

CNMI Tropical Energy Code



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1 PURPOSE

The purpose of this code is to provide minimum requirements for the energy-efficient design of buildings.

2 SCOPE

- (a) This code shall apply to all non-residential construction and residential construction.
- (b) This code provides minimum energy-efficiency requirements for the design and construction of:
 - (1) new buildings,
 - (2) additions to existing buildings,
 - (3) new or replacement air conditioning, water heating, and lighting equipment in existing buildings,
 - (4) replacement roofing, and
 - (5) major alterations of existing buildings. Major alterations are defined as projects where the estimated cost of construction is more than 50% of the appraised value of the structure.
- (c) Where this code is found to conflict with safety, health, or environmental codes, the safety, health or environmental codes shall govern.
- (d) Historic Buildings. *Any building or structure that is listed in the National Register of Historic Places; designated as a historic property under local designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National Register of Historic Places either individually or as a contribution building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempted from this code, insofar as complying with the code would compromise or damage the historic character of the building.*

3 ADMINISTRATION AND ENFORCEMENT

3.1 Compliance Requirements

(a) New Buildings

- (1) Low-rise residential buildings shall comply with the provisions of Section 4 through Section 6 of this code.

(2) Other buildings may comply with Section 4 through Section 7 of this code or the International Energy Conservation Code 2006, Chapter 5, including §506 on Total Building Performance, as amended by Section 4.3(a)(2) of this code.

- (b) Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems.

Exception: The following need not comply provided the energy use of the building is not increased:

- (1) Glass only replacements in an existing sash and frame.
- (2) Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
- (3) Construction where the existing roof, wall or floor cavities are not exposed.

- (c) **Change in occupancy.** Buildings undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.
- (d) **Mixed occupancy.** Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions for each occupancy.
- (e) **Replacement Roofing.** Replacement roofing membranes must comply with the cool roof requirements of Section 4.3(a)(2).

3.2 Administrative Requirements

Administrative requirements relating to permit requirements, enforcement, interpretations, claims of exemption, approved calculation methods and rights of appeal are specified by the authority having jurisdiction.

3.3 Compliance Documents

- (a) General: Plans, specifications, engineering calculations, diagrams, reports, and other data shall constitute the compliance documents.
- (b) Construction Details: Compliance documents shall show all pertinent data and features of the building, equipment, and systems in sufficient detail to permit an evaluation by the authority having jurisdiction relative to this code.
- (c) Supplemental Information: The authority having jurisdiction may require supplemental information necessary to verify compliance with this code, such as calculations, worksheets, compliance forms, vendor literature, or other data.

4 ENVELOPE

4.1 General

- (a) **Scope.** The envelope requirements apply to all enclosed buildings, except unconditioned factories, storage spaces, and warehouses.
- (b) **Compliance.** The building envelope shall comply with the mandatory provisions of Section 4.2 and either the prescriptive criteria of Section 4.3 or the building envelope trade-off procedures of Section 4.5. Low-rise residential buildings and hotel/motel guest rooms have the additional option of complying with the criteria for naturally ventilated buildings in Section 4.4.

4.2 Mandatory Provisions

- (a) **Insulation.** Insulation materials shall be installed to achieve proper densities, maintain clearances, and maintain rated R-value of insulation. Exception: Insulation may be compressed at the structural support for draped applications in metal buildings.
- (b) **Moisture Control.** The building envelope shall be designed to prevent moisture migration that leads to deterioration of the insulation or equipment and structural damage.
- (c) **U-factors.** U-factors for opaque constructions shall be calculated using procedures consistent with the ASHRAE Fundamentals, 2005.
- (d) **Certification and labeling of cool roof products.** The initial reflectance, aged reflectance, emittance, and the aged SRI of roofing products shall be determined by the Cool Roof Rating Council (CRRC) in accordance with CRRC-1.
- (e) **Fenestration product rating.** The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. As an alternative, the center-of-glass SHGC from glass manufacturers may be used. Products lacking such a SHGC as described above shall be assigned a default SHGC from Table 4.1.
- (f) **Building Envelope Sealing:**
 - (1) The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:
 - (A) All joints, seams and penetrations.
 - (B) Site-built windows, doors and skylights.
 - (C) Openings between window and door assemblies and their respective jambs and framing.
 - (D) Utility penetrations.
 - (E) Dropped ceilings or chases adjacent to the thermal envelope.

