Reference Material
Municipal Green Building Task Force meeting, November 18, 2020

Agenda Item 5: Old Business, Update to Environment Code Chapter 7.

Contents:
- Existing references to specific LEED v4 Rating System prerequisites and credits in Environment Code Chapter 7, Section 706 (Excerpted)

- Excerpt from SFE CalGreen (2016, 2019)–LEED v4 Crosswalk, Nov 2019

- Excerpts from the LEED BD+C Rating System - v4.0 and v4.1 Beta, accessed online Nov 4, 2020
  - Low Emitting Materials
  - Indoor Air Quality Assessment

- Excerpts from "LEED v4.1 BD+C rating system tracked changes", July 2020
  - Low Emitting Materials
  - Indoor Air Quality Assessment

- Existing references to other IEQ requirements for products/materials in Environment Code Chapter 7, Section 706 (Excerpted)

- Excerpt from the LEED BD+C Rating System v4.1 Beta, accessed online Nov 4, 2020
  - Building Product Disclosure and Optimization – Material Ingredients

- San Francisco Carpet Regulation

- Excerpts from DRAFT San Francisco Regulations, Forthcoming
  - Furniture (Upholstered)
  - Paints and Primers
  - Resilient Flooring
Existing references to specific LEED v4 Rating System prerequisites and credits in Environment Code Chapter 7, Section 706 (Excerpted)

- LEED credit Indoor Water Use Reduction
- LEED prerequisite Minimum Energy Performance
- LEED prerequisite Fundamental Commissioning and Verification
- LEED credit Enhanced and Monitoring-Based Commissioning
- LEED credit Construction and Demolition Waste Management
- LEED credit Enhanced Indoor Air Quality Strategies
- LEED credit Construction Indoor Air Quality Management Plan
- LEED credit Indoor Air Quality Assessment
- LEED credit Low Emitting Materials

(c) **Indoor Water Use Reduction.** Municipal construction projects subject to a LEED certification requirement shall demonstrate a minimum 30% reduction in the use of indoor potable water, as calculated to meet and achieve LEED credit Indoor Water Use Reduction.

(d) **Renewable Energy Efficiency, Better Roofs, and Energy Resilience.**
(2) For municipal construction projects subject to a LEED certification requirement, the design team shall demonstrate that the project meets LEED prerequisite Minimum Energy Performance EA 1 Energy Performance requirement and demonstrates compliance with Title 24, Part 6 California Energy Standards in effect at the time of the permit application.

(e) **Commissioning.** For each municipal construction project subject to a LEED certification requirement, the design team shall demonstrate that the project achieves Option 1 of LEED credit Enhanced and Monitoring-Based Commissioning, in addition to LEED prerequisite Fundamental Commissioning and Verification.

(f) **Construction Debris Management.** All municipal construction projects shall demonstrate a minimum 75% diversion from landfill. For all municipal construction projects subject to a LEED certification requirement, the LEED Project Administrator shall submit documentation verifying that the project achieves LEED credit Construction and Demolition Waste Management (75%; 2 points). The project must also satisfy the requirements of Section 708.

(g) **Indoor Air Quality.** For each municipal construction project subject to a LEED certification requirement, the LEED Project Administrator shall submit documentation verifying that the project achieves LEED credit Enhanced Indoor Air Quality Strategies (1 point), LEED credit Construction Indoor Air Quality Management Plan (1 point), and LEED credit Indoor Air Quality Assessment Option 2: Air Testing (2 points).

(h) **Low Emitting Materials.** For each municipal construction project subject to a LEED certification requirement, the LEED Project Administrator shall submit documentation verifying that the project achieves LEED Low Emitting Materials (3 points).
### Excerpt from CalGreen (2016, 2019) -- LEED v4 Crosswalk

#### LEGEND:
- **Bold** font shows **modified text**; **Black** font in the "Requirements" column highlights subtle changes between CALGreen versions.

#### Code / Rating System | Measure / Credit Name | Reference Number | Requirements: CalGreen 2016, LEED v4 | Reference Number | Requirements: CalGreen 2019 | Comparison Results
--- | --- | --- | --- | --- | --- | ---
**CalGreen** | Energy Efficiency | 5.201.1 | Meet or exceed the requirements of the California Building Energy Efficiency Standards (Title 24, Part 6, 2016) | 5.201.1 | Meet or exceed the requirements of the California Building Energy Efficiency Standards (Title 24, Part 6, 2019) | CALGreen (Title 24, Part 6) is more stringent than LEED v4 (ASHRAE 90.1-2010).

