

**REVISION RECORD FOR THE
STATE OF CALIFORNIA
SUPPLEMENT**

November 14, 2003

2001 Title 24, Part 6, California Building Standards Energy Code

**PLEASE NOTE: The date of this Supplement is for identification purposes only.
See the History Note Appendix for the adoption and effective dates of the provisions.**

It is suggested that the section number as well as the page number be checked when inserting this material and removing the superseded material. In case of doubt, rely on the section numbers rather than the page numbers since the section numbers must run consecutively.

It is further suggested that the superseded material be retained with this revision record sheet so that the prior wording of any section can be easily ascertained.

Please keep the removed pages with this revision page for future reference.

NOTE

Due to the fact that the application date for a building permit establishes the California Building Standards code provisions that are effective at the local level, which apply to the plans, specifications, and construction for that permit, it is strongly recommended that the removed pages be retained for historical reference.

Remove Existing Pages

5 through 10
15 and 16
35 and 36
81 and 82
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Insert Blue Pages

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ricate a fenestration product or exterior door. Field fabricated does not include site-assembled frame components that were manufactured elsewhere with the intention of being assembled on site (such as knocked-down products, sunspace kits and curtain walls).

FIREPLACE is a hearth and firechamber or similar prepared place in which a solid-fuel fire may be burned, as defined in UBC Section 3102.2 and as further clarified in UBC Section 3102.7; these include, but are not limited to, factory-built fireplaces, masonry fireplaces, and masonry heaters.

FLOOR/SOFFIT TYPE is a floor/soffit assembly having a specific heat capacity, framing type, and U-factor.

FRAMED PARTITION or **ASSEMBLY** is a partition or assembly constructed using separate structural members spaced not more than 32 inches on center.

GAS HEATING SYSTEM is a natural gas or liquefied petroleum gas heating system.

GAS LOG is a self-contained, free-standing, open-flame, gas-burning appliance consisting of a metal frame or base supporting simulated logs, and designed for installation only in a vented fireplace.

GENERAL LIGHTING is lighting designed to provide a substantially uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effect. When designed for lower-than-task illuminance used in conjunction with other specific task lighting systems, it is also called "ambient" lighting.

GLAZING (See "fenestration product.")

GOVERNMENTAL AGENCY is any public agency or subdivision thereof, including, but not limited to, any agency of the state, a county, a city, a district, an association of governments, or a joint power agency.

GROSS EXTERIOR ROOF AREA is the sum of the skylight area and the exterior roof/ceiling area.

GROSS EXTERIOR WALL AREA is the sum of the window area, door area and exterior wall area.

GROSS SALES FLOOR AREA is the total area (in square feet) of retail store floor space that is (1) used for the display and sale of merchandise; or (2) associated with that function, including, but not limited to, sales transactions areas, fitting rooms, and circulation areas and entry areas within the space used for display and sale.

GROSS SALES WALL AREA is the area (in square feet) of the inside of exterior walls and permanent full-height interior partitions within the gross sales floor area of a retail store that is used for the presentation of merchandise for sale, less the area of openings, doors, windows, baseboards, wainscots, mechanical or structural elements, and other obstructions preventing the use of the area for the presentation of merchandise.

HABITABLE STORY is a story that contains space in which humans may work or live in reasonable comfort, and that has at least 50 percent of its volume above grade.

HEAT CAPACITY (HC) of an assembly is the amount of heat necessary to raise the temperature of all the components of a unit area in the assembly 1 °F. It is calculated as the sum of the average thickness times the density times the specific heat for each component, and is expressed in Btu per square foot per °F.

HEAT PUMP is a device that is capable of heating by refrigeration, and that may include a capability for cooling.

HEATING EQUIPMENT is equipment used to provide mechanical heating for a room or rooms in a building.

HEATING SEASONAL PERFORMANCE FACTOR (HSPF) is the total heating output of a heat pump (in Btu) during its normal use period for heating divided by the total electrical energy input (in watt-hours) during the same period, as determined using the applicable test method in the Appliance Efficiency Regulations.

HI is the Hydronics Institute.

HIGH BAY is a space with luminaires 25 feet or more above the floor.

HIGH-RISE RESIDENTIAL BUILDING is a building, other than a hotel/motel, of occupancy Group R, Division 1 with four or more habitable stories.

HORIZONTAL GLAZING (See "skylight.")

HOTEL/MOTEL is a building or buildings incorporating six or more guest rooms or a lobby serving six or more guest rooms, where the guest rooms are intended or designed to be used, or which are used, rented, or hired out to be occupied, or which are occupied for sleeping purposes by guests, and all conditioned spaces within the same building envelope. Hotel/motel also includes all conditioned spaces which are (1) on the same property as the hotel/motel, (2) served by the same central heating, ventilating, and air-conditioning system as the hotel/motel, and (3) integrally related to the functioning of the hotel/motel as such, including, but not limited to, exhibition facilities, meeting and conference facilities, food service facilities, lobbies and laundries.

HVAC SYSTEM (See "space-conditioning system.")

ICBO is the International Conference of Building Officials.

ILLUMINATED FACE is a side of an exit sign that has the word "EXIT" on it.

INDIRECTLY CONDITIONED SPACE is enclosed space, including, but not limited to, unconditioned volume in atria, that (1) is not directly conditioned space; and (2) either (a) has an area-weighted heat transfer coefficient to directly conditioned space exceeding that to the outdoors or to unconditioned space, or (b) is a space through which air from directly conditioned spaces is transferred at a rate exceeding three air changes per hour.

INFILTRATION is uncontrolled inward air leakage from outside a building or unconditioned space, including leakage through cracks and interstices, around windows and doors, and through any other exterior or demising partition or pipe or duct penetration.

INTEGRATED PART LOAD VALUE (IPLV) is a single-number figure of merit based on part load EER or COP expressing part load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment as determined using the applicable test method in the Appliance Efficiency Regulations or Section 112.

ISOLATION DEVICE is a device that prevents the conditioning of a zone or group of zones in a building while other zones of the building are being conditioned.

LOW BAY is a space with luminaires less than 25 feet above the floor.

