



# 2012 IgCC RECOMMENDATION

Regarding:	2012 International Green Construction Code (IgCC) and 2011 ASHRAE 189.1	Date:	August 2, 2013
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## 2011 ASHRAE 189.1 – Chapter 1 - Purpose

*1.1 The purpose of this standard is to provide minimum requirements for the siting, design, construction, and plan for operation of high-performance green buildings to: a. balance environmental responsibility, resource efficiency, occupant comfort and well being, and community sensitivity, and b. support the goal of development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

## 2011 ASHRAE 189.1 – Chapter 2 - SCOPE

*2.1 This standard provides minimum criteria that: a. apply to the following elements of building projects: 1. new buildings and their systems 2. new portions of buildings and their systems 3. new systems and equipment in existing buildings b. address site sustainability, water use efficiency, energy efficiency, indoor environmental quality (IEQ), and the building's impact on the atmosphere, materials, and resources.*

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

*2.2 The provisions of this standard do not apply to: a. single-family houses, multi-family structures of three stories or fewer above grade, manufactured houses (mobile homes) and manufactured houses (modular), and b. buildings that use none of the following: electricity, fossil fuel, or water.*

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

*2.3 This standard shall not be used to circumvent any safety, health, or environmental requirements.*

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

## 2011 ASHRAE 189.1 – Chapter 3 – Definitions, Abbreviations, and Acronyms

*3.1 General. Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard. These definitions are applicable to all sections of this standard. Terms that are not defined herein, but that are defined in standards that are referenced herein (e.g., ANSI/ASHRAE/IES Standard 90.1), shall have the meanings as defined in those standards. Other terms that are not defined shall have their ordinarily accepted meanings within the context in which they are used. Ordinarily accepted meanings shall be based upon American standard English language usage, as documented in an unabridged dictionary accepted by the authority having jurisdiction.*

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

### 3.2 Definitions

*acceptance representative: An entity identified by the owner who leads, plans, schedules, and coordinates the activities needed to implement the building acceptance testing activities. The acceptance representative may be a qualified employee or consultant of the owner. The individual serving as the acceptance representative shall be independent of the project design and construction management, though this individual may be an employee of a firms providing those services.*

**adapted plants:** see plants, adapted.

**adequate transit service:** at least two buses (including bus rapid transit), streetcars, or light rail trains per hour on weekdays, operating between 6:00 a.m. and 9:00 a.m., and between 3:00 p.m. and 6:00 p.m., or at least five heavy passenger rail or ferries operating between 6:00 a.m. and 9:00 a.m., and between 3:00 p.m. and 6:00 p.m.

**agricultural land:** land that is, or was within ten years prior to the date of the building permit application for the building project, primarily devoted to the commercial production of horticultural, viticultural, floricultural, dairy, apiary, vegetable, or animal products or of berries, grain, hay, straw, turf, seed, finfish in upland hatcheries, or livestock, and that has long-term commercial significance for agricultural production. Land that meets this definition is agricultural land regardless of how the land is zoned by the local government with zoning jurisdiction over that land.

**air, outdoor:** see ANSI/ASHRAE Standard 62.1

**airflow rate, minimum outdoor:** the rate of outdoor airflow provided by a ventilation system when running when all densely occupied spaces with demand control ventilation are unoccupied.

**alternate on-site sources of water:** see water, alternate on-site sources of.

**annual load factor:** the calculated annual electric consumption, in kWh, divided by the product of the calculated annual peak electric demand, in kW, and 8760 hours.

**attic and other roofs:** see ANSI/ASHRAE/IES Standard 90.1.

**authority having jurisdiction (AHJ):** the agency or agent responsible for enforcing this standard.

**baseline building design:** see ANSI/ASHRAE/IES Standard 90.1.

**baseline building performance:** see ANSI/ASHRAE/IES Standard 90.1.

**basis of design (BOD):** a document that records the concepts, calculations, decisions, and product selections used to meet the owner's project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process. (See owner's project requirements.)

**biobased product:** a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable agricultural materials (including plant, animal, and marine materials) or forestry materials.

**bio-diverse plantings:** nonhomogeneous, multiple-species plantings.

**breathing zone:** see ANSI/ASHRAE Standard 62.1.

**brownfield site:** a site documented as contaminated by means of an ASTM E1903 Phase II Environmental Site Assessment or a site classified as a brownfield by a local, state, or federal government agency.

**building entrance:** see ANSI/ASHRAE/IES Standard 90.1.

**building envelope:** see ANSI/ASHRAE/IES Standard 90.1.

**building project:** a building, or group of buildings, and site that utilize a single submittal for a construction permit or that are within the boundary of contiguous properties under single ownership or effective control (see owner).

**carbon dioxide equivalent (CO<sub>2</sub>e):** a measure used to compare the impact of various greenhouse gases based on their global warming potential (GWP). CO<sub>2</sub>e approximates the time-integrated warming effect of a unit mass of a given greenhouse gas, relative to that of carbon dioxide (CO<sub>2</sub>). GWP is an index for estimating the relative global warming contribution of atmospheric emissions of 1 kg of a particular greenhouse gas compared to emissions of 1 kg of CO<sub>2</sub>. The following GWP values are used based on a 100-year time horizon: 1 for CO<sub>2</sub>, 25 for methane (CH<sub>4</sub>) and 298 for nitrous oxide (N<sub>2</sub>O).

**classroom:** a space primarily used for scheduled instructional activities.

**climate zone:** see Section 5.1.4 of ANSI/ASHRAE/IES Standard 90.1.

**cognizant authority:** see ANSI/ASHRAE Standard 62.1.

**commissioning authority (CxA):** An entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the building commissioning process. (See commissioning process.)

**commissioning plan:** A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the building commissioning process. (See commissioning process.)

**commissioning process:** A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements. (See owner's project requirements.)

**complete operational cycle:** a period of time as long as one year so as to account for climatic variations affecting outdoor water consumption.

**conditioned space:** see ANSI/ASHRAE/IES Standard 90.1.

**construction checklist:** a form used by the contractor to verify that appropriate components are onsite, ready for installation, correctly installed, and functional.

**continuous air barrier:** the combination of interconnected materials, assemblies, and flexible sealed joints and components of the building envelope that provide air tightness to a specified permeability. (See building envelope.)

**continuous daylight dimming:** method of automatic lighting control using daylight photo sensors where the lights are dimmed continuously or use at least four preset levels with at least a five-second fade between levels, and where the control turns the lights off when sufficient daylight is available.

**cycles of concentration:** the ratio of makeup rate to the sum of the blowdown and drift rates.

**daylight area:**

**a. primary sidelighted area (See Figure 3.1):** The total primary sidelighted area is the combined primary sidelighted area without double-counting overlapping areas. The floor area for each primary sidelighted area is directly adjacent to vertical fenestration in exterior wall with an area equal to the product of the primary sidelighted area width and the primary sidelighted area depth. The primary sidelighted area width is the width of the window plus, on each side, the smallest of 1. 2 ft (0.6 m) or 2. the distance to any 60 in. (1.5 m) or higher vertical obstruction. The primary sidelighted area depth is the horizontal distance perpendicular to the glazing which is the smallest of: 1. the distance from the floor to the top of the glazing or 2. the distance to any 60 in (1.5 m) or higher vertical obstruction.

**b. under skylights (see Figure 3.2):** The total daylight area under skylights is the combined daylight area without double-counting overlapping areas. The daylight area under skylights is bounded by the skylight opening, plus horizontally in each direction, the smallest of 1. 70% of the ceiling height [0.7x CH] or 2. the distance to any daylight area under roof monitors or 3. the distance to the front face of any vertical obstruction where any part of the obstruction is farther away from the nearest edge of the skylight opening than 70% of the distance between the top of the obstruction and the ceiling [0.7x (CH- OH)], where CH ≡ the height of the ceiling at the lowest edge of the skylight OH ≡ the height to the top of the obstruction

**c. under roof monitor (see Figure 3.3):** The total daylight area under roof monitors is the combined daylight area without double-counting overlapping areas. The daylight area under roof monitors is equal to the product of the width of the vertical fenestration above the ceiling level and

the smallest of the following horizontal distances inward from the bottom edge of the glazing: 1. the vertical distance from the floor to the bottom edge of the monitor glazing or 2. the distance to the edge of any primary side-lighting area or 3. the distance to the front face of any vertical obstruction where any part of the obstruction is farther away than the difference between obstruction height and the monitor sill height (MSH – OH).

**daylight hours:** the period from 30 minutes after sunrise to 30 minutes before sunset.

**demand control ventilation (DCV):** see ANSI/ASHRAE/IES Standard 90.1.

**densely occupied space:** those spaces with a design occupant density greater than or equal to 25 people per 1000 ft<sup>2</sup> (100 m<sup>2</sup>)

**designated park land:** federal-, state-, or local-government- owned land that is formally designated and set aside as park land or wildlife preserve.

**development footprint:** the total land area of a project site that will be developed with impervious surfaces, constructed as part of the project such as buildings, streets, other areas that have been graded so as to be effectively impervious, and parking areas.

**dwelling unit:** see ANSI/ASHRAE/IES Standard 90.1.

**emergency ride home:** access to transportation home in the case of a personal emergency, or unscheduled overtime for employees who commute via transit, carpool, or vanpool.

**lighting power allowance:** see ANSI/ASHRAE/IES Standard 90.1.

**lighting zone (LZ):** An area defining limitations for outdoor lighting.

**LZ0:** Undeveloped areas within national parks, state parks, forest land, rural areas, and other undeveloped areas as defined by the AHJ.

**LZ1:** Developed areas of national parks, state parks, forest land, and rural areas.

**LZ2:** Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use, and residential mixed-use areas.

**LZ3:** All areas not included in LZ0, LZ1, LZ2, or LZ4.

**LZ4:** High activity commercial districts in major metropolitan areas as designated by the local jurisdiction.

**liner system (Ls):** An insulation system for a metal building roof that includes the following components. A continuous membrane is installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins. For multilayer installations, the last rated R-value of insulation is for unfaced insulation draped over purlins and then compressed when the metal roof panels are attached. A minimum R-3 (R-0.5) thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor, or otherwise noted.

**low-impact trail:** erosion-stabilized pathway or track that utilizes natural groundcover or installed system greater than 50% pervious. The pathway or track is designed and used only for pedestrian and nonmotorized vehicles (excluding power-assisted conveyances for individuals with disabilities).

**maintenance plan:** see maintenance program in ANSI/ASHRAE/ACCA Standard 180.

**minimum outdoor airflow rate:** see airflow rate, minimum outdoor.

**native plants:** see plants, native.

**non-potable water:** see water, non-potable.

**nonresidential:** see ANSI/ASHRAE/IES Standard 90.1.

**north-oriented:** facing within 45 degrees of true north within the northern hemisphere (however, facing within 45 degrees of true south in the southern hemisphere).

**occupiable space:** see ANSI/ASHRAE Standard 62.1.

**office furniture system:** either a panel-based workstation comprised of modular interconnecting panels, hang-on components, and drawer/filing components, or a freestanding grouping of furniture items and their components that have been designed to work in concert.

**on-site renewable energy system:** photovoltaic, solar thermal, geothermal energy, and wind systems used to generate energy and located on the building project.

**once-through cooling:** The use of water as a cooling medium where the water is passed through a heat exchanger one time and is then discharged to the drainage system. This also includes the use of water to reduce the temperature of condensate or process water before discharging it to the drainage system.

**open-graded (uniform-sized) aggregate:** materials such as crushed stone or decomposed granite that provide 30%–40% void spaces.

**open plan workstation:** see ANSI/BIFMA M7.1.

**outdoor air:** see air, outdoor.

**owner:** The party in responsible control of development, construction, or operation of a project at any given time.

**owner's project requirements (OPR):** a written document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

**permanently installed:** see ANSI/ASHRAE/IES Standard 90.1.

**permeable pavement:** pervious concrete or porous asphalt that allows the movement of water and air through the paving material, and primarily used as paving for roads, parking lots, and walkways. Permeable paving materials have an open-graded coarse aggregate with interconnected voids.

**permeable pavers:** units that present a solid surface but allow natural drainage and migration of water into the base below by permitting water to drain through the spaces between the pavers.

**plants:**

- adapted plants:** plants that reliably grow well in a given habitat with minimal attention from humans in the form of winter protection, pest protection, water irrigation, or fertilization once root systems are established in the soil. Adapted plants are considered to be low maintenance but not invasive.
- invasive plants:** Species of plants that are not native to the building project site and that cause or are likely to cause environmental harm. At a minimum, the list of invasive species for a building project site includes plants included in city, county, and regional lists and State and Federal Noxious Weeds laws.
- native plants:** plants that adapted to a given area during a defined time period and are not invasive. In America, the term often refers to plants growing in a region prior to the time of settlement by people of European descent.

**porous pavers (open-grid pavers):** units where at least 40% of the surface area consists of holes or openings that are filled with sand, gravel, other porous material, or vegetation.

**post-consumer recycled content:** proportion of recycled material in a product generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain. (See recycled material.)

**potable water:** see water, potable.

**pre-consumer recycled content:** proportion of recycled material in a product diverted from the waste stream during the manufacturing process. Content that shall not be considered pre-consumer recycled includes the re-utilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it. (See recycled material.)

**private office workstation:** see ANSI/BIFMA M7.1.

**projection factor (PF):** see ANSI/ASHRAE/IES Standard 90.1.

**projection factor, interior:** the ratio of the horizontal depth of the interior shading projection divided by the sum of the height of the fenestration above the interior shading projection and, if the interior projection is below the bottom of the fenestration, the vertical distance from the bottom of the fenestration to the top of the farthest point of the interior shading projection, in consistent units.

**proposed building performance:** see ANSI/ASHRAE/IES Standard 90.1.

**proposed design:** see ANSI/ASHRAE/IES Standard 90.1.

**public way:** A street, alley, transit right of way, or other parcel of land open to the outdoors leading to a street or transit right of way that has been deeded, dedicated, or otherwise permanently appropriated to the public for public use and that has a clear width and height of not less than 10 ft (3 m).

**recovered material:** material that would have otherwise been disposed of as waste or used for energy recovery (e.g., incinerated for power generation), but has instead been collected and recovered as a material input, in lieu of new primary material, for a recycling or a manufacturing process.

**recycled content:** proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content. (See recycled material.)

**recycled material:** material that has been reprocessed from recovered (reclaimed) material by means of a manufacturing process and made into a final product or into a component for incorporation into a product. (See recovered material.)

**residential:** see ANSI/ASHRAE/IES Standard 90.1.

**roof:** see ANSI/ASHRAE/IES Standard 90.1.

**roof area, gross:** see ANSI/ASHRAE/IES Standard 90.1.

**roof monitor:** a raised central portion of a roof having vertical fenestration.

**seating:** task and guest chairs used with office furniture systems.

**semiheated space:** see ANSI/ASHRAE/IES Standard 90.1.

**service water heating:** see ANSI/ASHRAE/IES Standard 90.1.

**sidelighting:** daylighting provided by vertical fenestration mounted below the ceiling plane.

**sidelighting effective aperture:** the relationship of daylight transmitted through windows to the primary sidelighted areas. The sidelighting effective aperture is calculated according to the following formula: Sidelighting Effective Aperture =  $\Sigma$  Window Area X Window VLT / Area of Primary Sidelighted Area where Window VLT is the visible light transmittance of windows as determined in accordance with Section 5.8.2.6 of ASHRAE/IESNA Standard 90.1.

**single-rafter roof:** see ANSI/ASHRAE/IES Standard 90.1.

**skylight:** see ANSI/ASHRAE/IES Standard 90.1.

**site:** a contiguous area of land that is under the ownership or control of one entity.

**smart controller (weather-based irrigation controller):** a device that estimates or measures depletion of water from the soil moisture reservoir and operates an irrigation system to replenish water as needed while minimizing excess.

**soil gas retarder system:** a combination of measures that retard vapors in the soil from entering the occupied space.

**solar energy system:** any device or combination of devices or elements that rely upon direct sunlight as an energy source, including but not limited to any substance or device that collects sunlight for use in: a. the heating or cooling of a structure or building; b. the heating or pumping of water; c. industrial, commercial, or agricultural processes; or d. the generation of electricity.

**solar heat gain coefficient (SHGC):** see ANSI/ASHRAE/IES Standard 90.1.

**solar reflectance index (SRI):** a measure of a constructed surface's ability to reflect solar heat, as shown by a small temperature rise. A standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100.

**SWAT:** smart water application technology as defined by the Irrigation Association.

**toplighting:** lighting building interiors with daylight admitted through fenestration located on the roof such as skylights and roof monitors.

**tubular daylighting device:** a means to capture sunlight from a rooftop. Sunlight is then redirected down from a highly reflective shaft and diffused throughout interior space.

**turfgrass:** grasses that are regularly mowed and, as a consequence, form a dense growth of leaf blades, shoots, and roots.

**vendor:** a company that furnishes products to project contractors and/or subcontractors for on-site installation.

**variable air volume (VAV) system:** see ANSI/ASHRAE/IES Standard 90.1.

**verification:** the process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the owner's project requirements. (See owner's project requirements.)

**vertical fenestration:** see ANSI/ASHRAE/IES Standard 90.1.

**wall:** see ANSI/ASHRAE/IES Standard 90.1.

**wall area, gross:** see ANSI/ASHRAE/IES Standard 90.1.

**water, alternate on-site sources of:** alternate on-site sources of water include, but are not limited to: a. rainwater or stormwater harvesting, b. air conditioner condensate, c. gray water from interior applications and treated as required, d. swimming pool filter backwash water, e. cooling tower blowdown water, f. foundation drain water, g. industrial process water, or h. on-site wastewater treatment plant effluent.

**water, non-potable:** water that is not potable water. (See water, potable.)

**water, potable:** water from public drinking water systems or from natural freshwater sources such as lakes, streams, and aquifers where water from such natural sources would or could meet drinking water standards.

**water factor (WF):**

a. **clothes washer (residential and commercial):** the quantity of water in gal (L) used to wash each ft<sup>3</sup> (m<sup>3</sup>) of machine capacity.

b. **residential dishwasher:** the quantity of water use in gal (L) per full machine wash and rinse cycle.

**weatherproofing system:** a group of components including associated adhesives and primers that when installed create a protective envelope against water and wind.

