

N I N T H   E D I T I O N

T H E   I E S N A

# LIGHTING HANDBOOK

R E F E R E N C E  
&   A P P L I C A T I O N



The  
LIGHTING  
AUTHORITY

ILLUMINATING ENGINEERING  
SOCIETY OF NORTH AMERICA

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# Retail Lighting

## RETAIL LIGHTING DESIGN ISSUES

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New lighting techniques and equipment, as well as more efficient light sources, provide the designer with tools to meet the challenge and ever changing requirements of the retail world and the increasing cost of energy. Careful consideration must be given to visual cues that aid in establishing the image that a store wishes to project. The lighting system should be designed to create a pleasant and secure environment in which to do business.

Sophisticated consumers and the tendency toward fewer trained sales personnel make it essential to present merchandise under lighting that helps to increase sales. Attention should be given to the quality, quantity, and effectiveness of lighting and its ability to render colors in the displayed merchandise.

This chapter examines lighting application requirements within the store environment. The recommendations are largely based on merchandising techniques and activity types and images within the store. For best results in lighting retail spaces or where specialized merchandise lighting is required, a lighting professional should be consulted. Under ideal conditions the lighting professional should be added to the design team during the early stage of project development.

# GOALS OF RETAIL LIGHTING<sup>1</sup>

There are three primary goals common in the lighting of retail areas.

**Lighting Should Attract the Customer.** The first step in the merchandising process is to attract the customer to the retail space and merchandise. Lighting creates an immediate impression of the merchandise and the appearance of the area (show window or store interior) that can draw customers toward merchandise or spaces when the selling process can begin. Show windows as well as store interiors are important to customer attraction.

**Lighting Should Allow the Customer to Evaluate the Merchandise.** The next step is to enable the customer to visually evaluate the merchandise. The customer must be able to visually evaluate characteristics such as texture, color, and quality and to read labels. Fitting rooms as well as sales areas are important for merchandise evaluation.

**Lighting Should Facilitate the Completion of the Sale.** Finally, proper lighting at the point of sale is necessary to complete a transaction. Sales personnel should be able to quickly and accurately perform services such as recording sales on the register, preparing paperwork, reading prices, using credit card transaction tools, and packaging. Points of sales as well as customer service areas are important to sales completion.

## LIGHTING DESIGN CONSIDERATIONS

In order to achieve the goals of merchandise lighting, consideration must be given to task visibility, appearance of the space and its luminaires, appearance of people and objects, visual comfort, and health and well-being. Additionally, photodegradation, economics, maintenance, and energy management issues deserve attention in the beginning stages of lighting design development because these issues contribute to the lighting design solution.

Lighting requirements differ as the functional requirements of the space change. Consequently, identifying typical types of spaces within a retail environment, along with their functional requirements, helps to define the lighting design problem. There are basically four types of spaces that define a retail environment: sales areas, show windows, ancillary spaces, and exterior spaces. Each of these areas has different functional requirements, which consequently result in different lighting solutions. The lighting design solution unfolds when illuminance levels are defined, luminaires are selected, and lighting control strategies are generated.

### Sales Areas

Retail spaces should be conducive to initiating and completing sales transactions. Each of the following factors should be considered in the design of sales-area lighting:

- Type and characteristics of merchandise
- Merchandising strategies
- Location of each merchandising area within the store and at outdoor areas
- General illuminance level
- Illuminance levels of adjacent spaces
- Feature and display illuminance levels
- Size and shape of space
- Surface reflectances, colors, and textures
- Flexibility requirements
- Size and location of graphics
- Method of display (racks, gondolas, and counters)
- Method and location of sales transactions
- Location of merchandise displays including feature displays
- Traffic patterns

A typical sales area is shown in [Figure 17-1](#).



