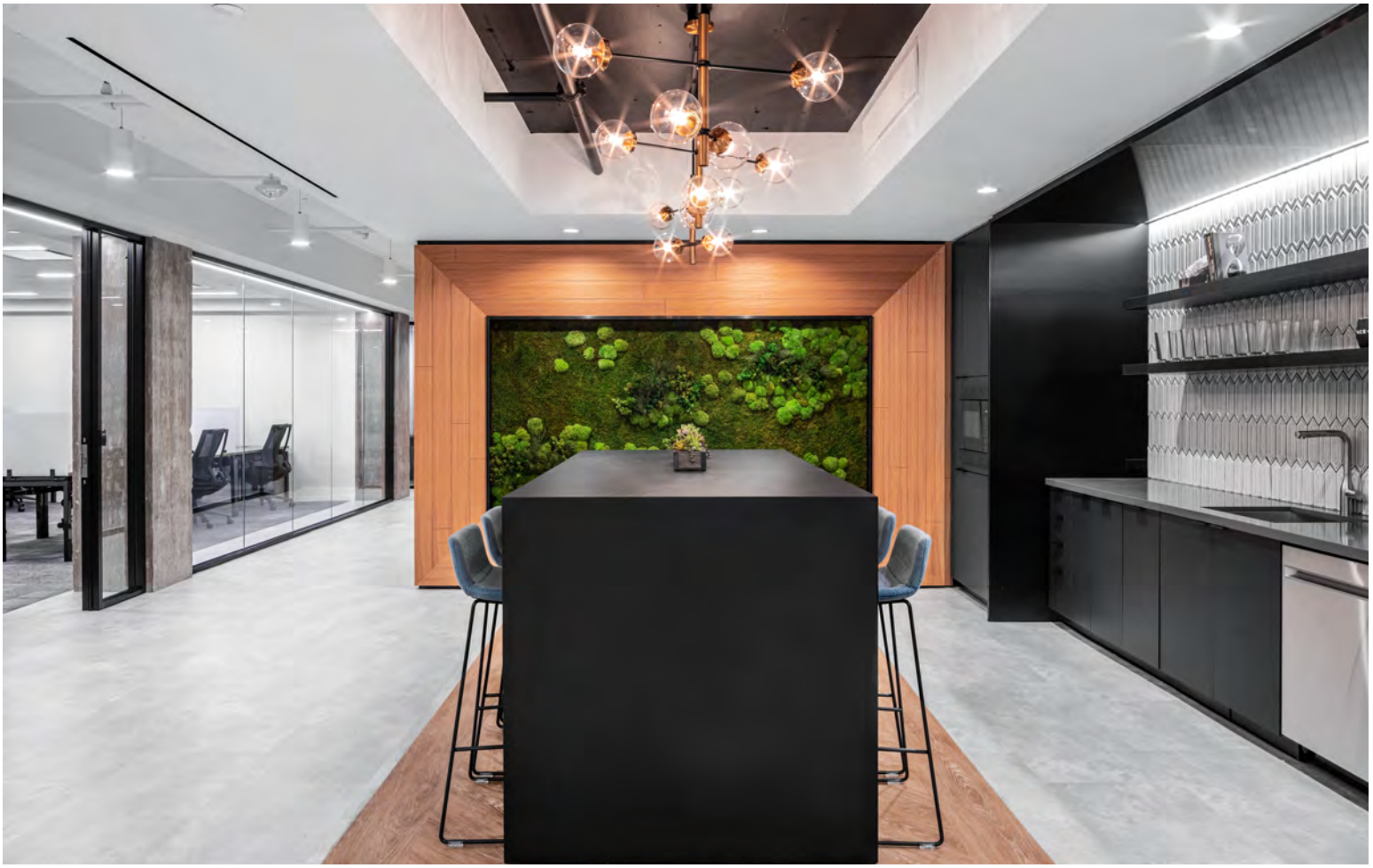
2024 NON-RESIDENTIAL LIGHTING ENERGY REGULATIONS

Elmington Captial Group – Nashville, Tennessee



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Understanding U.S. energy regulations and standards

- Energy regulations play a key role in helping reduce energy consumption.
- They set the mandatory requirements for new building construction and major renovations.

