Better FARM AND HOME LIGHTING

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Extension Bulletin 531 September 1939 Home Economics Series
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better Home Lighting</td>
<td>3</td>
</tr>
<tr>
<td>Fundamentals to be Considered for Good Lighting and for Safe Seeing</td>
<td>3</td>
</tr>
<tr>
<td>The Importance of Color in Illumination</td>
<td>4</td>
</tr>
<tr>
<td>Electric Lamps and How to Select Them</td>
<td>6</td>
</tr>
<tr>
<td>Selecting and Placing Electric Light Fixtures</td>
<td>7</td>
</tr>
<tr>
<td>General Illumination</td>
<td>7</td>
</tr>
<tr>
<td>Direct Opaque Reflector</td>
<td>8</td>
</tr>
<tr>
<td>Portable Local Lighting</td>
<td>8</td>
</tr>
<tr>
<td>Suggestions for Various Room Installations</td>
<td>8</td>
</tr>
<tr>
<td>Entrance</td>
<td>9</td>
</tr>
<tr>
<td>Hallway</td>
<td>9</td>
</tr>
<tr>
<td>Living Room</td>
<td>9</td>
</tr>
<tr>
<td>Dining Room</td>
<td>11</td>
</tr>
<tr>
<td>Bedroom</td>
<td>11</td>
</tr>
<tr>
<td>Children's Play Room</td>
<td>11</td>
</tr>
<tr>
<td>Closets</td>
<td>12</td>
</tr>
<tr>
<td>Kitchen</td>
<td>12</td>
</tr>
<tr>
<td>Bathroom</td>
<td>12</td>
</tr>
<tr>
<td>Laundry</td>
<td>13</td>
</tr>
<tr>
<td>Basement or Cellar</td>
<td>13</td>
</tr>
<tr>
<td>How to Choose the Right Lamp and the Right Shade</td>
<td>13</td>
</tr>
<tr>
<td>Other Recommendations for Lighting for Special Tasks</td>
<td>15</td>
</tr>
<tr>
<td>Making Over Old Fixtures into New Ones</td>
<td>15</td>
</tr>
<tr>
<td>Light for the Farm Buildings</td>
<td>17</td>
</tr>
<tr>
<td>Garage</td>
<td>17</td>
</tr>
<tr>
<td>Yard Light</td>
<td>18</td>
</tr>
<tr>
<td>Portable Flood Light</td>
<td>19</td>
</tr>
<tr>
<td>Dairy Barn</td>
<td>19</td>
</tr>
<tr>
<td>General-Purpose Barn</td>
<td>19</td>
</tr>
<tr>
<td>Haymow</td>
<td>20</td>
</tr>
<tr>
<td>Milk House</td>
<td>21</td>
</tr>
<tr>
<td>Poultry House</td>
<td>21</td>
</tr>
<tr>
<td>Sheep Barn and Beef Cattle Barn</td>
<td>23</td>
</tr>
<tr>
<td>Hog House</td>
<td>23</td>
</tr>
<tr>
<td>Farm Shop and Machine Shed</td>
<td>23</td>
</tr>
<tr>
<td>Granary and Feed Room</td>
<td>26</td>
</tr>
<tr>
<td>Silo and Chute</td>
<td>26</td>
</tr>
<tr>
<td>Storage Cellar</td>
<td>26</td>
</tr>
<tr>
<td>Woodshed</td>
<td>27</td>
</tr>
<tr>
<td>Selected References</td>
<td>27</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>27</td>
</tr>
<tr>
<td>Summary</td>
<td>28</td>
</tr>
</tbody>
</table>
Better Farm and Home Lighting

By

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BETTER HOME LIGHTING

FUNDAMENTALS TO BE CONSIDERED FOR GOOD LIGHTING
AND FOR SAFE SEEING

In acquiring knowledge through the several senses, vision is the most important. A very high percentage of muscular activity depends on ability to see; in other words, three-fourths of every activity in work or play depends on the eyes for guidance.

Eyes were developed to use light and there can be no vision without both eyes to see and light to illuminate the object. The only light valuable for vision is that reflected from the object or area to be seen. When the sun is not available to assist us with our unfinished tasks or our play, we modify this condition to a certain extent by supplying artificial light. Before man discovered fire, which gave him illumination as well as heat, his day was only as long as the sun shone. As civilization progressed, his desire to make use of some of the evening hours not needed for sleep prompted him to develop further methods of dispelling darkness.

Previous to the year 1879, when Thomas A. Edison developed the first incandescent lamp, light was obtained from a flame supplied by a torch, a candle, an oil lamp, or the gas jet. The discovery and development of the incandescent electric lamp brought the first light that did not flicker, that was free from the fire danger involved with light sources; and that could be easily shaded and directed so as to modify its intensity. Edison's first lamp was not very bright, but in a short time lamps were developed that produced many times the amount of light ever before created by man.

For ages the human eye was accustomed to seeing long distances out of doors in high intensities of daylight, but within a few centuries man has developed into a race of indoor workers, and has doubled his seeing hours by the use of artificial light. The most prolonged and most critical tasks are now being performed indoors, with only a small fraction of the light available for outdoor daylight duties. Electric light, however, is vastly brighter than any artificial light formerly used, and until recently there was a rather general lack of understanding of its adequate or hygienic use. This fact has become a matter of grave concern. As previously mentioned, moreover, electric light can be readily diffused and directed. Because of such possibilities of control, skilled scientists in recent years have been experimenting with electric lights to the end of establishing certain fundamental requirements for better and safer seeing.
First, they have learned to measure light, just as heat or cold may be measured. Light is measured in terms of footcandles, and the unit established is the amount of illumination a surface will receive when a standard candle one inch in diameter is placed one foot away from that surface. Certain requirements of light intensity for certain tasks have been established. People of different ages require more or less light for the same task, and as one grows older, more light is needed.