LOW-RISE RESIDENTIAL BUILDING is a building, other than a hotel/motel that is of Occupancy Group R, Division 1, and is three stories or less, or that is of Occupancy R, Division 3.

LPG is liquefied petroleum gas.

LUMINAIRE is a complete lighting unit consisting of a lamp and the parts designed to distribute the light, to position and pro-

tect the lamp, and to connect the lamp to the power supply; commonly referred to as “lighting fixtures” or “instruments.”

MANUAL is capable of being operated by personal intervention.

MANUFACTURED DEVICE is any heating, cooling, ventilation, lighting, water heating, refrigeration, cooking, plumbing fitting, insulation, door, fenestration product, or any other appliance, device, equipment, or system subject to Sections 110 through 119 of Title 24, Part 6.

MANUFACTURED FENESTRATION PRODUCT is a fenestration product typically assembled before delivery to a job site. A “knocked-down” or partially assembled product sold as a fenestration product must be considered a manufactured fenestration product and meet the rating and labeling requirements for manufactured fenestration products.

MECHANICAL COOLING is lowering the temperature within a space using refrigerant compressors or absorbers, desiccant dehumidifiers, or other systems that require energy from depletable sources to directly condition the space. In nonresidential, high-rise residential, and hotel/motel buildings, cooling of a space by direct or indirect evaporation of water alone is not considered mechanical cooling.

MECHANICAL HEATING is raising the temperature within a space using electric resistance heaters, fossil fuel burners, heat pumps, or other systems that require energy from depletable sources to directly condition the space.

MODELING ASSUMPTIONS are the conditions (such as weather conditions, thermostat settings and schedules, internal gain schedules, etc.) that are used for calculating a building’s annual energy consumption and that are in the Alternative Calculation Methods Manuals.

MOVABLE SHADING DEVICE (See “operable shading device.”)

MULTISCENE DIMMING SYSTEM is a lighting control device that has the capability of setting light levels throughout a continuous range, and that has pre-established settings within the range.

NEWLY CONDITIONED SPACE is any space being converted from unconditioned to directly conditioned or indirectly conditioned space, or any space being converted from semiconditioned to directly conditioned or indirectly conditioned space. Newly conditioned space must comply with the requirements for an addition. See Section 149 for nonresidential occupancies and Section 152 for residential occupancies.

NFRC 100 is the National Fenestration Rating Council document entitled “NFRC 100: Procedure for Determining Fenestration Product U-factors.” (1997 or November 2002; NFRC 100 includes procedures for site-built fenestration formerly included in a separate document, NFRC 100-SB)¹

NFRC 200 is the National Fenestration Rating Council document entitled “NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.” (1995 or November 2002)²

NFRC 400 is the National Fenestration Rating Council document entitled “NFRC 400: Procedure for Determining Fenestration Product Air Leakage.” (1995 or January 2002)³

NONRESIDENTIAL BUILDING is any building which is a Group A, B, E, F, H, M or S Occupancy.

NOTE: Requirements for high-rise residential buildings and hotels/motels are included in the nonresidential sections of Title 24, Part 6.

NONRESIDENTIAL MANUAL is the manual developed by the commission, under Section 25402.1 (e) of the Public Resources Code, to aid designers, builders and contractors in meeting the energy efficiency requirements for nonresidential, high-rise residential, and hotel/motel buildings.

NORTH-FACING is oriented to within 45 degrees of true north, including 45°00’00” east of north (NE), but excluding 45°00’00” west of north (NW).

OCCUPANCY SENSOR, LIGHTING, is a device that automatically turns lights off soon after an area is vacated.

OCCUPANCY TYPE is one of the following:

Auditorium is the part of a public building where an audience sits in fixed seating, or a room, area, or building with fixed seats used for public meetings or gatherings not specifically for the viewing of dramatic performances.

Auto repair is the portion of a building used to repair automotive equipment and/or vehicles, exchange parts, and may include work using an open flame or welding equipment.

Bank/financial institution is an area in a public establishment used for conducting financial transactions including the custody, loan, exchange, or issue of money, for the extension of credit, and for facilitating the transmission of funds.

Classroom, lecture, or training is a room or area where an audience or class receives instruction.

Commercial and industrial storage is a room, area, or building used for storing items.

Convention, conference, multipurpose and meeting centers is an assembly room, area, or building that is used for meetings, conventions and multiple purposes, including, but not limited to, dramatic performances, and that has neither fixed seating nor fixed staging.

Corridor is a passageway or route into which compartments or rooms open.

Dining is a room or rooms in a restaurant or hotel/motel (other than guest rooms) where meals that are served to the customers will be consumed.

Electrical/mechanical room is a room in which the building’s electrical switchbox or control panels, and/or HVAC controls or equipment is located.

Exercise center/gymnasium is a room or building equipped for gymnastics, exercise equipment, or indoor athletic activities.

Exhibit is a room or area that is used for exhibitions that has neither fixed seating nor fixed staging.

General commercial and industrial work is a room, area, or building in which an art, craft, assembly or manufacturing operation is performed.

High bay: Luminaires 25 feet or more above the floor.

¹Either the 1997 edition or the November 2002 edition may be used for product rating prior to April 1, 2004. Product ratings authorized by NFRC prior to April 1, 2004 are valid for the full certification period. Beginning April 1, 2004, only the November 2002 edition may be used for new product rating.

²Either the 1995 edition or the November 2002 edition may be used for product rating prior to April 1, 2004. Product ratings authorized by NFRC prior to April 1, 2004 are valid for the full certification period. Beginning April 1, 2004, only the November 2002 edition may be used for new product rating.

³Either the 1995 edition or the January 2002 edition may be used for product rating prior to April 1, 2004. Product ratings authorized by NFRC prior to April 1, 2004. Product ratings authorized by NFRC prior to April 1, 2004 are valid for the full certification period. Beginning April 1, 2004, only the January 2002 edition may be used for new product rating.

Low bay: Luminaires less than 25 feet above the floor.

Grocery store is a room, area, or building that has as its primary purpose the sale of foodstuffs requiring additional preparation prior to consumption.

Hotel function area is a hotel room or area such as a hotel ballroom, meeting room, exhibit hall or conference room, together with prefunction areas and other spaces ancillary to its function.

