

## CHAPTER 8 INDOOR ENVIRONMENTAL QUALITY (IEQ)

**801.1 (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, *lighting quality*, daylighting, and low-emitting materials.

**801.2 (8.2) Compliance** The indoor environmental quality shall comply with [Section 801.3 \(8.3\)](#), "Mandatory Provisions," and either

- a. [Section 801.4 \(8.4\)](#), "Prescriptive Option," or
- b. [Section 801.5 \(8.5\)](#), "Performance Option."

Daylighting and low-emitting materials are not required to use the same option, i.e., prescriptive or performance, for demonstrating compliance.

### 801.3 (8.3) Mandatory Provisions

**801.3.1 (8.3.1) Indoor Air Quality** Buildings shall comply with the design requirements of ANSI/ASHRAE Standard 62.1, [Sections 4](#) through [6](#), including applicable normative appendices, with the modifications and additions indicated herein. Health care facilities shall comply with the design requirements of ANSI/ASHRAE/ASHE Standard 170, including applicable normative appendices, with the modifications and additions indicated herein. *Residential dwelling units* shall comply with the design requirements of ANSI/ASHRAE Standard 62.2, [Sections 4](#) through [8](#), with the modifications and additions indicated herein. Requirements provided in [Sections 801.3.1.1 \(8.3.1.1\)](#) through [801.3.1.7 \(8.3.1.7\)](#) supersede such requirements in ASHRAE Standard 62.1, ASHRAE Standard 62.2, and ASHRAE/ASHE Standard 170.

#### 801.3.1.2 (8.3.1.2) Outdoor Air Delivery Monitoring

**801.3.1.2.1 (8.3.1.2.1) System Design for Outdoor Air Intake Measurement** Each mechanical ventilation system shall be configured to allow for the measurement of the *outdoor air* intake for use in testing and balancing, recommissioning, and *outdoor air* monitoring as required in [Section 801.3.1.2.2\(8.3.1.2.2\)](#).

**801.3.1.2.2 (8.3.1.2.2) Monitoring Requirements** Each mechanical ventilation system shall have a *permanently installed* device to measure the *minimum outdoor airflow*

**Exception:** Constant-volume air supply systems

#### 801.3.1.3 (8.3.1.3) Filtration and Air Cleaner Requirements

a. **Particulate Matter.** The following requirements shall apply in all buildings.

**Exceptions:** In health care facilities, the particulate filter requirements of ASHRAE/ ASHE Standard 170 shall apply.

1. **Wetted Surfaces.** Particulate matter filters or air cleaners having a minimum efficiency reporting value (MERV) of not less than 8 when rated in accordance with ANSI/ASHRAE Standard 52.2 shall be provided upstream of all cooling coils or other devices with wetted surfaces through which air is supplied to an *occupiable space*. These requirements supersede the requirements in ASHRAE Standard 62.1, Section 5.8.

2. **Particulate Matter Smaller than 10 Micrometers (PM10).** Particulate matter filters or air cleaners shall be provided in accordance with Standard 62.1, Section 6.2.1.1, with the following modification. Such filters or air cleaners shall have a MERV of not less than 8 when rated in accordance with ASHRAE Standard 52.2.

3. **Particulate Matter Smaller than 2.5 Micrometers (PM2.5).** Particulate matter filters or air cleaners shall be provided in accordance with Standard 62.1, Section 6.2.1.2, with the following modification. Such filters or air cleaners shall have a MERV of not less than 13 when rated in accordance with ASHRAE Standard 52.2.

**801.3.5 (8.3.5)Lighting Quality** The interior lighting and lighting controls shall be installed to meet the requirements of [Sections 801.3.5.1 \(8.3.5.1\)](#) and [801.3.5.2 \(8.3.5.2\)](#).

**801.3.5.1 (8.3.5.1)Enclosed Office Spaces** Lighting for at least 90% of enclosed office spaces with less than 250 ft<sup>2</sup>(23.3 m<sup>2</sup>) of floor area shall comply with at least one of the following:

- a. Provide *multilevel lighting control*.
- b. Provide *bilevel lighting control* and separate *task lighting*.

**801.3.5.2 (8.3.5.2)Multioccupant Spaces** Lighting for conference rooms, meeting rooms, multipurpose rooms, gymnasiums, auditoriums, ballrooms, cafeterias, *classrooms*, and other training or lecture rooms shall be provided with *multilevel lighting control*. Lighting settings or the lighting controlled by each manual control shall be labeled at the control devices. The lighting in gymnasiums, auditoriums, ballrooms, and cafeterias shall also consist of at least two separately controlled groups of luminaires.

