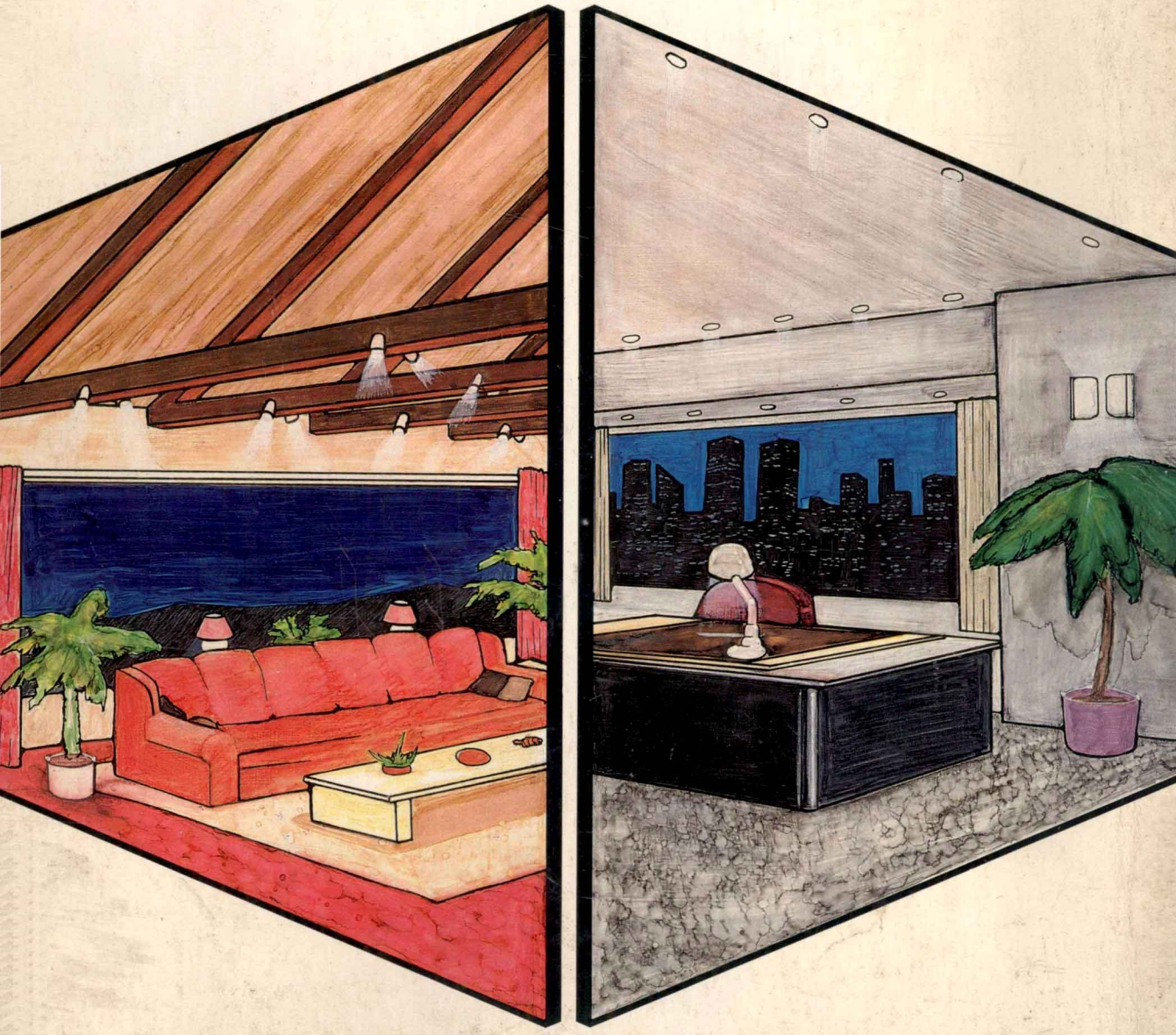
1658

EFFECTIVE LIGHTING FOR HOME & BUSINESS

BY DAN RAMSEY



EFFECTIVE LIGHTING FOR HOME & BUSINESS

BY DAN RAMSEY

TAB TAB BOOKS Inc.
BLUE RIDGE SUMMIT, PA. 17214

FIRST EDITION

FIRST PRINTING

Library of Congress Cataloging in Publication Data

Ramsey, Dan, 1945-
Effective lighting for home and business.