- (F) Knee walls.
 - (G) Walls and ceilings separating a garage from conditioned spaces.
 - (H) Behind tubs and showers on exterior walls.
 - (I) Common walls between dwelling units.
 - (J) Other sources of infiltration.
- (2) Fenestration air leakage Operable windows shall be capable of being tightly closed. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot, and swinging doors no more than 0.5 cfm per square foot, when tested according to NFRC 400 or AAMA/WDMA/CSA101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.
- Exception to 4.2(d)(2): Windows, skylights and glass doors in naturally ventilated low-rise residential buildings that comply with Section 4.4 may have an infiltration rate no more than 0.5 cfm/ft².
- (3) Commercial entrances enclosing conditioned space shall be revolving or self closing doors.

4.3 Prescriptive Building Envelope Requirements

(a) Roofs.

- (1) Roofs must meet the requirements of Table 4.2

Exception to 4.3(a)(1). A roof construction that contains a radiant barrier with an emissivity of less than 0.05 exposed to an air gap of at least 1.5 in.

- (2) Low-slope roof membranes shall have an aged reflectance of at least 0.55 and a minimum thermal emittance of 0.75, or a minimum aged SRI of at least 64.¹

(A) If only the new reflectance is known, the aged reflectance shall be calculated as follows:

$$\text{Equation 4.3-1} \quad \text{Refl}_{\text{Aged}} = 0.60 + 0.70 \times \text{Refl}_{\text{Initial}}$$

(B) If the SRI is not known, but the reflectance and emittance are known, then the SRI may be calculated:

$$\text{Equation 4.3-2} \quad \text{SRI} = -84 + 85 \times \text{Emit} + 203 \times \text{Ref} - 75 \times \text{Refl} \times \text{Emit}$$

(C) Roof surfaces shall have a minimum slope of 1/4 inch per foot of run.

Exception to 4.3(a)(2)(C): Replacement roofing.

(b) Walls. Wall insulation must meet the requirements of Table 4.3.

(c) Windows. Fenestration products must meet the requirements of Table 4.4. The window wall ratio is limited to a maximum of 40% of the gross wall area.

- (d) Skylights. Area is limited to a maximum of 3% of the gross area. The maximum SHGC for glass products is 0.40 and the maximum SHGC for plastic skylights is 0.35.

4.4 Prescriptive Building Envelope Requirements for Naturally Ventilated Low-Rise Residential Buildings

This section may be used as an alternative to 4.3 for low-rise residential buildings.

- (a) Roofs shall meet the requirements of 4.3(a). Windows shall meet the requirements of 4.3(c) and skylights shall meet the requirements of 4.3(d).
- (b) Comfort ventilation. All habitable spaces in naturally ventilated residential buildings, including hotel and motel guest rooms, shall meet the following requirements for comfort ventilation.
 - (1) Louvers or door catches which allow doors to be held open must be provided for interior doors. This requirement does not apply to hotel and motel guest room entry doors and other entry doors opening on an enclosed space.
 - (2) A minimum of two operable openings to outside must be provided on opposite or adjacent walls. Operable openings include operable windows, sliding glass doors, louvers and entry screen doors (if entry door is provided with door catches). For spaces with only one external wall, two operable openings on either side of a wing wall must be used; and
 - (3) The minimum total free area for ventilation in each space shall be equal to 12 percent of floor area. No more than 70 percent of the total free area may be placed on one wall. For spaces employing a wing wall, no more than 70 percent of the total free area may be placed on one side of the wing wall.