**wetlands:** those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. This definition incorporates all areas that

would meet the definition of "wetlands" under applicable federal or state guidance whether or not they are officially designated, delineated, or mapped, including man-made areas that are designed, constructed, or restored to include the ecological functions of natural wetlands.  
yearly average day-night average sound levels: level of the time-mean-square A-weighted sound pressure averaged over a one-year period with ten dB added to sound levels occurring in each night-time period from 2200 hours to 0700 hours, expressed in dB.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

### 3.3 Abbreviations and Acronyms

AC alternating current

AHJ authority having jurisdiction

AHRI Air-Conditioning, Heating, and Refrigeration Institute

ANSI American National Standards Institute

ASHP air-source heat pump

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ASME American Society of Mechanical Engineers

ASTM American Society for Testing and Materials International

BIFMA The Business and Institutional Furniture Manufacturer's Association

BMS Building Management System

BOD basis of design

Btu British thermal unit

Btu/h British thermal unit per hour

CDPH California Department of Public Health

CFC chlorofluorocarbon

cfm ft<sup>3</sup>/min

ci continuous insulation

CIE Commission Internationale de L'Eclairage (International Commission on Illumination)

CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora

cm centimeter

CO<sub>2</sub> carbon dioxide

CO<sub>2</sub>e carbon dioxide equivalent

CSA Canadian Standards Association

CxA commissioning authority

dB decibel

DB dry bulb

DC direct current

DCV demand control ventilation

DX direct expansion

EA effective aperture for vertical fenestration

EISA Energy Independence and Security Act

EMS Energy Management System

EPAct U.S. Energy Policy Act

ESC erosion and sedimentation control

ET<sub>c</sub> evapotranspiration

ET<sub>o</sub> maximum evapotranspiration

ETS environmental tobacco smoke

fc footcandle

FF&E furniture, fixtures, and equipment

ft foot

gal gallon

gpm gallons per minute

GWP global warming potential

h hour

ha hectare

HCFC hydrochlorofluorocarbon

HVAC heating, ventilation, and air conditioning

HVAC&R heating, ventilation, air conditioning, and refrigeration

IAPMO International Association of Plumbing and Mechanical Officials

I-P inch-pound

IA Irrigation Association

IAQ indoor air quality

IEQ indoor environmental quality

IES Illuminating Engineering Society of North America

in. inch

kg kilogram

kL kiloliter

km kilometer

kVA kilovolt-ampere

*kW* kilowatt  
*kWh* kilowatt-hour  
*L* liter  
*lb* pound  
*LCA* life-cycle assessment  
*LID* low impact development  
*lm* lumen  
*LPD* lighting power density  
*Ls* liner system  
*LZ* lighting zone  
*m* meter  
*M&V* measurement and verification  
*µg* microgram  
*mg* milligram  
*MCWB* maximum coincident wet bulb  
*MDF* medium density fiberboard  
*MERV* minimum efficiency reporting value  
*mi* mile  
*min* minute  
*MJ* megaJoule  
*mm* millimeter  
*mph* miles per hour  
*NA* not applicable  
*NAECA* National Appliance Energy Conservation Act  
*NC* noise criterion  
*NR* not required  
*O&M* operation and maintenance  
*OITC* outdoor-indoor transmission class  
*OPR* owner's project requirements  
*Pa* Pascal  
*PF* projection factor  
*ppb* parts per billion  
*ppm* parts per million  
*s* second  
*SCAQMD* South Coast Air Quality Management District  
*SHGC* solar heat gain coefficient  
*SMACNA* Sheet Metal and Air Conditioning Contractors National Association  
*SRI* solar reflectance index  
*STC* sound transmission class  
*TMP* transportation management plan  
*UL* Underwriters Laboratory  
*USDA* United States Department of Agriculture  
*USDOE* United States Department of Energy  
*USEPA* United States Environmental Protection Agency  
*USFEMA* United States Federal Emergency Management Agency  
*USGBC* United States Green Building Council  
*USGSA* United States General Services Administration  
*VAV* variable air volume  
*VOC* volatile organic compound  
*VRF* variable refrigerant flow system  
*WB* wet bulb  
*WF* water factor  
*yr* year

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

## 2011 ASHRAE 189.1 – Chapter 4 – Administration and Enforcement

**4.1 General.** Building projects shall comply with Sections 4 through 11. Within each of those sections, building projects shall comply with all Mandatory Provisions (x.3); and, where offered, either a. Prescriptive Option (x.4) or b. Performance Option (x.5).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**4.1.1 Normative Appendices.** The normative appendices to this standard are considered to be integral parts of the mandatory requirements of this standard, which for reasons of convenience, are placed apart from all other normative elements.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**4.1.2 Informative Appendices.** The informative appendices to this standard and informative notes located within this standard contain additional information and are not mandatory or part of this standard.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

## 2011 ASHRAE 189.1 – Chapter 5 – Site Sustainability

**5.1 Scope.** This section addresses requirements for building projects that pertain to site selection, site development, mitigation of heat island effect, and light pollution reduction.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**5.2 Compliance.** The site shall comply with Section 5.3, "Mandatory Provisions," and either a. Section 5.4, "Prescriptive Option," or b. Section 5.5, "Performance Option."

**PROPOSED ACTION:** Adopt with the following modifications(see sections 5.3, 5.4 and 5.5 below)

**RATIONALE / IMPACT:** To align with IgCC and other County adopted regulations and codes

**5.3.1 Site Selection.** The building project shall comply with 5.3.1.1 and 5.3.1.2.

**PROPOSED ACTION:** Delete

**RATIONALE / IMPACT:** Regulated by M-NCPPC and DPS (Article 59 – County Zoning Ordinance)

**5.3.1.1 Allowable Sites.** The building project shall take place on one of the following: a. in an existing building envelope. b. on a brownfield site. c. on a greyfield site. d. on a greenfield site that is within 1/2 mi (800 m) of residential land that is developed, or that has one or more buildings under construction, with an average density of 10 dwelling units per acre (4 units per ha) unless that site is agricultural land or forest land. Proximity is determined by drawing a circle with a 1/2 mi (800 m) radius around the center of the proposed site. e. on a greenfield site that is within 1/2 mi (800 m) of not less than ten basic services and that has pedestrian access between the building and the services unless that site is agricultural land or forest land. Basic services include, but are not limited to: (1) financial institutions, (2) places of worship, (3) convenience or grocery stores, (4) day care facilities, (5) dry cleaners, (6) fire stations, (7) beauty shops, (8) hardware stores, (9) laundry facilities, (10) libraries, (11) medical/dental offices, (12) senior care facilities, (13) parks, (14) pharmacies, (15) post offices, (16) restaurants, (17) schools, (18) supermarkets, (19) theaters, (20) community centers, (21) fitness centers, (22) museums, and (23) local government facilities. Proximity is determined by drawing a circle with a 1/2 mi (800 m) radius around the center of the proposed site. f. on a greenfield site that is either within 1/2 mi (800 m) of an existing, or planned and funded, commuter rail, light rail or subway station or within 1/4 mi (400 m) of adequate transit service usable by building occupants unless that site is agricultural land or forest land. Proximity is determined by drawing a circle with a 1/2 mi (800 m) radius around the center of the proposed site. g. on a greenfield site that is agricultural land and the building's purpose is related to the agricultural use of the land. h. on a greenfield site that is forest land and the building's purpose is related to the forestry use of the land. i. on a greenfield site that is designated park land and the building's purpose is related to the use of the land as a park.

**PROPOSED ACTION:** Delete

**RATIONALE / IMPACT:** Regulated by M-NCPPC and DPS (Article 59 – County Zoning Ordinance)

**5.3.1.2 Prohibited Development Activity.** There shall be no site disturbance or development of the following: a. previously undeveloped land having an elevation lower than 5 ft (1.5 m) above the elevation of the 100 year flood as defined by USFEMA. Exception to 5.3.1.2a: In alluvial "AO" designated flood zones, development is allowed when provided with engineered floodproofing for building structures up to an elevation that is at least as high as the minimum lowest floor elevation determined by the AHJ. Drainage paths shall be constructed to guide floodwaters around and away from the structures. b. within 150 ft (50 m) of any fish and wildlife habitat conservation area unless the site disturbance or development involves plantings or habitat enhancement of the functions and values of the area. c. within 100 ft (35 m) of any wetland unless the site disturbance or development involves plantings or habitat enhancement of the functions and values of the wetland. **Exception to 5.3.1.2:** Development of a low-impact trail is allowed within 15 ft (4.5 m) of a fish and wildlife habitat conservation area or wetland.

**PROPOSED ACTION:** Delete

**RATIONALE / IMPACT:** Regulated by FEMA, MDE and DPS (Article 19 of County Code – Sediment Control)

**5.3.2.1 Site Hardscape.** For the purposes of this section, the site hardscape includes roads, sidewalks, courtyards, and parking lots but not the constructed building surfaces and not any portion of the site hardscape covered by photovoltaic panels generating electricity or other solar energy systems used for space heating or water heating. At least 50% of the site hardscape shall be provided with one or any combination of the following: a. existing trees and vegetation or new bio-diverse plantings of native plants and adapted plants located to provide shade within ten years of issuance of the final certificate of occupancy. The effective shade coverage on the hardscape shall be the arithmetic mean of the shade coverage calculated at 10 a.m., noon, and 3 p.m. on the summer solstice. b. paving materials with a minimum initial SRI of 29. A default SRI value of 35 for new concrete without added color pigment is allowed to be used instead of measurements. c. open-graded (uniform-sized) aggregate, permeable pavement, permeable pavers, and porous pavers (open-grid pavers). Permeable pavement and permeable pavers shall have a percolation rate of not less than 2 gal/ min-ft<sup>2</sup> (100 L/min·m<sup>2</sup>). d. shading through the use of structures, provided that the top surface of the shading structure complies with the provisions of Section 5.3.2.3. e. parking under a building, provided that the roof of the building complies with the provisions of Section 5.3.2.3. f. buildings or structures that provide shade to the site hardscape. The effective shade coverage on the hardscape shall be the arithmetic mean of the shade coverage calculated at 10 a.m., noon, and 3 p.m. on the summer solstice. **Exception:** Section 5.3.2.1 shall not apply to building projects in climate zones 6, 7, and 8.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice: may represent significant cost impact for some projects

**5.3.2.2 Walls.** Above-grade building walls and retaining walls shall be shaded in accordance with this section. The building is allowed to be rotated up to 45 degrees to the nearest cardinal orientation for purposes of calculations and showing compliance. Compliance with this section shall be achieved through the use of shade-providing plants, man-made structures, existing buildings, hillsides, permanent building projections, on-site renewable energy systems or a combination of these, using the following criteria: a. shade shall be provided on at least 30% of the east and west above-grade walls and retaining walls from grade level to a height of 20 ft (6 m) above grade or the top of the exterior wall, whichever is less, within five years of issuance of the final certificate of occupancy. Shade coverage shall be calculated at 10 a.m. for the east walls and 3 p.m. for the west walls on the summer solstice. b. where shading is provided by vegetation, such vegetation (including trees) shall be existing trees and vegetation or new bio-diverse plantings of native plants and adapted plants and appropriately sized, selected, planted, and maintained so that they do not interfere with overhead or underground utilities. Such trees shall be placed a minimum of 5 ft (1.5 m) from and within 50 ft (15 m) of the building or retaining wall. **Exceptions:** 1. The requirements of this section are satisfied if 75% or more of the opaque wall surfaces on the east and west have a minimum SRI of 29. Each wall is allowed to be considered separately for this exception. 2. East wall shading is not required for buildings located in climate zones 5, 6, 7, and 8. West wall shading is not required for buildings located in climate zones 7 and 8.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice, may be difficult to implement for all projects and will have some cost impact

**5.3.2.3 Roofs.** This section applies to the building and covered parking roof surfaces for building projects in climate zones 1, 2, and 3. A minimum of 75% of the entire roof surface not used for roof penetrations and associated equipment, on-site renewable energy systems such as photovoltaics or solar thermal energy collectors including necessary space between rows of panels or collectors, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetated (green) roofing systems shall be covered with products that comply with one or more of the following: a. have a minimum initial SRI of 78 for a low-sloped roof (a slope less than or equal to 2:12) and a minimum initial SRI of 29 for a steep-sloped roof (a slope of more than 2:12). b. comply with the criteria for the USEPA's ENERGY STAR Program Requirements for Roof Products—Eligibility Criteria. **Exceptions:** 1. Building projects where an annual energy analysis simulation demonstrates that the total annual building energy cost and total annual CO<sub>2</sub>e, as calculated in accordance with Sections 7.5.2 and 7.5.3, are both a minimum of 2% less for the proposed roof than for a roof material complying with the requirements of Section 5.3.2.3(a), or 2. Roofs used to shade or cover parking and roofs over semi-heated spaces provided that they have a minimum initial SRI of 29. A default SRI value of 35 for new concrete without added color pigment is allowed to be used instead of measurements.

**PROPOSED ACTION:** N/A does not apply to climate zone 4

**RATIONALE / IMPACT:** No action required

**5.3.2.4 Solar Reflectance Index.** The SRI shall be calculated in accordance with ASTM E1980 for medium-speed wind conditions. The SRI shall be based upon solar reflectance as measured in accordance with ASTM E1918 or ASTM C1549, and the thermal emittance as measured in accordance with ASTM E408 or ASTM C1371. For roofing products, the values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization, and shall be certified by the manufacturer. For building materials other than roofing products, the values for solar reflectance and thermal emittance shall be determined by an independent third party.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**5.3.3.1 General.** Exterior lighting systems shall comply with Section 9 of ANSI/ASHRAE/IES Standard 90.1 and with Sections 5.3.3.2 and 5.3.3.3 of this standard.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Consistent with current practice

**5.3.3.2 Backlight and Glare a.** All building-mounted luminaires located less than two mounting heights from any property line shall meet the maximum allowable Glare Ratings in Table 5.3.3.2B. **b.** All other luminaires shall meet the maximum allowable Backlight and Glare Ratings in Table 5.3.3.2A.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Consistent with current practice

**5.3.3.3 Uplight.** All exterior lighting shall meet one of the following Uplight requirements: **a.** Exterior luminaires shall meet the maximum allowable Uplight Ratings of Table 5.3.3.2A or **b.** Exterior lighting shall meet the Uplight requirements of Table 5.3.3.3. **Exceptions:** 1. Lighting in lighting zones 3 and 4, solely for uplighting structures, building facades, or landscaping. 2. Lighting in lighting zones 1 and 2, solely for uplighting structures, building facades, or landscaping provided the applicable lighting power densities do not exceed 50% of the lighting power allowances in ANSI/ASHRAE/IES Standard 90.1, Table 9.4.3B.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Consistent with current practice

**TABLE 5.3.3.2A Maximum Allowable Backlight, Uplight, and Glare (BUG) Ratings<sup>1, 2, 3, 4</sup>**

	LZ0	LZ1	LZ2	LZ3	LZ4
<b>Allowed Backlight Rating</b>					
>2 mounting heights from property line	B0	B1	B2	B3	B4
1 to 2 mounting heights from property line	B0	B1	B2	B3	B3
0.5 to 1 mounting height to property line	B0	B0	B1	B2	B2
<0.5 mounting height to property line	B0	B0	B0	B1	B2
<b>Allowed Uplight Rating</b>					
	U0	U1	U2	U3	U4
<b>Allowed Glare Rating</b>					
	G0	G1	G2	G3	G4

**Notes to Table 5.3.3.2A:**

- Fixtures mounted two mounting heights or less from a property line shall have backlight towards the property line, except when mounted on buildings.
- For property lines that abut public walkways, bikeways, plazas, and parking lots, the property line may be considered to be 5 feet (1.5 m) beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
- If the luminaire is installed in other than the intended manner, or is an adjustable luminaire for which the aiming is specified, the rating shall be determined by the actual photometric geometry in the aimed orientation.
- Backlight, Uplight, and Glare ratings are defined based on specific lumen limits per IES TM-15 Addendum A.

**TABLE 5.3.3.2B Maximum Allowable Glare Ratings for Building Mounted Luminaires Within Two Mounting Heights of Any Property Line.**

	LZ0	LZ1	LZ2	LZ3	LZ4
Glare	G0	G0	G1	G1	G2

**Notes to Table 5.3.3.2B:**

- For property lines that abut public walkways, bikeways, plazas, and parking lots, the property line may be considered to be 5 feet (1.5 m) beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
- Backlight, Uplight, and Glare ratings are defined based on specific lumen limits per IES TM-15 Addendum A.

**TABLE 5.3.3.3 Maximum Allowable Percentage of Uplight**

	LZ0	LZ1	LZ2	LZ3	LZ4
Percentage of total exterior fixture lumens allowed to be emitted above 90 degrees or higher from nadir (straight down)	0%	0%	1%	2%	5%

**Exceptions to Sections 5.3.3.2 and 5.3.3.3:** 1. Specialized signal, directional, and marker lighting associated with transportation. 2. Advertising signage or directional signage. 3. Lighting integral to equipment or instrumentation and installed by its manufacturer. 4. Lighting for theatrical purposes, including performance, stage, film production, and video production. 5. Lighting for athletic playing areas. 6. Lighting that is in use for no more than 60 continuous days and is not reinstalled any sooner than 60 days after being uninstalled. 7. Lighting for industrial production, material handling, transportation sites, and associated storage areas. 8. Theme elements in theme/amusement parks. 9. Roadway lighting required by governmental authorities. 10. Lighting classified for and used in hazardous locations as specified in NFPA 70. 11. Lighting for swimming pools and water features.