**LEED** | Minimum Energy Performance | Ea3 | Demonstrate a 20% energy cost reduction compared to ASHRAE 90.1-2010 (5% New Construction, 3% Major Renovations, 2% Core and Shell) | 5.201.1 | Meet or exceed the requirements of the California Building Energy Efficiency Standards (Title 24, Part 6, 2010) | A report titled Energy Efficiency Comparison: California’s 2013 Building Energy Efficiency Standards and ASHRAE/IESNA Standard 90.1-2010 helps answer the question of which energy efficiency requirements are more stringent between CALGreen and LEED. The report concludes that estimated energy use for nonresidential buildings of California’s 2013 Building Energy Efficiency Standards exceed the energy savings expected from the commercial building requirements of ASHRAE/IESNA Standard 90.1-2010. It is expected that this would remain true for a comparison to Title 24, 2016 and 2019, since LEED v4 requirements have not changed.

**CalGreen** | Water conserving plumbing fixtures and fittings | 5.303.3 | Meet the following water flow rate requirements: | 5.303.3 | Meet the following flow rate requirements: | CALGreen is more stringent than LEED v4. On April 1, 2015, Governor Jerry Brown released Executive Order B-29-15 mandating emergency regulations that would improve the efficiency of water appliances—including toilets and faucets—in new and existing buildings.

**Compliance Results**

**LEED** | Water Conservation | Ea3 | Use whole building energy simulation to demonstrate increased energy cost reduction compared to ASHRAE 90.1-2010. | 5.303.3 | EA 2: Use whole building energy simulation to demonstrate increased energy cost reduction compared to ASHRAE 90.1-2010 | LEED requires commissioning (not just testing and adjusting) of all energy-related systems in all projects regardless of size. Therefore, LEED is more stringent than CALGreen. However, CALGreen requires testing and adjusting of irrigation systems, which LEED does not.

**CalGreen** | Commercial kitchen equipment | 5.303.4 | Disposer should not exceed 8 gpm when in use and 1 gpm when not in use (not actively grinding food) or it should shut off after 10 minutes of inactivity. | 5.303.4 | Same as CG-2016 | CALGreen and LEED are not aligned, but they are similar.

**CalGreen** | Standards for Plumbing Fixtures and Fittings | 5.303.6 | Install plumbing fixtures in accordance with the California Plumbing Code. | 5.303.6 | Same as CG-2016

**LEED** | Prequisite: Indoor Water Use Reduction | WP2 | Reduce water consumption by 20% from a baseline. Address fixtures & fittings, appliances, equipment, and processes. | WP2 | Further reduce fixture and fitting water use from the calculated baseline in WP2. | CALGreen and LEED are not aligned, but they are similar.

**CalGreen** | Construction Waste Management | 5.408.1 | Develop a Construction and Demolition Waste Management Plan and identify a 65% diversion goal. Use a waste management company to provide verifiable documentation. Or generate less than 2 lbs/sf of construction waste. | 5.408.1 | Same as CG-2016 | CALGreen and LEED are not aligned, but they are similar.

**LEED** | Construction and Demolition Waste Management Planning | MP2 | Develop a Construction and Demolition Waste Management Plan. Identify at least five materials for landfill diversion. Estimate their contribution to overall project waste. Specify diversion strategies and identify recycling facilities. | MP2 | Same as CG-2016 | CALGreen and LEED are not aligned, but they are similar.

**CalGreen** | Commissioning (Ca) | 5.410.2 | For new buildings > 100,000 sf, commission all systems covered by Title 24, Part 6, including process systems and renewable energy systems. Provide a systems manual and training on commissioned systems. | 5.410.2 | Same as CG-2016 | CALGreen and LEED are not aligned, but they are similar.

**LEED** | Fundamental Commissioning and Verification | EA1 | Commission MEP and renewable energy systems. | EA1 | Same as CG-2016 | CALGreen and LEED both require commissioning of all energy-related systems. CALGreen requires that irrigation systems be commissioned. CALGreen also requires development of a system manual and training on systems being commissioned. The LEED credit requires the OPR, BOD and peer review address the exterior envelope. LEED has more stringent requirements for the Commissioning Agent (CaA), and for projects >20,000 sf, the CaA must be independent of the design team. CALGreen has more relaxed requirements for qualified commissioning agents and only requires independence on projects >50,000 sf.

**CalGreen** | Testing and Adjusting | 5.410.4 | Test and adjust systems for buildings less than 10,000 square feet. Provide a final report. Provide building owner with a detailed operating and maintenance instruction manual. | 5.410.4 | Same as CG-2016 | CALGreen and LEED are not aligned, but they are similar.

**LEED** | Fundamental Commissioning and Verification | EA1 | Commission MEP and renewable energy systems. | EA1 | Same as CG-2016 | CALGreen and LEED both require commissioning of all energy-related systems. CALGreen requires that irrigation systems be commissioned. CALGreen also requires development of a system manual and training on systems being commissioned. The LEED credit requires the OPR, BOD and peer review address the exterior envelope. LEED has more stringent requirements for the Commissioning Agent (CaA), and for projects >20,000 sf, the CaA must be independent of the design team. CALGreen has more relaxed requirements for qualified commissioning agents and only requires independence on projects >50,000 sf.

**CalGreen** | Temporary Ventilation | 5.304.1 | Use return air filters with a MERV of 8. Replace filters before capacity. | 5.304.1 | Same as CG-2016 | LEED v4 is more stringent than CALGreen.

