

Techniques

Techniques are ways to “arrange” or distribute the light in a space to achieve a desired effect. For example, a room may contain luminaires that distribute light uniformly to all surfaces, or luminaires that distribute light mainly to the walls and ceiling, or luminaires that distribute light only to a few objects. Illuminance describes the amount of light that reaches a surface.

The techniques in this chapter are general and can be used for many areas of the home. Daylight is covered only briefly here because this book focuses on electric sources of light; daylight is an important light source for homes and is treated at length in many other books. Daylight and the techniques of Ambient lighting, Indirect lighting, and Wall Washing all can create a general, diffuse light distribution in a space. Other techniques that are used for more specific light distribution are Accent and Task lighting, and lighting for Special Purposes. Each technique is described and illustrated in this chapter, and appropriate luminaires are suggested. The Designs chapter shows examples of these techniques applied in various rooms of the home.

Daylight



Like electric lighting, daylighting has sources, luminaires, and controls. Daylight sources are the direct sun, the sky which can diffuse the sun's light, and surfaces surrounding a building that can reflect sun or sky light into the building. Daylight luminaires are the windows and skylights that admit daylight into the building. Examples of daylight controls are tinted glass and films, blinds, curtains, overhangs, and shades that reduce the brightness and change the distribution of daylight, and sensors and switches that control electric lighting in the daylit space.

Homes often have generous amounts of daylight, and residential building codes require that most rooms have windows. Typical residential rooms are small enough so that daylight can reach deep into the room, particularly if windows are located high on the wall. Daylighting only becomes an energy-efficient strategy if electric lamps are dimmed or turned off when daylight provides adequate illumination. Depending on climate or building orientation, the use of windows and skylights can have a positive or negative effect on a home's heating or cooling requirements. For instance, windows that are located below table height do not add much lighting benefit but may add considerably to the home's heating and cooling loads.

Daylight may introduce some lighting problems. Windows or skylights can cause direct and reflected glare on television and computer screens, cause some fabrics and artwork to fade, and can cause thermal discomfort. These problems are magnified when direct sunlight enters the room. Often people will counteract these problems by closing shades, blinds, or curtains, thus reducing or eliminating daylight and increasing the need for electric lighting.

Most daylit rooms average 10 to 12 hours per day of potentially avoided electric lighting; the proper use of electric lighting controls maximizes the energy savings available when daylight is used in a lighting design. For a simple yearly estimate of daylighting energy savings potential in kilowatt-hours, multiply the number of hours that lamps in a room would be on during the day times 365 days times the watts consumed by the lamps and divide by 1000.

Windows and skylights provide a view and are free of lighting energy costs; however, in terms of initial cost, windows and skylights are more expensive than an equal area of solid wall. Windows also can provide emergency egress and/or natural ventilation. Daylighting has excellent color qualities and can provide ample illuminance, although the intensity and color of daylight varies with season, time of day, and weather. Windows and skylights can provide solar heating benefit, but also can cause excessive solar heat gain and/or heat loss.

Use daylight in as many spaces as possible to reduce daytime electric lighting energy use. Small windows or skylights usually provide adequate light for moving around the home. In new construction or a major remodeling, consider installing a window or skylight in hallways, baths, and foyers. In larger rooms, windows on more than one wall will give balanced light distribution throughout the room, help reduce direct glare, and provide cross ventilation.

In order to avoid direct and reflected glare, position desks and seating for conversation and reading so that people are not facing the windows. Alternatively, adjust blinds to redirect sun to the ceiling. Transparent curtains and shades can soften direct sunlight. In rooms with windows on only one wall, people seated with their backs against the window may appear as silhouettes to others in the room, who may experience discomfort by trying to see a backlit face against the bright window.

Locate tasks that require more light nearer to windows. For instance, place a hobby or homework table next to a window. In bathrooms, a small window behind or beside the toilet often provides adequate illumination. Thus the maintenance problems of a window in the tub enclosure are avoided and the wall space above the sink is available for a mirror. Furthermore, the window is well-positioned for the task of reading! A window with a high sill permits privacy as well as daylight.

In rooms with television or computer screens, place the screen so that it does not reflect the image of the window in the screen. Hold a mirror in the proposed location of the screen. If you can see the image of a window, lamp, or luminaire in the mirror when it is viewed from the intended sitting position, the screen will also reflect that image. Direct sunlight can cause discomfort when the resident is watching television, working at the computer, or reading. Nonetheless, for many other less visually demanding tasks, sunlight enlivens the room.