The nation's top building energy codes and standards:

1. Part 6 of Title 24 of the California Code of Regulations
2. The International Energy Conservation Code (IECC)
3. ANSI/ASHRAE/IES Standard 90.1

These codes are used by every U.S. state as the basis for local building energy codes. ASHRAE (The American Society of Heating, Refrigerating and Air-Conditioning Engineers), ANSI (The American National Standards Institute), and IES (The Illuminating Engineering Society) collaborate to co-sponsor the 90.1 standard, commonly referred to as ASHRAE 90.1. The IECC addresses both residential and commercial buildings, while ASHRAE provides further regulation for commercial buildings only (North East Energy Efficiency Partnerships).

These U.S. building codes are typically updated every three years, with provisional updates proposed in between. They contain the mandatory lighting requirements that architects, designers, engineers and builders must meet for commercial and residential new construction or major renovation projects. The IECC and ASHRAE 90.1 national standards are referenced by each U.S. state for their energy regulations.

Tip: Learn the standards for your state
Take a moment to look at your state's regulations: U.S. Energy Code Regulations by State Tool

What's new in 2024 for non-residential building energy requirements?

In September 2023, the U.S. Department of Energy announced:
"...$400 million for states to improve building energy efficiency, save consumers money, and make buildings more climate resilient"

—U.S. DEPARTMENT OF ENERGY

735 Montgomery Street – San Francisco, California

The impact of energy regulations

Energy regulations aim to reduce energy consumption.

The goal:
Limit human impact on climate change.
The latest global trend:
Achieve net-zero emissions status

What does that mean? Running entirely on renewable energy.

- The U.S. has committed to achieving net-zero emissions by 2050, with a 65% reduction in emissions by 2030 (Sustainability.gov).
- Many states have outlined plans and dates for achieving net-zero emissions status.

California "set a renewable goal of 60 percent renewables by 2030 and a longer-term goal of serving 100 percent of California's retail sales and state loads with [...] renewable and zero carbon energy by 2045" (Energy.gov).

Designers may be eligible for tax incentives for energy-efficient development

Potential drawbacks of energy regulations

Hasty regulating without considering all potential use-case scenarios and consequences can have inefficient and problematic outcomes.

735 Montgomery Street – San Francisco, California

Regulation case study: Low-flow toilets

According to a report by American Home Shield (AHS), which was created in 1971 to protect homeowners from the inconvenience and cost of unexpected breakdowns, low-flow toilets led to problems including:

Noise

Low-flow toilets "rely on a pressure-assisted system that makes a distinctive 'whooshing' sound which tends to be louder than a regular toilet flush."

Water pressure and extra flushing

"Because they use a reduced volume of water and may apply less pressure than a regular toilet low-flow toilets do not always flush waste as well as their standard counterparts. A second or third flush is sometimes needed to ensure heavy waste has cleared the bowl, requiring the consumption of more water and rendering the toilet less efficient."

Additional costs for older homes

"The older the house, the greater the chance your plumbing may require adjustment or replacement in order to be compatible with low-flow toilets. This can lead to installation taking more time and being more expensive than anticipated."

Backups and pipe problems

Another California study found that reducing water flow caused backups or pipe problems.