**LEED** | Temporary Ventilation | EA1 | Commission MEP and renewable energy systems. | EA1 | Same as CG-2016 | LEED v4 is more stringent than CALGreen.

**CalGreen** | Covering of duct openings and protection of mechanical equipment during construction | 5.304.3 | Cover duct openings and protect mechanical equipment during construction to reduce the amount of dust, water, and debris which may enter the system. | 5.304.3 | Same as CG-2016 | LEED v4 is more stringent than CALGreen.

**LEED** | Construction Indoor Air Quality Management Plan | EQc3 | Meet SCAI IAQ Guidelines for Occupied Buildings Under Construction. Protect absorbative materials from moisture damage. Use MERV 8 filters. Prohibit tobacco products inside building and within 25 feet of the building entrance during construction. | EQc3 | Same as CG-2016 | LEED v4 is more stringent than CALGreen.

---

San Francisco Department of the Environment | CalGreen (2016, 2019)-LEED v4 crosswalk

file:///Users/CalGreen%20LEED%20v4%20crosswalk%20Html.html

November 2019
<table>
<thead>
<tr>
<th>Code/ Rating System</th>
<th>Measure / Credit Name</th>
<th>Reference Number</th>
<th>Requirements: CalGreen 2016, LEED v4</th>
<th>Requirements: CalGreen 2019</th>
<th>Comparison Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CalGreen</td>
<td>Adhesives, sealants and caulks</td>
<td>5.504.4.1</td>
<td>Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers and caulks comply with SCAQMD Rule 1168. Adhesive adhesives comply with state VOC standards.</td>
<td>5.504.4.1</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Low-Emitting Materials</td>
<td>EQc2</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Adhesives and sealants must comply with CDPH Standard Method V1.1-2010 or SCAQMD Rule 1168.</td>
<td>EQc2</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Points and coatings must comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2008.</td>
</tr>
<tr>
<td>CalGreen</td>
<td>Points and Coatings</td>
<td>5.504.4.3</td>
<td>Comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2008.</td>
<td>5.504.4.3</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Low-Emitting Materials</td>
<td>EQc3</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Points and coatings must comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2007 and CDPH Standard Method V1.1-2010 or SCAQMD Rule 1113.</td>
<td>EQc3</td>
<td>All interior carpet must meet one of the following: 1) Carpet and Rug Institute’s Green Label Plus Program, 2) CDPH Standard Method V1.1-2010, 3) NSF/ANSI 140 Gold or Higher, 4) UL Greenguard Gold, 5) 2012 CA-CHPS. Carpet cushion must meet CRI Green Label program, and carpet adhesives must meet SCAQMD Rule 1168.</td>
</tr>
<tr>
<td>CalGreen</td>
<td>Carpet Systems</td>
<td>5.504.4.4</td>
<td>All interior carpet must meet one of the following: 1) Carpet and Rug Institute’s Green Label Plus Program, 2) CDPH Standard Method V1.1-2010, 3) NSF/ANSI 140 Gold or Higher, 4) UL Greenguard Gold, 5) 2012 CA-CHPS. Carpet cushion must meet CRI Green Label program, and carpet adhesives must meet SCAQMD Rule 1168.</td>
<td>5.504.4.4</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Low-Emitting Materials</td>
<td>EQc3</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Points and coatings must comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2008.</td>
<td>EQc3</td>
<td>All interior carpet must meet one of the following: 1) Carpet and Rug Institute’s Green Label Plus Program, 2) CDPH Standard Method V1.1-2010, 3) NSF/ANSI 140 Gold or Higher, 4) UL Greenguard Gold, 5) 2012 CA-CHPS. Carpet cushion must meet CRI Green Label program, and carpet adhesives must meet SCAQMD Rule 1168.</td>
</tr>
<tr>
<td>CalGreen</td>
<td>Composite wood products</td>
<td>5.504.4.5</td>
<td>Hardwood plywood, particleboard, and MDF composite wood products used on the interior or exterior must meet formaldehyde requirements of the California Air Resources Board (CARB) 93120 Airborne Toxic Control Measure (ATCM).</td>
<td>5.504.4.5</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Low-Emitting Materials</td>
<td>EQc3</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Points and coatings must comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2008.</td>
<td>EQc3</td>
<td>All interior carpet must meet one of the following: 1) Carpet and Rug Institute’s Green Label Plus Program, 2) CDPH Standard Method V1.1-2010, 3) NSF/ANSI 140 Gold or Higher, 4) UL Greenguard Gold, 5) 2012 CA-CHPS. Carpet cushion must meet CRI Green Label program, and carpet adhesives must meet SCAQMD Rule 1168.</td>
</tr>
<tr>
<td>CalGreen</td>
<td>Resilient flooring systems</td>
<td>5.504.4.6</td>
<td>For 80% of resilient flooring area in buildings, install floorings which meets one of the following: 1) RFCI FloorScore Certified, 2) CDPH Standard Method V1.1-2010 3) CA-CHPS July 2012 Criteria 4) UL Greenguard Gold Certified</td>
<td>5.504.4.6</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Low-Emitting Materials</td>
<td>EQc2</td>
<td>Option 1: Achieve threshold levels of compliance with emissions and content standards for a number of product categories (up to 3 points). Points and coatings must comply with VOC limits in the California Air Resources Board, Architectural Coatings Suggested Control Measure 2008.</td>
<td>EQc2</td>
<td>All interior carpet must meet one of the following: 1) Carpet and Rug Institute’s Green Label Plus Program, 2) CDPH Standard Method V1.1-2010, 3) NSF/ANSI 140 Gold or Higher, 4) UL Greenguard Gold, 5) 2012 CA-CHPS. Carpet cushion must meet CRI Green Label program, and carpet adhesives must meet SCAQMD Rule 1168.</td>
</tr>
<tr>
<td>CalGreen</td>
<td>Filters</td>
<td>5.504.5.3</td>
<td>In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 8.</td>
<td>5.504.5.3</td>
<td>Same as CG-2016.</td>
</tr>
<tr>
<td>LEED</td>
<td>Enhanced IAQ Strategies</td>
<td>EQc1</td>
<td>Option 1: Employ strategies for Entryway Systems, Interior Cross-Contamination Prevention, Filtration</td>
<td>EQc1</td>
<td>Option 1: Employ strategies for Entryway Systems, Interior Cross-Contamination Prevention, Filtration</td>
</tr>
</tbody>
</table>