## 801.4 (8.4) Prescriptive Option

### 801.4.1 (8.4.1)Daylighting

**801.4.1.1 (8.4.1.1)Daylighting in Large Spaces Directly under a Roof and Having High Ceilings** *Enclosed spaces*, including conditioned and unconditioned *spaces*, meeting all of the following criteria, shall comply with [Sections 801.4.1.1.1, 801.4.1.1.2 and 801.4.1.1.3 \(8.4.1.1.1, 8.4.1.1.2 and 8.4.1.1.3\)](#):

- a. The *space* is in a building with three stories or fewer above grade.
- b. The *space* area is greater than 2500 ft<sup>2</sup>(232 m<sup>2</sup>).
- c. The *space* is located directly under a *roof*, and average ceiling heights are greater than 15 ft (4.6 m).

**Exceptions:**

1. *Spaces* in buildings located in *Climate Zones 7 or 8*.
2. Auditoria, motion picture theaters, performing arts theaters, museums, places of worship, and refrigerated warehouses.
3. *Enclosed spaces* where documentation shows that existing structures or natural objects block direct sunlight on at least 50% of the *roof over the enclosed space* at all three of the following times on the date of the spring equinox: three hours before solar noon (peak solar altitude), at solar noon, and three hours after solar noon.

**801.4.1.1.1 (8.4.1.1.1)Minimum Daylight Area** Not less than 50% of the floor area shall be in the *daylight area* as defined in [Chapter 3 \(Section 3\)](#). For the purposes of [Section 801.4.1.1.1 \(8.4.1.1.1\)](#), the definition of *daylight area* shall be modified such that partitions and other obstructions that are less than the ceiling height are disregarded. *Daylight areas* shall be under *skylights*, under *roof monitors*, or in the primary or *secondary sidelighted areas* and shall meet not less than one of the following requirements:

- a. The combined area of the *skylights* within the *space* shall not be less than 3% of the calculated *daylight area under skylights*.
- b. The *space* shall have a *skylight effective aperture* of not less than 1%.
- c. The combined area within the *space* of any *vertical fenestration* in *roof monitors* shall not be less than 20% of the calculated *daylight area under roof monitors*.
- d. *Primary sidelighted areas* shall have a *side-lighting effective aperture* of not less than 0.15.
- e. *Secondary sidelighted areas* shall have a *side-lighting effective aperture* of not less than 0.30.

**801.4.1.1.2 (8.4.1.1.2) Visible Transmittance (VT) of Skylights and Roof Monitors** The visible transmittance of *skylights* and *roof monitors* for *daylight areas* used to comply with [Section 801.4.1.1.1 \(8.4.1.1.1\)](#) shall not be less than 0.40. For *dynamic glazing*, the highest-labeled VT shall be used for compliance with this section.

**Exception:** *Enclosed spaces* that have a *skylight effective aperture* of not less than 1%.

**801.4.1.1.3 (8.4.1.1.3) Skylight Optical Diffusion Characteristics** *Skylights* used to comply with [Section 801.4.1.1.1 \(8.4.1.1.1\)](#) shall have a glazing material or diffuser that has a measured haze value greater than 90% when tested according to ASTM D1003 or other test method approved by the AHJ.

**Exceptions:**

1. *Skylights* with a measured haze value less than or equal to 90% and having a combined area not in excess of 5% of the total *skylight* area.
2. *Tubular daylighting devices* having a diffuser
3. *Skylights* designed to prevent direct sunlight from entering the occupied *space* below during occupied hours.
4. *Skylights* in transportation terminals and concourses, sports arenas, convention centers, atria, and shopping malls.

**801.4.1.2 (8.4.1.2) Minimum Sidelighting Effective Aperture** The *spaces* listed in [Table 801.4.1.2A \(8.4.1.2A\)](#) shall comply with items (a), (b) and (c).

a. The north-, south-, and east-facing *façades* shall have a minimum *sidelighting effective aperture* as prescribed in [Table 801.4.1.2B \(8.4.1.2B\)](#).

b. For all *façades*, the combined width of the *primary sidelighted areas* shall not be less than 75% of the length of the *façade wall*.

c. Opaque interior surfaces in *daylight areas* shall have average visible light reflectances greater than or equal to 80% for ceilings, 40% for partitions higher than 60 in. (1.5 m), and 60% for *walls*.