Includes index.
1. Electric lighting. I. Title.
TK4162.R36 1984 621.32'2 83-24374
ISBN 0-8306-0658-0
ISBN 0-8306-1658-6 (pbk.)

EFFECTIVE LIGHTING
FOR
HOME & BUSINESS

Other TAB Books by the Author

1263 *How To Be A Disc Jockey*
1458 *Building a Log Home from Scratch or Kit*
1508 *The Complete Book of Fences*
1568 *How to Forecast Weather*
1578 *Doors, Windows, and Skylights*
1598 *Kerosene Heaters*
2339 *Student Pilot's Solo Practice Guide*

When Jesus spoke again to the people, he said, "I am the light of the world. Whoever follows me will never walk in darkness, but will have the light of life."

John 8:12 (NIV)

Introduction

ELECTRIC LIGHTING IS BARELY A CENTURY old—a minute in world time—but to ask us to return to wick lamps would cause a revolution.

Many people, however, are still living in the Dark Ages, without an understanding of electricity and how lighting works daily to improve our lives. They can do little beyond change a light bulb.

Effective Lighting for Home and Business is written for everyone who uses electric lighting today: homeowners, students, housewives, factory workers, contractors, business people, and sports enthusiasts. It offers all the facts in simple language to help you understand how lighting works, as well as how to choose appropriate lighting, and how to install, maintain and repair lights, wires, switches, and fixtures.

Best of all, *Effective Lighting for Home and Business* takes you step by step with clear and understandable illustrations. If offers "new light" on an "illuminating subject."

Numerous individuals and firms have contributed to this book. In random order, they include: L.F. Muehling, public relations, General Electric Lighting Business Group; Linda E. Kobmann, product publicity manager, NuTone Division of Scovill Housing Products Group; Martha J. Lynch, communications director, The Wiremold Company; Richard H. Dowhan, public affairs manager, Sylvania Lighting Products, GTE Products Corporation; Loran, Inc.; Swivelier Company and Point-Electric; SBN Public Relations/General Electric Co., Wiring Device Department; Lighting Products, Inc.; The Superior Electric Company; and Globe Lighting Supply of Vancouver, Washington.

I wish to acknowledge and thank these sources for their invaluable contribution to this book.

Contents

1

All About Lighting

LIGHTING IS IMPORTANT TO BOTH HOW WE WORK and how we play. Good lighting makes a home comfortable and easy to live in as well as enhances furnishings, textures, and colors. Good lighting makes a business more attractive and more profitable.

If you are building or remodeling a home or business location, lighting should be part of the structural and interior plan. You can also simply start with the lighting you have and improve it. As you will learn throughout this book, much can be done at a surprisingly low cost once you understand and apply the principles of good lighting.

In this chapter you will learn how you see light, how lighting has changed through the years, what types of lighting are available, and how to plan, measure, and locate lighting. There is also an introduction to do-it-yourself lighting: electricity, lamps, wiring switches, fixtures, installation, and maintenance.

HOW WE SEE LIGHT

To understand lighting you must first understand what light is and how you see it. *Light* is radiant energy sensed by optical nerves. Heat is another product of radiant energy. Of course, the largest producer of radiant energy in man's world is the sun (Figs. 1-1 and 1-2). It produces both the light that allows us to see and the heat that keeps us warm.

Visible light is not the sun's only product. Higher on the electromagnetic energy spectrum are infrared (Fig. 1-3), ultraviolet (Fig. 1-4), and laser energies now being used in more applications in homes (microwave ovens), businesses (growing lights), and industry (laser drills).

Light is made visible with one of the most miraculous organs in our body: our eye. The eye is like a living camera that transforms light energy into sight. Light rays—from the sun or a lamp, or reflected from any object—pass through the cornea and lens of the eye and are focused on the retina. The retina continually transfers pictures to the optic nerve and onto the brain. The final step in seeing is performed in the brain.

During your waking hours, this rapid, complex

Fig. 1-1. The greatest source of light is the sun (courtesy Sylvania Lighting Products, GTE Products Corporation).

Fig. 1-2. Radiant energy from the sun grows our food (courtesy Sylvania Lighting Products, GTE Products Corporation).

