Extension Folder 648—1982

ENERGY-WISE INTERIORS

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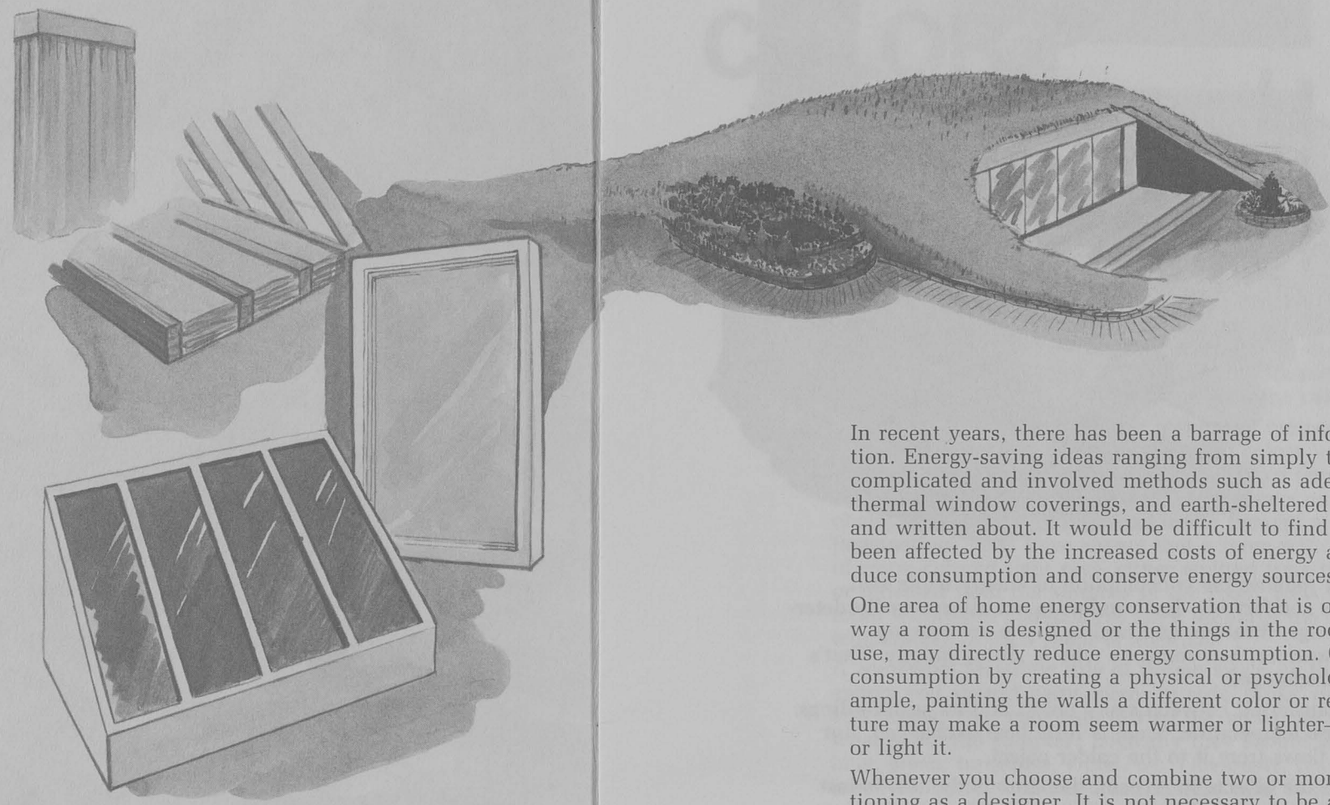


In recent years, there has been a barrage of information about energy use and conservation. Energy-saving ideas ranging from simply turning down your thermostat to more complicated and involved methods such as adequate insulation, passive solar heating, thermal window coverings, and earth-sheltered housing, have been discussed, debated, and written about. It would be difficult to find someone in Minnesota who has not been affected by the increased costs of energy and who is not aware of the need to reduce consumption and conserve energy sources.