**Exceptions:**

1. *Spaces* not adjacent to an exterior *wall*.
2. A *space* that would have tasks or activities requiring routine dark conditions for more than four daytime hours per day.
3. *Spaces* covered by and in compliance with [Section 801.4.1.1 \(8.4.1.1\)](#) without the use of any exception.
4. *Daylight areas* where the height of existing adjacent structures above the window is not less than twice the distance between the window and the adjacent structures, measured from the top of the glazing.
5. Existing buildings undergoing alteration, repair, relocation, or a change in occupancy.

**801.4.1.3 (8.4.1.3) Shading for Offices** For *spaces* 250 ft<sup>2</sup> (23 m<sup>2</sup>) and larger, east west and south *façade* shall be designed with a shading *projection/actor (PF)* on the *first floor level*. The *PF* shall not be less than 0.5 for the first story above grade

**Exceptions:**

1. *Facades* facing within 45 degrees of true north in the northern hemisphere or *facades* facing 45 degrees from true south in the southern hemisphere.
2. Translucent panels and glazing systems with a measured haze value greater than 90% when tested according to ASTM D1003 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.
3. Where equivalent shading of the *vertical fenestration* is provided by buildings, structures, geological formations, or permanent exterior projections that are not horizontal, as determined by sun-angle studies at the peak solar altitude on the summer solstice and three hours before and after the peak solar altitude on the summer solstice.
4. *Vertical fenestration* with automatically controlled shading devices in compliance with Exception (2) of [Section 701.4.2.5 \(7.4.2.5\)](#).
5. *Vertical fenestration* with automatically controlled *dynamic glazing* in compliance with Exception (3) of [Section 701.4.2.5 \(7.4.2.5\)](#).
6. Existing buildings undergoing alteration, repair, relocation, or a change in occupancy.

**TABLE 801.4.1.2A (TABLE 8.4.1.2A)  
DAYLIT SPACES**

Classroom/training room
Conference/meeting/multipurpose room except in convention centers
Lounge/breakroom
Enclosed office and open plan office
Library reading area
Patient rooms and physical therapy rooms within a healthcare facility

**TABLE 801.4.1.2B (TABLE 8.4.1.2B)  
MINIMUM SIDELIGHTING EFFECTIVE APERTURE**

CLIMATE ZONE	MINIMUM SIDELIGHTING EFFECTIVE APERTURE
0, 1, 2, 3A, 3B	0.10
3C, 4, 5, 6, 7, 8	0.15

**801.4.2 (8.4.2)Materials** Reported emissions or volatile organic compound (VOC) contents specified in the following subsections shall be from a representative product sample and determined 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 in the following subsections are exempted from this three-year testing requirement but shall meet all the other requirements as listed.

**801.4.2.1 (8.4.2.1)Adhesives and Sealant** 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 *weatherproofing system* and applied on-site) shall comply with the requirements of either [Section 801.4.2.1.1 \(8.4.2.1.1\)](#) or [801.4.2.1.2\(8.4.2.1.2\)](#).

**801.4.2.1.1 (8.4.2.1.1)Emissions Requirements** Emissions shall be determined according to CDPH/ EHLB/Standard Method V1.1 (commonly known as California Section 01350) and shall comply with the limit requirements for either office or *classroom spaces*, regardless of the *space* type. The emissions testing shall be performed by an ISO/IEC 17025 accredited laboratory that has CDPH/EHLB/Standard Method V.1.1, USEPA Method TO-17, and ASTM Standard Method D5197 within the scope of its accreditation. Third-party certifiers shall be accredited to ISO/IEC 17065 and have the relevant certification program in the scope of accreditation.

**801.4.2.1.2 (8.4.2.1.2)VOC Content Requirements** The VOC content of adhesives, sealants, and sealant primers shall be determined and limited in accordance with SCAQMD Rule 1168. HVAC duct sealants shall be classified as “Other” category within the SCAQMD Rule 1168 sealants table.

The VOC content of aerosol adhesives shall be determined and limited in accordance with Green Seal Standard GS-36, Section 3.

**Exceptions:** The following solvent welding and sealant products are not required to meet the emissions or VOC content requirements.

- 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).