Hotel lobby is the contiguous spaces in a hotel/motel between the main entrance and the front desk, including waiting and seating areas, and other spaces encompassing the activities normal to a hotel lobby function.

Kitchen/food preparation is a room or area with cooking facilities and/or an area where food is prepared.

Laundry is a place where laundering activities occur.

Library is a repository for literary materials, such as books, periodicals, newspapers, pamphlets and prints, kept for reading or reference.

Locker/dressing room is a room or area for changing clothing, sometimes equipped with lockers.

Lounge/recreation is a room used for leisure activities which may be associated with a restaurant or bar.

Main entry lobby/reception/waiting is the lobby of a building that is directly located by the main entrance of the building and includes the reception area, sitting areas, and public areas.

Malls, arcades and atria are public passageways or courtyards that provide access to rows of stores or shops.

Medical and clinical care is a room, area, or building that does not provide overnight patient care and that is used to promote the condition of being sound in body or mind through medical, dental, or psychological examination and treatment, including, but not limited to, laboratories and treatment facilities.

Museum is a space in which works of artistic, historical, or scientific value are cared for and exhibited.

Office is a room, area or building of UBC Group B Occupancy other than restaurants.

Precision commercial or industrial work is a room, area, or building in which an art, craft, assembly or a manufacturing operation is performed involving visual tasks of small size or fine detail such as electronic assembly, fine woodworking, metal lathe operation, fine hand painting and finishing, egg processing operations, or tasks of similar visual difficulty.

Reception/waiting area is an area where customers or clients are greeted prior to conducting business.

Religious worship is a room, area, or building for worship.

Restaurant is a room, area, or building that is a food establishment as defined in Section 27520 of the Health and Safety Code.

Restroom is a room or suite of rooms providing personal facilities such as toilets and washbasins.

Retail and sales is a room, area, or building in which the primary activity is the sale of merchandise.

School is a building or group of buildings that is predominately classrooms and that is used by an organization that provides instruction to students.

Stairs, active/inactive is a series of steps providing passage from one level of a building to another.

Support area is a room or area used as a passageway, utility room, storage space, or other type of space associated with or

secondary to the function of an occupancy that is listed in these regulations.

Theater, motion picture, is an assembly room, a hall, or a building with tiers of rising seats or steps for the showing of motion pictures.

Theater, performance, is an assembly room, a hall, or a building with tiers of rising seats or steps for the viewing of dramatic performances, lectures, musical events and similar live performances.

Vocational room is a room used to provide training in a special skill to be pursued as a trade.

Wholesale showroom is a room where samples of merchandise are displayed.

OPERABLE SHADING DEVICE is a device at the interior or exterior of a building or integral with a fenestration product, which is capable of being operated, either manually or automatically, to adjust the amount of solar radiation admitted to the interior of the building.

OPTIMAL OVERHANG is an overhang that completely shades the glazing at solar noon on August 21 and substantially exposes the glass at solar noon on December 21.

ORNAMENTAL CHANDELIERS are ceiling-mounted, close-to-ceiling, or suspended decorative luminaires that use glass, crystal, ornamental metals or other decorative material and that typically are used in hotels/motels, restaurants, or churches as significant elements in the interior architecture.

OUTDOOR AIR (Outside air) is air taken from outdoors and not previously circulated in the building.

OVERALL HEAT GAIN is the value obtained in Section 143 (b) 2 for determining compliance with the component envelope approach.

OVERALL HEAT LOSS is the value obtained in Section 143 (b) 1 for determining compliance with the component envelope approach.

POOR QUALITY LIGHTING TASKS are visual tasks that require illuminance category E or greater, because of the choice of a writing or printing method that produces characters that are of small size or lower contrast than good quality alternatives that are regularly used in offices.

PRIVATE OFFICE or **WORK AREA** is an office bounded by 30-inch or higher partitions and is no more than 200 square feet.

PROCESS is an activity or treatment that is not related to the space conditioning, lighting, service water heating, or ventilating of a building as it relates to human occupancy.

PROCESS LOAD is a load resulting from a process.

PUBLIC AREAS are spaces generally open to the public at large, customers or congregation members, or similar spaces where occupants need to be prevented from controlling lights for safety, security or business reasons.

PUBLIC FACILITY RESTROOM is a restroom designed for use by the public.

RADIANT BARRIER is any reflective material that has an emittance of 0.05 or less, tested in accordance with ASTM C-1371-98 or ASTM E 408-71 (1996) e1, and is certified to the California Department of Consumer Affairs as required by CCR, Title 24, Part 12, Chapter 12-13, Standards for Insulating Material.

RAISED FLOOR is a floor (partition) over a crawl space, or an unconditioned space, or ambient air.

READILY ACCESSIBLE is capable of being reached quickly for operation, repair or inspection, without requiring climbing or removing obstacles, or resorting to access equipment.

RECOOL is the cooling of air that has been previously heated by space-conditioning equipment or systems serving the same building.

RECOVERED ENERGY is energy used in a building that (1) is mechanically recovered from space conditioning, service water heating, lighting, or process equipment after the energy has performed its original function; (2) provides space conditioning, service water heating, or lighting; and (3) would otherwise be wasted.

REDUCED FLICKER OPERATION is the operation of a light, in which the light has a visual flicker less than 30 percent for frequency and modulation.

REHEAT is the heating of air that has been previously cooled by cooling equipment or systems or an economizer.

RELATIVE SOLAR HEAT GAIN is the ratio of solar heat gain through a fenestration product (corrected for external shading) to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

REPAIR is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance. Note: Repairs to low-rise residential buildings are not within the scope of these standards.

RESIDENTIAL BUILDING (See “high-rise residential building” and “low-rise residential building.”)

RESIDENTIAL MANUAL is the manual developed by the commission, under Section 25402.1 of the Public Resources Code, to aid designers, builders, and contractors in meeting energy efficiency standards for low-rise residential buildings.

ROOF/CEILING TYPE is a roof/ceiling assembly having a specific framing type and U-factor.

ROOM CAVITY RATIO (RCR) is:

$$(a) \text{ For rectangular rooms } \frac{5H(L + W)}{LW}$$

or

$$(b) \text{ For irregular-shaped rooms } \frac{2.5H \times P}{A}$$

WHERE:

L = length of room.