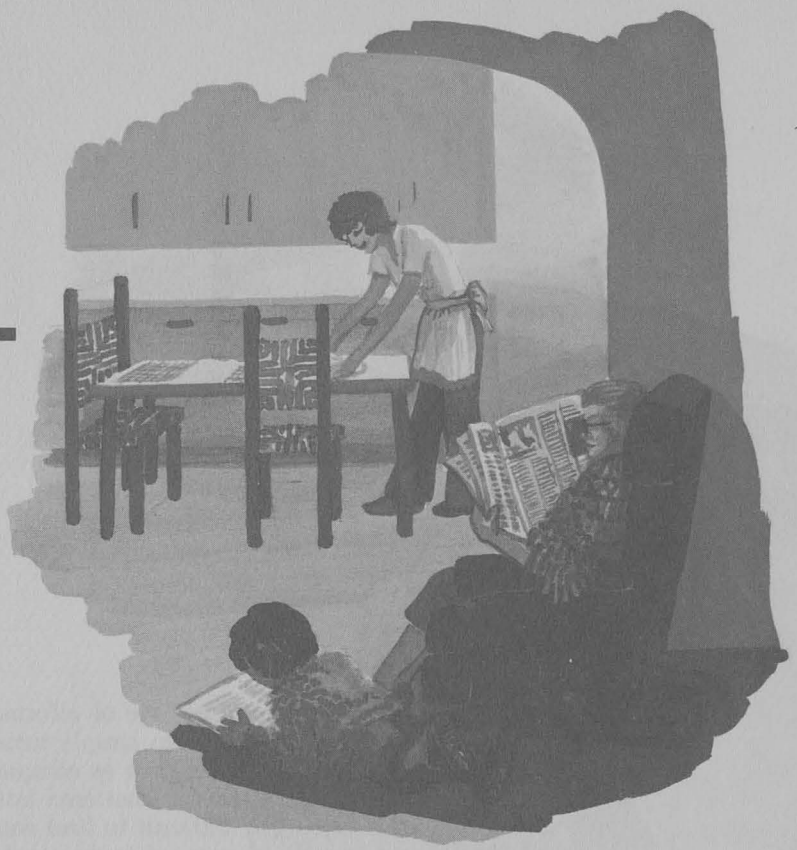
One area of home energy conservation that is often overlooked is interior design. The way a room is designed or the things in the room, such as the kinds of lighting you use, may directly reduce energy consumption. Other aspects of design may affect energy consumption by creating a physical or psychological feeling of warmth or cold. For example, painting the walls a different color or reupholstering or slipcovering some furniture may make a room seem warmer or lighter—and perhaps require less energy to heat or light it.

Whenever you choose and combine two or more objects, colors, or forms, you are functioning as a designer. It is not necessary to be a professional, but you should be aware of the many alternatives, possibilities, and consequences of design decisions, including how design can affect energy consumption.

It is important to keep in mind that there are many ways to solve a particular design problem. Too often, magazines and other publications present simplistic solutions that are supposed to work for everybody. What may be acceptable and effective in one geographical location may not work in another. A design that works well in southern California may not be appropriate or effective in Minnesota. In addition, the physical location and design of your interior spaces will also determine what solutions are effective. For example, one type of window treatment may indeed conserve energy on a specific type of window in a certain location, but may prove to be of little value in another. Consequently, there is often really no one "best" answer, just as there is no single style of chair or wall color that is always best for everyone.

Try to find a solution that satisfies as many of your needs as possible—both functional and aesthetic. But recognize that you may have to make some compromises. A design that keeps your home warm in the winter may prove to be very uncomfortable on a hot summer day. A design that is the most efficient and effective may require you to make extensive changes or to discard materials or furnishings you already possess.

COMFORT



The energy-wise interior is one that reduces the consumption of energy while still maintaining a temperature that feels comfortable. But comfort is not always easily determined. It depends on your activity, age, location, and health. If you are moving around, for example, you will feel warmer than someone who is sitting quietly. That's because of the way radiant heat is exchanged.

Radiant heat is continually being transferred between every object and its surroundings. When two objects are about the same temperature, there is little heat exchanged. But when one object is hotter, the heat flows from it to the colder object.

Normally your body is warmer than the objects in a room; therefore body heat is lost and you may feel cold. But if you are active, your movements will stimulate the flow of blood and warm you. This will compensate for any loss of radiant body heat and you will feel warmer than the person who is inactive and whose body heat loss is greater.