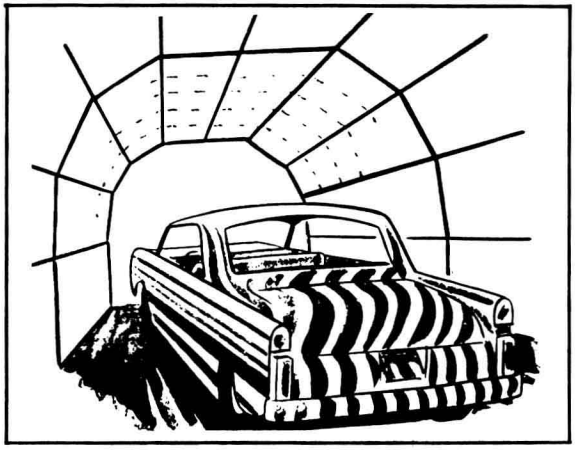


Fig. 1-3. Infrared light (courtesy Sylvania Lighting Products, GTE Product Corporation).

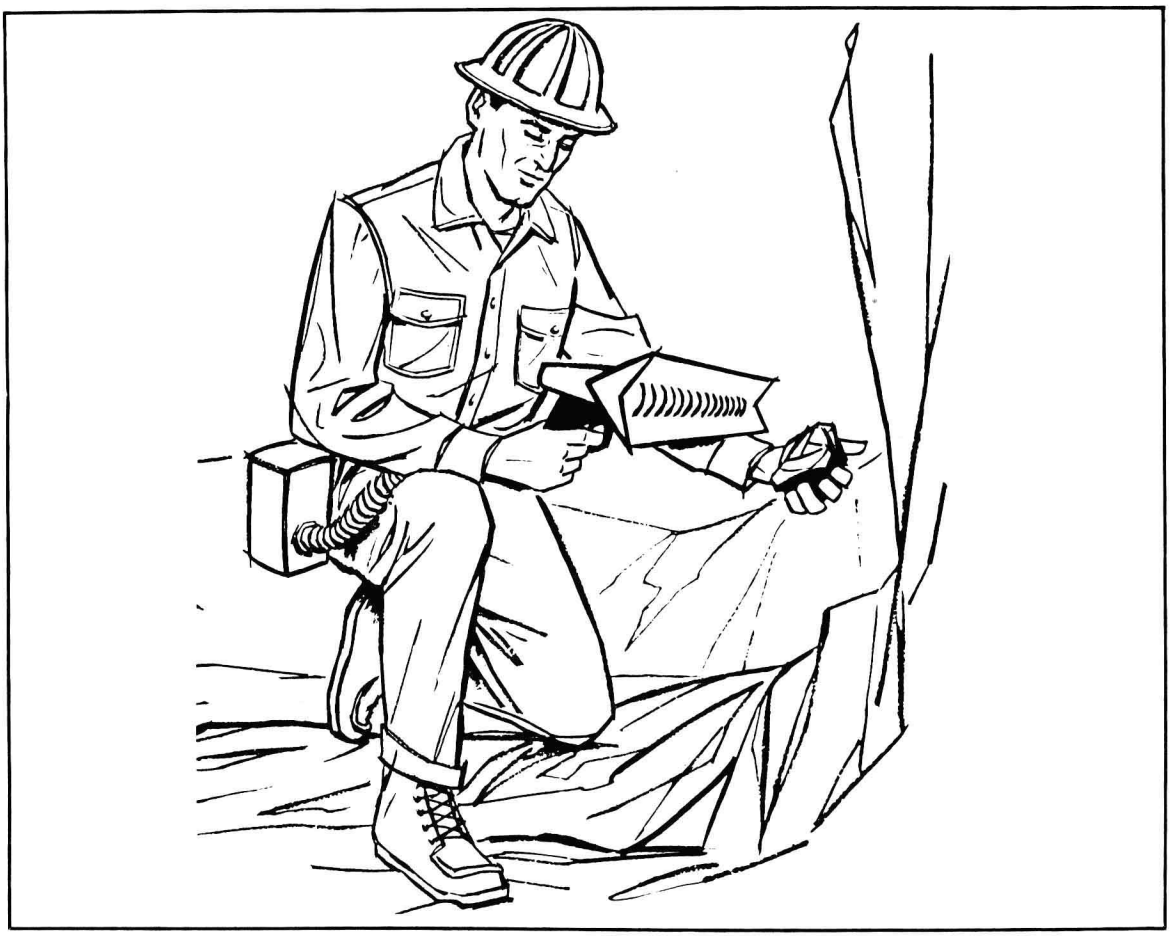


Fig. 1-4. Ultraviolet light (courtesy Sylvania Lighting Products, GTE Products Corporation).

process constantly gives back the shape, color, size, and motion of the things you see. More than ¾ of sensory impressions come through the eyes.