W = width of room.

H = vertical distance from the work plane to the center line of the lighting fixture.

P = perimeter of room.

A = area of room.

RUNOUT is piping that is no more than 12 feet long and that is connected to a fixture or an individual terminal unit.

SCONCE is a wall-mounted decorative light fixture.

SEASONAL ENERGY EFFICIENCY RATIO (SEER) means the total cooling output of a central air conditioner in Btu during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using the applicable test method in the Appliance Efficiency Regulations.

SEMICONDITIONED SPACE is an enclosed nonresidential space that is provided with wood heating, cooling by direct or indirect evaporation of water, mechanical heating that has a capacity of 10 Btu/(hr · ft²) or less, mechanical cooling that has a capacity of 5 Btu/(hr · ft²) or less, or is maintained for a process environment as set forth in the definition of “directly conditioned space.”

SERVICE WATER HEATING is heating of water for sanitary purposes for human occupancy, other than for comfort heating.

SHADING is the protection from heat gains because of direct solar radiation by permanently attached exterior devices or building elements, interior shading devices, glazing material, or adherent materials. Permanently attached means (a) attached with fasteners that require additional tools to remove (as opposed to clips, hooks, latches, snaps or ties); or (b) required by the UBC for emergency egress to be removable from the interior without the use of tools.

SHADING COEFFICIENT (SC) is the ratio of the solar heat gain through a fenestration product to the solar heat gain through an unshaded 1/8-inch-thick clear double strength glass under the same set of conditions. For nonresidential, high-rise residential and hotel/motel buildings, this shall exclude the effects of mullions, frames, sashes, and interior and exterior shading devices.

SITE-ASSEMBLED FENESTRATION includes both field-fabricated fenestration and site-built fenestration.

SITE-BUILT FENESTRATION PRODUCTS are fenestration products designed to be field-glazed or field assembled units comprised of specified framing and glazing components. Site-built fenestration is eligible for certification under NFRC 100 and may include both vertical glazing and horizontal glazing.

SITE SOLAR ENERGY is natural daylighting, or thermal, chemical, or electrical energy derived from direct conversion of incident solar radiation at the building site.

SKYLIGHT is glazing having a slope less than 60 degrees from the horizontal with conditioned space below.

SKYLIGHT AREA is the area of the surface of a skylight, plus the area of the frame, sash and mullions.

SKYLIGHT TYPE is a type of skylight assembly having a specific solar heat gain coefficient, and U-factor whether glass mounted on a curb, glass not mounted on a curb or plastic (assumed to be mounted on a curb).

SOLAR HEAT GAIN COEFFICIENT (SHGC) is the ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

SOURCE ENERGY is the energy that is used at a site and consumed in producing and in delivering energy to a site, including, but not limited to, power generation, transmission and distribution losses, and that is used to perform a specific function, such as space conditioning, lighting or water heating. Table 1-B contains the conversion factors for converting site to source energy.

SOUTH-FACING is oriented to within 45 degrees of true south, including 45°00'00" west of south (SW), but excluding 45°00'00" east of south (SE).

SPA is a vessel that contains heated water in which humans can immerse themselves, is not a pool, and is not a bathtub.

SPACE-CONDITIONING SYSTEM is a system that provides either collectively or individually heating, ventilating, or cooling within or associated with conditioned spaces in a building.

SMACNA is the Sheet Metal and Air-conditioning Contractors National Association.

SYSTEM is a combination of equipment, controls, accessories, interconnecting means, or terminal elements by which energy is transformed to perform a specific function, such as space conditioning, service water heating, or lighting.

TASK-ORIENTED LIGHTING is lighting that is designed specifically to illuminate a task location, and that is generally confined to the task location.

THERMAL MASS is solid or liquid material used to store heat for later heating use or for reducing cooling requirements.

THERMAL RESISTANCE (R) is the resistance of a material or building component to the passage of heat in (hr. × ft.² × °F)/Btu.

THERMOSTATIC EXPANSION VALVE (TXV) is a refrigerant metering valve, installed in an air conditioner or heat pump, which controls the flow of liquid refrigerant entering the evaporator in response to the superheat of the gas leaving it.

THROW DISTANCE is the distance between the luminaire and the center of the plane lit by the luminaire on a display.

TUNING is a lighting control device that allows authorized personnel only to select a single light level within a continuous range.

UBC is the 1997 edition of the state-adopted *Uniform Building Code*TM.

UL[®] is the Underwriters Laboratories[®].

UMC is the 1997 edition of the state-adopted *Uniform Mechanical Code*TM.

UNCONDITIONED SPACE is enclosed space within a building that is not directly conditioned, indirectly conditioned or semi-conditioned space.

UNIT INTERIOR MASS CAPACITY (UIMC) is the amount of effective heat capacity per unit of thermal mass, taking into account the type of mass material, thickness, specific heat, density and surface area.

U-FACTOR is the overall coefficient of thermal transmittance of a construction assembly, in Btu/(hr. · ft.² · °F), including air film resistance at both surfaces.

VAPOR BARRIER is a material that has a permeance of one perm or less and that provides resistance to the transmission of water vapor.

VARIABLE AIR VOLUME (VAV) SYSTEM is a space-conditioning system that maintains comfort levels by varying the volume of conditioned air to the zones served.

VERTICAL GLAZING (See “window.”)

VERY VALUABLE MERCHANDISE are rare or precious objects, including, but not limited to, jewelry, coins, small art objects, crystal, china, ceramics, or silver, the selling of which involves customer inspection of very fine detail from outside of a locked case.

VISIBLE LIGHT TRANSMITTANCE (VLT) is the ratio (expressed as a decimal) of visible light that is transmitted through a glazing material to the light that strikes the material.

WALL TYPE is a wall assembly having a specific heat capacity, framing type, and U-factor.