**Figure 17-1.** Typical sales area.

## Show Windows

The show window should be a powerful attractor, providing the link between the potential customer passing by and the merchandise within the store. Show window lighting should be brighter than the ambient conditions to attract attention and to minimize the impact of reflections that can obscure the merchandise being shown. If daylight is a consideration, sun angles and shadows are important to address. Dimming and/or multistep on/off controls for the electric lighting should be installed to compensate for the highly variable nature of daylight and to provide much lower illuminance levels for nighttime conditions. Each of the following factors should be considered in the design of show-window lighting:

- Location of show window (outdoor or enclosed mall area, urban or suburban, solo or shopping center)
- Night and day use and associated ambient illuminances
- The nature of the overall competition as well as adjacent show windows
- Fully enclosed or open back configuration
- Size and shape
- Reflections, contour, and slant of show window glazing
- Architectural canopies, жалousies, or louvers
- Interior surface reflectances and colors
- Size and location of display graphics

Show window illumination is shown in [Figure 17-2](#).



**Figure 17-2.** Show window.

## Ancillary Spaces

**Dressing and Fitting Room Lighting.** The dressing and fitting room area in a clothing store is one of the most critical sales areas. This is where the final evaluation of the merchandise and where the decision to buy is often made. Fitting rooms usually consist of a bank of dressing rooms in combination with a fitting area or large dressing room where a tailor or seamstress measures and fits the customer for tailoring or alterations. Dressing rooms may be simple in design and semi-private like those in a discount or warehouse store. Upscale stores use elaborate, large, private rooms and incorporate amenities like sofas, chairs, portable luminaires, and refreshment areas ([Figure 17-3](#)).





**Figure 17-3.** Ancillary area.

Lighting this space requires the utmost sensitivity from the designer to ensure appropriate vertical illuminance, good color rendering, and the elimination of harsh shadows. Modeling of faces and color appearance is important. Lighting solutions should provide a combination of diffuse and directional light to accentuate facial features and fabric texture without deep shadows.

Careful choice and placement of overhead luminaires adds to color vibrancy, texture enhancement, and sheen or glitter of hair and materials and can create modeling effects. Lighting at the mirror should be used to complement and soften facial shadows without reflected glare. Vertical illumination should extend far enough down to enable the customer to easily evaluate full-length garments. Background finishes should be light colored, matte, and simple in design to avoid color distortion or distraction from the merchandise.

Lighting for basic dressing rooms is usually comprised of overhead fluorescent lamp luminaires strategically placed to provide vertical illumination when viewing one's reflection in the mirror. Upscale fitting rooms employ dedicated mirror lighting. Upscale and designer fitting rooms and dressing areas use a mix of incandescent and fluorescent lamp luminaires, as well as luminaires for decorative and mood lighting.

The correct lighting is especially important at fitting and dressing room mirrors. The luminaire should be positioned to light the customer standing in front of the mirror, rather than the mirror itself. The light source should be diffuse to minimize shadows, and the color quality of the source is crucial. Warm (approximately 3000 K), high-color-rendering fluorescent lamps are well suited to mirror lighting. Halogen incandescent is also excellent, provided the application results in a diffuse and well-distributed pattern of light. It should be noted that incandescent lamps produce excessive heat, so good ventilation systems are essential for customer comfort in small fitting rooms.

The proper angle of illumination is especially important for mirror lighting. Ceiling luminaires should be placed at the mirror wall, or mirror lights should be located above the mirror. Direct downlights over mirrors should be avoided, especially parabolic reflector (PAR) downlights. Downlights tend to create unflattering shadows that result in an unattractive and undesirable view for the customer. If downlights must be used, wide-distribution luminaires are preferred, equipped with either incandescent A lamps or compact fluorescent lamps.

**Alteration Workrooms.** High levels of illuminance (1000 lx [100 fc]) are needed to perform detailed sewing tasks, and color appearance and glare control are especially important. Other important criteria for alterations workrooms are:

- Low-glare task lights for extremely fine detail and low-contrast sewing
- High-color-rendering lamps, 75 CRI or greater
- Minimal shadows

General lighting should provide the base lighting for the general sewing operation. Supplementary or localized lighting provides the required illuminance for the different tasks. Here there is both hand and machine sewing, often with dark thread on dark material.