Exceptions to Section 4.4(b):

- (1) Spaces with wiring provided for ceiling fans. In each space, a minimum of one ceiling fan outlet shall be provided for each 400 ft² of floor area. When more than one outlet is required within a space, the outlets shall be uniformly distributed throughout the room. Wiring shall enable wall-mounted fan controls.
- (2) Spaces employing innovative natural ventilation designs which do not comply with this section, but which can be shown through analysis or demonstration to provide adequate air movement or temperature and humidity conditions for human comfort.
- (3) Kitchens.

4.5 Building Envelope Trade-Off Option

The building envelope complies with the code if the proposed building satisfies the Mandatory Requirements and the envelope performance factor of the proposed building is less than or equal to the envelope performance factor of the budget building.

- (a) The envelope performance factor shall be calculated using the following equations.

$$EPF_{\text{Total}} = EPF_{\text{Roof}} + EPF_{\text{Wall}} + EPF_{\text{Fenest}}$$

Where:

$$\begin{aligned}
 EPF_{\text{Roof}} &= C_{\text{Roof,Mass}} \sum_{s=1}^n U_s A_s (1 - SRI)_s + C_{\text{Roof,MIBldg}} \sum_{s=1}^n U_s A_s (1 - SRI)_s + C_{\text{Roof,Other}} \sum_{s=1}^n U_s A_s (1 - SRI)_s \\
 EPF_{\text{Wall}} &= C_{\text{Wall,Mass}} \sum_{s=1}^n U_s A_s + C_{\text{Wall,MIBldg}} \sum_{s=1}^n U_s A_s + C_{\text{Wall,MIFrm}} \sum_{s=1}^n U_s A_s + C_{\text{Wall,Other}} \sum_{s=1}^n U_s A_s \\
 EPF_{\text{Fenest}} &= C_{\text{Fenest,North}} \sum_{w=1}^n A_w SHGC_w M_w + \\
 &\quad C_{\text{Fenest,East}} \sum_{w=1}^n A_w SHGC_w M_w + \\
 &\quad C_{\text{Fenest,South}} \sum_{w=1}^n A_w SHGC_w M_w + \\
 &\quad C_{\text{Fenest,West}} \sum_{w=1}^n A_w SHGC_w M_w + \\
 &\quad C_{\text{Fenest,Skylight}} \sum_{s=1}^n A_s SHGC_s
 \end{aligned}$$

Where:

EPF_{Roof}	Envelope performance factor for roofs. Other subscripts include walls and fenestration.
A_s, A_w	The area of a specific envelope component referenced by the subscript "s" or for windows the subscript "w".
$SHGC_w$	The solar heat gain coefficient for windows (w). SHGC refers to skylights.
M_w	A multiplier for the window SHGC that depends on the projection factor of an overhang or sidefin. These values are determined by the procedures in Section 4.5(b).
U_s	The U-factor for the envelope component referenced by the subscript "s".
SRI_s	The aged SRI must be used. If the aged SRI is not known, it can be calculated from the aged reflectance and emittance using Equation 4.3-2. If the SRI is not known and cannot be calculated for a product, an SRI of 10 must be used. Radiant Barrier: A roof with a properly installed radiant barrier is deemed to have an SRI of 64.
C_{Fenest}	The coefficients for use in the EPF equations are contained in Table 4.5.
$C_{\text{Roof,Mass}}$	A coefficient for the "Roof, Mass" class of construction. Values of "C" are taken from Table 4.5 for each class of construction.

(b) Credits for fixed shading devices (M) such as overhangs or side fins shall be calculated using the following equations.

(overhangs)	$M = 0.16 \times PF^2 + -0.61 \times PF + 1$
(sidefins)	$M = 0.23 \times PF^2 + -0.74 \times PF + 1$

- (c) The following rules shall be used to define the budget building.
- (1) The budget building shall have the same building floor area, gross wall area, and gross roof area as the proposed design. If the building has both 24-hour and daytime occupancies, the distribution between these shall be the same as the proposed design.
 - (2) The U-factor of each envelope component shall be equal to the criteria from Section 4.3 for each class of construction.
 - (3) The vertical fenestration area shall be equal to the proposed design or 40% of the gross exterior wall area, whichever is less. The skylight area shall be equal to the proposed design or 3% of the gross exterior roof area, whichever is less.
 - (4) The SHGC of each window or skylight component shall be equal to the criteria from Section 4.3.
 - (5) If the roof is low-sloped or metal, the SRI shall be 64. Otherwise, the SRI shall be 27.

