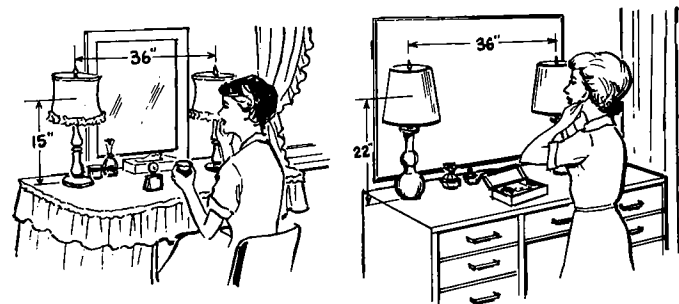
High intensity lamps, bullet lamps with opaque shades, or small narrow-shaded lamps do not provide good lighting for study.



3. *Light for Good Grooming* As with all special tasks, good lighting helps us in grooming, too. If you do your grooming at a desk or dresser in your bedroom, you should use two lamps placed on either side of your mirror. Their placement will depend on whether you are normally seated or standing, as the sketches below indicate.

You may want to make your own study lamp. The Things To Do at the end of this section will show you how.

2. *Light for Casual Reading* Lighting that is adequate for study is fine for casual reading also. However, lighting for this purpose does not have to meet the same requirements as for study. This is because we usually do not read for prolonged periods and may take frequent breaks.

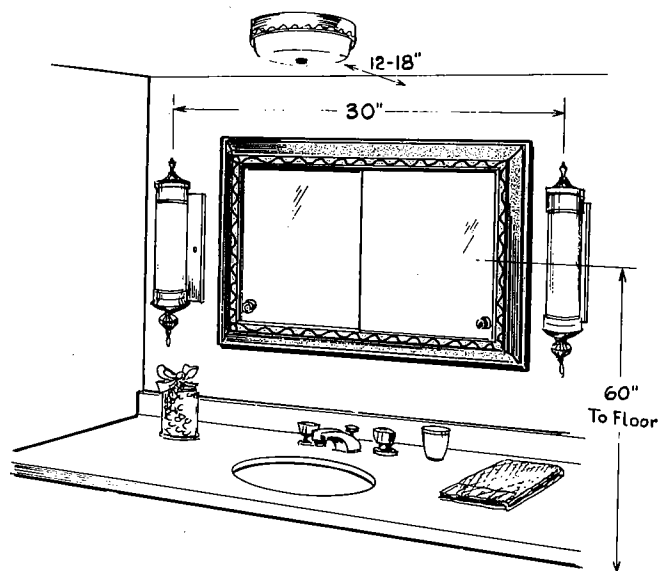


Lamps for casual reading should have light bulbs totaling at least 150 watts.

Table or floor lamps can be used for casual reading. As a general rule, the bottom of the shade should be even with eye level when the lamp is beside you — about 6" higher when placed behind you.

The lamps should have translucent shades that are white or off-white so your complexion color will not be distorted. A 100-watt frosted white bulb is fine, although 30-70-100-watt three-way bulbs will allow the lighting levels to be varied.

Fluorescent or incandescent lighting can be used. If you do your grooming at the bathroom basin, light can be evenly provided with three fixtures: one at each side of the mirror placed so the lights are at cheek height (usually about 60 inches from the floor) and about 30 inches apart, and a ceiling fixture directly above the mirror, 12 to 18 inches away from the wall. The third fixture can be an ordinary ceiling fixture, at least 12 inches in diameter, using two 60-watt bulbs. The wall lights should use two 60 or 40-watt bulbs each.



Prolonged sewing, sewing on dark materials, or fine embroidery and needlepoint all require 200 footcandles of illumination. This can be provided by:

- a. Using a high intensity lamp in combination with a floor or table lamp.
- b. Clamping an adjustable holder with a 75-watt R-30 spotlight to the floor lamp or table lamp. The lamp should be position below eye level.
- c. Using a pole lamp with an adjustable bullet housing and a 75-watt R-30 spotlight.

For fluorescent lighting, use deluxe warm white lamps. Two 20-watt tubes will be required in the ceiling fixture and one 20-watt tube in each side fixture. A single fluorescent fixture in the ceiling is best for use with mirrors that are wider than 36 inches.

4. *Light for Sewing* Sewing is a task that may be done in several different rooms in your house, as well as in various areas in a particular room. All sewing requires a considerable amount of light, whether sewing by machine or by hand. You may not sew, but someone in the family who does will appreciate your help and knowledge in making their sewing tasks easier.

Light for occasional hand sewing can be provided by a table or a floor lamp as shown.



Lighting for machine sewing can be provided by a wall lamp without a diffuser, or a pole lamp using 75-watt R-30 floodlights. Position the lamps as shown in the diagrams.