Four factors determine **visibility**, the ease and accuracy with which you see. They are:

Size. The larger the object, the easier it is to see.

Contrast. To be seen, an object must contrast to some extent with its background. For example, a dark wood carving against a white wall can be easily seen, but a white figurine against a white wall is difficult to see.

Time. It takes time to see clearly. For this reason, rapidly moving blades of an electric fan blur. There is not enough time to see individual blades.

Brightness. The amount of light the eye actually sees is called brightness. It may be direct or reflected from objects or surfaces. There is no visibility in darkness and little in dim light. As light increases, surrounding surfaces become brighter and reflect more light to the eyes. You see more efficiently and effortlessly.

Of the four factors, brightness is the one over which you have control. Usually you cannot change the size or form of an object or slow its speed. You may not be able to put the object against another background that gives more contrast. You can, however, add more and better light to make seeing easier.

NATURAL LIGHTING

Most light we use is supplied naturally by the sun. Imagine what would happen if the sun's light were switched off! "Due to lack of payment, the sun will be turned off indefinitely, effective the 31st. Signed: God." We could not produce enough bulbs and electricity to replace this 11 million-degree beacon that burns constantly to light both day and, indirectly, night.

There it is, though, and it is free for us to use. There are also millions more just like it in the sky! All we need to do is appropriate its light through engineering. That is, we must make windows in structure walls and skylights in ceilings to allow in the sun's electromagnetic waves.

Rooms and openings can be designed to take advantage of this natural light—both direct and reflected. Later in this book we will consider how to take advantage of the sun's free light to minimize artificial lighting and bring a warming glow to the interior of your home or business (Fig. 1-5).

ARTIFICIAL LIGHTING

There are times, however, when natural lighting is not available, such as during the night and in times of extensive cloud-cover. In other cases, the sun and structures may not allow enough natural light into the home or business; so artificial lighting is needed.

History of Lighting

In Babylon thick flax wicks were used in bowls capable of holding 50 pounds of animal fat. Ancient Rome developed the candle, the wax torch—later known as the flambeau—and the horn lantern.

Shetland Islanders, until comparatively recent times, captured and dried the stormy petrel, a bird with a high percentage of grease in its body, for lighting. The technique called for threading a wick through the petrel's beak, fixing its feet in clay, and burning the dried bird as a lamp! The now-extinct great auk was used as a light by the Danes, who inserted a wick in a dead bird's belly and burned it in their homes.

When America was settled, the colonists could not waste valuable shipping space for luxuries such