**PROPOSED ACTION:** Adopt as written with the following modification: add the following exceptions (to be consistent with Proposed Action for IgCC 409.2):

- Lighting used to highlight features of public monuments and registered landmark structures.
- Means of egress and emergency lighting
- Lighting for public safety
- Lighting for security

**RATIONALE / IMPACT:** To minimize vandalism and provide safe environments.

**5.3.4.1 Invasive Plants.** Invasive plants shall be removed from the building project site and destroyed or disposed of in a land fill. Invasive plants shall not be planted on the building project site.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**5.3.5.1.1 Walkways.** Each primary building entrance shall be provided with a pedestrian walkway that extends to either a public way or a transit stop. Walkways across parking lots shall be clearly delineated.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**5.4.1 Site Development.** Building projects shall comply with Sections 5.4.1.1 and 5.4.1.2.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**5.4.1.1 Effective Pervious Area for All Sites.** A minimum of 40% of the entire site shall incorporate one or any combination of the following: a. shall be vegetated with a minimum depth of growing medium of 12 in. (300 mm). Such vegetated areas include bioretention facilities, rain gardens, filter strips, grass swales, vegetated level spreaders, constructed wetlands, planters, and open space with plantings. At least 60% of the vegetated area shall consist of biodiverse planting of native plants and/or adapted plants other than turfgrass. b. shall have a vegetated (green) roof with a minimum depth of growing medium of 3 in. (75 mm). c. shall have porous pavers (open grid pavers). d. shall have permeable pavement, permeable pavers, or open graded (uniform-sized) aggregate with a minimum percolation rate of 2 gal/min·ft<sup>2</sup> (100 L/min·m<sup>2</sup>) and a minimum of 6 in. (150 mm) of open-graded base below. **Exceptions:** 1. The effective pervious surface is allowed to be reduced to a minimum of 20% of the entire site if 10% of the average annual rainfall for the entire development footprint is captured on site and reused for site or building water use. 2. The effective pervious surface is not required if 50% of the average annual rainfall for the entire development footprint is captured on site and reused for site or building water use. 3. Locations with less than 10 in. (250 mm) of average annual rainfall. 4. Areas of building projects on a brownfield site where contamination has been left in place.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**5.4.1.2 Greenfield Sites.** On a greenfield site: a. where more than 20% of the area of the predevelopment site has existing native plants or adapted plants, a minimum of 20% of the area of native plants or adapted plants shall be retained. b. where 20% or less of the area of the predevelopment site has existing native plants or adapted plants, a minimum of 20% of the site shall be developed or retained as vegetated area. Such vegetated areas include bioretention facilities, rain gardens, filter strips, grass swales, vegetated level spreaders, constructed wetlands, planters, and open space with plantings. A minimum of 60% of such vegetated area shall consist of biodiverse planting of native plants and/or adapted plants other than turfgrass. **Exception to 5.4.1.2(b):** Locations with less than 10 in. (250 mm) of average annual rainfall.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**5.5.1 Site Development.** Building projects shall comply with the following: a. If the project is in an existing building envelope, a minimum of 20% of the average annual rainfall on the development footprint shall be managed through infiltration, reuse, or ET. b. If the project is not in an existing building envelope, but is on a greyfield site or a brownfield site, a minimum of 40% of the average annual rainfall on the development footprint shall be managed through infiltration, reuse, or ET. c. For all other sites, a minimum of 50% of the average annual rainfall on the development footprint shall be managed through infiltration, reuse, or ET.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

## 2011 ASHRAE 189.1 – Chapter 6 – Water Use Efficiency

**6.1 Scope.** This section specifies requirements for potable water and non-potable water use efficiency, both for the site and for the building, and water monitoring.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**6.2 Compliance.** The water systems shall comply with Section 6.3, "Mandatory Provisions," and either a. Section 6.4, "Prescriptive Option," or b. Section 6.5, "Performance Option." Site water use and building water use are not required to use the same option, i.e., prescriptive or performance, for demonstrating compliance.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**6.3.1.1 Landscape Design.** A minimum of 60% of the area of the improved landscape shall be in bio-diverse planting of native plants and adapted plants other than turfgrass. **Exception:** The area of dedicated athletic fields, golf courses, and driving ranges shall be excluded from the calculation of the improved landscape for schools, residential common areas, or public recreational facilities.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.3.1.2 Irrigation System Design.** Hydrozoning of automatic irrigation systems to water different plant materials such as turfgrass versus shrubs is required. Landscaping sprinklers shall not be permitted to spray water directly on a building and within 3 ft (1 m) of a building.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.3.1.3 Controls.** Any irrigation system for the project site shall be controlled by a qualifying smart controller that uses ET and weather data to adjust irrigation schedules and that complies with the minimum requirements or an on-site rain or moisture sensor that automatically shuts the system off after a predetermined amount of rainfall or sensed moisture in the soil. Qualifying smart controllers shall meet the minimum requirements as listed below when tested in accordance with IA SWAT Climatological Based Controllers 8th Draft Testing Protocol. Smart controllers that use ET shall use the following inputs for calculating appropriate irrigation amounts: a. Irrigation adequacy—80% minimum ET c b. Irrigation excess—not to exceed 10%. **Exception:** A temporary irrigation system used exclusively for the establishment of new landscape shall be exempt from this requirement. Temporary irrigation systems shall be removed or permanently disabled at such time as the landscape establishment period has expired.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.3.2.1 Plumbing Fixtures and Fittings.** Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following requirements: a. Water closets (toilets)—flushometer valve type: For single flush, maximum flush volume shall be determined in accordance with ASME A112.19.2/CSA B45.1 and shall be 1.28 gal (4.8 L). For dual-flush, the effective flush volume shall be determined in accordance with ASME A112.19.14 and shall be 1.28 gal (4.8 L). b. Water closets (toilets)—tank-type: Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Tank-Type High-Efficiency Toilet Specification and shall have a maximum flush volume of 1.28 gal (4.8 L). c. Urinals: Maximum flush volume when determined in accordance with ASME A112.19.2/CSA B45.1—0.5 gal (1.9 L). Non-water urinals shall comply with ASME A112.19.19 (vitreous china) or IAPMO Z124.9 (plastic) as appropriate. d. Public lavatory faucets: Maximum flow rate—0.5 gpm (1.9 L/min) when tested in accordance with ASME A112.18.1/CSA B125.1. e. Public metering self-closing faucet: Maximum water use—0.25 gal (1.0 L) per metering cycle when tested in accordance with ASME A112.18.1/CSA B125.1. f. Residential bathroom lavatory sink faucets: Maximum flow rate—1.5 gpm (5.7 L/min) when tested in accordance with ASME A112.18.1/CSA B125.1. Residential bathroom lavatory sink faucets shall comply with the performance criteria of the USEPA WaterSense High-Efficiency Lavatory Faucet Specification. g. Residential kitchen faucets: Maximum flow rate—2.2 gpm (8.3 L/min) when tested in accordance with ASME A112.18.1/CSA B125.1. h. Residential shower showerheads: Maximum flow rate—2.0 gpm (7.6 L/min) when tested in accordance with ASME A112.18.1/CSA B125.1. i. Residential shower compartment (stall) in dwelling units and guest rooms: The allowable flow rate from all shower outlets (including rain systems, waterfalls, bodysprays, and jets) that can operate simultaneously shall be limited to a total of 2.0 gpm (7.6 L/min). **Exception:** Where the area of a shower compartment exceeds 2600 in.<sup>2</sup> (1.7 m<sup>2</sup>) an additional flow of 2.0 gpm (7.6 L/min) shall be permitted for each multiple of 2600 in.<sup>2</sup> (1.7 m<sup>2</sup>) of floor area or fraction thereof.

**PROPOSED ACTION:** Delete

**RATIONALE/IMPACT:** Regulated by WSSC, w/ local amendments to 2012 IPC.

**6.3.2.2 Appliances.** a. Clothes washers and dishwashers installed within dwelling units shall comply with the ENERGY STAR Program Requirements for Clothes Washers and ENERGY STAR Program Requirements for Dishwashers. Maximum water use shall be as follows: 1. Clothes Washers—maximum Water Factor of 6.0 gal/ft<sup>3</sup> of drum capacity (800 L/m<sup>3</sup> of drum capacity). 2. Dishwashers—maximum Water Factor of 5.8 gal/ full operating cycle (22 L/full operating cycle). (See also the energy efficiency requirements in Section 7.4.7.3.) b. Clothes washers installed in publicly accessible spaces (e.g., multifamily and hotel common areas) and coin-and card-operated clothes washers of any size used in laundromats shall have a maximum Water Factor of 7.5 gal/ft<sup>3</sup> of drum capacity-normal cycle (1.0 kL/m<sup>3</sup> of drum capacity-normal cycle). (See also the energy efficiency requirements in Sections 7.4.7.3 and 7.4.7.4.)

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 6.3.2.1 Plumbing Fixtures and Fittings Requirements**

Plumbing Fixture	Maximum
Water closets (toilets)—flushometer valve type	Single flush volume of 1.28 gal (4.8 L)
Water closets (toilets)—flushometer valve type	Effective dual flush volume of 1.28 gal (4.8 L)
Water closets (toilets)—tank-type	Single flush volume of 1.28 gal (4.8 L)
Water closets (toilets)—tank-type	Effective dual flush volume of 1.28 gal (4.8 L)
Urinals	Flush volume 0.5 gal (1.9 L)
Public lavatory faucets	Flow rate—0.5 gpm (1.9 L/min)
Public metering self-closing faucet	0.25 gal (1.0 L) per metering cycle
Residential bathroom lavatory sink faucets	Flow rate—1.5 gpm (5.7 L/min)
Residential kitchen faucets	Flow rate— 2.2 gpm (8.3 L/min)
Residential showerheads	Flow rate—2.0 gpm (7.6 L/min)
Residential shower compartment (stall) in <i>dwelling units</i> and guest rooms	Flow rate from all shower outlets total of 2.0 gpm (7.6 L/min)

**6.3.2.3 HVAC Systems and Equipment** a. Once-through cooling with potable water is prohibited. b. Cooling towers and evaporative coolers shall be equipped with makeup and blowdown meters, conductivity controllers, and overflow alarms in accordance with the thresholds listed in Table 6.3.3B. Cooling towers shall be equipped with efficient drift eliminators that achieve drift reduction to a maximum of 0.002% of the recirculated water volume for counterflow towers and 0.005% of the recirculated water flow for cross-flow towers. c. Building projects located in regions where the ambient mean coincident wet-bulb temperature at 1% design cooling conditions is greater than or equal to 72°F (22°C) shall have a system for collecting condensate from air-conditioning units with a capacity greater than 65,000 Btu/h (19 kW), and the condensate shall be recovered for re-use.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.3.2.4 Roofs** a. The use of potable water for roof spray systems to thermally condition the roof is prohibited. b. The use of potable water for irrigation of vegetated (green) roofs is prohibited once plant material has been established. After the landscape establishment period is completed, the potable water irrigation system shall be removed or permanently disconnected.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.3.3.1 Consumption Management.** Measurement devices with remote communication capability shall be provided to collect water consumption data for the domestic water supply to the building. Both potable and reclaimed water entering the building project shall be monitored or submetered. In addition, for individual leased, rented, or other tenant or subtenant space within any building totaling in excess of 50,000 ft<sup>2</sup> (5000 m<sup>2</sup>) separate submeters shall be provided. For subsystems with multiple similar units, such as multi-cell cooling towers, only one measurement device is required for the subsystem. Any project or building, or tenant or sub-tenant space within a project or building, such as a commercial car wash or aquarium, shall be submetered where consumption is projected to exceed 1000 gal/day (3800 L/day). Measurement devices with remote capability shall be provided to collect water use data for each water supply source (e.g., potable water, reclaimed water, rainwater) to the building project that exceeds the thresholds listed in Table 6.3.3A. Utility company service entrance/interval meters are allowed to be used. Provide submetering with remote communication measurement to collect water use data for each of the building subsystems, if such subsystems are sized above the threshold levels listed in Table 6.3.3B.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 6.3.3A Water Supply Source  
Measurement Thresholds**

Water Source	Main Measurement Threshold
Potable water	1000 gal/day (3800 L/day)
Municipally reclaimed water	1000 gal/day (3800 L/day)
Alternate sources of water	500 gal/day (1900 L/day)

**6.3.3.2 Consumption Data Collection.** All building measurement devices, monitoring systems, and submeters installed to comply with the thresholds limits in Section 6.3.3.1 shall be configured to communicate water consumption data to a meter data management system. At a minimum, meters shall provide daily data and shall record hourly consumption of water.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 6.3.3B Subsystem Water Measurement Thresholds**

Subsystem	Sub-Metering Threshold
Cooling towers (meter on makeup water and blowdown)	Cooling tower flow through tower >500 gpm (30 L/s)
Evaporative coolers	Makeup water >0.6 gpm (0.04 L/s)
Steam and hot-water boilers	>500,000 Btu/h (50 kW) input
Total Irrigated landscape area with controllers	>25,000 ft <sup>2</sup> (2500 m <sup>2</sup> )
Separate campus or project buildings	Consumption >1000 gal/day (3800 L/day)
Separately leased or rental space	Consumption >1000 gal/day (3800 L/day)
Any large water using process	Consumption >1000 gal/day (3800 L/day)

**6.3.3.3 Data Storage and Retrieval.** The meter data management system shall be capable of electronically storing water meter, monitoring systems, and submeter data and creating user reports showing calculated hourly, daily, monthly, and annual water consumption for each measurement device and submeter and provide alarming notification capabilities as needed to support the requirements of the Water User Efficiency Plan for Operation in Section 10.3.2.1.2.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.4.1 Site Water Use Reduction.** For golf courses and driving ranges, only municipally reclaimed water and/or alternate on-site sources of water shall be used to irrigate the landscape. For other landscaped areas, a maximum of one-third of improved landscape area is allowed to be irrigated with potable water. The area of dedicated athletic fields shall be excluded from the calculation of the improved landscape for schools, residential common areas, or public recreational facilities. All other irrigation shall be provided from alternate on-site sources of water or municipally reclaimed water. **Exception:** Potable water is allowed to be temporarily used on such newly installed landscape for the landscape establishment period. The amount of potable water that may be applied to the newly planted areas during the temporary landscape establishment period shall not exceed 70% of ET<sub>o</sub> for turfgrass and 55% of ET<sub>o</sub> for other plantings. If municipally-reclaimed water is available at a water main within 200 ft (60 m) of the project site, it shall be used in lieu of potable water during the landscape establishment period. After the landscape establishment period has expired, all irrigation water use shall comply with the requirements established elsewhere in this standard.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.4.2.1 Cooling Towers.** The water being discharged from cooling towers for air conditioning systems such as chilled-water systems shall be limited in accordance with method (a) or (b): a. For makeup waters having less than 200 ppm (200 mg/L) of total hardness expressed as calcium carbonate, by achieving a minimum of five cycles of concentration. b. For makeup waters with more than 200 ppm (200 mg/L) of total hardness expressed as calcium carbonate, by achieving a minimum of 3.5 cycles of concentration. **Exception:** Where the total dissolved solids concentration of the discharge water exceeds 1500 mg (1500 ppm/L), or the silica exceeds 150 ppm (150 mg/L) measured as silicon dioxide before the above cycles of concentration are reached.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.4.2.2 Commercial Food Service Operations.** Commercial food service operations (e.g., restaurants, cafeterias, food preparation kitchens, caterers, etc.): a. shall use high-efficiency pre-rinse spray valves (i.e., valves which function at 1.3 gpm (4.9 L/min) or less and comply with a 26-second performance requirement when tested in accordance with ASTM F2324), b. shall use dishwashers that comply with the requirements of the ENERGY STAR Program for Commercial Dishwashers, c. shall use boilerless/connectionless food steamers that consume no more than 2.0 gal/hour (7.5 L/hour) in the full operational mode, d. shall use combination ovens that consume not more than 10 gal/hour (38 L/hour) in the full operational mode, e. shall use air-cooled ice machines that comply with the requirements of the ENERGY STAR Program for Commercial Ice Machines, and f. shall be equipped with hands-free faucet controllers (foot controllers, sensor-activated, or other) for all faucet fittings within the food preparation area of the kitchen and the dish room, including pot sinks and washing sinks.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.4.2.3 Medical and Laboratory Facilities.** Medical and laboratory facilities, including clinics, hospitals, medical centers, physician and dental offices, and medical and non-medical laboratories of all types shall: a. use only water-efficient steam sterilizers equipped with (1) water-tempering devices that allow water to flow only when the discharge of condensate or hot water from the sterilizer exceeds 140°F (60°C) and (2) mechanical vacuum equipment in place of venturi-type vacuum systems for vacuum sterilizers. b. use film processor water recycling units where large frame x-ray films of more than 6 in. (150 mm) in either length or width are processed. Small dental x-ray equipment is exempt from this requirement. c. use digital imaging and radiography systems where the digital networks are installed. d. use a dry-hood scrubber system or, if the applicant determines that a wet-hood scrubber system is required, the scrubber shall be equipped with a water recirculation system. For perchlorate hoods and other applications where a hood wash-down system is required, the hood shall be equipped with self-closing valves on those wash-down systems. e. use only dry vacuum pumps, unless fire and safety codes for explosive, corrosive or oxidative gasses require a liquid ring pump. f. use only efficient water treatment systems that comply with the following criteria: 1. For all filtration processes, pressure gauges shall determine and display when to backwash or change cartridges. 2. For all ion exchange and softening processes, recharge cycles shall be set by volume of water treated or based upon conductivity or hardness. 3. For reverse osmosis and nanofiltration equipment, with capacity greater than 27 gal/h (100 L/h), reject water shall not exceed 60% of the feed water and shall be used as scrubber feed water or for other beneficial uses on the project site. 4. Simple distillation is not acceptable as a means of water purification. g. Food service operations within medical facilities shall comply with Section 6.4.2.2.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.4.3 Special Water Features.** Water use shall comply with the following: a. Ornamental fountains and other ornamental water features shall be supplied either by alternate on-site sources of water or by municipally reclaimed water delivered by the local water utility acceptable to the AHJ. Fountains and other features shall be equipped with: (1) makeup water meters (2) leak detection devices that shut off water flow if a leak of more than 1.0 gal/h (3.8 L/h) is detected, and (3) equipment to recirculate, filter, and treat all water for reuse within the system. **Exception:** Where alternate on-site sources of water or municipally reclaimed water are not available within 500 ft (150 m) of the building project site, potable water is allowed to be used for water features with less than 10,000 gallon (38,000 L) capacity. b. Pools and spas: 1. Backwash water: Recover filter backwash water for reuse on landscaping or other applications, or treat and reuse backwash water within the system. 2. Filtration: For filters with removable cartridges, only reusable cartridges and systems shall be used. For filters with backwash capability, use only pool filter equipment that includes a pressure drop gauge to determine when the filter needs to be backwashed and a sight glass enabling the operator to determine when to stop the backwash cycle. 3. Pool splash troughs, if provided, shall drain back into the pool system.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.5 Performance Option.** Calculations shall be done in accordance with generally accepted engineering standards and handbooks acceptable to the AHJ.