**Wrapping and Packing.** In addition to wrapping and boxing the customers' purchases, sample gift wrap displays are featured. The wall immediately behind the work area should have a reflectance above 40%. This reflected light is necessary to provide both good illumination on the task plane and uniform brightness for eye comfort. Ambient illumination also should be uniform for the worker who faces into the room. The luminaires should be positioned to avoid reflected glare from glossy materials at the user's normal position, unless reflections are desired for some special application.

Ceiling-mounted or suspended wide-distribution luminaires arranged over work areas provide uniform illumination. Portable equipment provides added directional lighting for special conditions.

**Stock Rooms.** Reading labels and identifying merchandise are the primary visual tasks in a stockroom; however, some stockrooms include a desk or table where other tasks occur. Attention to vertical illumination on storage shelves is important. Large (high-bay) storage/stock areas such as those associated with warehouse stores usually employ high-bay metal halide or fluorescent lamp luminaires. Color rendering can be important in some storage areas. Occupancy sensors and time delay switches, for turning off lights, are recommended in these intermittently occupied rooms for maximum energy efficiency.

**Restrooms, Lounges, and Locker Rooms.** Lighting for customer restrooms and lounges must be practical and aesthetically pleasing. Design of restroom counter and mirror lighting should follow the design concepts discussed above. However, restroom lighting systems need not be as elaborate as that for dressing and fitting rooms. Designs should focus on maintenance, brightness, and energy efficiency. The level of design and image should be in concert with the image and ambiance of the store.

Lounge lighting should include task illumination for reading and mirror lighting where appropriate. Luminaires should be located to provide enough light in the vicinity of the mirrors for adequate illumination of the face.

In public lavatories, visual tasks include grooming, which requires shadowless illumination on both sides of the face. Color rendering is important. Luminaires should be located so that their maximum light output is concentrated in sinks and urinal and toilet stall areas to encourage cleanliness.

The lighting of locker rooms and employee dressing areas is principally a matter of arranging the lighting equipment. The interior of the lockers should be illuminated, and general lighting should allow safe movement about the room.

**Offices.** Good office lighting is just as important in a store as it is in a corporate office tower (see [Chapter 11](#), Office Lighting). Store offices should also reflect the store image.

## Exterior Spaces

Emphasis should be placed on illuminating entrances. Lighting can enhance and enforce the architectural elements that define the entrance. Also, lighting as a design element can assist in projecting the store's character and image to the arriving customer ([Figure 17-4](#)).



**Figure 17-4.** Exterior entrance.

From the time the potential customer arrives in the vicinity of the shopping area, lighting plays an important part in the pattern of progression to the point of purchase. Consider the following goals when designing outdoor lighting for stores and shopping centers:

- Identifying key areas such as entrances, exits, parking facilities, anchor stores, and crosswalks
- Facilitating safe passage of motorists and pedestrians on the grounds
- Contributing to effective security and surveillance of people and property
- Visually unifying the shopping area
- Projecting the image and ambiance of the retail establishment

See [Chapter 21](#), Exterior Lighting, and IES RP 20-1998, Lighting for Parking Facilities, for recommended practices for

illuminating vehicular traffic areas.<sup>2</sup>

## LIGHTING METHODS FOR RETAIL

The lighting system should help create an atmosphere that emphasizes the store's character and makes it a desirable place in which to shop. The lighting should permit easy, accurate examination of the features and qualities of the merchandise and minimize glare and harsh brightness differences.

### Distribution and Direction of Light

In the initial phases of the lighting design process, the distribution of light must be defined. The luminous environment can range from uniform, diffuse light to very focused light with extreme contrast. The solution might include a combination of both. The target market plays a significant role in defining distribution characteristics of light in a retail environment.

### Ambient Lighting

The ambient lighting system in a retail environment should provide a general diffuse layer of uniform illuminance throughout the store. Often referred to as the "general" lighting, the maintained average ambient light level can range from low (30 to 300 lx) to high (500 to 1000 lx) levels depending on the store image. Luminaires for ambient lighting are usually symmetrically arranged with broad distributions. Chromaticity and color rendering quality vary depending on the market target and the store concept. Daylight integration can be important.