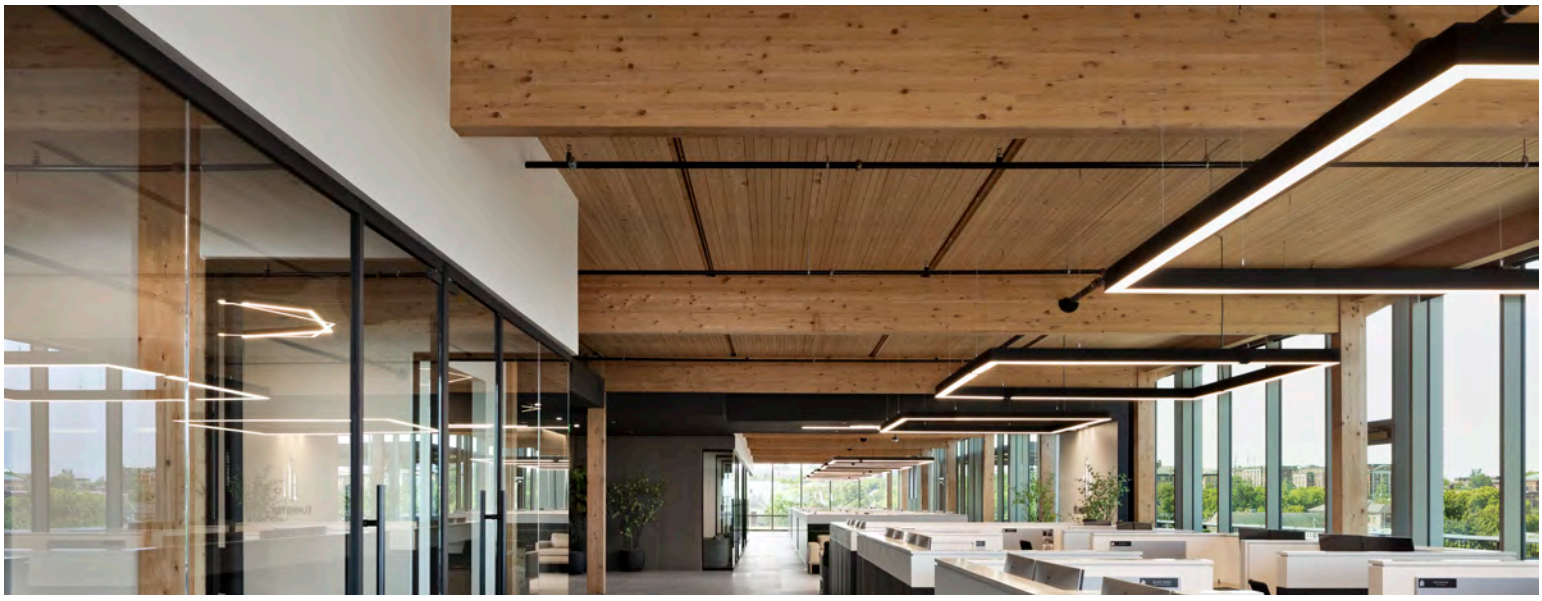
Overcoming regulatory drawbacks in lighting design

1. **Failing to reduce energy consumption**
   Lighting designer Christine Culver notes:
   "Use of occupancy sensors in a day-lit space can mean that lights come on when they are not needed."
   The solution: Opt for vacancy sensors over occupancy sensors because "[v]acancy sensors assume that a user will turn the lights on manually, typically via a wall switch."
2. **False-off and false-on triggers**
   Culver goes on to note that occupancy sensors that use passive infrared (PIR) detect major motion but are prone to false-offs. But those that use ultrasonic motion detection to detect minor motion are prone to false-ons.
   The solution: Dual-tech motion detection combines both PIR and ultrasonic.
3. **Stringent LPA regulations for high acuity space**
   There are specific spaces that require more light than the intended program allows. It can be difficult to meet strict lighting power density requirements while also providing enough light for a given task.
   The solution: Placing high-efficiency lights over important tasks. Advocating for specific room type allowances in regulations is also helpful to address future changes.

Case Study: Title-24 Compliant Lighting in Affordable Housing

Project: 1716 Wilton Court Apartments

Location: Palo Alto, California



Elmington Captial Group – Nashville, Tennessee

Wilton Court is Palo Alto's first affordable housing project in over a decade. Minuscule lighting designer Max Pierson-Liénard worked with Alcon Lighting to address two challenges created by Title 24 regulations.

1. **Budget constraints**
   Sensors to make fixtures Title 24 compliant add costs, which presented a challenge on a limited affordable housing budget.

2. **Limited wattage allowances**
   "Quality lighting design for affordable housing can be quite challenging. In addition to budget constraints, California's [regulation] Title 24 is quite restrictive in the wattage allowances for corridors in particular."

The solution

"It was important to us that [the corridors] didn't feel institutional and that each unit entry was clearly distinguished. We used a fixed-length [cove lighting] product to keep the cost down, which allowed us to get a much higher-end appearance than would typically be available for an affordable housing corridor setting…Corridors could feel relatively long and narrow and we liked that this approach makes them feel very open and navigable."