In listing requirements for good lighting and better seeing, several A.B.C.'s of lighting have to be considered that are not concerned with the actual source of the light itself. As no light is fully effective unless these factors are considered, we list them as good suggestions to follow:

1. Rest the eyes often. Do not tire or strain them.
2. Do not read or work with poor light.
3. Avoid fine print, blurred letters, and shiny paper. They are likely to strain the eyes.
4. Do not save light at the expense of the eyes.
5. Do not read or work facing a bright light, either artificial or daylight.
6. Do not judge illumination by the brightness of the light.
7. Eliminate glare by shading all lamps.
8. Keep all lamps and reflectors clean. From 20 to 50 per cent of the light may be absorbed by the accumulation of dust on the lamp or the reflector.
9. Keep the ceiling and walls light in color and free from dust in order to get the greatest amount of light from lamps and electricity. Dark ceilings and walls absorb light.
10. Do not paint walls, woodwork, or ceilings with glossy paint, and do not use luminous wallpaper. These produce a glaring background for lamps.
11. Provide enough light for the activities of each member of the family. Don't forget the small child.
12. Select and use simple, plain shades that have white linings. They are the most satisfying over a long period of use. Light colors tend to reflect most of the light produced by the lamp.
13. If possible, install electric convenience outlets on an average of every 12 feet of wall space in the living room of the house, and where needed in the other rooms. This will allow for the distribution of lamps and furniture to meet the needs of the family.
14. General illumination should be provided by well-shaded overhead lights, so that sharp shadows may be eliminated.

THE IMPORTANCE OF COLOR IN ILLUMINATION

The color and the quality of finish on walls, ceilings, and woodwork are very important factors, whether the illumination be daylight or artificial. Colors should be light enough to reflect as much light as possible into the room, and still not be trying to the eyes. White for ceilings and walls is not advised, because of its glaring quality. Off-white, such as ivory-white, ivory, light cream, and pale yellow, are good ceiling colors. Slightly darker tones of these colors, and buff, light green, pinks, etc. are recommended for walls. The
walls should be darker to establish a soft and restful glow throughout the room, but still not dark enough to absorb much light.

The finish on all background surfaces in the living room of a house should not be shiny as this causes an objectionable glare, irritating to the eyes. A soft mat surface on walls, which may be either rough or smooth, largely eliminates glare. An eggshell or semigloss finish may be used on woodwork surfaces. A smooth surface for walls and ceilings, particularly in the kitchen and bathroom, is preferable because it makes cleaning easier. The finish of this smooth surface should have a minimum of gloss and should be easily washed.

The following table will give an idea of the relative reflection from walls and ceilings of different colors. It is the result of a considerable number of tests by different authorities.*

<table>
<thead>
<tr>
<th>Color</th>
<th>Per cent of light reflected</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (new)</td>
<td>82 to 89</td>
</tr>
<tr>
<td>White (old)</td>
<td>75 to 85</td>
</tr>
<tr>
<td>Cream</td>
<td>63 to 80</td>
</tr>
<tr>
<td>Ivory</td>
<td>73 to 78</td>
</tr>
<tr>
<td>Buff</td>
<td>62 to 80</td>
</tr>
<tr>
<td>Gray</td>
<td>17 to 63†</td>
</tr>
<tr>
<td>Light green</td>
<td>44 to 75</td>
</tr>
<tr>
<td>Dark green</td>
<td>11 to 25</td>
</tr>
<tr>
<td>Light blue</td>
<td>34 to 61</td>
</tr>
<tr>
<td>Pink</td>
<td>36 to 61</td>
</tr>
<tr>
<td>Dark red</td>
<td>13 to 30</td>
</tr>
<tr>
<td>Yellow</td>
<td>61 to 75</td>
</tr>
<tr>
<td>Dark tan</td>
<td>30 to 46</td>
</tr>
<tr>
<td>Natural wood brown stain</td>
<td>17 to 29</td>
</tr>
<tr>
<td>Light wood varnish</td>
<td>42 to 49</td>
</tr>
</tbody>
</table>

Examples of desirable color schemes that give good reflection of light from fixtures as well as being attractive from a decorative standpoint are:

<table>
<thead>
<tr>
<th>Walls</th>
<th>Ceiling</th>
<th>Woodwork</th>
<th>Light fixtures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivory</td>
<td>ivory-white</td>
<td>ivory</td>
<td>Indirect ceiling fixtures, if de-</td>
</tr>
<tr>
<td>Buff</td>
<td>ivory-white</td>
<td>ivory-buff</td>
<td>sired. (See Figure 2.) Portable</td>
</tr>
<tr>
<td>Light green</td>
<td>ivory-white</td>
<td>ivory</td>
<td>table and floor lamps where desired.</td>
</tr>
<tr>
<td>Light peach</td>
<td>ivory-white</td>
<td>ivory</td>
<td></td>
</tr>
<tr>
<td>Light yellow</td>
<td>ivory-white</td>
<td>ivory or cream</td>
<td></td>
</tr>
<tr>
<td>Light gray</td>
<td>gray-white</td>
<td>off white</td>
<td></td>
</tr>
</tbody>
</table>

For rooms having dark woodwork, the walls and ceilings should be as light in color as possible for consistency in good color harmony. It is from these surfaces that most of the light reflection has to be directed. The light fixtures may be of any type, provided they are shaded. If the indirect type is used (Figure 2), the fixture should be dropped from the ceiling at least 10 to 14 inches so that the circle of reflected light that is projected on the ceiling by the lamp in the fixture is large enough to keep down ceiling brightness and to add to appearance and comfort in the room. This circle of light should cover the ceiling area, not any woodwork, such as heavy cornices or picture rails. These particular woodwork areas absorb more light than they reflect.