San Francisco Department of the Environment | CalGreen (2016, 2019)-LEED v4 crosswalk

November 2019
LEED BD+C: New Construction - LEED v4
Low-emitting materials - Indoor Environmental Quality
Possible 3 Points

Intent
To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Requirements
This credit includes requirements for product manufacturing as well as project teams. It covers volatile organic compound (VOC) emissions in the indoor air and the VOC content of materials, as well as the testing methods by which indoor VOC emissions are determined. Different materials must meet different requirements to be considered compliant for this credit. The building interior and exterior are organized in seven categories, each with different thresholds of compliance. The building interior is defined as everything within the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials.

Option 1. Product Category Calculations
Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in Table 2.

Table 1. Thresholds of compliance with emissions and content standards for 7 categories of materials

<table>
<thead>
<tr>
<th>Category</th>
<th>Threshold</th>
<th>Emissions and content requirements</th>
</tr>
</thead>
</table>
| Interior paints and coatings applied on site        | At least 90%, by volume, for emissions; 100% for VOC content | • General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings  
• VOC content requirements for wet applied products |
| Interior adhesives and sealants applied on site     | At least 90%, by volume, for emissions; 100% for VOC content | • General Emissions Evaluation  
• VOC content requirements for wet applied products |
| Flooring                                           | 100%                            | General Emissions Evaluation                                                                        |
| Composite wood                                     | 100% not covered by other categories | Composite Wood Evaluation                                                                        |
| Ceilings, walls, thermal, and acoustic insulation  | 100%                            | • General Emissions Evaluation  
• **Healthcare, Schools only** Additional insulation requirements |
| Furniture (include in calculations if part of scope of work) | At least 90%, by cost | Furniture Evaluation                                                                 |
| **Healthcare and Schools Projects only:** Exterior applied products | At least 90%, by volume | Exterior Applied Products                                                                 |
Table 2. Points for number of compliant categories of products

<table>
<thead>
<tr>
<th>Compliant categories</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC, CS, NC Retail, DC, WDC, NC Hos projects without furniture</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>NC, CS, NC Retail, DC, WDC, NC Hos projects with furniture, CI, CI Retail, CI Hos</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Schools, HC without furniture</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Schools, HC with furniture</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Option 2. Budget Calculation Method

If some products in a category do not meet the criteria, project teams may use the budget calculation method (Table 3).

Table 3. Points for percentage compliance, under budget calculation method

<table>
<thead>
<tr>
<th>Percentage of total</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 50% and &lt; 70%</td>
<td>1</td>
</tr>
<tr>
<td>≥ 70% and &lt; 90%</td>
<td>2</td>
</tr>
<tr>
<td>≥ 90%</td>
<td>3</td>
</tr>
</tbody>
</table>
The budget method organizes the building interior into five assemblies:

- flooring;
- ceilings;
- walls;
- thermal and acoustic insulation;
- furniture

Include furniture in the calculations if it is part of the scope of work. Walls, ceilings, and flooring are defined as building interior products; each layer of the assembly, including paints, coatings, adhesives, and sealants, must be evaluated for compliance. Insulation is tracked separately.

Determine the total percentage of compliant materials according to Equation 1.