**PROPOSED ACTION:** DPS to determine what generally accepted engineering standards and handbooks are acceptable to the AHJ

**RATIONALE / IMPACT:** Provide specific direction for consistency

**6.5.1. Site Water Use Reduction.** Potable water (and municipally reclaimed water, where used) intended to irrigate improved landscape shall be limited to 35% of the water demand for that landscape. The water demand shall be based upon ET for that climatic area and shall not exceed 70% of ET o for turfgrass areas and 55% of ET o for all other plant material after adjustment for rainfall.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**6.5.2 Building Water Use Reduction.** The building project shall be designed to have a total annual interior water use less than or equal to that achieved by compliance with Sections 6.3.2, 6.4.2, and 6.4.3.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

## 2011 ASHRAE 189.1 – Chapter 7 – Energy Efficiency

**7.1 Scope.** This section specifies requirements for energy efficiency for buildings and appliances, for on-site renewable energy systems, and for energy measuring.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.2 Compliance.** The energy systems shall comply with Section 7.3, "Mandatory Provisions," and either a. Section 7.4, "Prescriptive Option," or b. Section 7.5, "Performance Option."

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.3.1 General.** Building projects shall be designed to comply with Sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 of ANSI/ ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.3.2 On-Site Renewable Energy Systems.** Building project design shall show allocated space and pathways for future installation of on-site renewable energy systems and associated infrastructure that provide the annual energy production equivalent of not less than 6.0 kBtu/ft<sup>2</sup> (20 kWh/m<sup>2</sup> for single-story buildings and not less than 10.0 kBtu/ft<sup>2</sup> (32 kWh/ m<sup>2</sup> multiplied by the total roof area in ft<sup>2</sup> (m<sup>2</sup> for all other buildings).  
**Exceptions:** 1. Building projects that have an annual daily average incident solar radiation available to a flat plate collector oriented due south at an angle from horizontal equal to the latitude of the collector location less than 1.2 kBtu/ft<sup>2</sup>-day (4.0 kWh/m<sup>2</sup>-day), accounting for existing buildings, permanent infrastructure that is not part of the building project, topography, or trees. 2. Building projects that comply with Section 7.4.1.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice; significant cost impact

**7.3.3.1 Consumption Management.** Measurement devices with remote communication capability shall be provided to collect energy consumption data for each energy supply source to the building, including gas, electricity, and district energy, that exceeds the thresholds listed in Table 7.3.3.1A. The measurement devices shall have the capability to automatically communicate the energy consumption data to a data acquisition system. For all buildings that exceed the threshold in Table 7.3.3.1A, subsystem measurement devices with remote capability (including current sensors or flowmeters) shall be provided to measure energy consumption data of each subsystem for each use category that exceeds the thresholds listed in Table 7.3.3.1B. The energy consumption data from the subsystem measurement devices shall be automatically communicated to the data acquisition system.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice; represents a cost impact

**7.3.3.2 Energy Consumption Data Collection.** All building measurement devices shall be configured to automatically communicate the energy data to the data acquisition system. At a minimum, measurement devices shall provide daily data and shall record hourly energy profiles. Such hourly energy profiles shall be capable of being used to assess building performance at least monthly.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice; represents a cost impact

**7.3.3.3 Data Storage and Retrieval.** The data acquisition system shall be capable of electronically storing the data from the measurement devices and other sensing devices, for a minimum of 36 months, and creating user reports showing hourly, daily, monthly, and annual energy consumption. **Exception:** Portions of buildings used as residential.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice; represents a cost impact

**TABLE 7.3.3.1A Energy Source Thresholds**

Energy Source	Threshold
Electrical service	>200 kVA
On-site renewable electric power	All systems > 1 kVA (peak)
Gas and district services	>1,000,000 Btu/h (300 kW)
Geothermal energy	>1,000,000 Btu/h (300 kW) heating
On-site renewable thermal energy	>100,000 Btu/h (30 kW)

**TABLE 7.3.3.1B System Energy Use Thresholds**

Use (Total of All Loads)	Subsystem Threshold
HVAC system	Connected electric load > 100kVA
HVAC system	Connected gas or district services load > 500,000 Btu/h (150 kW)
People moving	Sum of all feeders > 50 kVA
Lighting	Connected load > 50 kVA
Process and plug process	Connected load > 50 kVA
	Connected gas or district services load > 250,000 Btu/h (75 kW)

**7.4.1 General Comprehensive Prescriptive Requirements.** When a requirement is provided below, it supersedes the requirement in ANSI/ASHRAE/IES Standard 90.1. For all other criteria, the building project shall comply with the requirements of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.1.1 On-Site Renewable Energy Systems.** Building projects shall contain on-site renewable energy systems that provide the annual energy production equivalent of not less than 6.0 kBtu/ft<sup>2</sup> (20 kWh/m<sup>2</sup> multiplied by the total roof area in ft<sup>2</sup> (m<sup>2</sup> for single-story buildings and not less than 10.0 kBtu/ft<sup>2</sup> (32 kWh/m<sup>2</sup> multiplied by the total roof area in ft<sup>2</sup> (m<sup>2</sup> for all other buildings). The annual energy production shall be the combined sum of all on-site renewable energy systems. **Exception:** Buildings that demonstrate compliance with both of the following are not required to contain on-site renewable energy systems: 1. An annual daily average incident solar radiation available to a flat plate collector oriented due south at an angle from horizontal equal to the latitude of the collector location less than 4.0 kWh/m<sup>2</sup>-day, accounting for existing buildings, permanent infrastructure that is not part of the building project, topography, and trees. 2. A commitment to purchase renewable electricity products complying with the Green-e Energy National Standard for Renewable Electricity Products of at least 7 kWh/ft<sup>2</sup> (75 kWh/m<sup>2</sup> of conditioned space each year until the cumulative purchase totals 70 kWh/ft<sup>2</sup> (750 kWh/m<sup>2</sup> of conditioned space).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice; represents a cost impact

**7.4.2 Building Envelope.** The building envelope shall comply with Section 5 of ANSI/ASHRAE/IES Standard 90.1 with the following modifications and additions:

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.4.2.1 Building Envelope Requirements.** The building envelope shall comply with the requirements in Tables A-1 to A-8 in Normative Appendix A. These requirements supersede the requirements in Tables 5.5-1 to 5.5-8 of ANSI/ASHRAE/IES Standard 90.1. **Exception:** Buildings that comply with Section 8.3.4 regardless of building area are exempt from the SHGC criteria for skylights.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.2.2 Roof Insulation.** Roofs shall comply with the provisions of Section 5.3.2.3 and Tables A-1 to A-8 of this standard. Section 5.5.3.1.1 of ANSI/ASHRAE/IES Standard 90.1 and Table 5.5.3.1 of ANSI/ASHRAE/IES Standard 90.1 shall not apply.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.2.3 Single-Rafter Roof Insulation.** Single-rafter roofs shall comply with the requirements in Table A-9 in Normative Appendix A. These requirements supersede the requirements in Section A2.4.2.4 of ANSI/ASHRAE/IES Standard 90.1. Section A2.4.2.4 and Table A2.4.2 of ANSI/ASHRAE/IES Standard 90.1 shall not apply.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.2.4 Vertical Fenestration Area.** The total vertical fenestration area shall be less than 40% of the gross wall area. This requirement supersedes the requirement in Section 5.5.4.2.1 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Request DPS to review and consider amending

**RATIONALE / IMPACT:** Restriction on maximum allowable fenestration and does not consider new technologies in glazing and represents a significant cost impact

**7.4.2.5 Permanent Projections.** For climate zones 1– 5, the vertical fenestration on the west, south, and east shall be shaded by permanent projections that have an area-weighted average PF of not less than 0.50. The building is allowed to be rotated up to 45 degrees to the nearest cardinal orientation for purposes of calculations and showing compliance. **Exceptions:** 1. Vertical fenestration that receives direct solar radiation for fewer than 250 hours per year because of shading by permanent external buildings, existing permanent infrastructure, or topography. 2. Vertical fenestration with automatically controlled shading devices capable of modulating in multiple steps the amount of solar gain and light transmitted into the space in response to daylight levels or solar intensity that comply with all of the following: a. Exterior shading devices shall be capable of providing at least 90% coverage of the fenestration in the closed position. b. Interior shading devices shall be capable of providing at least 90% coverage of the fenestration in the closed position and have a minimum solar reflectance of 0.50 for the surface facing the fenestration. c. A manual override located in the same enclosed space as the vertical fenestration shall override operation of automatic controls no longer than 4 hours. d. Acceptance testing and commissioning shall be conducted as required by Section 10 to verify that automatic controls for shading devices respond to changes in illumination or radiation intensity. 3. Vertical fenestration with automatically controlled dynamic glazing capable of modulating in multiple steps the amount of solar gain and light transmitted into the space in response to daylight levels or solar intensity that comply with all of the following: a. Dynamic glazing shall have a lower labeled SHGC equal to or less than 0.12, lowest labeled VT no greater than 0.05, and highest labeled VT no less than 0.40. b. A manual override located in the same enclosed space as the vertical fenestration shall override operation of automatic controls no longer than 4 hours. c. Acceptance testing and commissioning shall be conducted as required by Section 10 to verify that automatic controls for dynamic glazing respond to changes in illumination or radiation intensity.

**PROPOSED ACTION:** If adopted do so with the following modification: ... area-weighted average PF of not less than 0.25. Intended benefit recognized however, recommend deletion.

**RATIONALE / IMPACT:** Horizontal projections require complex flashing configurations in order to control and manage water intrusion, which is a significant risk since the horizontal projection will accumulate water rather than shedding water. Second, the complexity of the air barrier transitions at each floor where there is a projection will be significant, and complexity equals a greater degree of risk that the air barrier will not function effectively. Third, these horizontal projections always include a structural element to support them, and are inherently thermally inefficient and very difficult to insulate properly without some degree of thermal bridging (i.e energy loss). Represents a significant cost impact; does not allow vertical projections for exposures where they may be effective and impractical for buildings taller than 2 stories.

**7.4.2.6 SHGC of Vertical Fenestration.** For SHGC compliance, the methodology in exception (b) to Section 5.5.4.4.1 of ANSI/ASHRAE/IES Standard 90.1 is allowed, provided that the SHGC multipliers in Table 7.4.2.6 are used. This requirement supersedes the requirement in Table 5.5.4.4.1 of ANSI/ASHRAE/IES Standard 90.1. Table 5.5.4.4.1 of ANSI/ASHRAE/IES Standard 90.1 shall not apply. Vertical fenestration that is north-oriented shall be allowed to have a maximum SHGC of 0.10 greater than that specified in Tables A-1 through A-8 in Normative Appendix A. When this exception is utilized, separate calculations shall be performed for these sections of the building envelope, and these values shall not be averaged with any others for compliance purposes.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 7.4.2.6 SHGC Multipliers for Permanent Projections**

PF	SHGC Multiplier	SHGC Multiplier
	(All Other Orientations)	(North-Oriented)
0–0.60	1.00	1.00
>0.60–0.70	0.92	0.96
>0.70–0.80	0.84	0.94
>0.80–0.90	0.77	0.93
>0.90–1.00	0.72	0.90

**7.4.2.7 Building Envelope Trade-Off Option.** The building envelope trade-off option in Section 5.6 of ANSI/ASHRAE/IES Standard 90.1 shall not apply unless the procedure incorporates the modifications and additions to ANSI/ASHRAE/IES Standard 90.1 noted in Section 7.4.2.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice but calculations may be cumbersome and will have a cost impact

**7.4.2.8 Fenestration Orientation.** To reduce solar gains from the east and west in climate zones 1 through 4 and from the west in climate zones 5 and 6, the fenestration area and SHGC shall comply with the following requirements: a. For climate zones 1, 2, 3, and 4:  $(A N SHGC N A S SHGC S) \geq 1.1$  ( $A E SHGC E A W SHGC W$ ) b. For climate zones 5 and 6:  $1/3 (A N SHGC N A S SHGC S A E SHGC E) \geq 1.1$  ( $A W SHGC W$ ) where  $SHGC \times$  the SHGC for orientation  $\times A \times$  fenestration area for orientation  $\times N$  north (oriented less than 45 degrees of true north)  $S$  south (oriented less than 45 degrees of true south)  $E$  east (oriented less than or equal to 45 degrees of true east)  $W$  west (oriented less than or equal to 45 degrees of true west) **Exceptions:** a. Vertical fenestration that complies with the exception to Section 5.5.4.4.1 (c) of ANSI/ASHRAE/IES Standard 90.1. b. Buildings that have an existing building or existing permanent infrastructure within 20 ft (6 m) to the south or north that is at least half as tall as the proposed building. c. Buildings with shade on 75% of the west- and east-oriented vertical fenestration areas from existing buildings, existing permanent infrastructure, or topography at 9 a.m. and 3 p.m. on the summer solstice. d. Alterations and additions with no increase in vertical fenestration area.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice but calculations may be cumbersome

**7.4.2.9 Continuous Air Barrier.** The building envelope shall be designed and constructed with a continuous air barrier that complies with Normative Appendix B to control air leakage into, or out of, the conditioned space. All air barrier components of each envelope assembly shall be clearly identified on construction documents and the joints, interconnections, and penetrations of the air barrier components shall be detailed. **Exception:** Building envelopes of semiheated spaces provided that the building envelope complies with Section 5.4.3.1 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3 Heating, Ventilating, and Air Conditioning.** The heating, ventilating, and air conditioning shall comply with Section 6 of ANSI/ASHRAE/IES Standard 90.1 with the following modifications and additions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.4.3.1 Minimum Equipment Efficiencies.** Projects shall comply with one of the following: a. EPC baseline. Products shall comply with the minimum efficiencies addressed in the National Appliance Energy Conservation Act (NAECA), Energy Policy Act (EPA), and the Energy Independence and Security Act (EISA). b. Higher Efficiency. Products shall comply with the greater of the ENERGY STAR requirements in Section 7.4.7.3 and the values in Normative Appendix C. These requirements supersede the requirements in Tables 6.8.1A to 6.8.1G of ANSI/ASHRAE/IES Standard 90.1. The building project shall comply with Sections 7.4.1.1 and 7.4.5.1 with the following modifications: 1. The on-site renewable energy systems required in Section 7.4.1.1 shall provide an annual energy production of not less than 4.0 kBtu/ft<sup>2</sup> (13 kWh/m<sup>2</sup>) multiplied by the total roof area in ft<sup>2</sup> (m<sup>2</sup> for single-story buildings and not less than 7.0 kBtu/ft<sup>2</sup> (22 kWh/m<sup>2</sup>) multiplied by the total roof area in ft<sup>2</sup> (m<sup>2</sup> for all other buildings). 2. The peak load reduction systems required in Section 7.4.5.1 shall be capable of reducing electric peak demand by not less than 5% of the projected peak demand.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.2 Ventilation Controls for Densely Occupied Spaces.** DCV is required for densely occupied spaces. This requirement supersedes the occupant density threshold in Section 6.4.3.9 of ANSI/ASHRAE/IES Standard 90.1. The DCV system shall be designed to be in compliance with ANSI/ASHRAE Standard 62.1. Occupancy assumptions shall be shown in the design documents for spaces required to have DCV. All CO<sub>2</sub> sensors used as part of a DCV system or any other system that dynamically controls outdoor air shall meet the following requirements: a. Spaces with CO<sub>2</sub> sensors or air sampling probes leading to a central CO<sub>2</sub> monitoring station shall have one sensor or probe for each 10,000 ft<sup>2</sup> (1000 m<sup>2</sup>) of floor space and shall be located in the room between 3 and 6 ft (1 and 2 m) above the floor. b. CO<sub>2</sub> sensors must be accurate to  $\pm 50$  ppm at 1000 ppm. c. Outdoor air CO<sub>2</sub> concentrations shall be determined by one of the following: 1. Outdoor air CO<sub>2</sub> concentrations shall be dynamically measured using a CO<sub>2</sub> sensor located in the path of the outdoor air intake. 2. When documented statistical data are available on the local ambient CO<sub>2</sub> concentrations, a fixed value typical of the location where the building is located shall be allowed in lieu of an outdoor sensor. d. Occupant CO<sub>2</sub> generation rate assumptions shall be shown in the design documents

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.3 Economizers.** Systems shall have economizers meeting the requirements in Section 6.5.1 of ANSI/ASHRAE/IES 90.1 except as noted below. 1. The minimum size requirements for economizers are defined in Table 7.4.3.3 and supersede the requirements in Table 6.5.1 of ANSI/ASHRAE/IES Standard 90.1. 2. Rooftop units with a capacity of less than 60,000 Btu/h (18 kW) shall have two stages of capacity control, with the first stage used for cooling with the economizer and the second stage to add mechanical cooling. 3. For systems that control to a fixed leaving air temperature (i.e., VAV systems), the system shall be capable of resetting the supply air temperature up at least 5°F (3°C) during economizer operation. **Exceptions:** All the exceptions in Section 6.5.1 of ANSI/ASHRAE/IES Standard 90.1 shall apply except as noted below. 1. The use of exception (i) to Section 6.5.1 of ANSI/ASHRAE/IES Standard 90.1 shall be permitted to eliminate the economizer requirement provided the requirements in Table 6.3.2 of ANSI/ASHRAE/IES Standard 90.1 are applied to the efficiency requirements required by Section 7.4.3.1. 2. For water-cooled units with a capacity less than 54,000 Btu/h (16 kW) that are used in systems where heating and cooling loads are transferred within the building (i.e., water-source heat pump systems), the requirement for an air or water economizer can be eliminated if the condenser-water temperature controls are capable of being set to maintain full load heat rejection capacity down to a 55°F (12°C) condenser-water supply temperature and the HVAC equipment is capable of operating with a 55°F (12°C) condenser-water supply temperature.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 7.4.3.3 Minimum System Size for Which an Economizer is Required**

Climate Zones	Cooling Capacity for Which an Economizer is Required*
1A, 1B	No economizer requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	≥33,000 Btu/h (9.7 kW) <sup>1</sup>

\* Where economizers are required, the total capacity of all systems without economizers shall not exceed 480,000 Btu/h (140 kW) per building or 20% of the building's an economizer capacity, whichever is greater.

**7.4.3.4 Zone Controls.** The exceptions to Section 6.5.2.1 of ANSI/ASHRAE/IES Standard 90.1 shall be modified as follows: 1. **Exception (a)** shall not be used. 2. **Exception (b)1.ii** shall be replaced by the following text: "the design outdoor airflow rate for the zone."