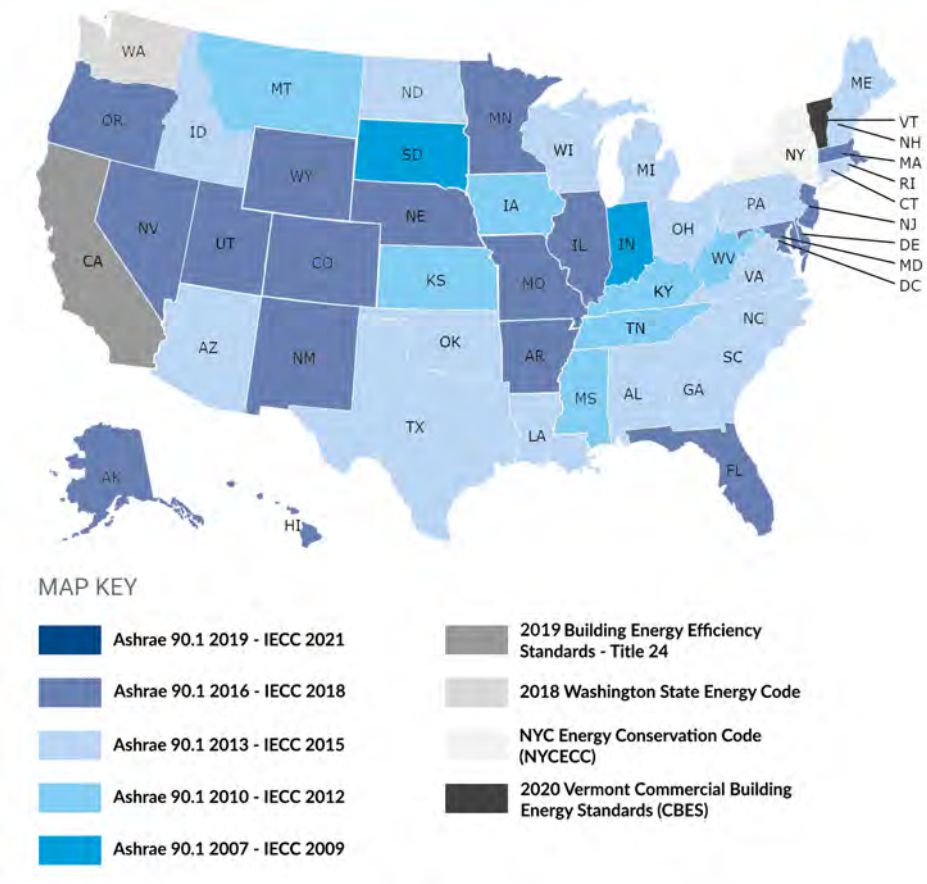
Ascendant Studios – Marin County, California

States leading the way on energy policy

Four states have codes that override and exceed Federal energy regulation:

1. The California Building Standards Commission (Title 24)
2. Vermont Commercial Building Energy Standards (CBES)
3. New York City Energy Conservation Code (NYCECC)
4. Washington State Energy Codes (WSEC)

Tabor Center – Denver, Colorado



U.S. Map Showing Energy Standard by State. Source: cove tools.

California's Title 24 currently imposes the most stringent set of regulations.

On the other end of the spectrum, states like Georgia, South Carolina, North Carolina, Virginia, and Alabama are less restrictive. These states currently abide by the IECC's 2015 standards.

Commercial lighting standards for 2024

Regulatory changes for 2024 are likely to bring four terms to the forefront of commercial lighting standards. Below are the most significant energy regulation updates set for 2023 across the country

General Controls Changes

ForTitle 24, scene controls must be able to turn on general lighting only, as well as manually turn off all lighting (Section 130.1, Part 3). Also, classrooms with up to 0.6 watts per square foot must have a control step between 30%-70% of full power (130.1(b)1). (Codes, ICC). A number of other changes to mandatory indoor lighting controls have been made to Title 24 Part 6 in section 130.1.

Lighting Power Allowance

The Lighting Power Allowance (LPA) is the maximum allowed watts per square foot. In California's Title 24, the LPA is being reduced from .65 to .6 watts per square foot in 2023. However, while most LPA requirements have decreased in energy, some have also increased. Also, new changes for allowances also include wall display, task lighting, and decorative lighting (Title 24 Part 6, Table 140.6-D).

Open Office Occupancy Controls

Occupant sensor controls are typically used in open-plan office spaces, cafeteria dining spaces, and fast-food dining spaces. Under regulations like Title 24, controls must be configured so general lighting can be controlled in "zones," with floor areas not greater than 600 square feet, and occupant sensors required in offices larger than 250 square feet. General lighting in each controlled zone should turn off after 20 minutes of occupants leaving a particular zone.

Automatic Daylighting Controls

Automatic daylighting controls refer to a photosensor and switch or dimming control unit. The photosensor is mounted to the interior wall, ceiling, or light fixture within the daylighting zone. It sends a signal to the control unit when the preset lighting threshold is reached to reduce electrical light levels in a particular zone.