Single Glazed		Double Glazed		
Clear	Tinted	Clear	Tinted	Glazed Block
0.8	0.7	0.7	0.6	0.6

Class	Non-Residential and High-Rise Residential		Low-Rise Residential	
	Maximum U-factor	Or Minimum Insulation:	Maximum U-factor	Or Minimum Insulation:
Insulation Directly Fastened to Deck	0.072	R-13	0.072	R-13
Metal building	0.065	R-19	0.065	R-19
Attic and other	0.034	R-30	0.027	R-30

Class	All Building Types	
	Maximum U-factor	Or Minimum Insulation:
Mass	None	None
Metal building	0.113	R-13
Steel-Framed	0.124	R-13
Wood-Framed and other	0.089	R-13

A mass wall has an HC greater than 7.0 or a weight greater than 35 lb/ft².

Table 4.4 Window Heat Gain

Building Type	Window Wall Ratio	Un-Shaded	Partially Shaded	Well Shaded or North Facing
Nonresidential or	Less than 5%	No Requirement	No Requirement	No Requirement
High-rise residential	5% - 25%	Special Coated Glass	Tinted Glass	No Requirement
	More than 25%	Special Coated Glass	Special Coated Glass	Tinted Glass
Low-rise residential	All	Tinted Glass	No Requirement	No Requirement

Window wall ratio is the ratio of the total window area of the building, measured to the outside of the frame, to the gross exterior wall area.
 A north-facing window is one that faces within 22.5 degrees of true north.
 Partially shaded windows are those that are protected from direct sun for the majority of the time. Shading can be provided by overhangs, side fins, mature trees, or other devices. Qualifying overhangs must have a projection factor greater than or equal to 0.5 and the overhang must extend past the window jambs a distance at least equal to the overhang projection. Qualifying sidefins must have a projection factor greater than or equal 0.5 and the side fin must extend above the window head a distance at least equal to the side fin projection.
 Well shaded windows are those that are more completely protected from direct sun. Shading can be provided by overhangs, side fins, mature trees, or other devices. Qualifying overhangs must have a projection factor greater than or equal to 1.0 and the overhang must extend past the window jambs a distance at least equal to the overhang projection. Qualifying sidefins must have a projection factor greater than or equal 1.0 and the side fin must extend above the window head a distance at least equal to the side fin projection.
 Tinted glass includes all glazing products with a bronze, green, gray or blue integral tint; clear glass with a coating or film; or any other glazing product that has a solar heat gain coefficient (SHGC) equal to or less than 0.61.
 Special coated glass includes glass with reflective coatings or films that have a solar heat gain coefficient (SHGC) equal to or less than 0.25.

Table 4.5 Envelope Performance Factor Coefficients

Component, Class	Daytime	24-Hour
Roofs, Mass	1.47	3.61
Roofs, MtlBldg	15.83	25.26
Roofs, Other	2.84	3.82
Wall, Mass	2.53	6.14
Wall, MtlBldg	6.36	9.28
Wall, MtlFrm	6.36	9.28
Wall, Other	6.36	9.28
Fenest, East	53	86
Fenest, North	31	51
Fenest, South	58	98
Fenest, West	50	85
Fenest , Skylights	101	163

5 VENTILATION AND AIR CONDITIONING

5.1 General

All mechanical equipment and systems serving the building’s cooling, dehumidification or ventilation needs shall meet the requirements of this section. The requirements of this section apply to ventilation and cooling systems that:

- (a) use unitary packaged or split-system air conditioners that are either air-cooled or evaporatively cooled,
- (b) serve a single thermal zone,
- (c) have a cooling capacity less than 65,000 Btu/h, and do not have a humidistat.