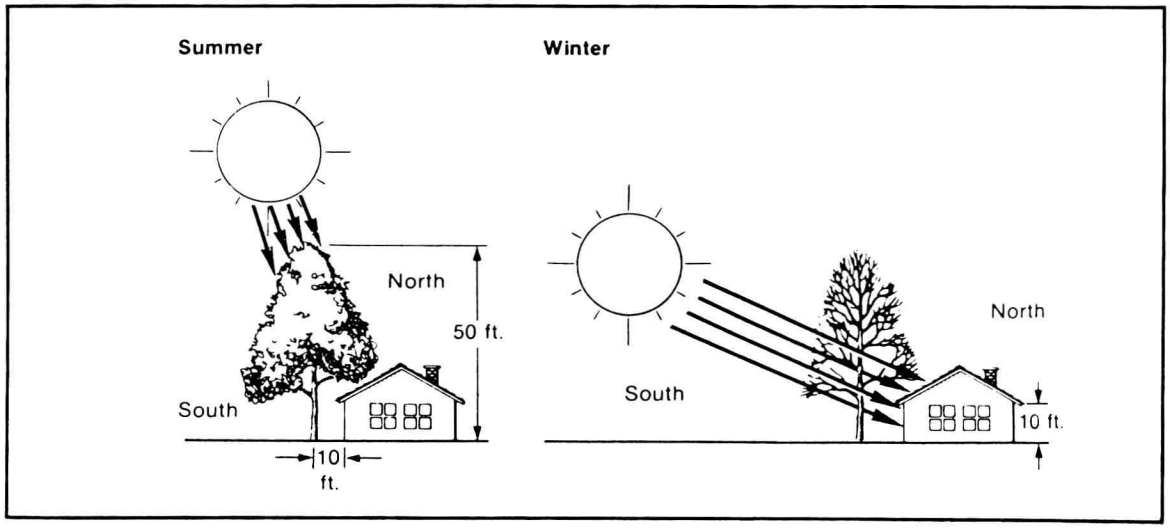


Fig. 1-5. Natural light from the sun can be controlled (courtesy Sylvania Lighting Products, GTE Products Corporation).

as candles, so they first used pine knots, torches, or their cooking fire for light. Later they made their own tallow or bayberry candles.

It was about 1640 when Massachusetts Bay Colony settlers began to seek whales in shallow waters just offshore. By 1650, some of these settlers had migrated to Long Island, where, in East Hampton and Southampton, whaling expeditions of two and three weeks duration were made up and down the coast. Whaling became so important in East Hampton that the schoolmaster accepted part of his annual salary in the form of whale oil.

As time went on, whale oil became increasingly popular for lighting. As a result, whales were intensively hunted from pole to pole. Whale oil lamps became popular. Oil prices rose, so only the wealthy could afford whale oil candles and lamps.

With the discovery of oil in Titusville, Pennsylvania, in 1859 by Colonel Edwin L. Drake, whaling as a source for lighting oil was doomed. Petroleum was less expensive than whale oil. It gave excellent light when refined to kerosene and burned-in lamps. In turn, as gas became available, oil lamps became less popular. Gas was piped to the consumer. It required no bulk storage in the home. A device called the Welsbach mantle, when placed on a gas outlet, produced an incandescent effect. Streets, trains, theaters, churches, and restaurants were lighted by gas lamps.

Meanwhile in Menlo Park, New Jersey, a man with an idea was working impatiently to produce an electric lamp. He was not the first to have such an idea, however.

Sir Humphrey Davy, an Englishman, developed the arc light in 1809. England's Sir William Robert Grave tried for years to make an electric lamp. Finally another Englishman, Frederick DeMoleyns, patented an electric lamp in 1841. His product, of platinum and charcoal, didn't work well, however. The platinum melted and the lamp went out.

In Russia, Aleksandr N. Lodygin developed a graphite lamp in 1874, but after testing 200 of these short-lived light sources in a St. Petersburg dockyard, he found them too expensive to be practical. Paul Jablochkoff, another Russian scientist, used Sir Humphrey Davy's ideas to produce huge carbon-arc lamps for the illumination of the Paris Exposition in 1879. The "Jablochkoff candles," however, were expensive and impractical, too.

In Menlo Park, Thomas A. Edison, the man with the idea, was busily developing the first practical incandescent lamp. After thousands of tests, he found a bamboo fiber which, after charring, lasted for hours and produced a reasonably good light. The age of the electric light was born on October 21, 1879.

In order to demonstrate to the public that electric lighting was practical, Edison developed the first power company to provide current for lights installed in New York City in 1882. Electric incandescent light spread through the country. The demand for light encouraged the formation of power companies, and the availability of current encouraged greater use of electric light.

From 1879 until 1938, the incandescent lamp was the single source of residential electric light. Then came the popularization of the fluorescent tube and the development of the first practical fluorescent fixture by Sylvania.

Today more light is produced by fluorescent lamps than by any other light source in the world, totaling about 270 billion kilowatt hours of consumption annually.

Types of Lighting

Not all lighting is the same. In fact, the types of lighting are as varied as the need. But lighting can be broken down into three broad groups: task, accent, and general (Fig. 1-6).

Task lighting is that needed to do a job (Figs. 1-7 through 1-10) preparing food in the kitchen, reading in the den, or sewing. Task lighting is more critical than other types of lighting and is usually the first type considered when planning a room's lighting system. What tasks require lighting in this room, how much light, and where?