Automatic daylight dimmers that are controlled by photosensors are impractical for most residences because of their high price. Photosensors are practical for operating luminaires that are used all night for security. Provide separate switches for luminaires in various parts of the room to allow residents to use only the luminaires that they need during the day.

Ambient



Ambient lighting provides the general illumination for a space and enables people to move around the home. Ambient lighting suffices for non-visually demanding activities such as conversation or television viewing. Ambient lighting can be provided by many types of luminaires. Most rooms in homes are small enough so that one or two luminaires will provide adequate ambient light.

Avoid high illuminances for ambient lighting, unless visually demanding tasks (such as reading or crafts) are done throughout the room. Lower illuminances can save energy because lower-wattage lamps can be used. For maximum efficiency, combine low ambient illuminances with local accent or task lighting for work areas.

Luminaires: Ceiling-Mounted Diffusers, Suspended, Recessed Downlights, Architectural, Wall-Mounted Sconces or Diffusers, Table and Floor Lamps



The technique of indirect lighting uses one or more luminaires to direct light onto the ceiling and upper walls of a room; the ceiling and upper walls act as reflectors and distribute the light evenly throughout the room. This technique is also referred to as uplighting. For highest efficiency, the walls and ceiling should be painted white, or a very light color. Indirect lighting minimizes shadows and reflected glare. It is especially appropriate for tasks involving glossy paper, or reflective surfaces such as computers or televisions. For other critical visual tasks, a supplementary task light may be required.

Use fluorescent lamps for greatest energy savings. Clean luminaires regularly because dust and insects collect on or in the luminaires and reduce light output. Avoid lighting ceilings and walls that have surface imperfections.

Luminaires: Suspended Uplights, Coves, Valances, Track or Adjustable Heads (Wall-Mounted), Floor Lamps

Wall Washing



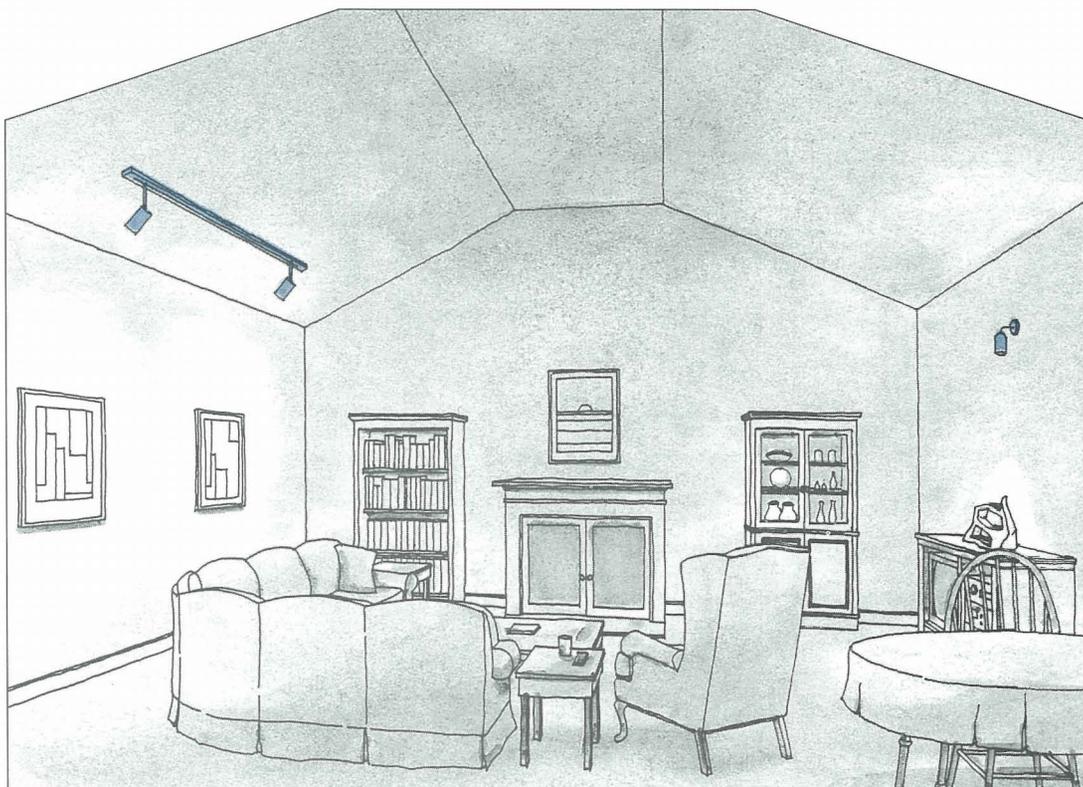
Wall washing illuminates a vertical surface to an acceptably uniform brightness. Wall washing draws attention to the wall, and can be used to accentuate an entrance, fireplace, or artwork. The light reflected from matte surface walls can make a room appear bright and will provide a soft, diffuse light in the room. Paint walls white or a light color for greatest efficiency. Wall washing can make spaces such as hallways or narrow rooms appear more spacious.