When you consider ways to make a room more energy-efficient, make sure you think about the kinds of activity that will take place there. A sitting room will probably require more heat for its occupants than a playroom or kitchen, where there is usually more physical activity.

Older people are often more sensitive to cold than younger people. If the older person is not active, then he or she will feel even colder. If there are elderly or sedentary people in your home, you need to consider their comfort when determining the placement of the furniture they use. For example, since the temperature in a room can vary, place their chairs in a warmer part of the room and away from drafts. Moving air hastens radiant heat transfer, and so a person feels colder if there is a draft.

COLOR

Color is a remarkable design component. It can affect emotions more than any other single element or principle of design. There are very few individuals who are not affected by the psychological influences of color, and in all probability they are color blind.

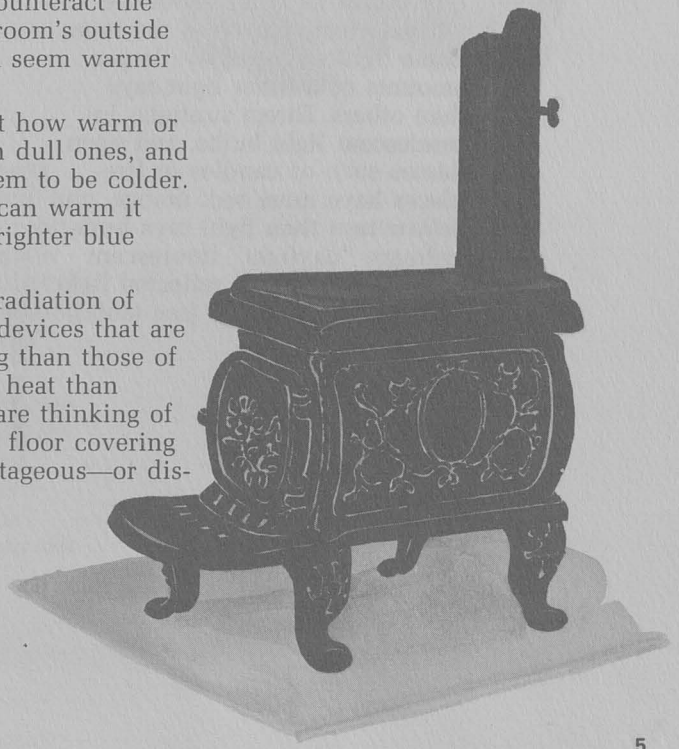
Certain relationships and meanings are attached to colors that are directly connected to energy. For example, as a piece of iron is heated, the color changes from grey to dull red, to bright red, orange, yellow, and finally to gleaming white. There is also the expression, "to turn blue with the cold."

Color affects our psychological feelings of temperature. Most people are aware of the so-called warm colors (yellow, orange, red) and cool colors (green, blue, violet), but they may not think of them when considering ways to save energy. This psychological attribute of color is not the figment of someone's imagination. Tests have shown that a room with an abundance of warm-colored light rays, either emitted from the light source or reflected from the surfaces in the room, feels warmer than a room with more cool-colored rays, although the actual physical temperature in each room is identical.

A somewhat facetious rule of thumb might be that to conserve energy you should paint rooms in reds, pinks, oranges, browns, and beiges. That may help during the winter months, but then what about the summer? Logically they should then be painted blue, green, turquoise, violet, etc. Obviously, that would be impractical, but you do need to consider what is practical for you before choosing a warm or cool color. If a room is excessively hot or cold, the wall color can help counteract the visual temperature problem. Also consider the room's outside exposure. For example, a north-facing room can seem warmer if the walls are painted in warm tones.

The intensity and value of colors can also affect how warm or cool they seem. Bright colors seem warmer than dull ones, and darker hues appear warm while lighter hues seem to be colder. If you are using a cool color such as blue, you can warm it up by making it a darker shade or by using a brighter blue rather than a subdued or grayish hue.

Black is the best color for both absorption and radiation of heat. Consequently, heat collecting and storing devices that are painted black are better for passive solar heating than those of any other color. Black stoves also give off more heat than stoves of other colors. Consider this when you are thinking of painting your hot water radiators, or selecting a floor covering where direct sunlight floods in. It can be advantageous—or disadvantageous.