Daylighting zones include:

- Primary side-lighting
- Secondary side-lighting
- Top-lighting

Primary and secondary side-lighting zones are illuminated by windows, while top-lighting zones are illuminated by skylights.

Automatic Receptacle Control

Automatic Receptacle Control, also known as plug-load control, is required to reduce building energy use. The government control limits energy consumption at electrical receptacles during non-occupied times, which reduces what the government deems "unnecessary energy usage and cost and supports sustainability." In addition, some states require these receptacles as part of code requirements.

However, healthcare facilities are no longer required to have Shut-OFF controls when a space is unoccupied. Receptacle controlling methods include:

- **Schedule-based or timer-based receptacles** that can switch off at programmed times
- **Occupancy-based sensor** which must turn off electrical outlets within 20 minutes of all occupants leaving a space
- **System-based signal** from another control or alarm system which must turn off electrical outlets within 20 minutes after determining that the area is unoccupied.

Outdoor Lighting Changes

All outdoor luminaries of 6,200 lumens or more must comply with backlight, uplight, glare (BUG) requirements set by ANSI/IES TM-15-20, except for facades, public monuments, public art, statues, vertical surfaces of bridges, and public roadways and walkways. Automatic scheduling and motion sensing control rules have also been updated. (Codes, ICC.)

Kendall Bronco – Meridian, Idaho

Demand Responsive Lighting Controls

Demand Responsive Lighting Controls utilize control mechanisms to dim lighting levels during periods of high grid-wide demand, primarily to aid utilities in maintaining grid stability. According to the Demand Responsive Lighting Control Declaration of California's Title 24, (Part 6, Section 110.12(a)1B)

"...requires that all demand responsive lighting controls be certified by the manufacturer as being capable of responding to signals from an OpenADR 2.0b Virtual End Node [utilities or state-controlled software]."

—California Title 24 Demand Responsive Lighting Declaration, Part 6, Section 110.12(a)1B

Demand responsive lighting controls are now required for any building with an installed general lighting load of 4000 Watts or more (LEDs Magazine).

Energy credit measures for lighting

IECC 2024 is adding additional efficiency credits to align with the new credit option included in ASHRAE 90.1 in 2022. Credits are likely to be available for the following:

- Dimming and tuning
- More occupancy sensors
- Increase in daylight areas
- Light power reduction

Federal tax deductions are also available for new construction and retrofit buildings through incentives such as IRS 179D (for commercial and high-rise buildings) and 45L (for multifamily developers). The 179D tax deduction enable owners, designers, and builders to benefit from significant tax deductions to their energy efficient commercial buildings. Review our guide to the 179D tax incentives for a better understanding of how these deductions work.

1716 Wilton Court Apartments – Palo Alto, California

Keywords

LPD — Lighting Power Density. The lighting allowance allotted by Title 24 expressed as watts per square foot.
Why it's important: The 2016 edition of Title 24 reduced the LPD for many types of spaces and buildings, making the requirements even tougher than the 2013 edition. Fortunately, LEDs are still the solution for meeting Title 24 standards.

Acceptance Test — An engineering term for "testing to see if the requirements of the code are met".
Why it's important: Acceptance testing is a requirement of Title 24.

Vacancy Sensor — Lights automatically turn OFF when the room is vacant for 20 minutes or longer, but only turn on manually.
Why it's important: A vacancy sensor is the most energy-friendly of all sensor options, because lights will automatically shut off if the room is unoccupied, and will only turn back on again manually.

Occupancy Sensor, Partial-ON — Lights automatically turn OFF when the room is vacant for 20 minutes or longer. Lights automatically turn ON to 50-70% when someone enters the room.
Why it's important: Partial-ON is the second most energy friendly of all the sensor options. Lights will switch ON automatically but not to 100%, with the expectation that most people won't bother to turn on more lights or adjust the lighting level.

Occupancy Sensor, Partial-OFF — Lights automatically dim to 50% or less of full power when the space is vacant for 20 minutes or longer. Lights automatically turn ON when someone enters.
Why it's important: Partial-OFF occupancy sensors are required for corridors, stairwells, and other spaces where full OFF is not feasible.

Multi-Level Lighting Controls — Lighting controls that reduce the power going to a lighting system in multiple steps—usually means a dimmer.
Why it's important: Multi-level Lighting Controls are required for any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5 watts per square foot.