Wall washing is achieved by placing luminaires in or on the ceiling or on the floor at regular intervals. The spacing between the luminaires and between the luminaires and the wall determines the brightness of the surface. The spacing can be calculated so that the wall is evenly illuminated, or illuminated in a regular pattern that creates a scalloped effect. Follow the manufacturers' recommendations for spacing the luminaires.

If wall washing is used for ambient light in a room, provide additional lighting for special purposes where needed, or locate tasks that need high illumination, such as reading or sewing, near the walls. Mount the luminaires close enough to the wall so that people seated nearby will not receive direct glare. Do not wall wash windows or mirrors because the image of the lamps and luminaires may be reflected.

Several other cautions pertain to wall washing. Dark surfaces reflect far less light than do white surfaces, so more light should be directed onto them if they are to be perceived as being wall washed. Luminaires mounted close to the wall create a grazing effect on textured surfaces. This can be an advantage if the texture is attractive, but should be avoided where the wall has surface irregularities resulting from poor-quality drywall taping or sanding.

Luminaires: Ceiling-Mounted Track or Adjustable Heads, Recessed Wall Wash, Soffits, Valances



Accent lighting, also called highlighting, emphasizes objects by focusing light directly on them. Accent lighting is used inside and outside the home to feature locations such as an entrance or to create dramatic effects. Also, points of visual interest can be created by highlighting artwork, fireplaces, plants, textured walls, or architectural details. However, be selective when using accent lighting because overuse can create a space that appears to be unorganized or cluttered.

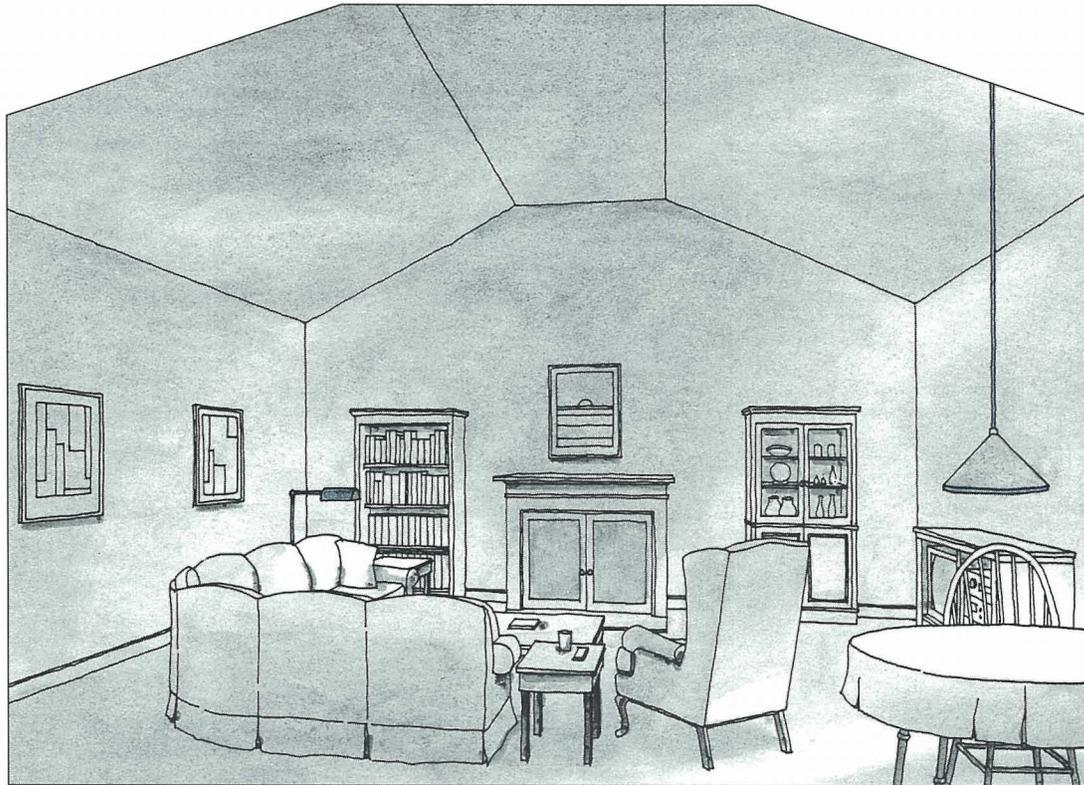
Accent lighting is achieved by properly locating directional luminaires. For highest efficiency, luminaires should be located as close as possible to the object they illuminate. To select an appropriate luminaire and lamp, consult Table 3 in the Economics chapter, or manufacturers' data for beam spreads and intensity values. Low-voltage parabolic aluminized reflector (PAR) and multi-faceted reflector (MR) lamps are available with very narrow beams that are appropriate for small objects. These lamps are energy efficient because little light is wasted as stray light.