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.5 Fan System Power Limitation.** Systems shall have fan power limitations 10% below limitations specified in Table 6.5.3.1, 1A of ANSI/ASHRAE/IES Standard 90.1. This requirement supersedes the requirement in Section 6.5.3.1 and Table 6.5.3.1.1A of ANSI/ASHRAE/IES Standard 90.1. All exceptions in Section 6.5.3.1 of ANSI/ASHRAE/IES Standard 90.1 shall apply.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.6 Exhaust Air Energy Recovery.** The exhaust air energy recovery requirements defined in Section 6.5.6.1 of ANSI/ASHRAE/IES Standard 90.1 shall be used except that the energy recovery effectiveness shall be 60% and the requirements of Table 7.4.3.6 shall be used instead of those of Table 6.5.6.1 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.7 Variable-Speed Fan Control for Commercial Kitchen Hoods.** In addition to the requirements in Section 6.5.7.1 of ANSI/ASHRAE/IES Standard 90.1, commercial kitchen Type I and Type II hood systems shall have variable-speed control for exhaust and makeup air fans to reduce hood airflow rates at least 50% during those times when cooking is not occurring and the cooking appliances are up to temperature in a standby, ready-to-cook mode. All exceptions in Section 6.5.7.1 of ANSI/ASHRAE/IES Standard 90.1 shall apply.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.8 Duct Insulation.** Duct insulation shall comply with the minimum requirements in Tables C-9 and C-10 in Normative Appendix C. These requirements supersede the requirements in Tables 6.8.2A and 6.8.2B of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.3.9 Automatic Control of HVAC and Lights in Hotel/Motel Guest Rooms.** In hotels and motels with over 50 guest rooms, the lighting, switched outlets, television, and HVAC equipment serving each guest room shall be automatically controlled such that the power for lighting, switched outlets, and televisions will be turned off within 30 minutes after all occupants leave the guest room and the HVAC set-point raised by at least 5°F (3°C) in the cooling mode and lowered by at least 5°F (3°C) in the heating mode within 30 minutes after all occupants leave the guest room. **Exception:** Guest rooms where the lighting, switched outlets, and televisions are turned off and the HVAC set-points are raised by at least 5°F (3°C) in the cooling mode and lowered by at least 5°F (3°C) in the heating mode when the occupant removes the card from a captive key system.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 7.4.3.6 Energy Recovery Requirement (I-P)**

Climate Zone	% Outside Air at Full Design Flow							
	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and <80%	≥80%
	Design Supply Fan Flow, cfm							
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	NR	NR	≥5000	≥5000
1B, 2B, 5C	NR	NR	NR	NR	≥26,000	≥12,000	≥5000	≥4000
6B	NR	≥22,500	≥11,000	≥5500	≥4500	≥3500	≥2500	≥1500
1A, 2A, 3A, 4A, 5A, 6A	≥30,000	≥13,000	≥5500	≥4500	≥3500	≥2000	≥1000	≥0
7, 8	≥4000	≥3000	≥2500	≥1000	≥0	≥0	≥0	≥0

**TABLE 7.4.3.6 Energy Recovery Requirement (SI)**

Climate Zone	% Outside Air at Full Design Flow							
	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and <80%	≥80%
	Design Supply Fan Flow, L/s							
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	NR	NR	≥2360	≥2360
1B, 2B, 5C	NR	NR	NR	NR	≥12,271	≥5663	≥2360	≥1888
6B	NR	≥10,619	≥5191	≥2596	≥2124	≥1652	≥1180	≥708
1A, 2A, 3A, 4A, 5A, 6A	≥14,158	≥6135	≥2596	≥2124	≥1652	≥944	≥472	>0
7, 8	≥1888	≥1416	≥1180	≥472	>0	>0	>0	>0

**7.4.4 Service Water Heating.** The service water heating shall comply with Section 7 of ANSI/ASHRAE/IES Standard 90.1 with the following modifications and additions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.4.1 Equipment Efficiency.** Equipment shall comply with the minimum efficiencies in Table C-11 in Normative Appendix C. These requirements supersede the requirements in Table 7.8 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.4.2 Service Hot-Water Piping Insulation.** Pipe insulation shall comply with Section 7.4.3.11. These requirements supersede the requirements in Section 7.4.3 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** DPS to contact ASHRAE to determine the proper reference because 7.4.3.11 does not exist; note also 7.4.4.2 in MADCAD version verses printed IgCC code book does not match

**RATIONALE / IMPACT:** There are discrepancies between printed and electronic versions of the documents

**7.4.4.3 Insulation for Spa Pools.** Pools heated to more than 90°F (32°C) shall have side and bottom surfaces insulated on the exterior with a minimum insulation value of R-12 (R-2.1).

**PROPOSED ACTION:** Adopt as written: note also 7.4.4.3 does not match the printed IgCC code book

**RATIONALE / IMPACT:** Good practice

**7.4.5 Power.** The power shall comply with Section 8 of ANSI/ASHRAE/IES Standard 90.1 with the following modifications and additions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.4.5.1 Peak Load Reduction.** Building projects shall contain automatic systems, such as demand limiting or load shifting, that are capable of reducing electric peak demand of the building by not less than 10% of the projected peak demand. Standby power generation shall not be used to achieve the reduction in peak demand.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.6 Lighting.** The lighting shall comply with Section 9 of ANSI/ASHRAE/IES Standard 90.1 and the following modifications and additions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.4.6.1 Lighting Power Allowance.** The interior lighting power allowance shall be a maximum of the values determined in accordance with Sections 9.5 and 9.6 of ANSI/ASHRAE/IES Standard 90.1 multiplied by an LPD Factor specified in Table 7.4.6.1A for those areas where the Building Area Method is used and in Table 7.4.6.1B for those areas where the Space-by-Space Method is used. Control factors from Table 9.6.2 in ANSI/ASHRAE/IES Standard 90.1 shall not be used for the control methodologies required in this standard. The exterior lighting power allowance shall be a maximum of the values determined in accordance with Sections 9.4.3. of ANSI/ASHRAE/IES Standard 90.1 multiplied by the corresponding factor found in Table 7.4.6.1C. This requirement supersedes the requirements in Sections 9.4.3 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.6.2 Occupancy Sensor Controls with Multi-Level Switching or Dimming.** The lighting in the following areas shall be controlled by an occupant sensor with multi-level switching or dimming system that reduces lighting power a minimum of 50% when no persons are present: a. Hallways in multifamily, dormitory, hotel, and motel buildings. b. Commercial and industrial storage stack areas. c. Library stack areas. **Exception:** Areas lit by HID lighting with a lighting power density of 0.8 W/ft<sup>2</sup> or less.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 7.4.6.1A LPD Factors when Using the Building Area Method**

Building Area Type	LPD Factor
Courthouse	0.95
Dining—Cafeteria/Fast Food	0.95
Dining—Family	0.95
Dormitory	0.95
Exercise Center	0.95
Healthcare Clinic	0.95
Hospital	0.95
Library	0.95
Multifamily	0.95
Office	0.95
Penitentiary	0.95
Police Station	0.95
Religious Building	0.95
School/University	0.90
Town Hall	0.95
Transportation	0.95
All Other Building Area Types	1.00

**TABLE 7.4.6.1B LPD Factors when  
Using the Space-by-Space Method**

<b>Common Space Type</b>	<b>LPD Factor</b>
Classroom/Lecture/Training	0.85
Conference Meeting/Multipurpose	0.90
Corridor/Transition	0.85
Dining Area	0.90
Dining Area for Family Dining	0.85
Laboratory for Medical/Industrial Research	0.95
Lobby	0.95
Lobby for Elevator	0.85
Lobby for Motion Picture Theater	0.95
Lounge/Recreation	0.85
Office—Enclosed	0.95
Office—Open Plan	0.85
Sales Area	0.95
All Other Common Space Types	1.00
<b>Building-Specific Space Type</b>	<b>LPD Factor</b>
Convention Center—Exhibit Space	0.85
Courthouse—Courtroom	0.85
Fitness Center—Fitness Area	0.85
Gymnasium—Audience Seating/Permanent Seating	0.85
Gymnasium—Fitness Area	0.85
Hospital—Emergency	0.95
Hospital—Exam/Treatment	0.85
Hospital—Laundry/Washing	0.95
Hospital—Lounge/Recreation	0.85
Hospital—Medical Supply	0.90
Hospital—Nursery	0.85
Hospital—Nurses' Station	0.90
Hospital—Patient Room	0.90
Hospital—Physical Therapy	0.85
Library—Card File and Cataloguing	0.90
Library—Stacks	0.95
Manufacturing Facility—High Bay	0.85
Manufacturing Facility—Low Bay	0.85
Motel—Dining Area	0.90
Transportation—Air Train/Bus—Baggage Area	0.90
Transportation—Airport—Concourse	0.90
Transportation—Terminal—Ticket Counter	0.85
Warehouse—Medium/Bulky Material Storage	0.85
All Other Building-Specific Space Types	1.00

**TABLE 7.4.6.1C Lighting Power Allowance Factors**

	Lighting Zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
For Tradable Areas	1.00	0.90	0.90	0.95	0.95
For Nontradable Areas	1.00	0.95	0.95	0.95	0.95

**7.4.6.3 Automatic Controls for Egress and Security Lighting.** Lighting in any area within a building that is required to be continuously illuminated for reasons of building security or emergency egress shall not exceed 0.1 W/ft<sup>2</sup> (1 W/m<sup>2</sup>). Additional egress and security lighting shall be allowed, provided it is controlled by an automatic control device that turns off the additional lighting.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.6.4 Occupancy Sensors.** Occupancy sensors shall have "manual ON", "automatic OFF" controls or shall be controlled to automatically turn the lighting on to not more than 50% power, except in the following spaces where full automatic-on is allowed: 1. occupancy sensor controls required in Section 7.4.6.2, 2. public corridors and stairwells, 3. restrooms, 4. primary building entrance areas and lobbies, and 5. areas where manual-on operation would endanger the safety or security of the room or building occupant(s).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.6.5 Controls for Exterior Sign Lighting.** All exterior sign lighting, including internally illuminated signs and lighting on externally illuminated signs, shall comply with the requirements of Sections 7.4.6.8.1 or 7.4.6.8.2. **Exceptions:** a. Sign lighting that is specifically required by a health or life safety statute, ordinance, or regulation. b. Signs in tunnels.

**7.4.6.5.1** All sign lighting that operates more than one hour per day during daylight hours shall include controls to automatically reduce the input power to a maximum of 35% of full power for a period from one hour after sunset to one hour before sunrise. **Exception:** Sign lighting using metal halide, high-pressure sodium, induction, cold cathode, or neon lamps that includes controls to automatically reduce the input power to a maximum of 70% of full power for a period from one hour after sunset to one hour before sunrise.

**7.4.6.5.2** All other sign lighting shall include: a. controls to automatically reduce the input power to a maximum of 70% of full power for a period from mid-night or within one hour of the end of business operations, whichever is later, until 6:00 am or business opening, whichever is earlier, and b. controls to automatically turn off during daylight hours.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.7 Other Equipment.** The other equipment shall comply with Section 10 of ANSI/ASHRAE/IES Standard 90.1 with the following modifications and additions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**7.4.7.1 Electric Motors.** Motors shall comply with the minimum requirements in Table C-12 in Normative Appendix C. These requirements supersede the requirements in Section 10.4.1 and Table 10.8 of ANSI/ASHRAE/IES Standard 90.1.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.7.2 Supermarket Heat Recovery.** Supermarkets with a floor area of 25,000 ft<sup>2</sup> (2500 m<sup>2</sup> or greater shall recover waste heat from the condenser heat rejection on permanently installed refrigeration equipment meeting one of the following criteria: 1. 25% of the refrigeration system full load total heat rejection. 2. 80% of the space heat, service water heating and dehumidification reheat. If a recovery system is used that is installed in the refrigeration system, the system shall not increase the saturated condensing temperature at design conditions by more than 5°F (3°C) and shall not impair other head pressure control/energy reduction strategies.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.7.3 ENERGY STAR Equipment.** The following equipment within the scope of the applicable ENERGY STAR program shall comply with the equivalent criteria required to achieve the ENERGY STAR label if installed prior to the issuance of the certificate of occupancy: a. Appliances 1. Clothes washers: ENERGY STAR Program Requirements for Clothes Washers (see also the water efficiency requirements in Section 6.3.2.2) 2. Dehumidifiers: ENERGY STAR Program Requirements for Dehumidifiers 3. Dishwashers: ENERGY STAR Program Requirements Product Specifications for Residential Dishwashers (see also the water efficiency requirements in Section 6.3.2.2) 4. Refrigerators and freezers: ENERGY STAR Program Requirements for Refrigerators and Freezers 5. Room air conditioners: ENERGY STAR Program Requirements and Criteria for Room Air Conditioners (see also the energy efficiency requirements in Section 7.4.1) 6. Room air cleaners: ENERGY STAR Program Requirements for Room Air Cleaners 7. Water coolers: ENERGY STAR Program Requirements for Water Coolers b. Heating and Cooling 1. Residential air-source heat pumps: ENERGY STAR Program Requirements for ASHPs and Central Air Conditioners (see also the energy efficiency requirements in Section 7.4.1) 2. Residential boilers: ENERGY STAR Program Requirements for Boilers (see also the energy efficiency requirements in Section 7.4.1) 3. Residential central air conditioners: ENERGY STAR Program Requirements for ASHPs and Central Air Conditioners (see also the energy efficiency requirements in Section 7.4.1) 4. Residential ceiling fans: ENERGY STAR Program Requirements for Residential Ceiling Fans 5. Dehumidifiers: ENERGY STAR Program Requirements for Dehumidifiers 6. Programmable thermostats: ENERGY STAR Program Requirements for Programmable Thermostats 7. Ventilating fans: ENERGY STAR Program Requirements for Residential Ventilating Fans 8. Residential warm air furnaces: ENERGY STAR Program Requirements for Furnaces 9. Residential geothermal heat pumps: ENERGY STAR Program Requirements for Geothermal Heat Pumps c. Electronics 1. Cordless phones: ENERGY STAR Program Requirements for Telephony 2. Audio and video: ENERGY STAR Program Requirements for Audio and Video 3. Televisions: ENERGY STAR Program Requirements for Televisions 4. Set-top boxes: ENERGY STAR Program Requirements for Set-Top Boxes d. Office Equipment 1. Computers: ENERGY STAR Program Requirements for Computers 2. Copiers: ENERGY STAR Program Requirements for Imaging Equipment 3. Fax machines: ENERGY STAR Program Requirements for Imaging Equipment 4. Laptops: ENERGY STAR Program Requirements for Computers 5. Mailing machines: ENERGY STAR Program Requirements for Imaging Equipment 6. Monitors: ENERGY STAR Program Requirements for Displays 7. Multifunction devices (printer/fax/scanner): Program Requirements for Imaging Equipment 8. Printers: ENERGY STAR Program Requirements for Imaging Equipment 9. Scanners: ENERGY STAR Program Requirements for Imaging Equipment 10. Computer servers: ENERGY Star Program Requirements for Computer Servers e. Water Heaters: ENERGY STAR Program Requirements for Residential Water Heaters f. Lighting 1. Compact fluorescent light bulbs (CFLs): ENERGY STAR Program Requirements for CFLs 2. Residential light fixtures: ENERGY STAR Program Requirements for Residential Light Fixtures 3. Integral LED lamps: ENERGY STAR Program Requirements for Integral LED Lamps g. Commercial Food Service 1. Commercial fryers: ENERGY STAR Program Requirements for Commercial Fryers 2. Commercial hot food holding cabinets: ENERGY STAR Program Requirements for Hot Food Holding Cabinets 3. Commercial refrigerators and freezers: ENERGY STAR Program Requirements for Commercial Refrigerators and Freezers 4. Commercial steam cookers: ENERGY STAR Program Requirements for Commercial Steam Cookers (see also water efficiency requirements in Section 6.4.2.2) 5. Commercial ice machines: ENERGY STAR Program Requirements for Commercial Ice Machines 6. Commercial dishwashers: ENERGY STAR Program Requirements for Commercial Dishwashers 7. Commercial griddles: ENERGY STAR Program Requirements for Commercial Griddles 8. Commercial ovens: ENERGY STAR Program Requirements for Commercial Ovens h. Other Products 1. Battery charging systems: ENERGY STAR Program Requirements for Products with Battery Charger Systems (BCSs) 2. External power adapters: ENERGY STAR Program Requirements for Single-Voltage AC-DC and AC-AC Power Supplies 3. Vending machines: ENERGY STAR Program Requirements for Refrigerated Beverage Vending Machines **Exception:** Products with minimum efficiencies addressed in the Energy Policy Act (EPA) and the Energy Independence and Security Act (EISA) when complying with Section 7.4.3.1a.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**7.4.7.4 Commercial Refrigerators, Freezers, and Clothes Washers** a. Commercial refrigerators and freezers shall comply with the minimum efficiencies in Table C-13 in Normative Appendix C. Open refrigerated display cases not covered by strips or curtains are prohibited. Lighting loads, including all power supplies or ballasts, for commercial reach-in refrigerator/freezer display cases shall not exceed 42 watts per door for case doors up to 5 ft (1.5 m) in height and 46 watts per door for case doors greater than 5 ft (1.5 m) in height. b. Commercial clothes washers shall comply with the minimum efficiencies in Table C-14 in Normative Appendix C.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

7.4.8 Energy Cost Budget. The Energy Cost Budget option in Section 11 of ANSI/ASHRAE/IES Standard 90.1 shall not be used.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

7.5.1 General Comprehensive Performance Requirements. Projects shall comply with Sections 7.5.2, 7.5.3, and 7.5.4.

7.5.2 Annual Energy Cost. The building project shall have an annual energy cost less than or equal to that achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, 8.3.4, and 8.4.1. Comparisons shall be made using Normative Appendix D.

7.5.3 Annual Carbon Dioxide Equivalent (CO<sub>2</sub>e). The building project shall have an annual CO<sub>2</sub>e less than or equal to that achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, 8.3.4, and 8.4.1. Comparisons shall be made using Normative Appendix D provided that the baseline building design is calculated in accordance with Section 7.5.2. To determine the CO<sub>2</sub>e value for each energy source supplied to the building project, multiply the energy consumption by the emissions factor. CO<sub>2</sub>e emission factors shall be taken from Table 7.5.3.