WELL INDEX is the ratio of the amount of visible light leaving a skylight well to the amount of visible light entering the skylight well and is calculated as follows:

(a) For rectangular wells:

$$\left(\frac{\text{Well height (well length + well width)}}{2 \times \text{well length} \times \text{well width}} \right)$$

or

(b) For irregular-shaped wells:

$$\left(\frac{\text{Well height} \times \text{well perimeter}}{4 \times \text{well area}} \right)$$

Where the length, width, perimeter, and area are measured at the bottom of the well, and *R* is the weighted average reflectance of the walls of the well.

WEST-FACING is oriented to within 45 degrees of true west, including 45°00'00" north of due west (NW), but excluding 45°00'00" south of west (SW).

WINDOW is glazing that is not a skylight.

WINDOW AREA is the area of the surface of a window, plus the area of the frame, sash, and mullions.

WINDOW TYPE is a window assembly having a specific solar heat gain coefficient, relative solar heat gain, and U-factor.

WINDOW WALL RATIO is the ratio of the window area to the gross exterior wall area.

WOOD HEATER is an enclosed wood-burning appliance used for space heating and/or domestic water heating, and which meets the definition in Federal Register, Volume 52, Number 32, February 18, 1987.

WOOD STOVE (See “wood heater.”)

ZONE, LIGHTING, is a space or group of spaces within a building that has sufficiently similar requirements so that lighting can be automatically controlled in unison throughout the zone by an illumination-controlling device or devices, and does not exceed one floor.

ZONE, SPACE-CONDITIONING, is a space or group of spaces within a building with sufficiently similar comfort conditioning requirements so that comfort conditions, as specified in Section 144 (b) 3 or 150 (h), as applicable, can be maintained throughout the zone by a single controlling device.



FIGURE 1-A—CLIMATE ZONES

field-fabricated fenestration products and field-fabricated exterior doors, may be installed only if the manufacturer has certified to the commission, or if an independent certifying organization approved by the commission has certified, that the product complies with all of the applicable requirements of this subsection.

1. **Air leakage.** Manufactured fenestration products and exterior doors shall have air infiltration rates not exceeding 0.3 cfm/ft² of window area, 0.3 cfm/ft² of door area for residential doors, 0.3 cfm/ft² of door area for nonresidential single doors (swinging and sliding), and 1.0 cfm/ft² for nonresidential double doors (swinging), when tested according to NFRC-400 or ASTM E 283-91 at a pressure differential of 75 pascals or 1.57 pounds/ft², incorporated herein by reference.

2. **U-factor and SHGC.** Fenestration products shall:

- A. Be certified for overall U-factor as rated in accordance with NFRC 100 and be certified for overall SHGC, as rated in accordance with NFRC 200, incorporated herein by reference, or such values shall be certified in accordance with Tables 1-D and 1-E and labeled as set forth in Section 10-111; and
- B. Have a temporary label or label certificate (for site-built products) meeting the requirements of Section 10-111 (a) 1, not to be removed before inspection by the enforcement agency, listing the certified U-factor and SHGC, and certifying that the air leakage requirements of Section 116 (a) 1 are met for each product line; and
- C. Have a permanent label or label certificate (for site-built products) meeting the requirements of Section 10-111 (a) 2 if the product is rated using NFRC procedures.

EXCEPTION to Section 116 (a): Fenestration products removed and reinstalled as part of a building alteration or addition.

EXCEPTION 1 to Section 116 (a) 2: Site-assembled vertical glazing in buildings covered by the nonresidential standards with less than 100,000 square feet of conditioned floor area or less than 10,000 square feet of vertical glazing shall have U-factors determined in accordance with NFRC 100 procedures or default values set forth in Appendix I of the Nonresidential ACM Manual. Temporary and permanent labels are not required.

EXCEPTION 2 to Section 116 (a) 2: Site-assembled vertical glazing in buildings covered by the nonresidential standards shall have SHGC values determined in accordance with NFRC 100 procedures or shall calculate the SHGC value for each vertical glazing as:

$$SHGC = 0.08 + 0.86 \times SHGC_c$$

WHERE:

SHGC = the solar heat gain coefficient for the fenestration, including glass and frame.

SHGC_c = the center of glass solar heat gain coefficient for the glass alone as documented in the glazing manufacturer's literature. Documentation shall be provided as set forth in Appendix I of the Nonresidential ACM Manual.

EXCEPTION 3 to Section 116 (a) 2: Skylights and site-assembled horizontal glazing shall have SHGC values and U-factors determined in accordance with NFRC procedures or default values set forth in Appendix I of the Nonresidential ACM Manual. Documentation shall be provided as set forth in Appendix I of the Nonresidential ACM Manual.

(b) Installation of Field-fabricated Fenestration Products and Exterior Doors. Field-fabricated fenestration products and exterior doors shall be caulked between the fenestration products or exterior door and the building, and shall be weatherstripped.

EXCEPTION to Section 116 (b): Unframed glass doors and fire doors.

SECTION 117 — MANDATORY REQUIREMENTS FOR JOINTS AND OTHER OPENINGS

Joints and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather-stripped, or otherwise sealed to limit infiltration and exfiltration.

SECTION 118 — MANDATORY REQUIREMENTS FOR INSULATION AND COOL ROOFS

(a) **Certification by Manufacturers.** Any insulation of the type and form listed below may be installed only if the manufacturer has certified that the insulation complies with the California Code of Regulations, Title 24, Part 12, Chapter 12-13, Standards for Insulating Material. See Appendix 1-A for availability of directories of certified insulating material.

TYPE	FORM
Aluminum foil	Reflective foil
Cellular glass	Board form
Cellulose fiber	Loose fill and spray applied
Mineral aggregate	Board form
Mineral fiber	Blankets, board form, loose fill
Perlite	Loose fill
Phenolic	Board form
Polystyrene	Board form, molded extruded
Polyurethane	Board form and field applied
Polyisocyanurate	Board form and field applied
Urea formaldehyde	Foam field applied
Vermiculite	Loose fill

(b) **Installation of Urea Formaldehyde Foam Insulation.** Urea formaldehyde foam insulation may be applied or installed only if:

- 1. It is installed in exterior side walls; and
- 2. A 4-mil-thick plastic polyethylene vapor barrier or equivalent plastic sheeting vapor barrier is installed between the urea formaldehyde foam insulation and the interior space in all applications.