Accent lighting is similar to task lighting in that it has a specific job to do. Accent lighting is used in decorating a home; (Fig. 1-11) and to offer accent or contrast to objects or areas (Figs. 1-12 through 1-16). That is, accent lighting will draw attention to

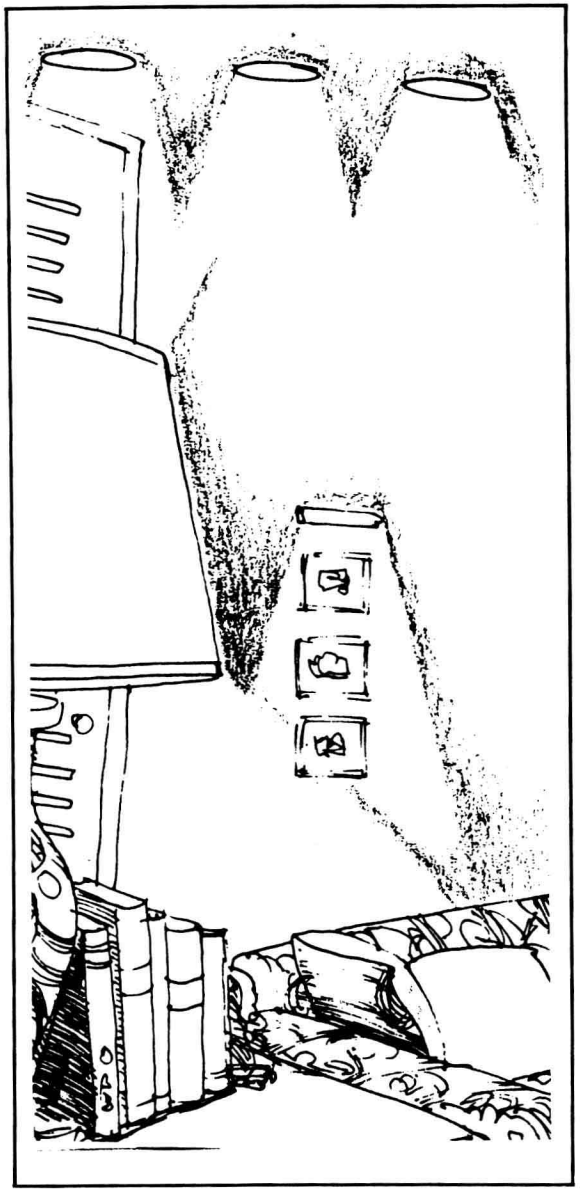


Fig. 1-6. The typical home uses both task and general lighting (courtesy General Electric Lighting Business Group and Wiring Device Department).

the stone work of a fireplace, the center of a room, or the landscaping outside the home. It can set the room's mood: soft, busy, multipurpose. Accent lighting is also used extensively in the decorating of stores and businesses.

General lighting is everything else. It usually consists of diffused or indirect lighting intended to illuminate a wide area such as an entire room. It is intended for noncritical use in a room where many different tasks are carried on. In the living room, general lighting is used for watching television, entertaining, relaxing, or playing games. There may also be accent lighting in the room for decoration and a task light for reading (Fig. 1-17).

HOW TO PLAN YOUR LIGHTING

In many homes, there are 50 or more "seeing" jobs that need specific lighting. The typical business or industry has as many or more.

A Lighting Inventory

An easy way to spot the places in your home or

Fig. 1-7. Task lighting makes work easier (courtesy General Electric Lighting Business Group and Wiring Device Department).

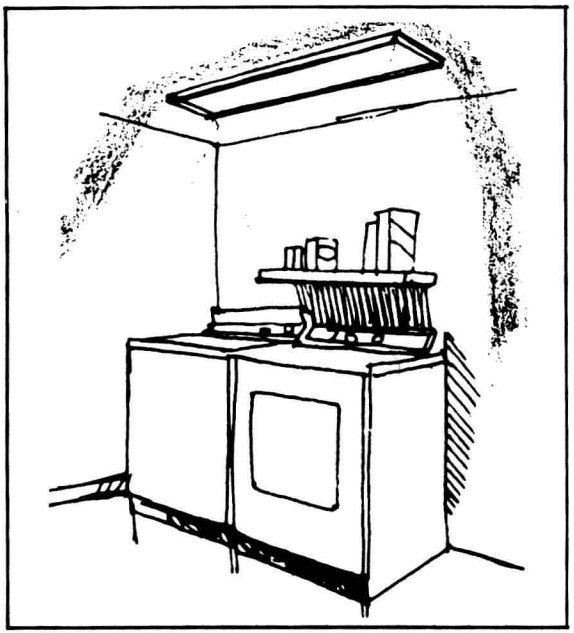


Fig. 1-8. Task lighting is often installed in work areas (courtesy General Electric Lighting Business Group and Wiring Device Department).