†Grays vary greatly, depending on the way in which they are prepared. Gray made by mixing lamp black with white paint has a low coefficient of reflection. Gray made by mixing green and red paint with a white base has a relatively high coefficient of reflection.
In rooms where dark beamed ceilings are a problem and interfere with good light reflection in the room, either of two methods can be used to rectify this condition. Either paint the ceiling beams similar to the ceiling in color, or install a drop ceiling to conceal the beams. Paint, paper, or calcimine the new drop ceiling in the desired color.

**ELECTRIC LAMPS AND HOW TO SELECT THEM**

**Sizes and shapes**

The various sizes and shapes of lamp bulbs are indicated by letters and numbers. The letter refers to the shape of the bulb, and the number to its diameter in eighths of an inch. An A-21 bulb, for example, is the teardrop shape, and is 21/8, or 2⅜ inches in diameter. Bulbs for general illumination are of the teardrop shape and are frosted inside. Bulbs of this shape may be obtained in sizes from 15 to 100 watts. “G” refers to the round bulbs, and “T” to tubular bulbs. Inside-frosted bulbs for general use are preferable to clear bulbs, as the frosting diffuses the brightness of the filament and absorbs less than 1 per cent of the light.

**Mazda daylight bulbs**

These are blue bulbs that emit a whiter light, more nearly like daylight, than the regular Mazda lamp. The efficiency is reduced by the blue coloring. A 100-watt inside-frosted bulb will transmit almost as much light as a 150-watt daylight bulb.

**Select lamps of the proper voltage**

Lamps are designed to operate efficiently for a definite length of time at a definite voltage, but sometimes longer life of the lamps is obtained at lower voltage at a sacrifice of lighting efficiency.

If a 120-volt lamp is used on a 115-volt circuit, the life of the lamp will be about 60 per cent longer, but its illuminating efficiency will be only about 86 per cent of normal output. If the situation is reversed, and a 110-volt lamp is used on a 115-volt circuit, the light produced will be 15 per cent greater than its normal output, but only about 58 per cent of the normal life of the lamp is obtained. One is able to see by these figures that it is necessary to know the voltage of the service, and then to buy lamps designed for that voltage. This information may be obtained from your power company. Electric supply stores usually carry in stock only electric lamps of the correct voltage for the city or community in which they are located. For general lighting, “A” bulbs are rated to burn an average of 1,000 hours. Most decorative bulbs are rated at 750 hours.

**Types of lamps**

Tungsten filaments are used in about 97 per cent of the incandescent lamps consumed in this country. They are classified as gas-filled or vacuum lamps. The gas-filled lamp is more efficient than the vacuum lamp.

Avoid cheap or foreign lamps as the quality is predominantly low, which result in low lighting efficiency, short life, or both, and greatly increased light cost.
SELECTING AND PLACING ELECTRIC LIGHT FIXTURES

Table 1. Electric Convenience Outlets

In order conveniently to use electrical appliances and to have floor lamps and table lamps where they are needed, it is necessary to have a sufficient number of convenience outlets. The following chart shows the number needed in each room.

<table>
<thead>
<tr>
<th>Room</th>
<th>Number outlets suggested</th>
<th>Use</th>
<th>Where located</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living room</td>
<td>At least one for every 12 feet of wall space</td>
<td>Portable floor and table lamps Radio Electric appliances</td>
<td>On baseboard or floor</td>
</tr>
<tr>
<td>Dining room</td>
<td>At least two</td>
<td>Electric appliances or indirect wall lamps</td>
<td>Baseboard</td>
</tr>
<tr>
<td>Kitchen</td>
<td>One over each work counter One in breakfast nook</td>
<td>Electric appliances</td>
<td>3½ feet from floor on wall</td>
</tr>
<tr>
<td>Bathroom</td>
<td>One near mirror One on wall</td>
<td>Electric appliances</td>
<td>4 feet from floor on wall or part of light fixture near mirror</td>
</tr>
<tr>
<td>Bedroom</td>
<td>At least one for every 12 feet of wall space</td>
<td>Lamps Electric appliances</td>
<td>Baseboard</td>
</tr>
<tr>
<td>Children’s room</td>
<td>Two</td>
<td>Lamps Electric toys Electric appliances</td>
<td>Baseboard</td>
</tr>
<tr>
<td>Sewing room, ironing room</td>
<td>One or two</td>
<td>Lamps Electric appliances</td>
<td>Baseboard</td>
</tr>
<tr>
<td>Laundry</td>
<td>One</td>
<td>Electric appliances</td>
<td>4 feet from floor or ceiling drop to 6 feet from floor with porcelain receptacle</td>
</tr>
<tr>
<td>Hall</td>
<td>One</td>
<td>Hall lamp Vacuum cleaner</td>
<td>Baseboard</td>
</tr>
</tbody>
</table>

Selection and location of fixtures

Because of the different uses of a room and the various activities of the members of the family, one cannot assign to each room a definite number of light fixtures nor specify exact types. The following discussion of various types of light fixtures and their appropriate use may be helpful, however, in planning home lighting.