(c) **Flamespread Rating.** All insulating material shall be installed in compliance with the flamespread rating and smoke density requirements of Section 707 of the UBC.

(d) **Installation of Insulation in Existing Buildings.** Insulation installed in an existing attic, or on an existing duct or water heater, shall comply with the applicable requirements of this subsection. If a contractor installs the insulation, the contractor shall certify to the customer, in writing, that the insulation meets the applicable requirements of this subsection.

1. **Attics.** If insulation is installed in the existing attic of a low-rise residential building, the R-value of the total amount of insulation (after addition of insulation to the amount, if any, already in the attic) shall be at least R-30 if the building is located in an area that has less than 5,000 heating degree days, or R-38 if the building is located in an area that has 5,000 heating degree days or more.

EXCEPTION to Section 118 (d) 1: Where the accessible space in the attic is not large enough to accommodate the required R-value, the entire accessible space shall be filled with insulation provided such installation does not violate Section 1505.3 of Title 24, Part 2.

2. **Water heaters.** If external insulation is installed on an existing unfired water storage tank or on an existing back-up tank for a solar water-heating system, it shall have an R-value of at least R-12, or the heat loss of the tank surface based on an 80°F

water-air temperature difference shall be less than 6.5 Btu per hour per square foot.

3. **Ducts.** If insulation is installed on an existing space-conditioning duct, it shall comply with Section 604 of the CMC¹.

(e) **Demising Walls in Nonresidential Buildings.** The opaque portions of framed demising walls in nonresidential buildings shall have insulation with an installed R-value of no less than R-11 between framing members.

(f) **Mandatory Requirements for Cool Roofs.** Effective January 1, 2003, a roof shall be considered a cool roof if the roofing product is certified and labeled according to requirements of Section 10-113 and if the roofing product meets condition 1 or 2 and, for liquid-applied roofing products, condition 3 below. Prior to January 1, 2003, manufacturer's published performance data shall be acceptable to show compliance with condition 1 or 2 and, for liquid-applied roofing products, condition 3 below.

1. Concrete tile (as defined in ASTM C 55-99) and clay tile (as defined in ASTM C 1167-96) roofing products shall have a minimum initial total solar reflectance of 0.40 when tested in accordance with ASTM E 903 or E 1918, and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E 408.

2. All other roofing products shall have a minimum initial total solar reflectance of 0.70 when tested in accordance with ASTM E 903 or E 1918, and a minimum thermal emittance of 0.75 when tested in accordance with ASTM E 408.

3. Liquid-applied roofing products shall be applied at a minimum dry mil thickness of 20 mils across the entire roof surface, and meet the minimum performance requirements of ASTM D6083-97 when tested in accordance with ASTM D 6083-97 for the following key properties:

- A. Initial Tensile Strength
- B. Initial Elongation
- C. Elongation after 1,000 Hours Accelerated Weathering
- D. Permeance
- E. Accelerated Weathering

SECTION 119 — MANDATORY REQUIREMENTS FOR LIGHTING CONTROL DEVICES

Any automatic time switch control device, occupant-sensing device, automatic daylighting control device, or interior photocell sensor device may be installed only if the manufacturer has certified to the commission that the device complies with all of the applicable requirements of Subsections (a) through (g), and if the device is installed in compliance with Subsection (h).

(a) **All Devices: Instructions for Installation and Calibration.** The manufacturer shall provide step-by-step instructions for installation and start-up calibration of the device.

(b) **All Devices: Status Signal.** The device shall have an indicator that visibly or audibly informs the device operator that it is operating properly, or that it has failed or malfunctioned.

EXCEPTION to Section 119 (b): Photocell sensors or other devices where a status signal is infeasible because of inadequate power.

(c) **Automatic Time Switch Control Devices.** Automatic time switch control devices shall:

1. Be capable of programming different schedules for weekdays and weekends; and

2. Have program backup capabilities that prevent the loss of the device's program and time setting for at least 10 hours if power is interrupted.

(d) **Occupant-sensing Devices.** Occupant-sensing devices shall be capable of automatically turning off all the lights in an area no more than 30 minutes after the area has been vacated. In addition, ultrasonic and microwave devices shall have a built-in mechanism that allows calibration of the sensitivity of the device to room movement in order to reduce the false sensing of occupants, and shall comply with either Item 1 or 2 below, as applicable:

1. If the device emits ultrasonic radiation as a signal for sensing occupants within an area, the device shall:

- A. Have had a Radiation Safety Abbreviated Report submitted to the Center for Devices and Radiological Health, Federal Food and Drug Administration, under 21 Code of Federal Regulations, Section 1002.12 (1996), and a copy of the report shall have been submitted to the California Energy Commission; and
- B. Emit no audible sound; and
- C. Not emit ultrasound in excess of the following decibel (dB) values, measured no more than 5 feet from the source, on axis:

MIDFREQUENCY OF SOUND PRESSURE THIRD-OCTAVE BAND (in kHz)	MAXIMUM dB LEVEL WITHIN THIRD-OCTAVE BAND (in dB reference 20 micropascals)
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

2. If the device emits microwave radiation as a signal for sensing occupants within the area, the device shall:

- A. Comply with all applicable provisions in 47 Code of Federal Regulations, Parts 2 and 15 (1996), and have an approved Federal Communications Commission Identifier that appears on all units of the device and that has been submitted to the commission; and
- B. Not emit radiation in excess of 1 milliwatt per square centimeter measured at no more than 5 centimeters from the emission surface of the device; and
- C. Have permanently affixed to it installation instructions recommending that it be installed at least 12 inches from any area normally used by room occupants.

(e) **Automatic Daylighting Control Devices.** Automatic daylighting control devices shall:

1. Be capable of reducing the light output of the general lighting of the controlled area by at least one half while maintaining a uniform level of illuminance throughout the area; and

2. If the device is a dimmer, provide electrical outputs to lamps for reduced flicker operation through the dimming range and without causing premature lamp failure; and

3. If the device is a stepped dimming system, incorporate time-delay circuits to prevent cycling of light level changes of less than three minutes; and

4. If the device uses step switching with separate on and off settings for the steps, have sufficient separation (deadband) of on and off points to prevent cycling; and

¹On and after the effective date designated by the California Building Standards Commission for the 2000 CMC, duct insulation shall comply with Section 605 of the 2000 CMC.