**801.4.2.2 (8.4.2.2)Paints and Coatings** Products in this category include anticorrosive coatings, basement specialty coatings, concrete/masonry sealers, concrete curing compounds, dry fog coatings, faux-finishing coatings, fire-resistive coatings, flat and nonflat topcoats, floor coatings, graphic arts (sign) coatings, high-temperature coatings, industrial maintenance coatings, low-solids coatings, mastic texture coatings, metallic pigmented coatings, multicolor coatings, pretreatment wash primers, primers, reactive penetrating sealers, recycled coatings, shellacs (clear and opaque), specialty primers, stains, stone consolidants, swimming-pool coatings, tub- and tile-refining coatings, under-coaters, waterproofing membranes, wood coatings (clear wood finishes), wood preservatives, and zinc primers. 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 801.4.2.2.1 \(8.4.2.2.1\)](#) or [801.4.2.2.2 \(8.4.2.2.2\)](#).

**801.4.2.2.1 (8.4.2.2.1)Emissions Requirements** Emissions shall be determined according to CDPH/ EHLB/Standard Method V1.1 (commonly known as California Section 01350) and shall comply with the limit requirements for either office or *classroom spaces*, regardless of the *space* type. The emissions testing shall be performed by an ISO/IEC 17025 accredited laboratory that has CDPH/EHLB/Standard Method V.1.1, USEPA Method TO-17, and ASTM Standard Method D5197 within the scope of its accreditation. Third-party certifiers shall be accredited to ISO/IEC 17065 and have the relevant certification program in the scope of accreditation.

**801.4.2.2.2 (8.4.2.2.2)VOC Content Requirements**

- a. The VOC content for flat and nonflat coatings, nonflat high-gloss coatings, specialty coatings, basement specialty coatings, concrete/ masonry sealers, fire-resistive coatings, floor coatings, low-solids coatings, primers, sealers and undercoaters, rust preventative coatings, shellacs (clear and opaque), stains, wood coatings, reflective *wall* coatings, varnishes, conjugated oil varnish, lacquer, and clear brushing lacquer shall be determined and limited in accordance with Green Seal Standard GS-11.
- b. The VOC content for concrete curing compounds, dry fog coatings, faux finishing coatings, graphic arts coatings (sign paints), industrial maintenance coatings, mastic texture coatings, metallic pigmented coatings, multicolor coatings, pretreatment wash primers, reactive penetrating sealers, recycled coatings, specialty primers, wood preservatives, and zinc primers shall be determined and limited in accordance with the California Air Resources Board Suggested Control Measure for Architectural Coatings or SCAQMD Rule 1113r.
- c. The VOC content for high-temperature coatings, stone consolidants, swimming-pool coatings, tub- and tile-refinishing coatings, and waterproofing membranes shall be determined and limited in accordance with the California Air Resources Board Suggested Control Measure for Architectural Coatings.

**801.4.2.3 (8.4.2.3)Floor Covering Materials** Emissions of floor covering materials installed in the building interior, and each product layer within a flooring system containing more than one distinct product layer, shall be individually determined according to CDPH/EHLB/Standard Method V1.1 (commonly known as California Section 01350) and shall comply with the limit requirements for either office or *classroom spaces*, regardless of the *space* type. The emissions testing shall be performed by an ISO/IEC 17025 accredited laboratory that has CDPH/EHLB/Standard Method V.I.I, USEPA TO-17, and ASTM Standard Method D5197 within the scope of its accreditation. Third-party certifiers shall be accredited to ISO/IEC 17065 and have the relevant certification program in the scope of accreditation.

**801.4.2.3.1 (8.4.2.3.1)Deemed to Comply** Floor covering materials that are composed of materials listed in [Table 801.4.2.3.1 \(8.4.2.3.1\)](#) shall be deemed to comply with the requirements of [Section 801.4.2.3 \(8.4.2.3\)](#). Where these products include integral organic-based surface coatings, binders, or sealants, or are installed using adhesives, sealants, paints, or coatings, those products shall be subject to other requirements of [Section 801.4.2 \(8.4.2\)](#).

**TABLE 801.4.2.3.1 (TABLE 8.4.2.3.1)  
FLOOR COVERING DEEMED TO COMPLY WITH VOC EMISSION LIMITS**

Ceramic and concrete tile
Natural stone
Gypsum plaster
Clay masonry Concrete masonry
Concrete
Metal

**801.4.2.4 (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 follows: 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.