GENERAL ILLUMINATION

General illumination created by one central ceiling fixture in a room is adequate only if the fixture is of an adequate size. A lumiline fixture (Figure 1) under the spice cupboard lights up the work center directly under it. Cupboard projection shields the eyes against glare. A convenience outlet is suitably placed for electrical appliances.
indirect or semidirect type. If the fixture is of a direct type, equipped with a
diffusing bowl and a white-lined shade, it may be placed in a dining room and
will supply sufficient light over the table for study and reading purposes.
(See Figures 3 and 17.)

The light in a room may come from
a ceiling fixture, of which there are several
types:

INDIRECT. In which all the light is re-
lected from the fixture toward the ceiling.
The ceiling in this case acts as a reflector
of the light.

If the ceiling is not
light in color, the efficiency
of this type of fixture is greatly reduced. (See Figure 2.)

SEMIDIRECT. In which the surrounding bowl or shade is of
heavy glass, parchment, or silk, and directs up to 75 per cent
of the light to the ceiling for redistribution into
the room, and 10 to 25 per cent of the light
downward. (See Figure 3.)

DIRECT ENCLOSING GLOBE. In which as much
light is reflected up as down, but the lamp is
totally enclosed by a white opal glass globe
to reduce the glare. (See Figure 4.)

Direct opaque reflector
In which the opaque reflector directs all the light down-
ward into the room. (See Figure 5.) For work areas only.

RLM reflectors are made by many manufacturers, but all
adhere to one design and quality. They direct the light downward where it is
needed, and are a protection against glare. There are many sizes—the one
most widely used in farm outbuildings being 12 inches in diameter to fit the
100-watt inside frost bulb.

Portable local lighting
Wall-bracket, table, and floor lamps
may have the same characteristics as the
ceiling fixtures as far as light reflection is
concerned. The difference is in the design
for the particular location. They may be
placed on tables, hung on the wall, or used
as floor lamps; but the direct, indirect, and
semidirect characteristics remain the same,
with the same requirements necessary for
their efficiency—light-colored walls and
ceilings.

SUGGESTIONS FOR VARIOUS
ROOM INSTALLATIONS
Since the varied interests of the mem-
bers of any family make it difficult to
recommend any exact number of lamps for a room, only the main objective of
good lighting in the home is considered here. A general treatment of the room
is suggested, with the hope that each family will provide light in the home sufficient for its own particular demands.

**Entrance**

**Requirements:** 1. To illuminate steps and house number. 2. To emphasize architectural details. 3. To light the faces of approaching visitors.

**Approved Practice:** Two 40-watt lamps at sides of door; or one single 60-watt lamp overhead. These should be encased in a lantern type of fixture or a ceiling globe. (See Figure 6.)

**Hallway**

**Requirements:** 1. To light any stairway. 2. To give the impression of hospitality and to emphasize the character of the house.

**Approved Practice:** Lantern-shaped or shaded candle type of fixture, or small indirect type that may be equipped with one 60- to 100-watt lamp. (See Figure 7.) The total for the hallway should be from 40 to 100 watts, depending on the size of the hall. Back halls should have at least 40 to 60 watts.

**Living room**

**Requirements:** 1. At least one reading lamp for every two persons for local lighting. 2. One ceiling fixture for sufficient general illumination.

**Approved Practice:** One central fixture for general illumination. May be any shaded type of fixture and enclosing a total of 100 to 200 watts, preferably one watt per square foot of floor space. If the ceiling is low, the fixture may be as shown in Figure 2, a close-fitting type, or a type as shown in Figures 8, 9, and 10. A pendant type as shown in Figure 11 is particularly suitable in a room with a high ceiling. The main requirement is that the total wattage be 100 to 200, and that each lamp be shaded from view.

For local lighting it is advisable to have at least one good floor lamp in the room, supplemented by smaller reading and decorative lamps. If the floor lamp is equipped with a reflecting bowl, white shade, 3-way socket, and a 2-filament lamp, at least two persons may do concentrated work under it with perfect ease. The lamp may be turned on at 100, 200, or 300 watts, depending on the use to be made of the light. (See Figures 12 and 13.)
For auxiliary illumination a reflecting type of lamp may be used on a table as in Figure 14; or a taller study lamp for a desk as in Figure 15; or wall brackets. “Pin-it-up” lamps are recommended (Figure 16), as they are useful in many locations where there is not room for a table or floor lamp. They are available at a low cost and are very efficient.

Whatever the selection in lamps, they should be well distributed about the room so as to light all of it equally. Small decorative lamps such as radio lights and wall brackets should never be used for reading or studying, nor for the chief source of light when any critical work is being done. Such use can only result in eyestrain. If such lights are used in a room, they must be shaded. Their use is being discouraged, and they are not often seen in modern homes. The location of such decorative lamps is usually at eye level, or below it. They should never shine directly into the eyes of the people in the room. Decorative table lamps may be used for general illumination of the room, but not for reading.
One or two lamps of this type may be used in combination with one or two of the types pictured in Figures 14, 15, and 16.