Fig. 1-9. Task lighting can help learning (courtesy General Electric Lighting Business Group and Wiring Device Department).

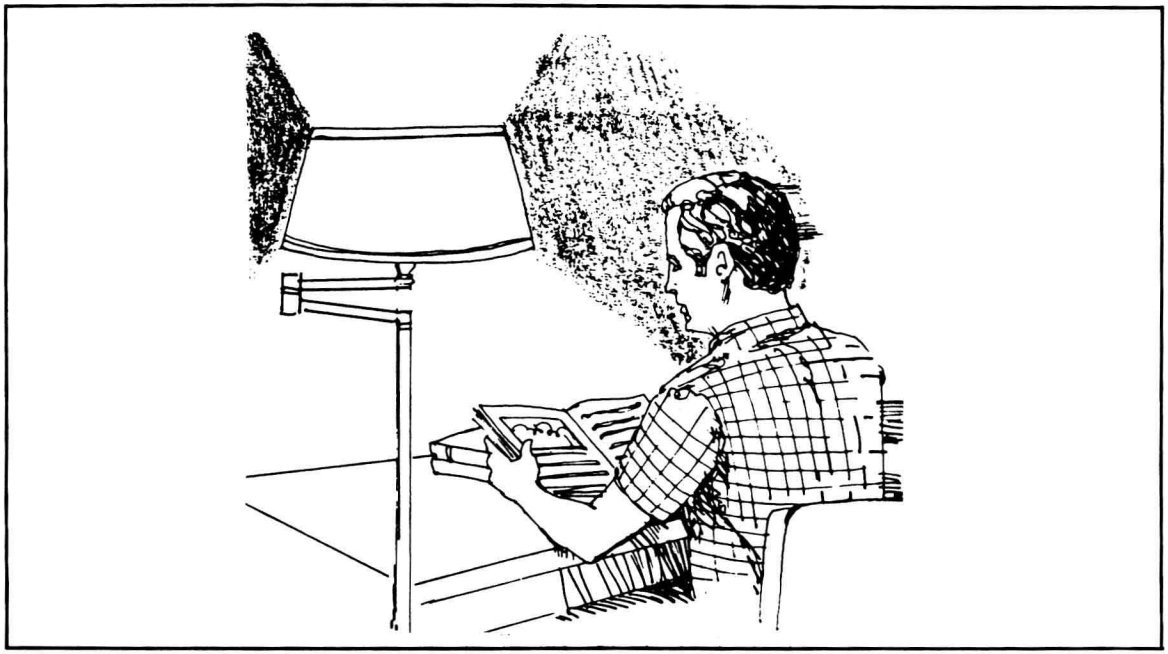


Fig. 1-10. Reading requires task lighting designed for the purpose (courtesy General Electric Lighting Business Group and Wiring Device Department).

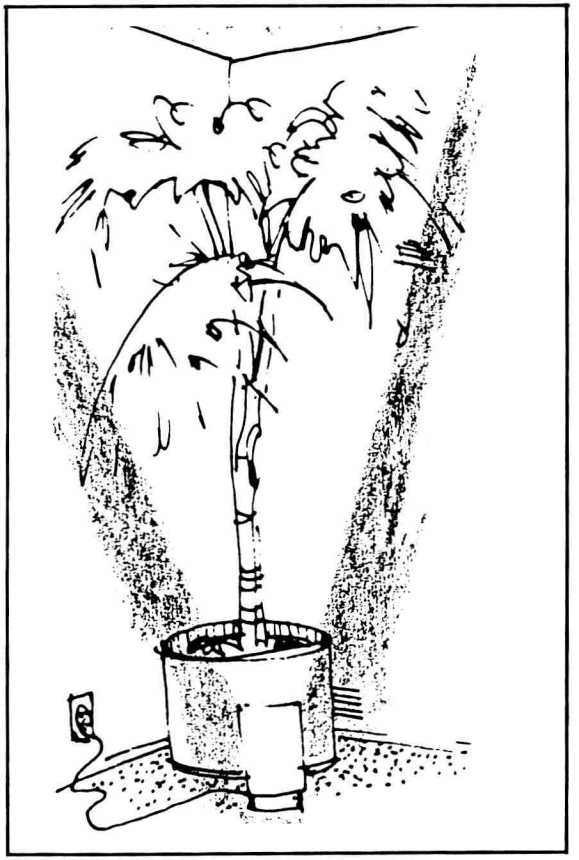


Fig. 1-11. Accent lighting can emphasize decorative elements within the home (courtesy General Electric Lighting Business Group and Wiring Device Department).