SUBCHAPTER 5

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY

SECTION 140 — CHOICE OF PERFORMANCE AND PRESCRIPTIVE APPROACHES

The envelope and the space-conditioning, lighting and service water-heating systems of all nonresidential, high-rise residential, and hotel/motel buildings subject to Title 24, Part 6, shall be designed, constructed and installed either:

(a) **Performance Approach**—to use no more source energy from depletable sources than the energy budget, calculated according to Section 141; or

(b) **Prescriptive Approach**—in accordance with all the applicable requirements of Sections 142 through 146.

SECTION 141 — PERFORMANCE APPROACH: ENERGY BUDGETS

In order to meet the energy budget, a proposed building's use of source energy calculated under Subsection (b) must be no greater than the energy budget calculated under Subsection (a).

(a) **Energy Budget.** The energy budget for a proposed building is the sum of the space-conditioning, lighting and service water-heating budgets in Subdivisions 1, 2 and 3 of this subsection, expressed in Btu per square foot of conditioned floor area per year.

1. **Space-conditioning budget.** The space-conditioning budget is the source energy used for space conditioning in a standard building in the climate zone in which the proposed building is located, calculated with a method approved by the commission (expressed in Btu per square foot of conditioned floor area per year), and assuming that:

- A. The standard building has space heating, space cooling and ventilation systems that meet, but do not exceed, the minimum efficiency requirements of Sections 111 and 112, and the requirements of Section 144; and
- B. The performance of the roof/ceiling, walls, floors and soffits, windows, and skylights is equal to an applicable value using the same assembly type from Table 1-I or 1-J; and
- C. The zoning, the orientation of each building feature, and the gross envelope areas of the standard building are the same as in the proposed building; and
- D. The window area of the standard building is the greater of (1) or (2): (1) the window area of the proposed building, excluding the window area in demising walls, or 40 percent of the gross exterior wall area of the standard building, whichever is less; or (2) 6 feet times the display perimeter; and
- E. The skylight area of the standard building is the same as in the proposed building, or is 5 percent of the gross exterior roof/ceiling area of the standard building, whichever is less.

2. **Lighting budget.** The lighting budget is the source energy used for lighting in a standard building calculated with a method approved by the commission (expressed in Btu per square foot of conditioned floor area per year), and assuming that:

- A. The lighting power density of the standard building, for areas where no lighting plans or specifications are submitted for permit and the occupancy of the building is known, is the maximum allowed lighting power density calculated according to Section 146 (b) 1; and
- B. The lighting power density of the standard building, for areas where no lighting plans or specifications are submitted for permit, and the occupancy of the building is not known, is 1.2 watts per square foot; and
- C. The lighting power density of the standard building, for areas where lighting plans and specifications are being submitted for permit, is the maximum allowed lighting power density calculated according to Section 146 (b) 1, 2 or 3.

3. **Service water-heating budget.** The service water-heating budget is the source energy used for service water heating in a standard building in the climate zone in which the proposed building is located, calculated with a method approved by the commission (expressed in Btu per square foot of conditioned floor area per year), and assuming that the standard building has a service water-heating system that meets, but does not exceed, the applicable requirements of Sections 111, 113 and 123.

(b) **Source Energy Use of Proposed Building.** The source energy use of a proposed building is the sum of the space-conditioning, lighting and service water-heating source energy use calculated in Subdivisions 1, 2 and 3 of this subsection, using the same ACM used to calculate the budget under Subsection (a), and expressed in Btu per square foot of conditioned floor area per year. If any feature of the proposed building, including, but not limited to, the envelope or the space-conditioning, lighting or service water-heating system, is not included in the building permit application, the energy performance of the feature shall be assumed to be that of the corresponding feature calculated in Subsection (a).

1. **Space-conditioning source energy use.** The space-conditioning source energy use shall be calculated by:

- A. Using a method approved by the commission; and
- B. Using the proposed building's space heating, space cooling, lighting, and ventilation systems, roof and ceiling, walls, floors and soffits, opaque envelope areas, windows, skylights, zoning, and orientation, as shown on the plans and specifications submitted in the building permit application under Section 10-103 of Title 24, Part 1.

2. **Lighting source energy use.** The lighting source energy use shall be calculated using a method approved by the commission, and using the actual lighting power density calculated under Section 146 (a), including reduction of wattage through controls.

3. **Service water-heating source energy use.** The service water-heating source energy use shall be calculated using a method approved by the commission, and using the proposed building's actual service water-heating system.

(c) **Calculation of Budget and Energy Use.** When calculating the energy budget under Subsection (a) and the source energy use under Subsection (b), all of the following rules shall apply:

1. **Methodology.** The methodology, computer programs, inputs and assumptions approved by the commission shall be used.

2. **Energy included.** All energy from depletable sources used for space conditioning, lighting and service water heating shall be included.

3. **Energy excluded.** The following energy shall be excluded:

- A. Process loads; and
- B. Loads of redundant or backup equipment, if the plans submitted under Section 10-103 of Title 24, Part 1, show controls that will allow the redundant or backup equipment to operate only when the primary equipment is not operating, and if such controls are installed; and
- C. Recovered energy; and
- D. Additional energy use caused solely by outside air filtration and treatment for the reduction and treatment of unusual outdoor contaminants with final pressure drops more than 1-inch water column. Only the energy accounted for by the amount of the pressure drop that is over 1 inch may be excluded.

4. **U-factors.** U-factors shall be calculated as follows:

- A. **All building components.** The U-factor of all building components shall be calculated to three decimal places; the calculations shall assume still inside air and a 15 miles per hour outside air velocity, or other assumptions approved by the commission.
- B. **Wood-framed assemblies.** U-factors for wood-framed assemblies shall be calculated using the parallel path method listed in ASHRAE Handbook, 1993, Fundamentals Volume, Chapter 22, with framing factors approved by the commission.
- C. **Metal-framed assemblies.** U-factors for metal-framed assemblies shall be calculated using the zone method listed in ASHRAE Handbook, 1993, Fundamentals Volume, Chapter 22, or a method approved by the commission.
- D. **Fenestration.** U-factors for fenestration shall be determined as follows:
 - i. For site-assembled fenestration products, U-factors shall include the effects of framing and shall be determined using NFRC procedures or default values as set forth in Section 116; or
 - ii. For manufactured windows, U-factors shall be as certified under Section 116; or
 - iii. Using a method approved by the commission.
- E. **Masonry assemblies.** U-factors for masonry assemblies shall be calculated using the transverse isothermal planes method listed in ASHRAE Handbook, 1993, Fundamentals Volume, Chapter 22, or a method approved by the commission.
- F. **Other.** U-factors for components not listed in this subsection shall be calculated using a method approved by the commission.