Low-end (mass merchandising), middle, and high-end (exclusive) are the basic categories of retail markets. For low-end, mass-merchandising stores, the lighting system typically takes on a general lighting, single-system approach (Figure 17-5). Symmetrically located luminaires provide a uniform general lighting level. Illuminance levels are high (750 to 1500 lx), and the color expression is neutral to cool (3500 to 5000 K). The middle category uses a general lighting system with average illuminance levels (300 to 600 lx), coupled with accent lighting for specialty areas. Color temperature is typically neutral. Department stores often fall into this category (Figure 17-6). High-end, exclusive stores employ complex lighting systems. Luminaire styles include decorative, accent, and ambient. A zoned approach to regulating illuminance levels within the space creates contrast (Figure 17-7). Ambient lighting levels are low (30 to 240 lx), and color expression is typically warm (2700 to 3000 K).



**Figure 17-5.** Mass merchant/discount store.



**Figure 17-6.** Typical department store.



**Figure 17-7.** Designer boutique.

**Ambient Lighting Systems.** There are three basic approaches to the lighting of merchandise areas in stores: the general pattern system, the specific system, and flexible system. Each system should have supplemental lighting to attract attention to featured displays, to influence traffic circulation, and to create added interest.

In choosing a system or combination of systems, consideration must be given both to the architectural interior design requirements and to the flexibility and adjustment required for the merchandising task.

- The general pattern lighting system employs a pattern of luminaires to provide general lighting throughout the sales area, with or without display lighting, and without regard for the location of the merchandise ([Figure 17-8](#)). The system may include switching or dimming controls for flexibility of space use and for efficient energy utilization.
- The specific pattern system employs a layout of luminaires determined by the location of the merchandise displays (store fixtures, showcases, or gondolas). It is tailored to emphasize the merchandise and delineate sales areas ([Figure 17-9](#)).
- With the flexible pattern system a pattern of electric outlets of continuous or individual type is provided for temporary installation of luminaires. These may be wired for multiple circuit application and control. This system may be used for general or specific pattern lighting and offers the added advantage of interchangeability of luminaire types to create lighting tailored to the merchandise display ([Figure 17-10](#)).

Three types of lighting equipment frequently used in flexible pattern are: recessed adjustable luminaires, recessed



adjustable pull-down luminaires, and track lighting. Recessed adjustable luminaires have the appearance of recessed downlights but provide aiming adjustability to between 30 and 45° from the vertical (depending on manufacturer) and usually 355° or more of horizontal rotation.



**Figure 17-9.** Specific pattern lighting.



**Figure 17-8.** General pattern grid lighting.



**Figure 17-10.** Flexible pattern lighting.

The recessed adjustable luminaire provides a clean ceiling line (see [Chapter 7, Luminaires](#)). The recessed adjustable pull-down luminaire adds the flexibility of being able to position the light source below the ceiling line and hence allows much greater vertical adjustment (0 to 90°). When properly positioned, the recessed adjustable pull-down luminaire appears as semi-recessed on the ceiling. The most flexible system is track lighting, where the luminaire can be

positioned at any point on a linear electrified track of arbitrary length, and the luminaire is adjustable both horizontally (355°) and vertically (0 to 90°). Track may appear cluttered on the ceiling. Although pull-down and track luminaires are the most flexible, care must be taken when using these types of luminaires to assure that aiming angles do not create objectionable glare.

## Perimeter Lighting

Perimeter lighting is an important consideration for proper illumination of a merchandising space because vertical surface brightness plays a significant part in the shopper's impression of the store. Perimeter lighting is an asset to a store environment, contributing to a sense of pleasantness and the perception of brightness and improving visibility and visual impact of displays at the walls. It provides the lighting necessary for merchandising walls and makes the space feel larger. If properly used, perimeter lighting draws the prospective customer out of the main aisle and into the merchandising space.