Ventilation and air conditioning systems that do not satisfy the above requirements shall be designed in accordance with Section 503 of the IECC 2006.

5.2 Requirements²

- (a) Each system shall be controlled by a thermostat.
- (b) Each thermostat shall be provided with setback controls that are controlled by either an automatic time clock or programmable control system.
 - (1) Thermostatic setback capabilities. Thermostatic setback controls shall have the capability to set back or temporarily operate the system to maintain zone temperatures up to 85°F.
 - (2) Automatic setback and shutdown capabilities. Automatic time clock or programmable controls shall be capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for at least 10 hours. Additionally, the controls shall have a manual override that allows temporary operation of the system for up to 2 hours; a manually operated timer capable of being adjusted to operate the system for up to 2 hours; or an occupancy sensor.

Exceptions to 5.2(b):

- (1) Zones that will be operated continuously.
 - (2) Zones with a full HVAC load demand not exceeding 6,800 Btu/h and having a readily accessible manual shutoff switch.
- (c) Hotel and motel rooms shall be equipped with a mechanism that shuts off the cooling mechanism for the room when exterior doors and/or windows to the room are open.
 - (d) All equipment installed in the building shall have the U. S. DOE EnergyGuide label.
 - (e) Refrigerant suction piping on split systems shall have at least 1/2 in. cellular foam or fiberglass insulation. Insulation exposed to weather shall be protected by aluminum sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above, or be painted with water retardant paint.
 - (f) Duct and plenum insulation. All supply and return air ducts and plenums shall be insulated with a minimum of R-5 insulation when located in unconditioned spaces and with a minimum of R-8 insulation when located outside the building. When located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation.

Exception to 5.2(f): When located within equipment.

- (g) Duct and plenum sealing. All joints, longitudinal and transverse seams and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded- fabric systems or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A and shall be marked “181A-P” for pressure-sensitive tape, “181A-M” for mastic or
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“181A-H” for heat-sensitive tape. Tapes and mastics used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181B-M” for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Unlisted duct tape is not permitted as a sealant on any duct.

- (h) Air Curtains. Air curtains shall be required in retail shops oriented to tourists in districts defined by the authority having jurisdiction.

6 SERVICE WATER HEATING

6.1 General

New service water heating systems and equipment shall meet the requirements of this section.

6.2 Requirements

- (a) The following categories of water heating equipment shall be rated by the U. S. Department of Energy and contain the EnergyGuide label.
 - (1) Storage electric water heaters less than or equal to 12 kW
 - (2) Storage gas water heaters less than or equal to 75,000 Btu/h
 - (3) Storage oil water heaters less than or equal to 105,000 Btu/h
 - (4) Instantaneous gas water heaters greater than 50,000 Btu/h and less than 200,000 Btu/h
 - (5) Instantaneous oil water heaters greater than 210,000 Btu/h
- (b) Residential structures under three stories, including hotels and motels, must meet the following water heating requirements:
 - (1) All water heating systems that use electricity as the primary heating source must have a Solar Energy Factor (SEF) of at least 2.0 as determined by OC300 of the Solar Rating and Certification Corporation (SRCC) or the authority having jurisdiction.

Exception to 6.2(a)(1). Any electric water heating system that uses equal or less energy.
 - (2) Water heating systems that use natural gas or propane as the primary heating source must have a solar energy factor (SEF) of at least 0.85 as determined by OC300 of the Solar Rating and Certification Corporation or the authority having jurisdiction.

Exception to 6.2(a)(2). Any propane or gas water heating system that uses equal or less energy.