**Exceptions:** 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.

**801.4.2.6 (8.4.2.6) Ceiling and Wall Assemblies and Systems**

Ceiling and wall assemblies and systems include acoustical treatments, ceiling panels and tiles, gypsum panel products, tackable *wall* panels and coverings, *wall* coverings, and *wall* and ceiling paneling and planking. Emissions from these assemblies and systems shall be determined according to CDPH/EHLB/Standard Method V1.1 (commonly known as California Section 01350) and shall comply with the limit requirements for either office or *classroom spaces*, regardless of the *space* type. The emissions testing shall be performed by an ISO/IEC 17025 accredited laboratory that has CDPH/ EHLB/Standard Method V.1.1, USEPA TO-17, and ASTM Standard Method D5197 within the scope of its accreditation. Third-party certifiers shall be accredited to ISO/IEC 17065 and have the relevant certification program in the scope of accreditation.

**801.4.2.6.1 (8.4.2.6.1) Deemed to Comply** Ceiling and *wall* assemblies and systems that are composed of materials listed in [Table 801.4.2.6.1 \(8.4.2.6.1\)](#) shall be deemed to comply with the requirements of [Section 801.4.2.6 \(8.4.2.6\)](#). Where these products include integral organic-based surface coatings, binders, or sealants, or are installed using adhesives, sealants, paints, or coatings, those products shall be subject to other requirements of [Section 801.4.2 \(8.4.2\)](#).

**TABLE 801.4.2.6.1 (TABLE 8.4.2.6.1)  
CEILING AND WALL PRODUCTS DEEMED TO COMPLY WITH VOC EMISSION LIMITS**

Ceramic and concrete tile
Natural stone
Gypsum plaster
Clay masonry
Concrete masonry
Concrete
Metal

**801.4.2.7 (8.4.2.7) Insulation** Emissions shall be determined according to CDPH/EHLB/Standard Method V1.1 (commonly known as California Section 01350) and shall comply with the limit requirements for either office or *classroom spaces*, regardless of the *space* type. The emissions testing shall be performed by an ISO/IEC 17025 accredited laboratory that has CDPH/EHLB/Standard Method V.1.1, USEPA TO-17, and ASTM Standard Method D5197 within the scope of its accreditation. Third-party certifiers shall be accredited to ISO/IEC 17065 and have the relevant certification program in the scope of accreditation.

## 801.5 (8.5) Performance Option

**801.5.1 (8.5.1)Daylight Simulation** For the *spaces* listed in [Table 801.4.1.2A \(8.4.1.2A\)](#), and any *spaces* required to have daylighting in accordance with [Section 801.4.1.1 \(8.4.1.1\)](#), the total floor area shall be calculated, and computer modeling shall be used to determine that the requirements specified in [Sections 801.5.1.1 \(8.5.1.1\)](#) and [801.5.1.2 \(8.5.1.2\)](#) are met. Computer models shall use an hourly simulation and shall adhere to the modeling protocols described in IES LM 83 for *spatial daylight autonomy (sDA)* calculations in [Section 801.5.1.1 \(8.5.1.1\)](#) and *annual sunlight exposure (ASE)* calculations in [Section 801.5.1.2\(8.5.1.2\)](#).

**801.5.1.1 (8.5.1.1)Minimum Daylight** The computed area-weighted *sDA* shall not be less than 40%.

The *sDA* within each *space* shall be calculated in accordance with the methodology of IES LM 83. Calculations shall be made on the basis of 28 fc (300 lux) for all *spaces*, with the exception of the following *space* types, which shall be calculated on the basis of 14 fc (150 lux): health-care patient rooms, post-office sorting areas, gymnasias, big box retail, transportation facility terminal ticket counters, airport concourses, and nonrefrigerated warehouses.

**Exceptions:**

1. A *space* used for tasks or activities requiring routine dark conditions for more than 4 daytime hours per day.
2. A *space* where the height of existing facing structures above the *vertical fenestration* is not less than twice the distance between the *vertical fenestration* and facing structures, measured from the top of the glazing.

**801.5.2 (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 on-site) 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 CDPH/EHLB/Standard Method V1.1 (commonly referred to as California Section 01350), Section 4.3, 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 D](#) of this code. Emissions of materials used for modeling VOC concentrations shall be obtained in accordance with the testing procedures of CDPH/EHLB/Standard Method V1.1 unless otherwise noted below.

- 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.
- 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.