7.5.4 Annual Load Factor/Peak Electric Demand. The building project shall have the same or less peak electric demand than achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, 8.3.4, and 8.4.1. Comparisons shall be made using Normative Appendix D provided that the baseline building design is calculated in accordance with Section 7.5.2. In addition, the building project shall have a minimum electrical annual load factor of 0.25.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**TABLE 7.5.3 CO<sub>2</sub>e Emission Factors**

Building Project Energy Source	CO <sub>2</sub> e lb/kWh (kg/kWh)
Grid delivered electricity and other fuels not specified in this table	1,670 (0,758)
LPG or propane	0,602 (0,274)
Fuel oil (residual)	0,686 (0,312)
Fuel oil (distillate)	0,614 (0,279)
Coal (except lignite)	0,822 (0,373)
Coal (lignite)	1,287 (0,583)
Gasoline	0,681 (0,309)
Natural gas	0,510 (0,232)

## 2011 ASHRAE 189.1 – Chapter 8 – Indoor Environmental Quality (IEQ)

8.1 Scope. This section specifies requirements for indoor environmental quality, including indoor air quality, environmental tobacco smoke control, outdoor air delivery monitoring, thermal comfort, building entrances, acoustic control, daylighting, and low emitting materials.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

8.2 Compliance. The indoor environmental quality shall comply with Section 8.3, "Mandatory Provisions," and either: a. Section 8.4, "Prescriptive Option," or b. Section 8.5, "Performance Option." Daylighting and low-emitting materials are not required to use the same option, i.e., prescriptive or performance, for demonstrating compliance.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**8.3.1 Indoor Air Quality.** The building shall comply with Sections 4 through 7 of ANSI/ASHRAE Standard 62.1 with the following modifications and additions. When a requirement is provided below, this supersedes the requirements in ANSI/ASHRAE Standard 62.1.

**8.3.1.1 Minimum Ventilation Rates.** The Ventilation Rate Procedure of ANSI/ASHRAE Standard 62.1 shall be used.

**8.3.1.2.1 Spaces Ventilated by Mechanical Systems.** A permanently mounted, direct total outdoor airflow measurement device shall be provided that is capable of measuring the system minimum outdoor airflow rate. The device shall be capable of measuring flow within an accuracy of  $\pm 15\%$  of the minimum outdoor airflow rate. The device shall also be capable of being used to alarm the building operator or for sending a signal to a building central monitoring system when flow rates are not in compliance. **Exception:** Constant volume air supply systems that use a damper position feedback system are not required to have a direct total outdoor airflow measurement device.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.3.1.3 Filtration and Air Cleaner Requirements** a. **Particulate Matter 1. Wetted Surfaces.** Particulate matter filters or air cleaners provided upstream of wetted surfaces in accordance with Section 5.8 of ANSI/ASHRAE Standard 62.1 shall have a MERV of not less than 8. 2. **Particulate Matter Smaller than 10 Micrometers (PM10).** Particulate matter filters or air cleaners provided to reduce PM10 in outdoor intake in accordance with 6.2.1.1 of ANSI/ASHRAE Standard 62.1 shall have a MERV of not less than 8. 3. **Particulate Matter Smaller than 2.5 Micrometers (PM2.5).** Particulate matter filters or air cleaners provided to reduce PM2.5 in outdoor intake air in accordance with Section 6.2.1.2 of ANSI/ASHRAE Standard 62.1 shall have a MERV of not less than 13. b. **Ozone.** In addition to Section 6.2.1.3 of ANSI/ASHRAE Standard 62.1, when the building is located in an area that is designated "non-attainment" with the National Ambient Air Quality Standards for ozone as determined by the AHJ, air-cleaning devices having a removal efficiency of no less than the efficiency specified in Section 6.2.1.3 of ANSI/ASHRAE Standard 62.1 shall be provided to clean outdoor air prior to its introduction to occupied spaces. c. **Bypass Pathways.** All filter frames, air cleaner racks, access doors, and air cleaner cartridges shall be sealed.

**PROPOSED ACTION:** AHJ to determine if Montgomery County is "designated non-attainment area with the National Ambient Air Quality Standards".

**RATIONALE / IMPACT:** Provide specific direction for consistency

**8.3.1.4 Environmental Tobacco Smoke** a. Smoking shall not be allowed inside the building. Signage stating such shall be posted within 10 ft (3 m) of each building entrance. b. Any exterior designated smoking areas shall be located a minimum of 25 ft (7.5 m) away from building entrances, outdoor air intakes, and operable windows.

**PROPOSED ACTION:** Delete

**RATIONALE / IMPACT:** Covered by County ordinance

**8.3.1.5 Building Entrances.** All building entrances shall employ an entry mat system that shall have a scraper surface, an absorption surface, and a finishing surface. Each surface shall be a minimum of the width of the entry opening, and the minimum length is measured in the primary direction of travel. **Exceptions:** 1. Entrances to individual dwelling units. 2. Length of entry mat surfaces is allowed to be reduced due to a barrier, such as a counter, partition, or wall, or local regulations prohibiting the use of scraper surfaces outside the entry. In this case entry mat surfaces shall have a minimum length of 3 ft (1 m) of indoor surface, with a minimum combined length of 6 ft (2 m).

**8.3.1.5.1 Scraper Surface.** The scraper surface shall comply with the following: a. Shall be the first surface stepped on when entering the building. b. Shall be either immediately outside or inside the entry. c. Shall be a minimum of 3 ft (1 m) long. d. Shall be either permanently mounted grates or removable mats with knobby or squeegee-like projections.

**8.3.1.5.2 Absorption Surface.** The absorption surface shall comply with the following: a. Shall be the second surface stepped on when entering the building. b. Shall be a minimum of 3 ft (1 m) long, and made from materials that can perform both a scraping action and a moisture wicking action.

**8.3.1.5.3 Finishing Surface.** The finishing surface shall comply with the following: a. Shall be the third surface stepped on when entering the building. b. Shall be a minimum of 4 ft (1.2 m) long, and made from material that will both capture and hold any remaining particles or moisture.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.3.2 Thermal Environmental Conditions for Human Occupancy.** The building shall be designed in compliance with ANSI/ASHRAE Standard 55, Sections 6.1, "Design," and 6.2, "Documentation." **Exception:** Spaces with special requirements for processes, activities, or contents that require a thermal environment outside that which humans find thermally acceptable, such as food storage, natatoriums, shower rooms, saunas, and drying rooms.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**8.3.3.1 Exterior Sound.** Wall and roof-ceiling assemblies that are part of the building envelope shall have a composite OITC rating of 40 or greater or a composite STC rating of 50 or greater, and fenestration that is part of the building envelope shall have an OITC or STC rating of 30 or greater for any of the following conditions: a. Buildings within 1000 ft (300 m) of expressways. b. Buildings within 5 mi (8 km) of airports serving more than 10,000 commercial jets per year. c. Where yearly average day-night average sound levels at the property line exceed 65 decibels. **Exception:** Buildings that may have to adhere to functional and operational requirements such as factories, stadiums, storage, enclosed parking structure, and utility buildings.

**PROPOSED ACTION:** Request DPS to confirm the intent of 8.3.3.1; and that a lower rated OITC is required near expressways and airports than at areas where noise is not an issue.

**RATIONALE / IMPACT:** Confusing

**8.3.3.2 Interior Sound.** Interior wall and floor/ceiling assemblies separating interior rooms and spaces shall be designed in accordance with all of the following: a. Wall and floor-ceiling assemblies separating adjacent dwelling units, dwelling units and public spaces, adjacent tenant spaces, tenant spaces and public places, and adjacent classrooms shall have a composite STC rating of 50 or greater. b. Wall and floor-ceiling assemblies separating hotel rooms, motel rooms, and patient rooms in nursing homes and hospitals shall have a composite STC rating of 45 or greater. c. Wall and floor-ceiling assemblies separating classrooms from rest rooms and showers shall have a composite STC rating of 53 or greater. d. Wall and floor-ceiling assemblies separating classrooms from music rooms, mechanical rooms, cafeteria, gymnasiums, and indoor swimming pools shall have a composite STC rating of 60 or greater.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.3.3.3 Outdoor-Indoor Transmission Class and Sound Transmission Class.** OITC values for assemblies and components shall be determined in accordance with ASTM E1332. STC values for assemblies and components shall be determined in accordance with ASTM E90 and ASTM E413.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**8.3.4 Daylighting by Toplighting.** There shall be a minimum fenestration area providing daylighting by toplighting for large enclosed spaces. In buildings three stories and less above grade, conditioned or unconditioned enclosed spaces that are greater than 20,000 ft<sup>2</sup> (2000 m<sup>2</sup>) directly under a roof with finished ceiling heights greater than 15 ft (4 m) and that have a lighting power allowance for general lighting equal to or greater than 0.5 W/ft<sup>2</sup> (5.5 W/m<sup>2</sup>) shall comply with the following. **Exceptions:** 1. Buildings in climate zones 7 or 8. 2. Auditoria, theaters, museums, places of worship, and refrigerated warehouses.

**8.3.4.1 Minimum Daylight Area by Toplighting.** A minimum of 50% of the floor area directly under a roof in spaces with a lighting power density or lighting power allowance greater than 0.5 W/ft<sup>2</sup> (5 W/m<sup>2</sup>) shall be in the daylight area. Areas that are daylight shall have a minimum toplighting area to daylight area ratio as shown in Table 8.3.4.1. For purposes of compliance with Table 8.3.4.1, the greater of the space lighting power density and the space lighting power allowance shall be used.

**PROPOSED ACTION:** Strong reservations, not taking into account newer higher efficiency lighting technologies

**RATIONALE / IMPACT:** Greater thermal losses and compromised roofs that cannot be used for renewable energy sources

**TABLE 8.3.4.1 Minimum Toplighting Area**

Lighting Power Density or Lighting Power Allowances in Daylight Area, W/ft <sup>2</sup> (W/m <sup>2</sup> )	Minimum Toplighting Area to Daylight Area Ratio
1.0 W/ft <sup>2</sup> (14 W/m <sup>2</sup> ) < LPD	3.6%
1.0 W/ft <sup>2</sup> (10 W/m <sup>2</sup> ) < LPD < 1.4 W/ft <sup>2</sup> (14 W/m <sup>2</sup> )	3.3%
0.5 W/ft <sup>2</sup> (5 W/m <sup>2</sup> ) < LPD < 1.0 W/ft <sup>2</sup> (10 W/m <sup>2</sup> )	3.0%

**8.3.4.2 Skylight Characteristics.** Skylights used to comply with Section 8.3.4.1 shall have a glazing material or diffuser that has a measured haze value greater than 90%, tested according to ASTM D1003 (notwithstanding its scope) or other test method approved by the AHJ. **Exceptions:** 1. Skylights with a measured haze value less than or equal to 90% whose combined area does not exceed 5% of the total skylight area. 2. Tubular daylighting devices having a diffuser. 3. Skylights that are capable of preventing direct sunlight from entering the occupied space below the well during occupied hours. This shall be accomplished using one or more of the following: a. orientation b. automated shading or diffusing devices c. diffusers d. fixed internal or external baffles 4. Airline terminals, convention centers, and shopping malls.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.3.5 Isolation of the Building from Pollutants in Soil.** Building projects that include construction or expansion of a ground-level foundation and which are located on brownfield sites or in "Zone 1" counties identified to have a significant probability of radon concentrations higher than 4 picocuries/ liter on the USEPA map of radon zones, shall have a soil gas retarding system installed between the newly constructed space and the soil.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.1.1 Minimum Sidelighting Effective Aperture.** Office spaces and classrooms shall comply with the following criteria: a. All north-, south-, and east-facing facades for those spaces shall have a minimum sidelighting effective aperture as prescribed in Table 8.4.1.1. b. The combined width of the primary sidelighted areas shall be at least 75% of the length of the façade wall. c. Opaque interior surfaces in daylight areas shall have visible light reflectances greater than or equal to 80% for ceilings and 70% for partitions higher than 60 in. (1.8 m) in daylight areas. **Exceptions:** 1. Spaces with programming that requires dark conditions (e.g., photographic processing). 2. Spaces with toplighting in compliance with Section 8.3.4. 3. Daylight areas where the height of existing adjacent structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.

**PROPOSED ACTION:** Request DPS to review and consider amending

**RATIONALE / IMPACT:** Conflicts with section 7.4.2.4 restriction on maximum allowable fenestration and does not consider new technologies in glazing

**TABLE 8.4.1.1 Minimum Sidelighting Effective Aperture**

Climate Zone	Minimum Sidelighting Effective Aperture
1, 2, 3A, 3B	0.10
3C, 4, 5, 6, 7, 8	0.15

**8.4.1.2 Office Space Shading.** Each west-, south-, and east-facing facade, shall be designed with a shading PF. The PF shall be not less than 0.5. Shading is allowed to be external or internal using the interior PF. The building is allowed to be rotated up to 45 degrees for purposes of calculations and showing compliance. The following shading devices are allowed to be used: a. Louvers, sun shades, light shelves, and any other permanent device. Any vertical fenestration that employs a combination of interior and external shading is allowed to be separated into multiple segments for compliance purposes. Each segment shall comply with the requirements for either external or interior projection factor. b. Building self-shading through roof overhangs or recessed windows. **Exceptions:** 1. Translucent panels and glazing systems with a measured haze value greater than 90%, tested according to ASTM D1003 (notwithstanding its scope) or other test method approved by the AHJ, and that are entirely 8 ft (2.5 m) above the floor, do not require external shading devices. 2. Vertical fenestration that receives direct solar radiation for less than 250 hours per year because of shading by permanent external buildings, existing permanent infrastructure, or topography. 3. Vertical fenestration with automatically controlled shading devices in compliance with Exception 2 of Section 7.4.2.5. 4. Vertical fenestration with automatically controlled dynamic glazing in compliance with Exception 3 of Section 7.4.2.5.

**PROPOSED ACTION:** : If adopted do so with the following modification: ... not be less than 0.25.

**RATIONALE / IMPACT:** See Rationale / Impact statement under 7.4.2.5, also consider interior light shelves and impact on fire sprinkler design.

**8.4.2 Materials.** Reported emissions or VOC contents specified below shall be from a representative product sample and conducted with each product reformulation or at a minimum of every three years. Products certified under third-party certification programs as meeting the specific emission or VOC content requirements listed below are exempted from this three-year testing requirement but shall meet all the other requirements as listed below.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required; represents cost impact

**8.4.2.1 Adhesives and Sealants.** Products in this category include carpet, resilient, and wood flooring adhesives; base cove adhesives; ceramic tile adhesives; drywall and panel adhesives; aerosol adhesives; adhesive primers; acoustical sealants; firestop sealants; HVAC air duct sealants, sealant primers; and caulks. All adhesives and sealants used on the interior of the building (defined as inside of the weather-proofing system and applied on-site) shall comply with the requirements of either Section 8.4.2.1.1 or 8.4.2.1.2:

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**8.4.2.1.1 Emissions Requirements.** Emissions shall be determined according to CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) and shall comply with the limit requirements for either office or classroom spaces regardless of the space type.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.1.2 VOC Content Requirements.** VOC content shall comply with and shall be determined according to the following limit requirements: a. Adhesives, sealants and sealant primers: SCAQMD Rule 1168. HVAC duct sealants shall be classified as "Other" category within the SCAQMD Rule 1168 sealants table. b. Aerosol adhesives: Green Seal Standard GS-36. Exceptions: The following solvent welding and sealant products are not required to meet the emissions or the VOC content requirements listed above. 1. Cleaners, solvent cements, and primers used with plastic piping and conduit in plumbing, fire suppression, and electrical systems. 2. HVAC air duct sealants when the air temperature of the space in which they are applied is less than 40°F (4.5°C).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.2 Paints and Coatings.** Products in this category include sealers, stains, clear wood finishes, floor sealers and coatings, waterproofing sealers, primers, flat paints and coatings, non-flat paints and coatings, and rust-preventative coatings. Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with either Section 8.4.2.2.1 or 8.4.2.2.2.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.2.1 Emissions Requirements.** Emissions shall be determined according to CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) and shall comply with the limit requirements for either office or classroom spaces regardless of the space type.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.2.2 VOC Content Requirements.** VOC content shall comply with and be determined according to the following limit requirements: a. Architectural paints, coatings and primers applied to interior surfaces: Green Seal Standard GS-11. b. Clear wood finishes, floor coatings, stains, sealers, and shellacs: SCAQMD Rule 1113.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.3 Floor Covering Materials.** Floor covering materials installed in the building interior shall comply with the following: a. Carpet: Carpet shall be tested in accordance with and shown to be compliant with the requirements of CDPH/ EHLB/Standard Method V1.1 (commonly referred to as California Section 01350). Products that have been verified and labeled to be in compliance with Section 9 of CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) comply with this requirement. b. Hard surface flooring in office spaces and classrooms: Materials shall be tested in accordance with and shown to be compliant with the requirements of CDPH/EHLB/ Standard Method V1.1 (commonly referred to as California Section 01350).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.4 Composite Wood, Wood Structural Panel and Agrifiber Products.** Composite wood, wood structural panel, and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea- formaldehyde resins. Composite wood and agrifiber products are defined as: particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Materials considered furniture, fixtures and equipment (FF&E) are not considered base building elements and are not included in this requirement. Emissions for products covered by this section shall be determined according to and shall comply with one of the following: a. Third-party certification shall be submitted indicating compliance with the California Air Resource Board's (CARB) regulation, Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products. Third-party certifier shall be approved by CARB. b. CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) and shall comply with the limit requirements for either office or classroom spaces regardless of the space type. **Exception:** Structural panel components such as plywood, particle board, wafer board, and oriented strand board identified as "EXPOSURE 1," "EXTERIOR," or "HUD-APPROVED" are considered acceptable for interior use.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.5 Office Furniture Systems and Seating.** All office furniture systems and seating installed prior to occupancy shall be tested according to ANSI/BIFMA M7.1 and shall not exceed the limit requirements listed in Normative Appendix E of this standard.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**8.4.2.6 Ceiling and Wall Systems.** These systems include ceiling and wall insulation, acoustical ceiling panels, tackable wall panels, gypsum wall board and panels, and wall coverings. Emissions for these products shall be determined according to CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) and shall comply with the limit requirements for either office or classroom spaces regardless of the space type.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

#### **8.5.1 Daylighting Simulation**

**8.5.1.1 Usable Illuminance in Office Spaces and Classrooms.** The design for the building project shall demonstrate an illuminance of at least 30 fc (300 lux) on a plane 2.5 ft (0.8 m) above the floor, within 75% of the area of the daylight area. The simulation shall be made at noon on the equinox using an accurate physical model or computer daylighting model. a. Computer models shall be built using daylight simulation software based on the ray-tracing or radiosity methodology. b. Simulation shall be done using either the CIE Overcast Sky Model or the CIE Clear Sky Model. **Exception:** Where the simulation demonstrates that existing adjacent structures preclude meeting the illuminance requirements.