Avoid glare by using proper mounting locations and aiming angles. Manufacturers' catalogs often provide product-specific guidelines. Choose luminaires that have baffles or shields because glare is a special concern when using accent lighting.

Switch accent luminaires separately from other luminaires in the room so that the resident can use the accent luminaires only when they are needed. This also permits the resident to limit the time that sensitive objects such as photographs and artwork are exposed to light.

Create effective highlights and save energy by reducing the ambient light in the space surrounding the accented object. Additionally, choose background colors that contrast strongly with the highlighted object to reduce the light output required to achieve a dramatic effect. For example, place a white object on a dark background.

Luminaires: Ceiling-Mounted Track or Adjustable Heads, Suspended Downlights, Recessed Accent



Task lighting provides increased light for specific tasks in a room that may already have some ambient lighting. Task lighting is especially appropriate for seeing small objects or objects of low contrast. For example, a person who is sewing would need extra light to easily see black stitches on black fabric. Task lighting can also provide increased illuminances for tasks that are critical, such as reading directions on a bottle of medicine. Some residential appliances, including sewing machines, range hoods, refrigerators, and upright vacuum cleaners, have built-in task lighting.

Always consider the tasks that will be performed in a room before designing the lighting. Plan for multiple uses of rooms, and for various arrangements of furniture. Remember that as people age, they need more light for critical tasks.

In the Designs chapter, the introductions to some rooms suggest task lighting techniques, as follows. To light counters, refer to Kitchen designs; to light desks, refer to Home Office designs; to light tables, refer to Dinette and Dining Room designs.

Luminaires: Ceiling-Mounted Diffusers, Ceiling-Mounted Track or Adjustable Heads, Suspended, Recessed Downlights, Recessed Wall Wash, Architectural, Under-Cabinet, Table and Desk Lamps

Special Purposes

Lighting for special purposes includes techniques that are useful in specific places or for specific purposes.

In the Designs chapter, the introductions to some rooms suggest techniques for lighting for special purposes, as follows. To light artwork, plants, or televisions, refer to Living Room designs; to light mirrors, refer to Bathroom designs; for lighting for reading in bed or for closets, refer to Bedroom designs; for security lighting, refer to Outdoor Spaces designs.

For more information refer to the indicated luminaires

Artwork: Ceiling-Mounted Track or Adjustable Heads, Recessed Wall Wash, Recessed Accent, Soffits, Valances, Artwork

Plants: Suspended Downlights, Shelf or Display Cabinet, Under-Cabinet

Televisions: Ceiling-Mounted Diffusers, Suspended, Recessed Downlights, Architectural, Wall-Mounted Sconces or Diffusers, Table and Floor Lamps

Mirrors: Ceiling- and Wall-Mounted Diffusers, Recessed Downlights, Soffits, Valances, Vanity Lights, Medicine Cabinet

Reading in Bed: Ceiling-Mounted Track or Adjustable Heads, Recessed Downlights, Soffits, Valances, Table and Desk Lamps, Night Light

Closets: Ceiling-Mounted Diffusers, Recessed Downlights, Night Light

Security: Ceiling-Mounted, Recessed, Soffits, Wall-Mounted, Exterior