**Equation 1. Total percentage compliance**

\[ \text{Total } \% \text{ compliant for projects without furniture} = \frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation})}{4} \]

\[ \text{Total } \% \text{ compliant for projects with furniture} = \frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation}) + (\% \text{ compliant furniture})}{5} \]

**Equation 2. System percentage compliant**

\[ \text{Flooring, walls, ceilings, insulation } \% \text{ compliant} = \frac{\text{(compliant surface area of layer 1} + \text{compliant surface area of layer 2} + \text{compliant surface area of layer 3} + \ldots \text{)} \times 100}{\text{total surface area of layer 1} + \text{total surface area of layer 2} + \text{total surface area of layer 3} + \ldots} \]

**Equation 3. Furniture systems compliant, using ANSI/BIFMA evaluation**

\[ \text{\% compliant for furniture} = \frac{0.5 \times \text{cost compliant with §7.6.1 of ANSI/BIFMA e3-2011} + \text{cost compliant with §7.6.2 of ANSI/BIFMA e3-2011}}{\text{total furniture cost}} \times 100 \]

Calculate surface area of assembly layers based on the manufacturer’s documentation for application. If 90% of an assembly meets the criteria, the system counts as 100% compliant. If less than 50% of an assembly meets the criteria, the assembly counts as 0% compliant.

Manufacturers’ claims. Both first-party and third-party statements of product compliance must follow the guidelines in CDPH SM V1.1–2010, Section 8. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 65.

Laboratory requirements. Laboratories that conduct the tests specified in this credit must be accredited under ISO/IEC 17025 for the test methods they use.

**Emissions and Content Requirements**

To demonstrate compliance, a product or layer must meet all of the following requirements, as applicable.
**Inherently nonemitting sources.** Products that are inherently nonemitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.

**General emissions evaluation.** Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer’s or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area.

Manufacturers’ claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:
- 0.5 mg/m³ or less;
- between 0.5 and 5.0 mg/m³; or
- 5.0 mg/m³ or more.

Projects outside the U.S. may use products tested and deemed compliant in accordance with either (1) the CDPH standard method (2010) or (2) the German AgBB Testing and Evaluation Scheme (2010). Test products either with (1) the CDPH Standard Method (2010), (2) the German AgBB Testing and Evaluation Scheme (2010), (3) ISO 16000-3: 2010, ISO 16000-6: 2011, ISO 16000-9: 2006, ISO 16000-11:2006 either in conjunction with AgBB, or with French legislation on VOC emission class labeling, or (4) the DIBt testing method (2010). If the applied testing method does not specify testing details for a product group for which the CDPH standard method does provide details, use the specifications in the CDPH standard method. U.S. projects must follow the CDPH standard method.

**Additional VOC content requirements for wet-applied products.** In addition to meeting the general requirements for VOC emissions (above), on-site wet-applied products must not contain excessive levels of VOCs, for the health of the installers and other tradesworkers who are exposed to these products. To demonstrate compliance, a product or layer must meet the following requirements, as applicable. Disclosure of VOC content must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation.

- All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
- For projects outside the U.S., all paints, coatings, adhesives, and sealants wet-applied on site must either meet the technical requirements of the above regulations, or comply with applicable national VOC control regulations, such as the European Decopaint Directive (2004/42/EC), the Canadian VOC Concentration Limits for Architectural Coatings, or the Hong Kong Air Pollution Control (VOC) Regulation.
- If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
- If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
- For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

**Composite Wood Evaluation.** Composite wood, as defined by the California Air Resources Board, Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, must be documented to have low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins. For projects outside the U.S., composite wood must be documented not to exceed a concentration limit of 0.05 ppm of formaldehyde (0.06 mg/m²·h when expressed as emission rate) as tested following either EN-
Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants. *Furniture evaluation.* New furniture and furnishing items must be tested in accordance with ANSI/BIFMA Standard Method M7.1–2011. Comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost), using either the concentration modeling approach or the emissions factor approach. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. For classroom furniture, use the standard school classroom model in CDPH Standard Method v1.1. Documentation submitted for furniture must indicate the modeling scenario used to determine compliance.

Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
LEED BD+C: New Construction - LEED v4.1
Low-Emitting Materials - Indoor Environmental Quality
Possible 3 Points

**Intent**
To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

**Requirements**
Use materials on the building interior (everything within the waterproofing membrane) that meet the low-emitting criteria below. Points are awarded according to Table 1:

Table 1. Points for low-emitting materials

<table>
<thead>
<tr>
<th>Product Categories</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1 point</td>
</tr>
<tr>
<td>3</td>
<td>2 points</td>
</tr>
<tr>
<td>4</td>
<td>3 points</td>
</tr>
<tr>
<td>5</td>
<td>3 points + exemplary performance</td>
</tr>
</tbody>
</table>

Reach 90% threshold in at least three product categories

Exemplary performance or 1 additional point if only 1 or 2 points achieved above.

**Paints and Coatings**
At least 75% of all paints and coatings, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.
The paints and coatings product category includes all interior paints and coatings applied on site.

**Adhesives and Sealants**
At least 75% of all adhesives and sealants, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.
The adhesives and sealants product category includes all interior adhesives and sealants applied on site.