**PROPOSED ACTION:** Revise language to require daylight calculations in accordance with Daylight Autonomy Calculation Analysis Method and define more achievable goals for initial code adoption.

**RATIONALE / IMPACT:** Methodology described does not recognize orientation and % of sunlight. Conflicts with section 7.4.2.4 restriction on maximum allowable fenestration.

**8.5.1.2 Direct Sun Limitation on Worksurfaces in Offices.** It shall be demonstrated that direct sun does not strike anywhere on a worksurface in any daylight space for more than 20% of the occupied hours during an equinox day in regularly occupied office spaces. If the worksurface height is not defined, a height of 2.5 ft (0.75 m) above the floor shall be used.

**PROPOSED ACTION:** **PROPOSED ACTION:** Request DPS to review and consider amending

**RATIONALE / IMPACT:** Conflicts with daylighting requirements (8.3.4); confirm internal and external shading devices shall be included in the calculation (7.4.2.5)

**8.5.2 Materials.** The emissions of all the materials listed below and used within the building (defined as inside of the weatherproofing system and applied onsite) shall be modeled for individual VOC concentrations. The sum of each individual VOC concentration from the materials listed below shall be shown to be in compliance with the limits as listed in Section 4.3 of the CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) and shall be compared to 100% of its corresponding listed limit. In addition, the modeling for the building shall include at a minimum the criteria listed in Normative Appendix F. Emissions of materials used for modeling VOC concentrations shall be obtained in accordance with the testing procedures of CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350) unless otherwise noted below. c. Rigid panel products, including gypsum board, other wall paneling, insulation board, oriented strand board, medium density fiber board, wood structural panel, acoustical ceiling tiles, and particleboard. d. Insulation products. e. Containerized products, including adhesives, sealants, paints, other coatings, primers, and other "wet" products. f. Cabinets, shelves, and worksurfaces that are permanently attached to the building before occupancy. Emissions of these items shall be obtained in accordance with the ANSI/BIFMA M7.1. g. Office furniture systems and seating installed prior to initial occupancy. Emissions of these items shall be obtained in accordance with the ANSI/BIFMA M7.1. a. Tile, strip, panel, and plank products, including vinyl composition tile, resilient floor tile, linoleum tile, wood floor strips, parquet flooring, laminated flooring, and modular carpet tile. b. Sheet and roll goods, including broadloom carpet, sheet vinyl, sheet linoleum, carpet cushion, wallcovering, and other fabric. **Exception:** Salvaged materials that have not been refurbished or refinished within one year prior to installation.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

## 2011 ASHRAE 189.1 – Chapter 9 – The Buildings Impact on Atmosphere, Materials and Resources

**9.1 Scope.** This section specifies requirements for the building's impact on the atmosphere, materials, and resources, including construction waste management, refrigerants, storage and collection of recyclables, and reduced impact materials.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**9.2 Compliance.** The building materials shall comply with Section 9.3, "Mandatory Provisions," and either a. Section 9.4, "Prescriptive Option," or b. Section 9.5, "Performance Option."

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**9.3.1.1 Diversion.** A minimum of 50% of nonhazardous construction and demolition waste material generated prior to the issuance of the final certificate of occupancy shall be diverted from disposal in landfills and incinerators by recycling and/or reuse. Reuse includes donation of materials to charitable organizations, salvage of existing materials onsite, and packaging materials returned to the manufacturer, shipper, or other source that will reuse the packaging in future shipments. Excavated soil and land-clearing debris shall not be included in the calculation. Calculations are allowed to be done by either weight or volume, but shall be consistent throughout. Specific area(s) on the construction site shall be designated for collection of recyclable and reusable materials. Off-site storage and sorting of materials shall be allowed. Diversion efforts shall be tracked throughout the construction process.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.1.2 Total Waste.** For new building projects on sites with less than 5% existing buildings, structures or hardscape, the total amount of construction waste generated prior to the issuance of the final certificate of occupancy on the project shall not exceed 42 yd<sup>3</sup> or 12,000 lbs per 10,000 ft<sup>2</sup> (35 m<sup>3</sup> or 6000 kg per 1000 m<sup>2</sup> of new building floor area. This shall apply to all waste whether diverted, landfilled, incinerated, or otherwise disposed of. Excavated soil and land-clearing debris shall not be included in the calculation. The amount of waste shall be tracked throughout the construction process.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.2 Extracting, Harvesting, and/or Manufacturing.** This section applies to all materials, products, and/or assemblies installed prior to the issuance of the final certificate of occupancy. Materials shall be harvested and/or extracted and products and/or assemblies shall be manufactured according to the laws and regulations of the country of origin. Wood products in the project, other than recovered or reused wood, shall not contain wood from endangered wood species unless the trade of such wood conforms with the requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.3 Refrigerants.** CFC-based refrigerants in HVAC&R systems shall not be used. Fire suppression systems shall not contain ozone-depleting substances (CFCs, HCFCs, or Halons).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.4.1 Recyclables.** There shall be an area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including paper, corrugated cardboard, glass, plastics, and metals. The size and functionality of the recycling areas shall be coordinated with the anticipated collection services to maximize the effectiveness of the dedicated areas.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.4.2 Reusable goods.** For building projects with residential spaces, there shall be an area that serves the entire building and is designed for the collection and storage of discarded but clean items in good condition. Charitable organizations or others to arrange for periodic pickups shall be identified and posted.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.3.4.3 Fluorescent and HID Lamps and Ballasts.** An area shall be provided that serves the entire building and is designed for the collection and storage of fluorescent and HID lamps and ballasts and facilitates proper disposal and/or recycling according to state and local hazardous waste requirements.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.4.1 Reduced Impact Materials.** The building project shall contain materials that comply with Section 9.4.1.1, 9.4.1.2, or 9.4.1.3. Components of mechanical, electrical, plumbing, fire safety systems, and transportation devices shall not be included in the calculations except for piping, plumbing fixtures, ductwork, conduit, wiring, cabling, and elevator and escalator framing. Calculations shall only include materials permanently installed in the project. A value of 45% of the total construction cost is allowed to be used in lieu of the actual total cost of materials.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.4.1.1 Recycled Content.** The sum of post-consumer recycled content plus one-half of the pre-consumer recycled content shall constitute a minimum of 10%, based on cost, of the total materials in the building project. The recycled content of a material shall be determined by weight. The recycled fraction of the material in an assembly shall then be multiplied by the cost of assembly to determine its contribution to the 10% requirement. The annual average industry values, by country of production, for the recycled content of steel products manufactured in basic oxygen furnaces and electric arc furnaces are allowed to be used as the recycled content of the steel. For the purpose of calculating the recycled content contribution of concrete, the constituent materials in concrete (e.g., the cementitious materials, aggregates, and water) are allowed to be treated as separate components and calculated separately.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.4.1.2 Regional Materials.** A minimum of 15% of building materials or products used, based on cost, shall be regionally extracted/harvested/recovered or manufactured within a radius of 500 mi (800 km) of the project site. If only a fraction of a product or material is extracted/harvested/ recovered or manufactured locally, then only that percentage (by weight) shall contribute to the regional value. **Exception:** For building materials or products shipped in part by rail or water, the total distance to the project shall be determined by weighted average, whereby that portion of the distance shipped by rail or water shall be multiplied by 0.25 and added to that portion not shipped by rail or water, provided that the total does not exceed 500 mi (800 km).

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.4.1.3 Biobased Products.** A minimum of 5% of building materials used, based on cost, shall be biobased products. Biobased products shall comply with the minimum biobased contents of the USDA's Designation of Biobased Items for Federal Procurement, contain the "USDA Certified Biobased Product" label, or be composed of solid wood, engineered wood, bamboo, wool, cotton, cork, agricultural fibers, or other biobased materials with at least 50% biobased content.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.4.1.3.1 Wood Building Components.** Wood building components including, but not limited to, structural framing, sheathing, flooring, sub-flooring, wood window sash and frames, doors, and architectural millwork used to comply with this requirement shall contain not less than 60% certified wood content tracked through a chain of custody process either by physical separation or percentage-based approaches. Acceptable certified wood content documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59, or the WTO Technical Barriers to Trade. Wood building components from a vendor are allowed to comply when the annual average amount of certified wood products purchased by the vendor, for which they have chain of custody verification not older than two years, is 60% or greater of their total annual wood products purchased.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.5.1 Life-Cycle Assessment.** A LCA shall be performed in accordance with ISO Standard 14044 for a minimum of two building alternatives, considering at least those material components included for consideration in Section 9.4.1, both of which shall conform to the OPR. Each building alternative shall consist of a common design, construction, and materials for the locale, including building size and use, as commonly approved by the AHJ. Each building alternative shall comply with Sections 6, 7, and 8. The service life of the buildings shall be not less than that determined using Table 10.3.2.3, except that the design life of long-life buildings shall be no less than 75 years.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.5.1.1 LCA Performance Metric.** The building alternative chosen for the project shall have a 5% improvement over the other building alternative assessed in the LCA in a minimum of two of the impact categories. The impact categories are: land use (or habitat alteration), resource use, climate change, ozone layer depletion, human health effects, ecotoxicity, smog, acidification, and eutrophication.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.5.1.2 Procedure.** The LCA shall include the following three steps: Step 1: Perform a life-cycle inventory (LCI). The LCI accounts for all the individual environmental flows to and from the material components in a building throughout its life cycle. 1. The LCI shall include the materials and energy consumed and the emissions to air, land, and water for each of the following stages: a. Extracting and harvesting materials and fuel sources from nature. b. Processing building materials and manufacturing building components. c. Transporting materials and components. d. Assembly and construction. e. Maintenance, repair, and replacement during the design life with or without operational energy consumption. f. Demolition, disposal, recycling, and reuse of the building at the end of its life cycle. 2. The LCI shall account for emissions to air for the following: a. The six principal pollutants for which the USEPA has set National Ambient Air Quality Standards as required by the Clean Air Act and its amendments: carbon monoxide, nitrogen dioxide, lead, sulfur oxides, particulate matter (PM 10 and PM 2.5 and ozone. b. Greenhouse gases (not including water vapor and ozone) as described in the Inventory of U.S. Green-house Gas Emissions and Sinks: carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydrochlorofluorocarbons, bromofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, sulfur dioxide, and VOCs. c. Hazardous air pollutants listed in the Clean Air Act and its amendments. Step 2: Compare the two building alternatives using a published third-party impact indicator method that includes, at a minimum the impact categories listed in Section 9.5.1.1. An LCA report shall be prepared that meets the requirements for third-party reporting in ISO Standard 14044 and also includes: 1. A description of the two building alternatives, including: a. a description of the system boundary used, b. the design life of each building, and c. the physical differences between buildings. 2. The impact indicator method and impact categories used. 3. The results of the LCA indicating a minimum of 5% improvement in the proposed building compared to the other building alternative for a minimum of two impact categories, including an explanation of the rationale for the weighting and averaging of the impacts. Step 3: Conduct a critical review by an external expert independent of those performing the LCA.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**9.5.1.3 Reporting.** The following shall be submitted to the AHJ: a. The LCA report. b. The documentation of critical peer review by a third party including the results from the review and the reviewer's name and contact information.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

## **2011 ASHRAE 189.1 – Chapter 10 – Construction and Plans for Operation**

**10.1 Scope.** This section specifies requirements for construction and plans for operation, including the commissioning process, building acceptance testing, measurement and verification, energy use reporting, durability, transportation management, erosion and sediment control, construction, and indoor air quality during construction.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**10.2 Compliance.** All of the provisions of Section 10 are mandatory provisions.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**10.3.1.1 Building Acceptance Testing.** Acceptance testing shall be performed on all buildings in accordance with this section using generally accepted engineering standards and handbooks acceptable to the AHJ. An acceptance testing process shall be incorporated into the design and construction of the building project that verifies systems specified in this section perform in accordance with construction documents.

**PROPOSED ACTION:** DPS to determine what generally accepted engineering standards and handbooks are acceptable to the AHJ

**RATIONALE / IMPACT:** Provide specific direction

**10.3.1.1.1 Activities Prior to Building Permit.** Complete the following: a. Designate a project Acceptance Representative to lead, review, and oversee completion of acceptance testing activities. b. Construction documents shall indicate who is to perform acceptance tests and the details of the tests to be performed. c. Acceptance representative shall review construction documents to verify relevant sensor locations, devices, and control sequences are properly documented.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.1.2 Activities Prior to Building Occupancy.** Complete the following: a. Verify proper installation and start-up of the systems. b. Perform acceptance tests. For each acceptance test, complete test form and include a signature and license number, as appropriate, for the party who has performed the test. c. Verify a system manual has been prepared that includes O&M documentation and full warranty information, and provides operating staff the information needed to understand and optimally operate building systems.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.1.3 Systems.** The following systems, if included in the building project, shall have acceptance testing: a. Mechanical systems: heating, ventilating, air conditioning, IAQ, and refrigeration systems (mechanical and/or passive) and associated controls. b. Lighting systems: automatic daylighting controls, manual daylighting controls, occupancy sensing devices, and, automatic shut-off controls c. Fenestration Control Systems: Automatic controls for shading devices and dynamic glazing. d. Renewable energy systems. e. Water measurement devices, as required in Section 6.3.3. f. Energy measurement devices, as required in Section 7.3.3.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.1.4 Documentation.** The owner shall retain completed acceptance test forms.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.2 Building Project Commissioning.** For buildings that exceed 5000 ft<sup>2</sup> (500 m<sup>2</sup> of gross floor area, commissioning shall be performed in accordance with this section using generally accepted engineering standards and handbooks acceptable to the AHJ. Buildings undergoing the commissioning process will be deemed to comply with the requirements of Section 10.3.1.1, "Building Acceptance Testing." A commissioning process shall be incorporated into the predesign, design, construction, and first year occupancy of the building project that verifies that the delivered building and its components, assemblies, and systems comply with the documented OPR. Procedures, documentation, tools, and training shall be provided to the building operating staff to sustain features of the building assemblies and systems for the service life of the building. This material shall be assembled and organized into a systems manual that provides necessary information to the building operating staff to operate and maintain all commissioned systems identified within the building project.

**PROPOSED ACTION:** Adopt with the following modification: For buildings that exceed 5000 ft<sup>2</sup> (500 m<sup>2</sup> of gross floor area and an energy density of \_\_\_ watts per sq ft [DPS to enter minimum watts per sq ft], commissioning shall be performed in accordance with this section using generally accepted engineering standards and handbooks acceptable to the AHJ.

**RATIONALE / IMPACT:** A more realistic approach for the need to commission a building smaller than the recommended threshold of 10,000 sq ft

**10.3.1.2.1 Activities Prior to Building Permit.** The following activities shall be completed: a. Designate a project commissioning authority (CxA) to lead, review, and oversee completion of the commissioning process activities prior to completion of schematic design. b. The owner, in conjunction with the design team as necessary, shall develop the OPR during predesign and updated during the design phase by the design team as necessary, in conjunction with the owner and the commissioning team. The OPR will be distributed to all parties participating in project programming, design, construction, and operations, and the commissioning team members. c. The design team shall develop the BOD. The BOD document shall include all the information required in Section 6.2, "Documentation," of ANSI/ASHRAE Standard 55. d. The CxA shall review both the OPR and BOD to ensure that no conflicting requirements or goals exist and that the OPR and BOD, based on the professional judgment and experience of the CxA, are sufficiently detailed for the project being undertaken. e. Construction phase commissioning requirements shall be incorporated into project specifications and other construction documents developed by the design team. f. The CxA shall conduct two focused OPR reviews of the construction documents: the first at near 50% design completion and the second of the final construction documents prior to delivery to the contractor. The purpose of these reviews is to verify that the documents achieve the construction phase OPR and the BOD document fully supports the OPR, with sufficient details. g. Develop and implement a commissioning plan containing all required forms and procedures for the complete testing of all equipment, systems, and controls included in Section 10.3.1.2.4.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.2.2 Activities Prior to Building Occupancy.** The following activities shall be completed: a. Verify the installation and performance of the systems to be commissioned, including completion of the construction checklist and verification. **Exception to 10.3.1.2.2(a):** Systems that, because their operation is seasonally dependent, cannot be fully commissioned in accordance with the commissioning plan at time of occupancy. These systems shall be commissioned at the earliest time after occupancy when operation of systems is allowed to be fully demonstrated as determined by CxA. b. It shall be verified that the owner requirements for the training of operating personnel and building occupants is completed. Where systems cannot be fully commissioned at the time of occupancy because of seasonal dependence, the training of personnel and building occupants shall be completed when the systems' operation can be fully demonstrated by the CxA. c. Complete preliminary commissioning report. d. Verify a system manual has been prepared that includes O&M documentation, full warranty information, and provides operating staff the information needed to understand and operate the commissioned systems as designed.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.2.3 Post-Occupancy Activities.** Complete the following: a. Complete any commissioning activities called out in the commissioning plan for systems whose commissioning can only be completed subsequent to building occupancy, including trend logging and off-season testing. b. Verify the owner requirements for training operating personnel and building occupants are completed for those systems whose seasonal operational dependence mean they were unable to be fully commissioned prior to building occupancy. c. Complete a final commissioning report.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.2.4 Systems.** The following systems, if included in the building project, shall be commissioned: a. Heating, ventilating, air-conditioning, IAQ, and refrigeration systems (mechanical and/or passive) and associated controls. Control sequences to be verified for compliance with construction documentation as part of verification. b. Building envelope systems, components, and assemblies to verify the thermal and moisture integrity. c. Building envelope pressurization to confirm air-tightness if included in BOD requirements. d. Lighting systems. e. Fenestration control systems: Automatic controls for shading devices and dynamic glazing. f. Irrigation. g. Plumbing. h. Domestic and process water pumping and mixing systems. i. Service water heating systems. j. Renewable energy systems. k. Water measurement devices, as required in Section 6.3.3. l. Energy measurement devices, as required in Section 7.3.3.