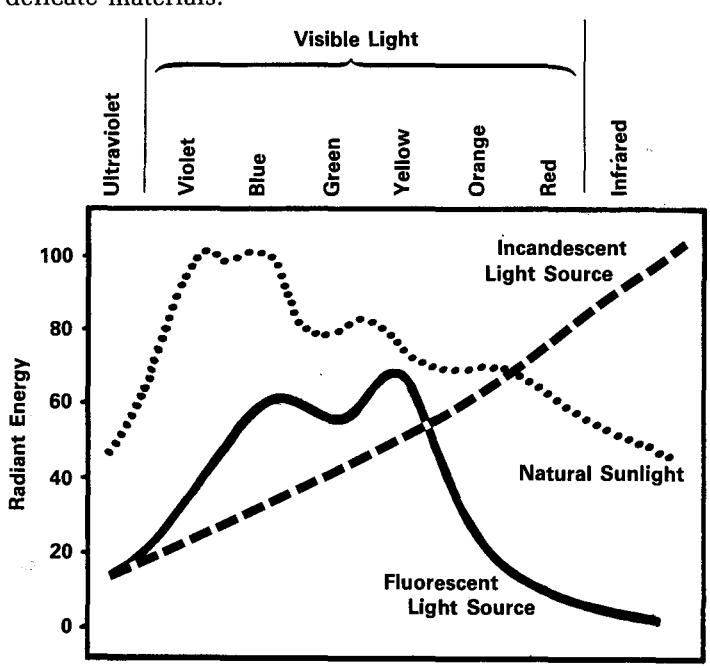
LIGHT

On a clear day the sunny side of a house has up to 20 times more illumination than the shady side. Modern lighting for interiors often calls for illumination levels that are about one-fifth of that found on the shady side of a building on a clear day. Our eyes compensate and we think of this as bright and very adequate. It is interesting to note that this is 20 times *more* illumination than was once considered satisfactory for homes.

Task lighting coupled with lower ambiance lighting is now recommended by many lighting experts. It conserves energy without harming your eyes. Instead of a higher level of overall illumination, lower the general lighting and concentrate brighter light where the work is performed. It is not a good idea to eliminate all of the general lighting and use only the task lighting because that creates too much contrast between the darkened and lighted surfaces and may cause eyestrain. White paper on a dark desk top is also very conducive to eye strain. Task lighting sources need to be carefully placed to eliminate glare. Try to avoid any glare from white or shiny surfaces. Even a black or dark surface can reflect objectionable light rays if it is slick.

Although it is usually advantageous to allow as much direct and reflected light as possible to enter a room to help illuminate and heat the space, keep in mind that sunlight can also fade or bleach many fabrics, woods, and other materials and may even cause some to deteriorate. Therefore, it may not be advisable to have unlimited direct sunlight entering a room that contains delicate materials.

The source of light in a room is a powerful determinant of the "visual" temperature of the room. Some light sources have larger amounts of warmer light rays than others. Direct sunlight, incandescent light bulbs, and open flames such as candles or fireplaces have more red, orange, and yellow rays than light rays from ordinary "daylight" fluorescent tubes, arc lights, or reflected light such as "north light" (see table).



Colored light rays emitted by different light sources

On an after-dark stroll note the different lighting "temperatures" of different rooms in neighborhood houses. Frequently the light from kitchen and bathroom windows (the most common locations for fluorescent lights) will appear bluer and colder—and usually brighter—than the light from other windows.

Different kinds of lighting will affect the way colors appear. Try to match colors under fluorescent and then incandescent lamps. Check your matched colors later under natural daylight. Undoubtedly there will be some differences.