Perimeter wall lighting can be achieved by various techniques using either linear or point sources to create continuous or individual patterns of light. Architectural cornices, soffits, or valances with concealed fluorescent, cold cathode, or linear socket strip-luminaires using ceramic metal halide PAR lamps can be employed, as well as properly spaced wall-wash luminaires that provide a continuous luminous pattern (Figures 17-11 and 17-12). Patterns of light and concentrated accent light, which require precise beam control, can be accomplished by track or monopoint luminaires, recessed adjustable luminaires, or widely spaced wall-wash luminaires.



**Figure 17-11.** Valance/soffit lighting.



**Figure 17-12.** Wall washer lighting.



**Figure 17-13.** Accent lighting.

## Accent Lighting

Accent lighting is an important component in most merchandising lighting applications. Except for mass market stores, retailers use some level of accent lighting to attract customers to the merchandise.

Accent lighting emphasizes the shape, texture, finish, and color of the product. Point sources are ideal for accent lighting because they can be controlled and directed, providing the focal lighting required. By elevating the attributes of the merchandise, customers become drawn to these defined focal points in a retail environment ([Figure 17-13](#)).

Comfortable lighting requires uniform brightness. Generally, luminance ratios should not exceed 5:1 in any adjacent areas. Accent lighting requires brightness higher than the surround, however. This means that the merchandise and displays should be at least three times brighter than the surround. Dark men's suits, for example, may require an accent illuminance ten times higher than that in the surround. To really attract attention, very high illuminances are often used for feature displays at the end of long aisles or with jewelry (sometimes as high as 15:1).

In outdoor retail, it is imperative to limit brightness to those found in surrounding areas. Direct glare or reflected glare off merchandise should not impede motorist visibility or cause nuisance glare.

## Decorative Lighting

Decorative lighting elements include sconces, chandeliers, table and floor lamps, torchieres, light sculpture, and light art (graphics). Decorative lighting is used in the retail merchandise environment to create ambiance and set the mood for a shopping experience. It is used primarily in specialty stores, high-end department stores, and designer boutiques. Decorative lighting must not compete or detract from the primary merchandise lighting scheme.

## Feature and Supplementary Lighting

The proper balance of a general pattern or specific lighting system depends on the type of store and merchandise and the methods of presentation. Special consideration should be given to the store's most prominent feature, and supplemental lighting should be added to attain the results desired. Specific consideration should be given to placing the light sources at angles to prevent direct and reflected glare from reaching the eyes of the customers and sales personnel. The following is a discussion of merchandising areas that generally require supplementary lighting.

**Rack Lighting (Clothing).** Rack lighting should be designed to attract customers and for easy evaluation of the merchandise. Racks located in large, cased wall areas can be lighted from above by concealed light sources. The lighting system should fully illuminate the articles of clothing and reveal both color and texture. Where linear light sources are used, the lamps should render the colors of the merchandise in the same way as the fitting room lighting.

In the open rack areas, flush- or surface-mounted adjustable ceiling accent lights should be directed obliquely onto the displayed merchandise. The illuminance on the clothing should be greater than that provided by the ambient lighting. Caution must be exercised to avoid directing the accent light into the eyes of customers viewing clothing on adjacent racks. Louvers, baffles, and lenses help accomplish this important goal.

**Shelf and Gondola Lighting.** The principles of shelf and gondola lighting are identical to those for rack lighting.

**Counter Lighting.** A form of accent lighting in which merchandise displayed on counter tops or at the point of sale near the counter tops receives three to five times the illuminance in circulation areas. This is usually accomplished with focused downlights.

**Modeling Lighting.** The form and texture of merchandise may be more apparent through the use of directional lighting to supplement the general diffuse lighting needed for the overall effect. However, light should not be directed at too steep an angle because objectionable shadows may result. See the section "Museum and Art Gallery Lighting" in [Chapter 14](#), Lighting for Public Places and Institutions.