- (c) Heat traps. Water-heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.
- (d) Pipe insulation. For automatic-circulating hot water systems, piping shall be insulated with 1 inch of insulation having a conductivity not exceeding 0.27 Btu per inch/h-ft²-°F. The first 8 feet of piping in non-circulating systems served by equipment without integral heat traps shall be insulated with 0.5 inch of material having a conductivity not exceeding 0.27 Btu per inch/h-ft²-°F.
- (e) Hot water system controls. Automatic-circulating hot water system pumps or heat trace shall be arranged to be conveniently turned off automatically or manually when the hot water system is not in operation.
- (f) Water Conservation. Shower heads and lavatories shall be labeled as meeting the requirements of the National Energy Policy Act of 1992 (PL 102-486). Lavatories in public facility restrooms shall: (a) be equipped with a foot switch, occupancy sensor, or similar shutoff device or, (b) limit hot water delivery to 0.25 gal/cycle for circulating systems and 0.50 gal/cycle for non-circulating systems. Exception: lavatories for physically handicapped persons.
- (g) Gas-Fired Water Heaters. Gas-fired storage water heaters installed in conditioned spaces shall be equipped with a vent damper listed in accordance with nationally recognized safety standards for vent dampers for use on gas appliances.

Exceptions:

- (1) water heaters equipped with fan assisted combustion or a power venting device,
or
- (2) water heaters equipped with a flue damper.

7 LIGHTING

7.1 General

Lighting systems and equipment shall comply with Section 7.2, Section 7.3, and Section 7.4. The lighting requirements in this section shall apply to:

- (a) interior spaces of buildings,
- (b) exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks, and illuminated canopies, and
- (c) exterior building grounds for lighting that is provided through the building's electrical service.

Exceptions to Section 7.1:

- (1) emergency lighting that is automatically off during normal building operation and is powered by battery, generator, or other alternate power source; and,
- (2) residential dwelling units.

7.2 Mandatory Provisions

(a) Lighting Control

(1) Space Control. Each space enclosed by ceiling-height partitions shall have at least one control device to independently control the general lighting within the space. Each control device shall be activated either manually by an occupant or automatically by sensing an occupant. Each control device shall:

- (A) control a maximum of 2,500 ft² for a space less than 10,000 ft² and a maximum of 10,000 ft² for a space greater than 10,000 ft²,
- (B) be capable of overriding the automatic shutoff control required in Section 7.2(a)(1) for no more than 2 hours, and
- (C) be readily accessible and located so the occupant can see the controlled lighting.

Exception to Section 7.2(a)(1)(C). The required control device may be remotely installed if required for reasons of safety or security. A remotely located device shall have a pilot light indicator as part of or next to the control device and is clearly labeled to identify the controlled lighting.

(2) Automatic Lighting Shutoff. Interior lighting systems serving more than 5,000 ft² shall be equipped with an automatic control device. This automatic control device shall function on either a scheduled basis at specific programmed times or on an unscheduled basis by occupant sensors. An independent program schedule shall be provided for areas of no more than 25,000 ft² but not more than one floor.

Exception: lighting systems designed for 24-hour use.

- (3) Daylighted Area Control. Luminaires in daylighted areas greater than 250 ft² shall be equipped with an independent control device that: (a) is capable of reducing the light output of the luminaires in the daylighted areas by at least 50%, and (b) controls only the luminaires located entirely within the daylighted area.
- (4) Exterior Lighting Control. Lighting for all exterior applications not exempted shall be controlled by a photosensor or astronomical time switch that is capable of automatically turning off the exterior lighting when daylight is available or the lighting is not required.
- (5) Additional Control. The following lighting applications shall be equipped with a control device to control such lighting independently of general lighting:
 - (A) Display/Accent Lighting. Display or accent lighting within a 3,000 ft² area shall have a separate control device.
 - (B) Case Lighting. Lighting in cases used for display purposes within a 3,000 ft² area shall be equipped with a separate control device.
 - (C) Hotel and Motel Guest Room Lighting. Hotel and motel guest rooms and guest suites shall have a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles.