**Flooring**
At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.
The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayments, and other floor coverings.
Subflooring is excluded.

**Wall panels**
At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.
The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments.
Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded.
### Ceilings

At least 90% of all ceilings, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.  
The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.  
Overhead structural elements (exposed, finished, and unfinished) are excluded.

### Insulation

At least 75% of all insulation, by cost or surface area, meets the VOC emissions evaluation.  
The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attention fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.  
Insulation for HVAC ducts and plumbing piping are excluded.

### Furniture

At least 75% of all furniture in the project scope of work, by cost, meets the furniture emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.  
The furniture product category includes all stand-alone furniture items purchased for the project.

### Composite Wood

At least 75% of all composite wood, by cost or surface area, meets the Formaldehyde emissions evaluation OR salvaged and reused materials criteria.  
The composite wood product category includes all particleboard, medium density fiberboard, hardwood veneer plywood, and structural composite wood not included in the flooring, ceiling, wall panels, or furniture material categories.

### Low-emitting criteria

#### inherently nonemitting sources

Product is an inherently nonemitting source of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) and has no integral organic-based surface coatings, binders, or sealants.

#### Salvaged and reused materials

Product is more than one year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the VOC emissions evaluation AND VOC content evaluation requirements.

#### VOC emissions evaluation

**Option 1.** Product has been tested according to California Department of Public Health (CDPH) Standard Method v1.2–2017 and complies with the VOC limits in Table 4-1 of the method. Additionally, the range of total VOCs after 14 days (336 hours) was measured as specified in the CDPH Standard Method v1.2 and is reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Products used in school classrooms must be evaluated using the classroom scenario, products used in other spaces must be evaluated using the default private office scenario.  

The statement of product compliance must include the exposure scenario(s) used, the amount of wet-applied product applied in mass per surface area (if applicable), the range of total VOCs, and follow guidelines in CDPH Standard Method v1.2-2017, Section 8. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 17065.

**Option 2.** Product has been tested according to EN 16516:2017 and complies with the LCI values from Table 1 of the German AgBB Testing and Evaluation Scheme (2015) and a formaldehyde limit of 10 micrograms per cubic meter. Additionally, the range of total VOCs after 28 days was measured as specified in EN 16516 and reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.
The statement of product compliance must include the amount of wet-applied product applied in mass per surface area (if applicable) and the range of total VOCs. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 17065.

**VOC content evaluation**
Product meets the VOC content limits outlined in one of the applicable standards and for projects in North America, methylene chloride and perchloroethylene may not be intentionally added.

Statement of product compliance must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

- **Paints and coatings:**
  - California Air Resource Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings
  - South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016
  - Hong Kong Air pollution control (VOC) Regulation for regulated architectural paints (January 2010)

- **Adhesives and sealants:**
  - SCAQMD Rule 1168, October 6, 2017
  - Canadian VOC Concentration Limits for Architectural Coatings (SOR/2009-264)
  - Hong Kong Air Pollution Control (VOC) Regulation for regulated adhesives and regulated sealants (April 2012)
  - Free of solvents, as defined in TRGS 610 (January 2011)

**Formaldehyde emissions evaluation**
Product meets one of the following:

- EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or
- EPA TSCA Title VI or CARB ATCM formaldehyde requirements for no added formaldehyde resins (NAF).
- Tested per EN 717-1:2014 for formaldehyde emissions and complies with emissions class E1. Structural composite wood product made with moisture resistant adhesives meeting ASTM 2559, no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following industry standards:
  - Plywood: compliant in accordance with Voluntary Product Standard - Structural Plywood (PS 1-09), Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10), or one of the standards considered by CARB to be equivalent to PS 1 or PS 2: (AS/NZS 2269, EN 636 3S (including CE label), Canadian Standards Association CSA O121 for Douglas fir plywood, CSA O151 for Canadian softwood plywood, for CSA O153 Poplar plywood, or CSAO325 for Construction sheathing)
  - Oriented strand board: specified with the Exposure 1 or Exterior bond classification in accordance with Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10)
  - Structural composite lumber: compliant in accordance with Standard Specification for Evaluation of Structural Composite Lumber Products (ASTM D 5456-13)
  - Glued laminated timber: compliant in accordance with Structural Glued Laminated Timber (ANSI A190.1-2012)
  - Cross-laminated timber: compliant in accordance with Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15)
  - Finger-jointed lumber labeled “Heat Resistant Adhesive (HRA)” in accordance with the American Softwood Lumber Standard (DOC PS-20 2015)
**Furniture emissions evaluation**

Product has been tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 (R2016) and complies with ANSI/BIFMA e3-2014e Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost). If 75% of the furniture also complies with Section 7.6.3 in addition to 7.6.2, the category counts for exemplary level (90%). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Seating products must be evaluated using the seating scenario. Classroom furniture must be evaluated using the standard school classroom scenario. Other products should be evaluated using the open plan or private office scenario, as appropriate. The open plan scenario is more stringent.