**Dining room**

**Requirements:** To light the table and the faces of the family without producing a glare.

**Approved Practice:** Fixtures same as living room, if the two rooms are connected by a large arch and the appearance is that of one room. If it is a separate room, a pendant type of fixture such as that in Figure 3 or Figure 11 may be used; or if the ceiling is low, a close-fitting type is recommended, as in Figure 8. The pendant type of fixture directs the light down over the table, which is desirable.

If reading and writing are done on the dining-room table, the fixture should be similar to that in Figure 17, with a switch control to vary intensity according to need. This allows for a small amount of light to be turned on while dining, and a larger amount when reading or writing. The various parts of an I.E.S. 3-way semidirect fixture are shown in Figure 18.

**Bedroom**

**Requirements:** 1. To supply general lighting. 2. To furnish adequate light for reading in bed. 3. To light the dressing table.

**Approved Practice:** One center fixture similar to those in Figure 2, Figure 8, or Figure 10, is recommended for general illumination. At least 100 watts should be enclosed in this fixture. If the room is large, decorative shaded candle fixtures may be used. Each candle should have a 25- to 30-watt lamp in it and should be shaded. Separate small dressing-table lamps may be placed on the dressing table, the shades of which should be at face level for use when seated. These fixtures require 40- to 50-watt lamps.

A 100-watt Pin-it-up lamp may be placed directly over the head of the bed on the wall (Figure 16); or a good reading lamp on one or both sides of the bed. Each should contain at least a 60-watt lamp. (See Figure 14.)

**Children's play room**

**Requirements:** To supply adequate lighting for play.
**Approved Practice:** In children's play rooms the overhead light should be well shaded, because their immature eyes are particularly susceptible to eye-strain. The room should be lighted with a 100- to 150-watt lamp in an indirect or well-shaded fixture. (See Figure 2, 4, 7, or 8.)

### Closets

**Requirements:** To light a closet that is more than two feet deep, to make it easier to find clothing and equipment.

**Approved Practice:** Bracket-type lamp or simple ceiling fixture with pull chain or wall switch. (See Figure 20.)

### Kitchen

**Requirements:**
1. General illumination of entire kitchen.
2. Local illumination over sink, stove, and work counters.

**Approved Practice:** A crystal-top diffusing globe, 150- to 200-watt lamp; or a glass diffusing globe 10 to 12 inches in diameter, recommended for general overhead lighting (Figures 4, and 22).

Kitchens not wired with wall convenience outlets can be equipped with ceiling fixtures having suspended switch combinations and electric outlets. (See Figure 23.) Wall outlets, however, are recommended.

Bracket lights such as in Figures 21 and 24 are recommended for use over the sink and over the range. This type of fixture is available with a convenience outlet.

Work surfaces under cupboards should be lighted. Lumiline (rod-shaped) fixtures are recommended. (See Figure 1.)

### Bathroom

**Requirements:** Shaded lamps to facilitate shaving and dressing, and for general illumination.
APPROVED PRACTICE: For this purpose one bracket lamp with 60 watts over the mirror, or two bracket fixtures with 40 to 60 watts each, one on each side of the mirror, are recommended (Figure 25).

Lumiline fixtures are long frosted tubes and may be used unshaded. (See Figure 26.)

If the bathroom is large and dark, a center diffusing-globe fixture may be necessary. (See Figure 4.)

Laundry

APPROVED PRACTICE: A 100- to 150-watt lamp with a reflector is recommended over the laundry trays. (See Figure 5.) If ironing is done in this room, a similar fixture will be required over the ironing board. If blue daylight lamps are used in the laundry, the light will appear more nearly true in color, which will aid in distinguishing and avoiding scorching. All light sockets should be all porcelain.

Basement or cellar

REQUIREMENT: To illuminate the basement stairs and the furnace.

APPROVED PRACTICE: Porcelain sockets with 60-watt lamps and shallow dome reflectors (Figure 5) are recommended for use in front of the furnace and other work places. An enclosed globe unit similar to the kitchen unit may be used to light the stairs, this to be controlled by a 3-way switch, which may be operated either at the head or the foot of the stairs. If bare lamps are used to light the basement stairs, without enclosing globes, the light should be located on the basement ceiling to one side of the stair well, to avoid glare to persons coming down the stairs.

Pull-chain switches and metal-socket switches should be avoided in all basement locations, as they may cause serious shock if the operator is standing on a damp floor.

HOW TO CHOOSE THE RIGHT LAMP AND THE RIGHT SHADE

There are many light fixtures on the market, similar to those recommended in this bulletin, for various room installations. The main thing to remember when selecting a lamp or a light fixture is that in order to give...
adequate light for certain tasks and to eliminate glare, the fixture must have certain definite characteristics. These have been developed through years of research by reliable specialists in the fields of optometry, engineering, and interior decoration.

Several lighting-fixture companies offer sets of modern light units for five- and six-room houses at prices ranging from $20 to $30. They are the ceiling and wall type of fixtures used for general illumination.