- (D) Task Lighting. Supplemental task lighting including permanently installed under shelf or under cabinet, lighting shall have a control device integral to the luminaire or be controlled by a wall-mounted control device provided the control device complies with Section 7.2(a)(1)(C).
 - (E) Non-visual Lighting. Lighting for non-visual applications, such as plant growth and food-warming, shall be equipped with a separate control device.
 - (F) Demonstration Lighting. Lighting equipment that is for sale or for demonstrations in lighting education shall be equipped with a separate control device accessible only to authorized personnel.
- (b) Exit Signs. Exit sign luminaire power shall not exceed 5 watts for each exposed face.
- (c) Installed Interior Lighting Power. The installed interior lighting power shall include the power of all the lighting indicated on the plans and specifications. The installed interior lighting power includes all power used by the luminaires, including lamps, ballasts, current regulators, and control devices except as specifically exempted in Section 7.1.
- Exception to Section 7.2(c). If two or more independently operating lighting systems in a space are controlled to prevent simultaneous user operation, the installed interior lighting power shall be based solely on the lighting system with the highest power.
- (d) Luminaire Wattage. Luminaire wattage incorporated into the installed interior lighting power shall be determined in accordance with the following criteria:
- (1) The wattage of incandescent luminaires with medium screw base sockets and not containing permanently installed ballasts shall be the maximum labeled wattage of the luminaire.
 - (2) The wattage of luminaires containing permanently installed ballasts shall be the operating input wattage of the specified lamp/ballast combination based on values from manufacturers catalogs or values from independent testing laboratory reports.
 - (3) The wattage of all other miscellaneous luminaire types not described in (a) or (b) shall be the specified wattage of the luminaire.
 - (4) The wattage of lighting track, plug-in busway, and flexible-lighting systems that allow the addition and/or relocation of luminaires without altering the wiring of the system shall be the larger of the specified wattage of the luminaires included in the system or 45 W/lin ft. Systems with integral overload protection, such as fuses or circuit breakers, shall be rated at 100% of the maximum rated load of the limiting device.
- (e) Exterior Building Grounds Lighting. Lighting for exterior building grounds luminaires which operate at greater than 100 W shall contain lamps having a minimum efficacy of 60 lm/W unless the luminaire is controlled by a motion sensor or exempt under Section 7.1.

7.3 Interior Lighting Power

- (a) The installed interior lighting power for a building or a separately metered or permitted portion of a building shall be calculated in accordance with Section 7.2(d) and shall not exceed the interior lighting power allowance determined in accordance with either Section 7.3(b) or Section 7.3(c). Tradeoffs of interior lighting power allowance among portions of the building for which a different method of calculation has been used are not permitted.
- (b) Building Area Method Determination of interior lighting power allowance (watts) by the building area method shall be in accordance with the following:
 - (1) Determine the appropriate building type from Table 7.1 and the allowed lighting power density. For building area types not listed, selection of a reasonably equivalent type shall be permitted.
 - (2) Determine the gross lighted floor area of the building.
 - (3) The interior lighting power allowance is the product of the lighted floor area of the building times the allowed lighting power density.
 - (4) If a building is comprised of different building area types, an allowance for each shall be computed separately. Trade-offs among building area types are permitted provided that the total installed interior lighting power does not exceed the interior lighting power allowance.

Exceptions to Section 7.3(b): The following lighting equipment and applications shall not be considered when determining the interior lighting power allowance, nor shall the wattage for such lighting be included in the installed interior lighting power identified in accordance with Section 7.2(d). However, any such lighting shall not be exempt unless it is an addition to general lighting and is controlled by an independent control device.

- (A) Display or accent lighting that is an essential element for the function performed in galleries, museums, and monuments.
- (B) Lighting that is integral to equipment or instrumentation and is installed by its manufacturer.
- (C) Lighting specifically designed for medical or dental procedures and lighting integral to medical equipment.
- (D) Lighting integral to food warming and food preparation equipment.
- (E) Lighting for plant growth or maintenance.
- (F) Lighting in spaces specifically designed for use by the visually impaired.
- (G) Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.
- (H) Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
- (I) Lighting that is an integral part of advertising or directional signage.

- (J) Exit signs.
 - (K) Lighting that is for sale or lighting educational demonstration systems.
 - (L) Lighting for theatrical purposes, including performance, stage, and film or video production.
 - (M) Athletic playing areas with permanent facilities for television broadcasting.
 - (N) Casino gaming areas.
- (c) Alternative Method: The interior lighting power may alternatively be calculated by using Chapter 9 of ASHRAE Standard 90.1-2004, which permits usage of the Space by Space method or the Building Area Method.