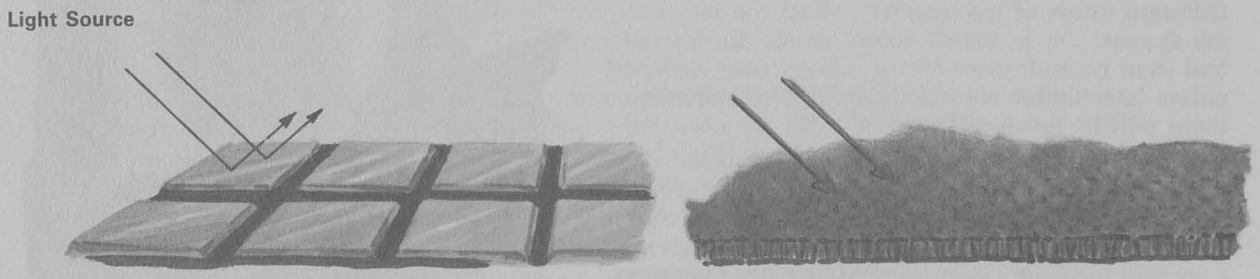
The most common artificial light source used in American homes is the incandescent bulb. More than 2½ billion incandescent light bulbs are consumed annually in the United States. They give off a warm-toned light (considerably redder than sunlight) as well as a large amount of radiant heat. Over 95 percent of the energy consumed by an incandescent bulb is given off as heat and less than 5 percent produces the light. This visible and actual heat source can be used to advantage. It can also be a disadvantage. For example, incandescent light sources must be ventilated. When high levels of illumination are required in small, poorly ventilated rooms, the accumulated heat can become oppressive. If the incandescent light source is not adequately vented it can also become a fire hazard. A dimmer attached to the light switch can give some control over the amount of light and heat produced, but the incandescent light still needs to be vented.

Fluorescent lamps are far more efficient from an energy standpoint than incandescents. To produce the same amount of illumination, an incandescent bulb requires approximately three times more energy than a fluorescent.

In addition to their energy efficiency, fluorescent lamps have another advantage. They remain relatively cool to the touch and require little if any ventilation when installed in close surroundings. One disadvantage is that they are long and narrow and somewhat clumsy, although circular and U-shaped tubes are available. The light from fluorescent lamps is more diffused and general, and cannot be concentrated or focused like the light coming from an incandescent bulb.

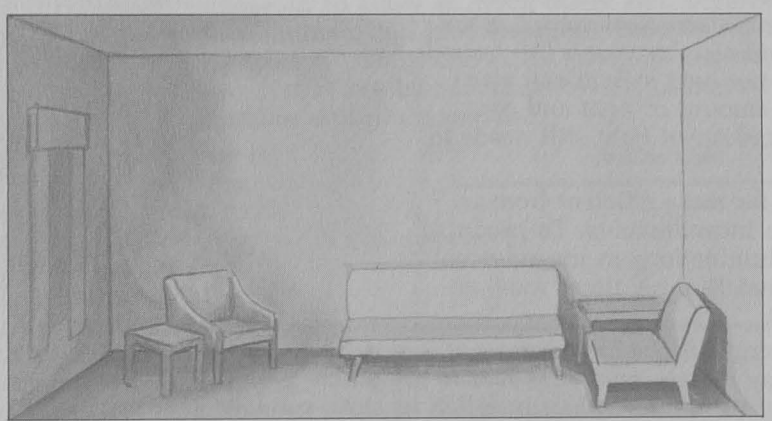
The common "daylight" fluorescent lamp emits more blue rays and has a much colder appearance than either natural sunlight or the incandescent lamp. The table shows that fluorescent lamps emit hardly any orange or red rays. Recently, better color-balanced fluorescent lamps such as the "warm white" have become available and it is worthwhile to search them out rather than to accept the too-blue "daylight" lamp.

REFLECTED LIGHT

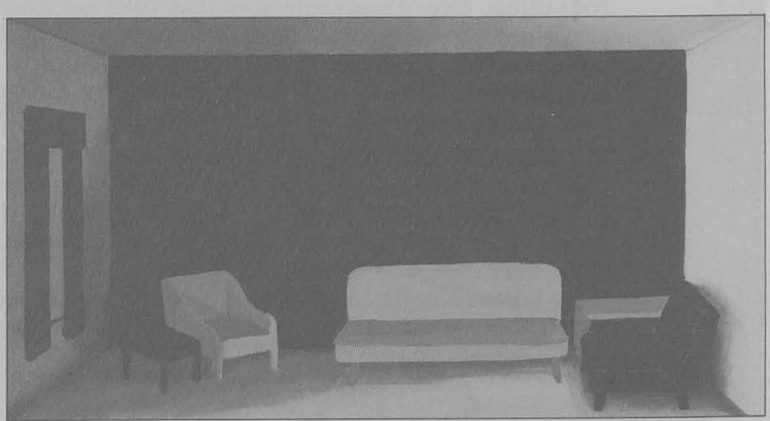


The amount of lighting required in an interior often depends on how much reflected light as well as direct light there is in the room. And the amount of reflected light in turn depends on the textures and colors of the interior surfaces.