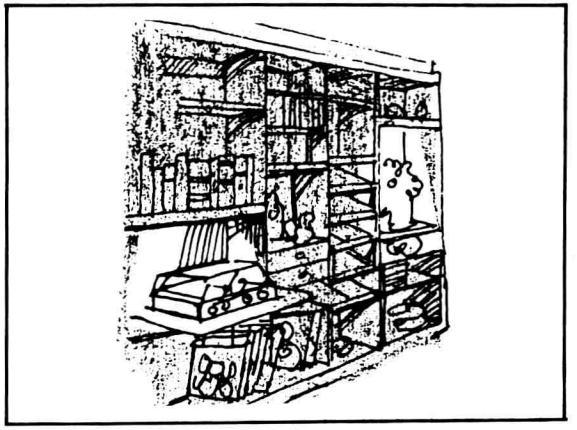


Fig. 1-12. Accent lighting (courtesy General Electric Lighting Business Group and Wiring Device Department).

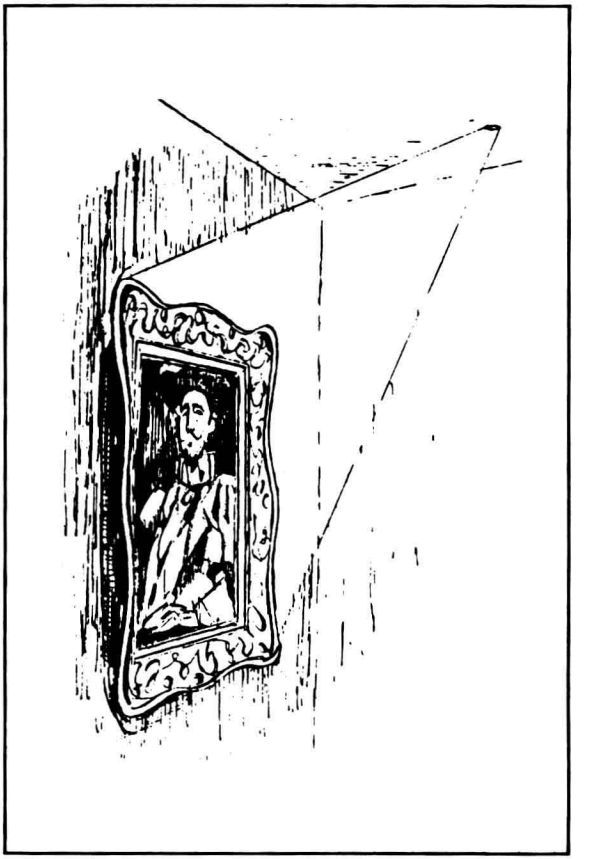


Fig. 1-13. Accent lighting can be installed for a specific purpose (courtesy General Electric Lighting Business Group and Wiring Device Department).

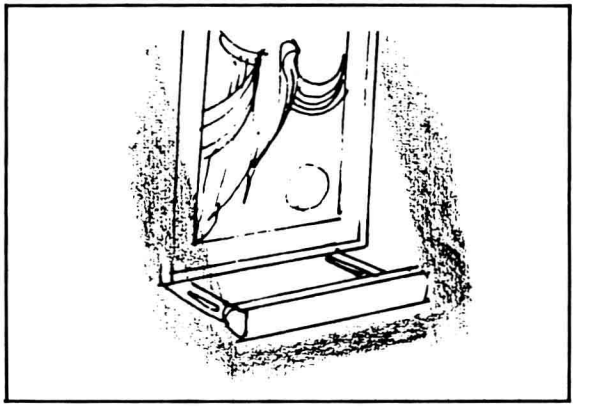


Fig. 1-14. Accent lights can be mounted directly on picture frames (courtesy General Electric Lighting Business Group and Wiring Device Department).