7.4 Exterior Building Lighting Power

The total exterior lighting power allowance for all exterior building applications is the sum of the individual lighting power densities permitted in Table 7.2 plus an additional allowance of 5% of that sum. Trade-offs are permitted only for those elements designated as “Tradeable Surfaces” in Table 7.2. All fixtures must comply with Section 7.2(e).

Exceptions to Section 7.4: Lighting used for the following exterior applications is exempt when equipped with an independent control device:

- (a) Specialized signal, directional, and marker lighting associated with transportation.
- (b) Advertising signage or directional signage.
- (c) Lighting integral to equipment or instrumentation that is installed by its manufacturer.
- (d) Lighting for theatrical purposes, including performance, stage, film production, and video production.
- (e) Lighting for athletic playing areas.
- (f) Temporary lighting.
- (g) Lighting for industrial production, material handling, transportation sites, and associated storage areas.
- (h) Theme elements in theme/amusement parks.
- (i) Lighting used to highlight features of public monuments and registered historic landmark structures or buildings.

Table 7.1 Interior Lighting Power Densities – Building Area Method			
Building Area Type	W/ft ²	Building Area Type	W/ft ²
Automotive Facility	0.9	Multi-Family	0.7
Convention Center	1.2	Museum	1.1
Court House	1.2	Office	1.0
Dining: Bar Lounge/Leisure	1.3	Parking Garage	0.3
Dining: Cafeteria/Fast Food	1.4	Penitentiary	1.0
Dining: Family	1.6	Performing Arts Theater	1.6
Dormitory	1.0	Police/Fire Station	1.0
Exercise Center	1.0	Post Office	1.1
Gymnasium	1.1	Religious Building	1.3
Health Care-Clinic	1.0	Retail	1.5
Hospital	1.2	School/University	1.2
Hotel	1.0	Sports Arena	1.1
Library	1.3	Town Hall	1.1
Manufacturing Facility	1.3	Transportation	1.0
Motel	1.0	Warehouse	0.8
Motion Picture Theater	1.2	Workshop	1.4
In cases where both general building area type and a specific building area type are listed, the specific building area type shall apply. ASHRAE 90.1-2004.			

Table 7.2 – Exterior Lighting Power Densities		
<p>Tradeable Surfaces: (Lighting power densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs, and outdoor sales areas may be traded)</p>	Uncovered Parking Areas	
	Parking lots and drives	0.15 W/ft ²
	Building Grounds	
	Walkways less than 10 feet wide	1.0 W/linear foot
	Walkways 10 feet wide or greater	0.2 W/ft ²
	Plaza areas	
	Special feature areas	
	Stairways	1.0 W/ft ²
	Building Entrances and Exits	
	Main entries	30 W/linear foot of door width
	Other doors	20 W/linear foot of door width
	Canopies and Overhangs	
	Canopies (free standing and attached overhangs)	1.25 W/ft ²
	Outdoor Sales	
	Open areas (including vehicle sales lots)	0.5 W/ft ²
Street frontage for vehicle sales lots in addition to "open area" allowance	20 W/linear foot	
<p>Non-Tradeable Surfaces: (Lighting Power density calculations for these applications can be used only for the specific application and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the "Tradeable Surfaces" section of this table.)</p>	Building Facades	0.2 W/ft ² for each illuminated wall or surface or 5.0 W/linear foot for each illuminated wall or surface length
	Automate Teller Machines and Night Depositories	270 W per location plus 90 W per additional ATM per location
	Entrances and Gatehouse Inspection Stations at Guarded Facilities	1.25 W/ft ² of uncovered area (covered areas are included in the "Canopies and Overhangs" section of "Tradable Surfaces")
	Drive-Up Windows at Fast Food Restaurants	400 W per drive-through
	Parking near 24-hour retail entrances	800 W per main entry