If you want light rays evenly reflected, then choose smooth surfaces. A slightly textured surface will diffuse the light. Highly textured, rough surfaces will absorb more of the



Light-colored surfaces reflect more light than dark-colored surfaces. The light source is the same for all rooms.



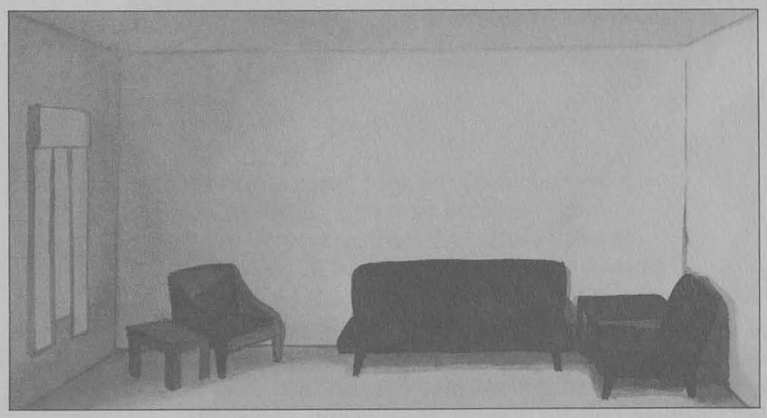
rays. Today there is a marked trend toward glazed and shiny wall and furniture surfaces. That's fine if you want a bright effect. However, glare can be a problem. Very smooth surfaces reflect so well that all rays are reflected directly. A mirror, for example, reflects almost every ray (that is why we see the reflected image), and we do not see the surface. Some surfaces are so smooth and reflective that the glare even hides the color. Matte or slightly dull finishes will often reflect almost as much light as a glossy finish, but the rays will be diffused and the objectionable glare reduced or eliminated.

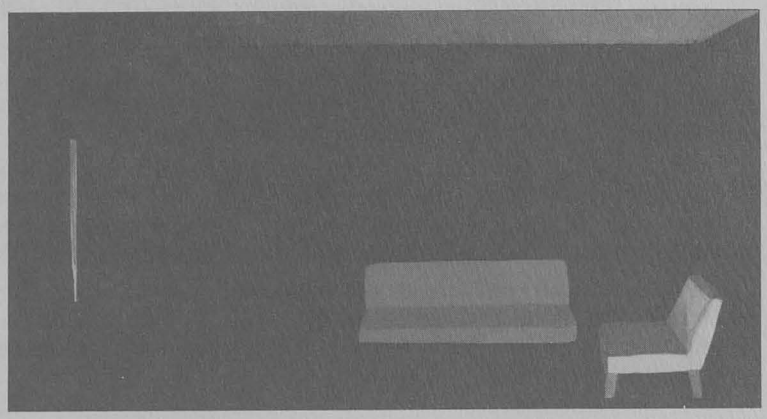
Surface color also affects the amount of reflected light in a room. For maximum reflectance, the ideal color is pure white. It reflects 90 percent of the light that strikes it. Black and very dark colors reflect very little. Approximate reflectance values of a number of colors used in homes are shown below.

Since dark colors absorb more energy rays than light colors, a dark surfaced floor will become warmer. A light floor will not be as warm, but it will reflect the light elsewhere in the room.

REFLECTANCE VALUES

Pure white	90%
Off white	82%
Medium gray	50%
Sky blue	49%
Leaf green	45%
Pale yellow	78%
Golden yellow	54%
Chocolate brown	15%
Very pale pink	70%
Mandarin red	21%
Walnut	10%





TEXTURE

The texture of walls and furnishings also affect our feelings of temperature-related comfort. Rough textures and irregular surfaces appear to be warmer than smooth textures. A room with many slick and shiny surfaces will appear cooler, regardless of the colors or the actual temperature. Velvets, tweeds, homespun weaves, quarry tiles, natural wood surfaces, brick, and stone will look warmer, and many will actually feel warmer to the touch. Satins, brocades, many plastics, glass, metals, and glazed tiles will look and often feel cooler.