5. **Solar heat gain coefficients.** Solar heat gain coefficients shall be determined using NFRC 200, or NFRC 100 as set forth in Section 116, and shall not be adjusted for the effects of interior or exterior shading devices.

6. **Visible light transmittance.** Visible light transmittance shall be determined using the values listed in ASHRAE Handbook, 1993, Fundamentals Volume, Chapter 27, or manufacturers' literature, and shall be adjusted for the effects of framing and interior or exterior shading devices.

SECTION 142 — PRESCRIPTIVE APPROACH

In order to comply with the prescriptive approach under this section, a building shall be designed with and shall have constructed and installed:

- (a) A building envelope that complies with Section 143 (a) or (b);
- (b) A space-conditioning system that complies with Section 144;
- (c) A service water-heating system that complies with Section 145; and
- (d) A lighting system that complies with Section 146.

SECTION 143 — PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES

A building complies with this section by being designed with and having constructed and installed either (1) envelope components that comply with each of the requirements in Subsection (a) for each individual component, or (2) an envelope that complies with the overall requirements in Subsection (b). When making calculations under Subsection (a) or (b), all of the rules listed in Section 141 (c) 1, 4 and 5 shall apply.

(a) Envelope Component Approach.

1. **Exterior roofs and ceilings.** Exterior roofs and ceilings shall have either an installed insulation R-value no less than, or an overall assembly U-factor no greater than, the applicable value in Table 1-H or 1-I.

2. **Exterior walls.** Exterior walls shall have either an installed insulation R-value no less than, or an overall assembly U-factor no greater than, the applicable value in Table 1-H or 1-I.

3. **Demising walls.** The opaque portions of framed demising walls in nonresidential buildings shall have insulation with an installed insulation R-value no less than R-11 between framing members.

4. **External floors and soffits.** External floors and soffits shall have either an installed insulation R-value no less than, or an overall assembly U-factor no greater than, the applicable value in Table 1-H or 1-I.

5. Windows. Windows shall:

- A. Have an area no greater than 40 percent of the gross exterior wall area, or 6 feet times the display perimeter, whichever is greater; and

EXCEPTION to Section 143 (a) 5 A: Window area in demising walls is not counted as part of the window area for this requirement. Demising wall area is not counted as part of the gross exterior wall area or display perimeter.

- B. Have a U-factor no greater than the applicable value in Table 1-H or 1-I; and
- C. Have a relative solar heat gain, excluding the effects of interior shading, no greater than the applicable value in Table 1-H or 1-I. The relative solar heat gain of windows is:
 - i. The solar heat gain coefficient of the windows; or
 - ii. Relative solar heat gain as calculated by Equation (1-B), if an overhang extends beyond both sides of

Authority: Sections 25402 and 25402.1, Public Resources Code.
Reference: Sections 25402 and 25402.1, Public Resources Code.

HYDRONICS INSTITUTE

HI Heating Boiler Standard 86, 6th Edition, June 1989
 Available from: Hydronics Institute
 Berkeley Heights, New Jersey 07922
 (908) 464-8200

ILLUMINATING ENGINEERING SOCIETY

Office Lighting American National Standard Practice,
 ANSI/IES RP-1, 1993 IES Handbook, Applications Volume
 (1987 ed.)
 Available from: IESNA
 120 Wall Street, 17th Floor
 New York, New York 10005
 (212) 248-5000
 Fax (212) 248-5017

ISO

ISO-13256-1 Water-Source Heat Pumps-Testing and
 Rating for Performance-Part 1:
 Water-to-Air and Brine-to-Air Heat Pumps
 Available from: ISO
 1, rue de Varembe
 Case postale 56
 CH-1211
 Geneve 20, Switzerland

ASSOCIATED AIR BALANCE COUNCIL

AABC National Standards, 5th Edition, 1989
 Available from: Associated Air Balance Council
 1518 K Street, NW, Suite 503

Washington, D.C. 20005
 (202) 737-0202

NEBB Procedural Standards (1983)

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION

HVAC Duct Construction Standards—Metal and Flexible,
 1995, 2nd Edition
 Available from: Sheet Metal and Air Conditioning
 Contractors National Association
 1020 12th Street, Suite 101
 Sacramento, California 95814
 (916) 442-3807
 Fax (916) 442-6541

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100 Procedure for Determining Fenestration
 Product U-factors
 NFRC 200 Procedure for Determining Fenestration
 Product Solar Heat Gain Coefficients at
 Normal Incidence
 NFRC 400 Procedure for Determining Fenestration
 Product Air Leakage
 Available from: National Fenestration Rating Council
 8484 Georgia Avenue, Suite 320
 Silver Spring, Maryland 20910
 Voice: (301) 589-1776
 Fax: (301) 589-3884
 Email: info@nfr.org



HISTORY NOTE APPENDIX

CALIFORNIA ENERGY CODE

(Title 24, Part 6, California Code of Regulations)

For prior history, see History Note Appendix to the *California Energy Code*, 1998 Triennial Edition, effective July 1, 1999.

1. The 2001 Triennial Edition, *California Energy Code*, was published May 1, 2002. The California Building Standards Commission established November 1, 2002 as the effective date.
2. (CEC 03/02) Approval of energy efficiency standards, which adopt by reference the National Fenestration Rating Council's (NFRC) 2002 window rating and labeling procedures; CCR, Title 24, Parts 1 and 6. Approved by the California Building Standards Commission on May 14, 2003, and filed with the Secretary of State on May 16, 2003. Effective June 14, 2003.