**PROPOSED ACTION:** Adopt with modifications to revise language that requires full commissioning for disciplines with full industry support, and require partial commissioning for disciplines with emerging technology.

**RATIONALE / IMPACT:** Good practice but more time is required for full implementation: readily achievable for several disciplines listed however there are many disciplines listed which are not supported by their respective industries in terms of product development, procedures, and trained/licensed professionals to comply with all requirements. Will have significant cost impact.

**10.3.1.2.5 Documentation.** Owner shall retain the System Manual and Final Commissioning Report.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.3 Erosion and Sediment Control (ESC).** Develop and implement an erosion and sediment control (ESC) plan for all construction activities. The ESC plan shall conform to the erosion and sedimentation control requirements of the most current version of the USEPA NPDES General Permit for Stormwater Discharges From Construction Activities or local erosion and sedimentation control standards and codes, whichever is more stringent and regardless of size of project.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.4 Indoor Air Quality (IAQ) Construction Management.** Develop and implement an indoor air quality (IAQ) construction management plan to include the following: a. Air conveyance materials shall be stored and covered so that they remain clean. All filters and controls shall be in place and operational when HVAC systems are operated during building "flush-out" or baseline IAQ monitoring. Except for system startup, testing, balancing, and commissioning, permanent HVAC systems shall not be used during construction. b. After construction ends, prior to occupancy and with all interior finishes installed, a post-construction, pre-occupancy building flush-out as described under Section 10.3.1.4 (b) 1, or post-construction, pre-occupancy baseline IAQ monitoring as described under Section 10.3.1.4 (b) 2 shall be performed: 1. Post-Construction, Pre-Occupancy Flush-Out: A total air volume of outdoor air in total air changes as defined by Equation 10.3.1.4 shall be supplied while maintaining an internal temperature of a minimum of 60°F (15°C) and relative humidity no higher than 60%. For buildings located in non-attainment areas, filtration and/or air cleaning as described in Section 8.3.1.3 shall be supplied when the Air Quality Index forecast exceeds 100 (category orange, red, purple, or maroon). One of the following options shall be followed: (a) Continuous Post-Construction, Pre-Occupancy Flush-Out: The flush-out shall be continuous and supplied at an outdoor airflow rate no less than that determined in Section 8.3.1.1. (b) Continuous Post-Construction, Pre-Occupancy/ Post-Occupancy Flush-Out: If occupancy is desired prior to completion of the flush-out, the space is allowed to be occupied following delivery of half of the total air changes calculated from Equation 10.3.1.4 to the space. The space shall be ventilated at a minimum rate of 0.30 cfm per ft<sup>2</sup> (1.5 L/s per m<sup>2</sup> of outdoor air or the outdoor airflow rate determined in Section 8.3.1.1, whichever is greater. These conditions shall be maintained until the total air changes calculated according to Equation 10.3.1.4 have been delivered to the space. The flush out shall be continuous. Equation 10.3.1.4: TAC V of 1/A 1/H 60 min/h 24 h/day 14 days (I-P) TAC V of 1 m<sup>3</sup>/1000 L 1/A 1/H 3600 s/h 24 h/day 14 days (SI) where TAC total air changes V of system design outdoor air intake flow cfm (L/s) (according to Equation 6-8 of ANSI/ASHRAE Standard 62.1) A floor area ft<sup>2</sup> (m<sup>2</sup> H ceiling height, ft (m) 2. Post-Construction, Pre-Occupancy Baseline IAQ Monitoring: Baseline IAQ testing shall be conducted after construction ends and prior to occupancy. The ventilation system shall be operated continuously within ±10% of the outdoor airflow rate provided by the ventilation system at design occupancy for a minimum of 24 hours prior to IAQ monitoring. Testing shall be done using protocols consistent with the USEPA Compendium of Methods for the Determination of Toxic Organic Pollutants in Ambient Air, TO-1, TO-11, TO-17 and ASTM Standard Method D 5197. The testing shall demonstrate that the contaminant maximum concentrations listed in Table 10.3.1.4 are not exceeded in the return airstreams of the HVAC systems that serve the space intended to be occupied. If the return airstream of the HVAC system serving the space intended to be occupied cannot be separated from other spaces either already occupied or not occupied at all, for each portion of the building served by a separate ventilation system, the testing shall demonstrate that the contaminant maximum concentrations at breathing zone listed in Table 10.3.1.4 are not exceeded in the larger of the following number of locations: (a) no less than one location per 25,000 ft<sup>2</sup> (2500 m<sup>2</sup> or (b) in each contiguous floor area. For each sampling point where the maximum concentration limits are exceeded conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to demonstrate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 10.3.1.4 Maximum Concentration of Air Pollutants Relevant to IAQ**

Contaminant	Maximum Concentration, $\mu\text{g}/\text{m}^3$ (Unless Otherwise Noted)
<b>Nonsoluble Organic Compounds</b>	
Carbon monoxide (CO)	9 ppm and no greater than 2 ppm above outdoor levels
Ozone	0.075 ppm (8-hr)
Particulates (PM <sub>2.5</sub> )	35 (24-hr)
Particulates (PM <sub>10</sub> )	150 (24-hr)
<b>Volatile Organic Compounds</b>	
Acetaldehyde	140
Acrylonitrile	5
Benzene	60
1,3-Butadiene	20
t-Butyl methyl ether (Methyl-t-butyl ether)	8000
Carbon disulfide	800
Caprolactam*	100
Carbon tetrachloride	80
Chlorobenzene	1000
Chloroform	300
1,4-Dichlorobenzene	800
Dichloromethane (Methylene chloride)	400
1,4-Dioxane	3000
Ethylbenzene	2000
Ethylene glycol	400
Formaldehyde	33
2-Ethylhexanoic acid*	25
n-Hexane	7000
1-Methyl-2-pyrrolidinone*	160
Naphthalene	9
Nonanal*	13
Octanal*	7.2
Phenol	200
4-Phenylethylbenzene (4-PEH)*	2.5
2-Propanol (Isopropanol)	7000
Styrene	900
Tetrachloroethene (Tetrachloroethylene, Perchloromethylene)	35
Toluene	300
1,1,1-Trichloroethane (Methyl chloroform)	1000
Trichloroethene (Trichloromethylene)	600
Xylene isomers	700
Total Volatile Organic Compounds (TVOC)	-

\* The test is only required if carpets and floors with styrene-butadiene rubber (SBR) backings are installed as part of the base building systems.  
 \* TVOC\* reporting shall be in accordance with CA DHS EDD:R-174 and shall be in conjunction with the individual VOCs listed above.

**10.3.1.5 Moisture Control.** The following items to control moisture shall be implemented during construction: a. Materials stored onsite or materials installed that are absorptive shall be protected from moisture damage. b. Building construction materials that show visual evidence of biological growth due to the presence of moisture shall not be installed on the building project.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.1.6 Construction Activity Pollution Prevention: No-Idling of Construction Vehicles:** Vehicle staging areas shall be established for waiting to load or unload materials. These staging areas shall be located 100 ft (30 m) from any outdoor air intakes, operable openings, and hospitals, schools, residences, hotels, daycare facilities, elderly housing, and convalescent facilities.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2 Plans for Operation.** This section specifies the items to be included in plans for operation of a building project that falls under the requirements of this standard.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1 High Performance Building Operation Plan.** A Master Building Plan for Operation shall be developed that meets the requirements specified in Sections 10.3.2.1.1 through 10.3.2.1.4.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.1 Site Sustainability.** A site sustainability portion of the Plan for Operation shall be developed and contain the following provisions. When trees and vegetation are used to comply with the shade requirements of Section 5.3.2.1, 5.4 or 5.5, the Plan for Operation shall include the maintenance procedures needed to maintain healthy vegetation growth. The Plan shall also outline the procedures for replacing any vegetation used to comply with the provisions in Section 5.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.2 Water Use Efficiency.** The Plan for Operation shall specify water use verification activities for building projects to track and assess building water consumption. The Plan shall describe the procedures needed to comply with the requirements outlined below.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.2.1 Initial Measurement and Verification.** Use the water measurement devices and collection/storage infrastructure specified in Section 6.3.3 to collect and store water use data for each device, starting no later than after building acceptance testing has been completed and certificate of occupancy has been issued.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.2.2 Track and Assess Water Use.** The Plan shall specify the procedures for tracking and assessing the building project water use, and the frequency for benchmark comparisons. The initial assessment shall be completed after 12 months but no later than 18 months after a certificate of occupancy has been issued. Ongoing assessments shall be completed at least every three years. The Plan shall include the following: a. Usage Reports: Develop a Plan for collecting building project water use data for water sources and subsystems measured in Section 6.3.3. b. Benchmark Water Performance: Develop a Plan to enter building operating characteristics and water use data into the ENERGY STAR Portfolio Manager. For building parameter inputs into Portfolio Manager (e.g., number of occupants, hours of operation, etc.), use actual average values. c. Assess Water Use Performance: Develop a Plan to assess building project water use efficiency.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.2.3 Documentation of Water Use.** All documents associated with the measurement and verification of the building's water use shall be retained by owner for a minimum of three years.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.3 Energy Efficiency.** The Plan for Operation shall specify energy performance verification activities for building projects to track and assess building energy performance. The Plan shall describe the procedures needed to comply with the requirements outlined below.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.3.1 Initial Measurement and Verification.** Use the energy measurement devices and collection/ storage infrastructure specified in Section 7.3.3 to collect and store energy data for each device, starting no later than after acceptance testing has been completed and certificate of occupancy has been issued.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.3.2 Track and Assess Energy Consumption.** The Plan for Operation shall specify the procedures for tracking and assessing the building project energy performance, and the frequency for benchmark comparisons. The initial assessment shall be completed after 12 months but no later than 18 months after a certificate of occupancy has been issued. Ongoing assessments shall be completed at least every three years. The Plan shall include the following: a. Energy Usage Reports: Develop a Plan for collecting building project energy data for energy sources and system energy loads measured in Section 7.3.3. The reports shall include the following, as minimum: 1. Hourly load profile for each day 2. Monthly average daily load profile 3. Monthly and annual energy use 4. Monthly and annual peak demand b. Track Energy Performance: Develop a Plan to enter building operating characteristics and energy consumption data into the ENERGY STAR Portfolio Manager for those building types addressed by this program to track building performance. For building parameter inputs into Portfolio Manager (e.g., number of occupants, hours of operation, number of PCs, etc.), use actual average values. c. Assess Energy Performance: Develop a Plan to assess building project energy performance.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.3.3 Documentation of Energy Efficiency.** All documents associated with the measurement and verification of the building's energy efficiency shall be retained by owner.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4 Indoor Environmental Quality.** The Plan for Operation shall include the requirements of Section 8 of ANSI/ASHRAE Standard 62.1 and shall describe the procedures for implementing a regular indoor environmental quality measurement and verification program after building occupancy, as outlined below.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.1 Outdoor Airflow Measurement.** The Plan for Operation shall document procedures for implementing a regular outdoor airflow monitoring program after building occupancy. The Plan shall include minimum verification frequencies of airflows supplied by mechanical ventilation systems at the system level. Verification shall be performed using hand-held airflow measuring instruments appropriate for such measurements or permanently installed airflow measuring stations. Hand-held airflow measuring instruments or airflow measuring stations used for airflow verifications must be calibrated no more than 6 months prior to such verifications. Naturally ventilated systems shall be exempted from this requirement provided that the design parameters, including but not limited to permanent openings or window opening frequency are not modified.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.2 Outdoor Airflow Verification Procedures.** The plan procedures shall contain the following requirements: a. For each mechanical ventilation system where direct outdoor airflow measurement is required according to Section 8.3.1.2, a procedure shall be in place to react when the outdoor airflow is 15% or more lower than minimum outdoor airflow rate. It shall be verified that the device that measures outdoor air flow rate is actually measuring the flow rate within  $\pm 15\%$  of the sensor output reading at the minimum outdoor airflow rate. If the sensor is not within  $\pm 15\%$ , it shall be recalibrated. Verification of outdoor airflow shall be done on a quarterly basis and records maintained onsite. Direct outdoor airflow measurement devices shall be calibrated at the manufacturer's recommended interval or at least annually. b. For each mechanical ventilation system where direct outdoor airflow measurement is not required according to Section 8.3.1, a procedure shall be in place to verify outdoor airflow and records maintained onsite and shall be made available upon request.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.3 Outdoor Airflow Scheduling.** Ventilation systems shall be operated such that spaces are ventilated when these spaces are expected to be occupied.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.4 Outdoor Airflow Documentation.** The following documentation shall be maintained concerning outdoor airflow measurement and verification. a. A list of each air system requiring direct outdoor air flow measurement. b. Monitoring procedures and monitoring frequencies for each monitored sensing device, including a description of the specific response measures to be taken if needed. c. Ventilation systems shall be operated such that spaces are ventilated when these spaces are expected to be occupied. d. Operation and calibration check procedures, and the records associated with operation checks and recalibration.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.5 Indoor Air Quality.** The Plan for Operation shall document procedures for maintaining and monitoring indoor air quality after building occupancy, and shall contain the following: a. For buildings located in non-attainment areas for PM 2.5 as defined by the USEPA, air filtration and/or air cleaning equipment as defined in Section 8.3.1.3(a) shall be operated continuously during occupied hours or when the USEPA Air Quality Index exceeds 100 or equivalent designations by the local authorities for PM 2.5 **Exception to 10.3.2.1.4.5(a):** Spaces without mechanical ventilation. b. For buildings located in non-attainment areas for ozone as defined by the USEPA, air-cleaning equipment as defined in Section 8.3.1.3(b) shall be operated continuously during occupied hours during the local summer and fall seasons, or when the USEPA Air Quality Index exceeds 100 or equivalent designations by the local authorities for ozone. **Exception to 10.3.2.1.4.5(b):** Spaces without mechanical ventilation. c. Biennial monitoring of Indoor Air Quality by one of the following methods: 1. Perform IAQ testing as described in Section 10.3.1.4. 2. Monitoring occupant perceptions of indoor air quality by any method, including but not limited to occupant questionnaires. 3. Each building shall have an occupant complain/ response program for IEQ.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.6 Building Green Cleaning Plan.** A Green Cleaning Plan shall be developed for the building project in compliance with Green Seal Standard, GS-42. **Exception:** Dwelling units of a building project.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.1.4.7 Document all measurement and verification data.**

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.2 Maintenance Plan.** A Maintenance Plan shall be developed for mechanical, electrical, plumbing, and fire protection systems, which includes the following: a. The Plan shall be in accordance with ANSI/ASHRAE/ ACCA Standard 180 for HVAC systems in buildings that meet the definition of commercial buildings in ANSI/ASHRAE/ACCA Standard 180. b. The Plan shall address all elements of Section 4 of ANSI/ASHRAE/ACCA Standard 180 and shall develop required inspection and maintenance tasks similar to Section 5 of ANSI/ASHRAE/ACCA Standard 180 for electrical and plumbing systems in buildings that meet the definition of commercial buildings in ANSI/ASHRAE/ACCA Standard 180. c. Documentation of the Plan and of completed maintenance procedures shall be maintained on the building site at all times in: 1. Electronic format for storage on the building Energy Management System (EMS), Building Management System (BMS), computerized maintenance management system (CMMS) or other computer storage means, or 2. Maintenance manuals specifically developed and maintained for documenting completed maintenance activities.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.3 Service Life Plan.** A Service Life Plan that is consistent with the OPR shall be developed to estimate to what extent structural, building envelope (not mechanical and electrical), and hardscape materials will need to be repaired or replaced during the service life of the building. The design service life of the building shall be no less than that determined using Table 10.3.2.3. The estimated service life shall be documented for building assemblies, products, and materials that will need to be inspected, repaired, and/or replaced during the service life of the building. Site improvements and hardscape shall also be included. Documentation in the Service Life Plan shall include the building project design service life and basis for determination, and the following for each assembly or component: a. Building assembly description b. Materials or products c. Design or estimated service life, years d. Maintenance frequency e. Maintenance access for components with an estimated service life less than the service life of the building Provide a Service Life Plan at the completion of design development. The owner shall retain a copy of the Service Life Plan for use during the life of building.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**TABLE 10.3.2.3 Minimum Design Service Life for Buildings**

Category	Minimum Service Life	Building Types
Temporary	Up to 10 years	Non-permanent construction buildings (sales offices, bunkhouses) Temporary exhibition buildings
Medium life	25 years	Industrial buildings Stand-alone parking structures
Long life	50 years	All buildings not temporary or medium life, including the parking structures below buildings designed for long life category

**10.3.2.4 Transportation Management Plan (TMP).** A transportation management plan shall be developed compliant with the following requirements. Owner shall retain a copy of the transportation management plan.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.4.1 All Building Projects.** The Plan shall include the following: a. Preferred parking for carpools and vanpools with parking facilities. b. A plan for bicycle transportation.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.4.2 Owner-Occupied Building Projects or Portions of Building Projects.** For owner-occupied buildings, or for the employees in the owner-occupied portions of a building, the building owner shall offer at least one of the following primary benefits to the owner's employees: a. Incentivize employees to commute using mass transit, vanpool, carpool, or non-motorized forms of transportation. b. Initiate a telework or flexible work schedule program that reduces by at least 5% the number of commuting trips by the owner's employees. c. Initiate a ridesharing or carpool matching program, either in-house or through an outside organization. **Exception:** Multifamily residential building project. In addition, the owner shall provide all of the following to the owner's employees: a. Access to an emergency ride home for employees, either provided in-house or by an outside organization. b. A central point of contact in charge of commuter benefits. c. Maintenance of commuter benefits in a centralized location. d. Active promotion of commuter benefits to employees.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.3.2.4.3 Building Tenant.** The building owner: a. shall provide a copy of the Plan to tenants within the building. b. shall not include parking fees in lease rates or shall identify the value of parking in the lease.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** Good practice

**10.4 Prescriptive Option.** There are no prescriptive options.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required

**10.5 Performance Option.** There are no performance options.

**PROPOSED ACTION:** Adopt as written

**RATIONALE / IMPACT:** No action required