Statements of product compliance must include the exposure scenario(s). Organizations that certify manufacturers' claims must be accredited under ISO Guide 17065.
LEED BD+C: New Construction - LEED v4
Indoor air quality assessment - Indoor Environmental Quality
Possible 2 Points

**Intent**
To establish better quality indoor air in the building after construction and during occupancy.

**Requirements**
Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

* * *

**Option 2. Air testing (2 points)**
After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing using protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use. Retail projects may conduct the testing within 14 days of occupancy. Demonstrate that contaminants do not exceed the concentration levels listed in Table 1.
Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test. For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

Table 1. Maximum concentration levels, by contaminant and testing method

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Maximum concentration</th>
<th>ASTM and U.S. EPA methods</th>
<th>ISO method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM10 (for all buildings)</td>
<td>50 µg/m³</td>
<td>EPA Compendium Method IP-10</td>
<td>ISO 7708</td>
</tr>
<tr>
<td>Healthcare only: 20 µg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM2.5 (for buildings in EPA nonattainment areas for PM2.5, or local equivalent)</td>
<td>15 µg/m³</td>
<td>ASTM D5149 - 02</td>
<td>ISO 13964</td>
</tr>
<tr>
<td>Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)</td>
<td>0.075 ppm</td>
<td>EPA Compendium Method IP-3</td>
<td>ISO 4224</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>9 ppm; no more than 2 ppm above outdoor levels</td>
<td>EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-6</td>
</tr>
<tr>
<td>Total volatile organic compounds (TVOCs)</td>
<td>500 µg/m³</td>
<td>EPA TO-11, or EPA Compendium Method IP-6</td>
<td>ISO 16000-3</td>
</tr>
<tr>
<td>Healthcare only: 200 µg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>27 ppb</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>Healthcare only: 16.3 ppb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target volatile organic compounds*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Acetaldehyde</td>
<td>140 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>2 Benzene</td>
<td>3 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Carbon disulfide</td>
<td>800 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Carbon tetrachloride</td>
<td>40 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Chlorobenzene</td>
<td>1000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Chloroform</td>
<td>300 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Dichlorobenzene (1,4-)</td>
<td>800 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Dichloroethylene (1,1)</td>
<td>70 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Dimethylformamide (N,N-)</td>
<td>80 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Dioxane (1,4-)</td>
<td>3000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Epichlorohydrin</td>
<td>3 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Ethylbenzene</td>
<td>2000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Ethylene glycol</td>
<td>400 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Ethylene glycol monomethyl ether</td>
<td>70 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>15 Ethylene glycol monomethyl ether acetate</td>
<td>300 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>16 Ethylene glycol monomethyl ether acetate</td>
<td>60 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>17 Ethylene glycol monomethyl ether acetate</td>
<td>90 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>19 Hexane (n-)</td>
<td>7000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Isopropyl ether</td>
<td>2000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Isopropanol</td>
<td>7000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Methyl chloroform</td>
<td>1000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 Methylene chloride</td>
<td>400 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Methyl t-butyl ether</td>
<td>8000 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Naphthalene</td>
<td>9 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Phenol</td>
<td>200 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Propylene glycol monomethyl ether</td>
<td>7000 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>28 Styrene</td>
<td>900 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Tetrachloroethylene (Perchloroethylene)</td>
<td>35 µg/m³</td>
<td>ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
<tr>
<td>30 Toluene</td>
<td>300 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 Trichloroethylene</td>
<td>600 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Vinyl acetate</td>
<td>200 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 Xylenes, technical mixture (m-, o-, p- xyylene combined)</td>
<td>700 µg/m³</td>
<td>EPA Compendium Method IP-6</td>
<td>ISO 16000-3, ISO 16000-6</td>
</tr>
</tbody>
</table>

*The target volatile organic compounds are from CDPH Standard Method v1.1, Table 4-1. The Maximum concentration limits for these target compounds are the full CREL adopted by Cal/EPA OEHHA in effect on June 2014 http://oehha.ca.gov/air/allirels.html
LEED BD+C: New Construction - LEED v4.1
Indoor Air Quality Assessment - Indoor Environmental Quality
Possible 2 Points

**Intent**
To establish better quality indoor air in the building after construction and during occupancy.

**Requirements**
Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

***

**Option 2. Air Testing (1-2 points)**
After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in Path 1. Particulate matter and inorganic gases (for 1 point) and/or Path 2. Volatile organic compounds (for 1 point). Retail projects may conduct the testing within 14 days of occupancy.

**Path 1. Particulate Matter and Inorganic Gases (1 point)**
Test for the particulate matter (PM) and inorganic gases listed in Table 1, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed in the table.