**Mirror Lighting.** See the section "Dressing and Fitting Room Lighting" in this chapter.

**Showcase Lighting.** Another common technique is to light merchandise displayed in showcases ([Figure 17-14](#)). Generally, showcase lighting requires three times the illuminance of the circulation area lighting. Fluorescent lamps may be employed for a continuous line of light and to minimize the heat created in enclosed spaces. Despite the general use of fluorescent lamps, incandescent and miniature halogen lamps are sometimes used to add sparkle, especially for items such as jewelry and glassware. For a curved or irregular case, miniature halogen, compact fluorescent, and cold-cathode tubing can be used to conform to the shape of the case. Continuing developments in fiber-optics technology have also enabled fiber-optic illumination to be a viable source for some types of showcase lighting. See the section on "Museum and Art Gallery Lighting" in [Chapter 14](#), Lighting for Public Places and Institutions.

**Wall-Case Lighting.** Wall-case lighting is similar in concept to showcase lighting. It falls into three categories: the free-standing vertical display mounted against a wall; the encased, open-front, wall-mounted display; and the glass-door, wall-mounted display case. Wall-case lighting is usually used in merchandise displays in upscale stores ([Figure 17-15](#)).

Free-standing vertical displays offer the greatest flexibility. This type of lighting may be accomplished by flush, surface-mounted or suspended adjustable luminaires, strategically located to produce highlights and shadows so as to create a three-dimensional display. Colored light may be considered to further dramatize the displayed merchandise or theme elements.

The open-front, wall-case display follows the lighting methods of the free-standing vertical display. The system should be planned to project light within the encased area. Added flexibility can be obtained by using adjustable luminaires installed at locations and aimed at angles that avoid reflected glare.



**Figure 17-14.** Showcase lighting.



**Figure 17-15.** Wall case lighting.

Display cases with glass doors present a different problem, namely that the merchandise displayed behind the glass panel is obscured by surface reflections from the glass. An extensive discussion of display case lighting principles can be found in [Chapter 14](#), Lighting for Public Places and Institutions, in the section "Museum and Art Gallery Lighting."

## FADING, BLEACHING, AND SHELF-LIFE

When the merchandiser displays a product, the color stability of merchandise should be considered. Not all products have the same color stability and products fade or change chemical composition because of varying environmental reasons. Fading of merchandise may be caused by exposure to high illuminances for extended periods of time. Other factors that could contribute to fading are duration of environmental exposure, spectral distribution of radiation, moisture, temperature, chemical composition of merchandise, saturation and stability of dye in merchandise, and composition of weave of fabrics.

Once merchandise is on display within the retail space, fading of individual items can be controlled by:

- Rotating merchandise so that no one item receives the maximum amount of light exposure
- Avoiding placement of merchandise directly under skylights or near store windows where light levels can be excessive
- Avoiding placement of merchandise considered "highly susceptible" to fading (for example, cottons and silks) close to light sources
- Sacrificing a few items to attract attention through higher accent lighting levels, and keeping the remainder of the merchandise under much lower light levels

See the section "Museum and Art Gallery Lighting" in [Chapter 14](#), Lighting for Public Places and Institutions, for an extensive discussion of lighting techniques for photosensitive materials.

## Design Considerations

Individual lighting needs and requirements of a store depend on many factors, including the type of store, type of merchandise sold, projected store image, and age of the typical customer. The selection of the appropriate illuminance for a specific task must also consider weighting factors such as age of the person, task importance, reflectance of task, and luminances of the environment. Also one should consider that certain stores may include a number of illumination scenarios in the same facility, resulting in deliberate nonuniform lighting. See [Chapter 10](#), Quality of the Visual Environment, for more detailed information on the design issues that should be considered when lighting merchandising areas.

## LIGHTING LIVE AND FRESH PRODUCTS

Like all materials, products like fresh and processed meats, fruits, vegetables, and floral displays have unique responses to light and heat. Meat display lighting systems must provide color balance to bring out the natural meat color and minimize deterioration of the product over expected shelf life. In contrast to textiles and other hardware and software items, turnover time for fresh products tends to be much shorter, a few days rather than perhaps several weeks. In the case of live or growing displays like potted plants, lighting must support basic growth processes over a potentially longer period of time.

### Meat Case Lighting