Daylighting Controls — Controls that use one or more photosensors to detect changes in daylight illumination, adjusting the lighting level in response.
Why it's important: Daylighting controls are required in day-lit zones, as defined by Title 24. Primary day-lit zones must be controlled separately from secondary day-lit zones.

Local Switch — Manual switch that is easily accessible.
Why it's important: Most spaces require a local switch, although there are exceptions for public restrooms, stairwells, and corridors.

Automatic Time-Switch Control — Programmable time clock that turns off lighting when a space is typically unoccupied.
Why it's important: Meets the requirement for an occupancy/vacancy sensor for some types of spaces.

Area Category Method — Values for LPD in this document are those allotted by the Area Category Method, one of three possible methods for meeting Title 24 requirements.

Power Adjustment Factor (PAF) — An additional adjustment or credit to the lighting power allowance of a space.

BUG — BUG stands for backlight, uplight, and glare. This rating describes the amount of light directed behind, above, and from high angles of a luminaire, to assess unwanted light exposure.

Demand Management — engineering or controlling energy demand through various methods such as market controls, financial incentives and social, cultural and behavioral change, often through state-sponsored programs and campaigns.

Demand Response — a reduction in energy demand intended to reduce peak demand or avoid system emergencies. In this sense, demand response purports to be more efficient than adding generation capacity to meet peak and occasional demand.

Energy regulations are part of the quantitative aspect of lighting design, one of two foundational principles.

TABLE 140.6-C AREA CATEGORY METHOD- LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER DENSITY (W/ft²)	PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER DENSITY (W/ft²)
Auditorium Area		0.7	Healthcare Facilities and Hospitals	Exam room	1.15
Auto Repair Area		0.55		Imaging room	0.6
Beauty Salon Area		0.7		Nursery	0.8
Civic Meeting Place Area		0.9		Nurse's station	0.85
Classroom, Lecture, Training, Vocational Areas		0.6		Medical supply room	0.55
Commercial and Industrial Storage Areas (warehouse)		0.4		Operating room	1.9
Commercial and Industrial Storage Areas (shipping & handling)		0.6		Patient room	0.7
Convention, Conference, Multipurpose and Meeting Center Areas		0.75		Physical therapy room	0.75
Corridor Area		0.4		Recovery room	0.9
Dining Area (bar, lounge, fine dining, cafeteria, fast food)		0.45	Kitchen/Food Prep Area		0.95
Electrical, Mechanical, Telephone Rooms		0.4	Lounge/ Breakroom Area		0.55
Exercise Center, Gymnasium Areas		0.5	Malls and Atria		0.6
Exhibit, Museum Areas		0.6	Office Area	> 250 square feet	0.6
Financial Transaction Area		0.7		**≤ 250 square feet**	0.65
General Commercial and Industrial Work Areas	Low bay	0.6	Parking Garage Area	Parking Area and ramps	0.1
	High bay	0.65			
	Precision	0.85		Daylight Adaptation Zones	1.0
Grocery Sales Area		1.0			
Library Area	Reading areas	0.8	Religious Worship Area		0.95
	Stack areas	1.0	Retail Sales Area		1.0
Lobby Area	Main entry lobby	0.7		Retail merchandise sales	0.95
Copy Room		0.5		Fitting rooms	0.6
Locker Room		0.45	Theater Area	Motion picture	0.5
				Performance	0.8

Based on Table 104.6-C of 2022 Energy Codes

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES (WATTS/FT²)

Type of Building	Lighting Power Allowance (W/ft²)
Assembly	0.65
Financial Institution	0.65
Grocery Store	0.9
Gymnasium	0.6
Healthcare	0.9
Industrial / Manufacturing	0.6
Library	0.7
Motion Picture Theater	0.6
Museum	0.65
Office	0.6
Parking Garage	0.13
Performing Arts Theater	0.75
Religious	0.7
Restaurant	0.7
Retail Store	0.65
School	0.6
Sports Arena	0.75
All Other Buildings	0.4

Based on Table 140.6-B in the 2022 Energy Code

Additional lighting power allowances and adjustment factors are also available for certain spaces.

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Sources:

https://codes.iccsafe.org/content/CAEC2022P2/subchapter-4-nonresidential-and-hotel-motel-occupancies-mandatory-requirements-for-lighting-systems-and-equipment-and-electrical-power-distribution-systems

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https://www.sustainability.gov/federalsustainabilityplan/emissions.html

Stay up-to-date on the latest U.S. commercial lighting energy code updates.

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