MATERIALS

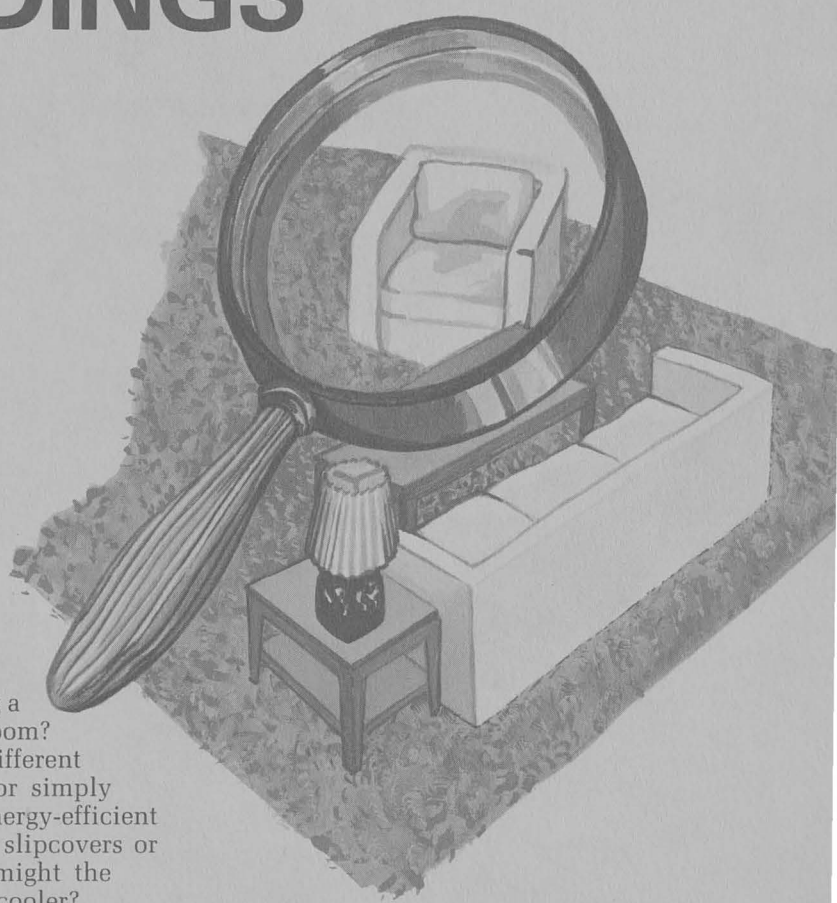
Certain materials can cause temperature changes. Metal, for example, is an excellent conductor of heat. Regardless of the type of metal or the texture or color of the surface, all metals will actually feel cooler to the touch under normal conditions. This is because the metal surface, when touched, readily conducts body heat away. Metal furniture, with its glossy, smooth surfaces, will not only look colder, it will *be* colder.

Glass is another excellent conductor of heat and will remove body heat when touched. You need only touch a window in winter to discover this. The reason that so much heat escapes through windows is that glass is such an excellent conductor. It conducts the heat right through it, almost as if nothing were there.

Wood, on the other hand, looks and often feels warm. Wood is not a very good conductor of heat. It is a cellular material and air is trapped within its structure. The normal color of most woods is brownish, a warm color, but even if the wood is painted, it will usually feel warmer than a metal surface painted the same color.

Woven and knitted fabrics also look and feel warmer. The texture, the trapped air between the fibers and yarns, and the fact that cotton, linen, wool and other fibers do not conduct heat effectively are the reasons why fabrics seem both visually and physically warmer.

EXAMINE YOUR SURROUNDINGS



Take a good look at your surroundings. Can you increase your sense of comfort by some minor changes in furniture placement? Would painting the walls a different color bring a more warm and intimate feeling to the room? Should you get some additional or different light sources, add dimmer switches, or simply relocate some of the lamps for more energy-efficient illumination? If you acquired different slipcovers or reupholstered some of the furniture might the room seem lighter, brighter, warmer, or cooler?

Whether you are planning a major redecoration or just looking for simple ways to cut energy costs, take the time to think how design elements can affect your sense of comfort and the amount of energy that is consumed.

See Extension Folder 647, *Hints for Conserving Home Energy*, for additional ideas on energy conservation in interiors.

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