The Illuminating Engineering Society has adopted specifications for fixtures that conform to good lighting and safety practices. There are 54 specifications, 29 of which are for mechanical safety, 14 for electrical safety, and 11 for eye safety. Manufacturers who produce fixtures that meet these specifications can obtain the approval of the Illuminating Engineering Society to carry a special tag with the letters "I.E.S." This tag is available to all light-fixture manufacturers who produce fixtures that meet these specifications. The main visible features that characterize these fixtures are:

1. A lamp large enough to project good light.
2. A diffusing opal white glass bowl that surrounds the lamp and reflects part of the light upward, and diffuses the light that is projected down. The Illuminating Engineering Society recommends glass globes that bear the inscription "I.G.G." (International Glass Guild), being made of a special type of glass that is heatproof and gives a more evenly diffused light (Figure 18).
3. A large white-lined shade that has little or no ornamentation. It may be of paper, parchment, or fabric, the base of the shade large enough to project a large circle of light from the fixture.

The higher a given shade is placed above the table surface, whether the lamp hangs from the ceiling or rests on the table, the larger the circle of light will be and the lower the light intensity on the table. The height of the lamp should be determined by the use to which it is put. According to I.E.S. specifications, a table study lamp shall be 28 to 29 inches high, with a shade 8 inches in diameter at the top and 16 inches at the bottom, and 9 inches in height. This lamp should have a 100-watt bulb. This lamp will produce about 50 footcandles of light about 24 inches from the bowl, and about 15 to 20 footcandles about 3 feet from the bowl. This lamp is recommended for general reading or sewing purposes, if the sewing is on light materials. A full 30 to 50 footcandles are necessary for continuous close work, for study, or for sewing on dark materials.
OTHER RECOMMENDATIONS FOR LIGHTING FOR SPECIAL TASKS

Reading a newspaper. Good local light, at least 100 watts. Intensity, 20 to 30 footcandles.

Dining and conversation. Generally diffused light, 100 to 200 watts, or 2-filament lamps, 100-200-300 watts. Intensity 20 footcandles.

Dressing. Two lamps of 60 watts each on each side of the mirror. Center fixture of 75 watts, 20 to 30 footcandles intensity.

Sewing. I. E. S. 100-, 200-, 300-watt, 2-filament lamp is good. At least 30 footcandles needed.

General illumination. Usually from overhead, 100 to 200 watts, intensity 10 footcandles, 20 for reading.

It must be remembered that the above light intensity and wattage recommendations require efficient fixtures, the shades white lined, and the ceilings light enough to reflect 85 per cent of the light back into the room. Of course the walls should be a tone darker. The footcandle recommendations given above call for larger lamps than ordinarily used, but one acceptable fixture of the one described else-

FOR THIS OLD LAMP

A. A converter like this with 100-watt lamp turns old lamps into new.

FOR THIS GLARING BRIDGE LAMP

—an adapter as shown or a silver bowl lamp (75 to 100 watts) and shade with reflector top or a bridge shader combining the advantages of a good shade and a diffuser.

FOR DINING ROOM

B. Left—Attractive modern semidirect lighting fixture—parchment shade. Right—Semidirect lighting with this 150-watt silver bowl lamp underneath a broad shade with reflector top.

Figure 28.

where in this bulletin is worth far more than several fixtures of an inferior type. These fixtures control the light in a scientific manner, and they are safer not only from an electrical and a mechanical standpoint, but also safer for the smallest child whose eyes may be injured by strong, glaring light.

Scientifically correct light fixtures are not necessarily expensive, I. E. S. fixtures are available in several price ranges.

MAKING OVER OLD FIXTURES INTO NEW ONES

There are many ways in which old light fixtures can be improved. (See Figure 30.) First of
An oval or round drum of parchment does things for this ceiling rosette fixture with two bare 40-watt lamps.

For lamps (40-60 watts) burned base down—The Candle-ette with a bowl underneath each small shade. For lamps (40-60 watts inside frost or silver bowl) burned base up use individual cones.

These fixtures in parchment and plastic are attractive and well designed to provide good lighting very inexpensively.

Figure 30.
all, bare lamps should be shaded, and lamps of adequate wattage should be installed to meet specifications.

Small 4-inch shades may be purchased at your local stores, and can be clamped over the hanging bare lamps on ceiling cluster fixtures. Three, four, or five lamps appear in this type of fixture, and the appearance is greatly improved by the addition of small matching shades. (See Figure 30.)

Table lamps not less than 20 inches tall over-all may be greatly improved by the addition of a converter unit consisting of a single socket, a plastic or glass diffusing bowl, and a white semi-transparent shade. (Figure 28A.) It is not practical to remodel a table lamp of less than this height. Some older style table lamps have Benjamin or branch sockets installed, in which more than one light may be used at one time. Since lighting efficiency is greatly increased if only one globe is used instead of two or three, it is a simple matter to remove a branch socket and replace it with a single socket. This socket should be installed directly on the top of the lamp base. Such a socket may be obtained at little cost at your ten-cent store or electric supply store. A collar to hold the diffusing bowl screws directly on to the socket. This also may be obtained from your local stores. The diffusing bowl is then fastened into place by small set screws, and the shade placed over the bowl. Lamps of not less than 75 watts and preferably 100 watts should be used with this fixture.

Much of the efficiency of a remodeled lamp depends on its ability to throw light to the ceiling, which is then reflected back into the room. (See Figure 28A.)

A bridge lamp may be remodeled by the simple addition of a silver-tipped lamp. The silver coating on the lower portion of the lamp prevents glare when the lamp shade is tilted. The shade should be light colored on the inside. If a new shade is desired, one with an adapter may be used. (Figure 29.)

The silver-tipped lamp is used to advantage in a fixture similar to that shown in Figure 28B. This fixture is inexpensive and is particularly recommended for dining room use, especially if studying, reading, or writing is done on the dining table.

Floor lamps may easily be remodeled and greatly improved by the addition of a three-way switch to hold a two-filament lamp instead of having two or three sources of light from the common Benjamin-type socket. This type of socket should be removed and a single socket put in its place. A three-way socket converter unit may be obtained at a local electric appliance store for approximately three dollars, including a 9-inch diffusing bowl. This converter unit may be turned on in three intensities of light. A large white-lined shade with an open top should be used, as the efficiency of the lamp depends almost entirely on this white lining.

**LIGHT FOR THE FARM BUILDINGS**

Light in the farm buildings makes it possible to do the work quicker, easier, and safer. It provides the farmer with cheap protection from several dangers, particularly the fire hazard and prowlers. Lights play an important part in the management of livestock and poultry.

**Garage**

**Requirements:** Light used for work on the car and for moving about in safety.
Garage. Where there is only one light in the garage, it is usually best to mount it over the hood of the car.

**APPROVED PRACTICE:** Use a 60-watt lamp with reflector, mounted over the hood, for each car. (Figure 31).

If a yard light is not located where the area between the house and garage is illuminated, a 3-way switch should be installed so as to control the garage lights from the house as well as the garage. A convenience outlet should also be provided.

![Yard Light](image)

**Yard light**

**Requirements:** A well-lighted farmstead provides protection against prowlers and accidents. Good yard lighting makes the farm appear more hospitable to friends or customers.

**APPROVED PRACTICE:** The light should be mounted at least 15 feet high, whether mounted on a pole, on the side of a building, or suspended on wires. Where the unit can be mounted on a pole or building, centrally located in the yard, shallow dome reflectors and sockets of the weather-proof type suspended from a bracket arm are recommended. A 100-watt or 150-watt lamp should be used (Figure 32).

The yard light can be controlled with a single switch in the farm house; or the farmer, for convenience and economy, may desire to have the light controlled by three-way switches located in the house and barn, or garage. This would enable the light to be turned on or off at either point.
Portable flood light

Requirements: To be used as an emergency light around the farmstead. Ideal for repairing machinery, painting, or doing other numerous jobs at night.

Approved practice: Consists of a bowl reflector with weatherproof socket, 200-watt lamp, and 50 feet of weatherproof cord. Can be provided with a spear base to spear into the ground wherever light in addition to the yard light is needed.

Dairy barn

Requirements: Milk contamination is reduced because light makes work easier and promotes cleanliness during feeding, cleaning, and milking.

Approved practice: A row of lights should be placed both along the feed alley and the cleaning alley. Space the lights 15 to 20 feet apart, using 60-watt lamps with shallow dome reflectors if the ceiling and walls are unpainted (Figure 33). The lights in the feeding alley should be staggered with those in the cleaning alley. No reflectors are needed if the ceiling is painted white.

Figure 33. Oregon State College dairy barn. No reflectors needed because ceiling is painted white. Vapor-proof fixtures are used so that ceiling can be washed without damaging electric fixtures.

Walls and ceilings painted white increase the general illumination, distribute the light more uniformly, and soften shadows.

Control the rows of lights by means of wall switches mounted at the main entrance to the building. Three or four single lights may be used to light passageways when full illumination is not needed, thus reducing operating cost.

Haymow lighting is described below.

General-purpose barn

Requirements: Light simplifies harnessing, feeding, bedding, grooming, cleaning, and milking.
Figure 34. General-purpose barn. A light at the rear of each two stalls, and two along the feeding alley simplify chores in this horsebarn.

**Approved Practice:** Lights for the dairy cows are the same as described above.

Provide one row of lights at the rear of the horse stalls, allowing a light between each two stalls. Use 60-watt lamps with reflectors (Figure 34).

**Haymow**

**Requirements:** Light used for short periods to enable the farmer to move about safely and conveniently.

Figure 35. Haymow. 60-watt inside frost lamps in vapor proof angle reflectors mounted well above the hay line, light the haymow—safely and well.
**APPROVED PRACTICE:** Use 100-watt lamps in vaporproof angle or dome reflectors mounted above the hay line and clear of the hay fork and track. Vaporproof reflectors and switches are required by the State Wiring Code in the haymow as a safety precaution against fire hazard. Provide one light for every 35 to 40 feet of barn length (Figure 35). A switch should be located at the foot of the stairs to the mow to control the lights.

**Milk house**

**REQUIREMENTS:** To promote safety and sanitation.

**APPROVED PRACTICE:** In the milk-handling room use a 75-watt or a 100-watt vaporproof fixture mounted on the ceiling in the center of the room. Since the ceiling will be painted white no reflector is needed. In the wash room mount a 75-watt or a 100-watt lamp with a reflector on the ceiling over the wash rack (Figure 36).

**Poultry house**

**REQUIREMENTS:** By increasing the length of the light day, electric lighting increases egg production during the winter months when prices are highest. Poultrymen usually plan on a 12-hour light day.

**APPROVED PRACTICE:** Space lights 10 feet apart and midway between the front of the house and the front of the dropping boards. Use 60-watt lamps with reflectors mounted on porcelain sockets. Hang lights six feet eight inches above the floor. (Figure 37.) Plans for a type of reflector that may be made from 28-gauge galvanized-iron sheet metal are given in Figures 38 and 39.
The inside of the reflector should be painted with white enamel or aluminum paint.

A master control switch should be provided in the feed room or some other convenient location for all the lights in a poultry house. Ordinarily lights are used on laying hens either a few hours in the morning or a few hours in the evening. With either method the master switch makes possible the easy control of all lights.

Evening lights must be dimmed in some way in order to warn the hens to go to the roost before the lights are turned off completely. Many dimming arrangements are in use. In general, the dimming is accomplished by placing special resistance in the lighting circuit.
One method of supplying this resistance is shown in Figure 41. In this method one light wire is connected directly across the junction box, while the other wire is so connected that in completing the circuit the current passes through the switch when it is closed or through the resistance lights when the switch is open. When the current passes through the switch the house lights will be on bright. When the switch is opened, the current passes through the resistance lights and all lights will be dimmed equally. The wattage of the resistance lights should be the same as that of the house lights. The unscrewing of one or more resistance lights results in a greater degree of dimming of all lights.

Morning lights are more easily controlled because no dimming is required. The lights may be turned on mechanically by using an alarm clock to operate an ordinary tumbler switch. This is done by mounting the switch and clock so that the alarm winding key engages the tumbler switch when the alarm goes off. This arrangement is shown in Figure 40. When this method is used, the lights must be turned off manually. Automatic electric switches, which can be set to turn the lights on and off as desired, are available and should be investigated by poultrymen desiring full automatic control.

Sheep barn and beef cattle barn

**Requirements:** Light is needed primarily for feeding.

**Approved Practice:** Space lights 20 to 30 feet apart using 60-watt lamps with reflectors. Mount lights over the center of the feeding alley.

Hog house

**Requirements:** Light is used primarily for feeding.

**Approved Practice:** Mount lights in the center of the ceiling, spaced 10 to 20 feet apart. Use 60-watt lamps with reflectors. A suitably placed yard light will ordinarily provide light for the outdoor feeding trough.

Farm shop and machine shed

**Requirements:** Light makes repair work in the shop possible at night and facilitates work on machinery in the shed.
Figure 41. Dimming assembly. A method of wiring when using four electric lamps to supply the resistance necessary in dimming poultry-house lights.
Figure 42. Farm shop. The intense light required to do close work is supplied in this workshop by 3 RLM reflectors with 100-watt inside frost lamps.

**APPROVED PRACTICE:** Mount a 100-watt lamp with a reflector directly over the work bench and locate one of these units in the center of the shop for general illumination (Figure 42). A service light the same as recommended for the garage should be provided for the shop and machine shed.

Space lights in the machine shed 15 feet apart using 60-watt lamps with reflectors.

Figure 43. Granary and feed room. An added precaution against fire—vapor proof RLM domes in the granary, with 100-watt inside frost lamps to provide good light and low cost.
Granary and feed room

Requirements: Light is needed for the handling of feed and to prevent personal injuries.

Approved Practice: Use 50-watt or 75-watt lamps with reflectors mounted on the ceiling and spaced 15 feet apart (Figure 43). Danger of fire from ignition of dust may be eliminated by the use of vaporproof units. Locate the switch near the door.

Silo and chute

Requirements: Light is used here for safety, convenience, and freedom of movement.

Approved Practice: Use a 60-watt or 100-watt lamp with an angle or RLM reflector near the top of the silo, over the chute or space between silo and barn. The unit should be located so that it will direct some light within the silo through the open doors to lessen the danger of a fall and to facilitate the handling of silage.

Storage cellar

Requirements: Light makes it possible to handle fruits and vegetables with accuracy and speed. It also provides illumination for moving about in safety and comfort.

Figure 44. Woodshed. In the woodshed, a 75-watt inside frost lamp in a shallow dome reflector will help the farmer's whole household.
APPROVED PRACTICE: Use a 150-watt daylight lamp with reflector centrally located over the area where the fruit and vegetables are handled. A blue daylight lamp is recommended to aid in distinguishing injury to fruit or vegetables. Use porcelain socket switches or wall switches to avoid electric shock when standing on damp floor.

Woodshed

REQUIREMENTS: General illumination.

APPROVED PRACTICE: A 75-watt lamp with a shallow dome or home-made reflector (Figure 38 and 39) located in the center of the ceiling is recommended (Figure 44). Because people often go in and out of the woodshed with their arms laden, a wall switch is recommended.

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The following bulletins of the Illuminating Engineering Society may be obtained through the General Electric Co.;
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- Light for Seeing Safety
- Light for the Farm
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- Light Conditioning
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ACKNOWLEDGMENTS

The authors are grateful to the General Electric Company for the use of many illustrations they have supplied; to the Electrical Engineering Department, Oregon State College, and the Portland General Electric Company for their counsel and assistance in preparing this bulletin, and to other lighting specialists who have given assistance that has made this publication possible.
SUMMARY

Good lighting practices, following the recommendations set forth here, will result in four very important items:

1. There will be enough light. Be sure your lighting adviser helps you to decide what is right in your own home, to meet the needs of your family, by measuring with a light meter.

2. There will be light in enough places. For greatest comfort there will be a good light for seeing wherever there is a comfortable chair for sitting.

3. There will be freedom from glare. Glare is wasted light, and light is truly conserved and useful when it is shaded, diffused, and controlled.

4. There will be a minimum of contrast. A bright lamp placed against a dark background always produces glare. Enough good lighting units in a room will eliminate dark pockets and harsh shadows. Don't skimp on light—save your eyes. They cannot be replaced at any price.