**Table 1. Particulate Matter and inorganic gases**

<table>
<thead>
<tr>
<th>Contaminant (CAS#)</th>
<th>Concentration Limit (µg/m³)</th>
<th>Allowed Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide (CO)</td>
<td>9 ppm; no more than 2 ppm above outdoor levels</td>
<td>ISO 4224 EPA Compendium Method IP-3 GB/T 18883-2002 for projects in China Direct calibrated electrochemical instrument with accuracy of +/- 2% ppm &lt;50 ppm minimum accuracy.</td>
</tr>
<tr>
<td>PM 10</td>
<td>ISO 14644-1:2015, cleanroom class of 8 or lower 50 µg/m³ Healthcare only: 20 µg/m³</td>
<td>Particulate monitoring device with accuracy greater of 5 micrograms/m³ or 20% of reading and resolution (5 min average data) +/- 5 µg/m³</td>
</tr>
<tr>
<td>PM 2.5</td>
<td>12 µg/m³ or 35 µg/m³**</td>
<td>Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb ISO 13964 ASTM D5149 --- 02 EPA designated methods for Ozone</td>
</tr>
<tr>
<td>Ozone</td>
<td>0.07 ppm</td>
<td></td>
</tr>
</tbody>
</table>

**Projects in areas with high ambient levels of PM2.5 (known EPA nonattainment areas for PM2.5, or local equivalent) must meet the 35 µg/m³ limit, all other projects should meet the 12 µg/m³ limit.

**AND/OR**

**Path 2. Volatile Organic Compounds (1 point)**
Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH
Standard Method v1.2 2017 section 3.9.4, or alternative calculation method as long as full method description is included in test report. If the TVOC levels exceed 500 µg/m³, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary. Additionally, test for the individual volatile organic compounds listed in Table 2 using an allowed test method and demonstrate the contaminants do not exceed the concentration limits listed in the table. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Exemplary performance is available for projects that test for the additional target volatile organic compounds specified in CDPH Standard Method v1.2-2017, Table 4-1 and do not exceed the full CREL levels for these compounds adopted by Cal/EPA OEHHA in effect on June 2016.

Table 2. Volatile organic compounds

<table>
<thead>
<tr>
<th>Contaminant (CAS#)</th>
<th>Concentration Limit (µg/m³)</th>
<th>Allowed Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde 50-00-0</td>
<td>20 µg/m³ (16 ppb)</td>
<td>ISO 16000-3, 4; EPA TO-11a, EPA comp. IP-6</td>
</tr>
<tr>
<td>Acetaldehyde 75-07-0</td>
<td>140 µg/m³</td>
<td>ASTM D5197-16</td>
</tr>
<tr>
<td>Benzene 71-43-2</td>
<td>3 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Hexane (n-) 110-54-3</td>
<td>7000 µg/m³</td>
<td>ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15</td>
</tr>
<tr>
<td>Naphthalene 91-20-3</td>
<td>9 µg/m³</td>
<td>ISO 16017-1, 2; ASTM D6196-15</td>
</tr>
<tr>
<td>Phenol 108-95-2</td>
<td>200 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Styrene 100-42-5</td>
<td>900 µg/m³</td>
<td>ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15</td>
</tr>
<tr>
<td>Tetrachloroethylene 127-18-4</td>
<td>35 µg/m³</td>
<td>ISO 16017-1, 2; ASTM D6196-15</td>
</tr>
<tr>
<td>Toluene 108-88-3</td>
<td>300 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Vinyl acetate 108-05-4</td>
<td>200 µg/m³</td>
<td>ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15</td>
</tr>
<tr>
<td>Dichlorobenzene (1,4-) 106-46-7</td>
<td>800 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Xylenes-total 108-38-3, 95-47-6, and 106-42-3</td>
<td>700 µg/m³</td>
<td>ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15</td>
</tr>
</tbody>
</table>

Exemplary performance is available for projects that test for the additional target volatile organic compounds specified in CDPH Standard Method v1.2-2017, Table 4-1 and do not exceed the full CREL levels for these compounds adopted by Cal/EPA OEHHA in effect on June 2016.
### Table 4-1  Target CREL VOCs and their maximum allowable concentrations

<table>
<thead>
<tr>
<th>No.</th>
<th>Compound Name</th>
<th>CAS No.</th>
<th>Allowable Conc. $^a$ $(\mu g/m^3)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Acetaldehyde</strong></td>
<td>75-07-0</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td><strong>Benzene</strong></td>
<td>71-43-2</td>
<td>1.5 $^b$</td>
</tr>
<tr>
<td>3</td>
<td>Carbon disulfide</td>
<td>75-15-0</td>
<td>400</td>
</tr>
<tr>
<td>4</td>
<td>Carbon tetrachloride</td>
<td>56-23-5</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Chlorobenzene</td>
<td>108-90-7</td>
<td>500</td>
</tr>
<tr>
<td>6</td>
<td>Chloroform</td>
<td>67-66-3</td>
<td>150</td>
</tr>
<tr>
<td>7</td>
<td>Dichlorobenzene (1,4-)</td>
<td>106-46-7</td>
<td>400</td>
</tr>
<tr>
<td>8</td>
<td>Dichloroethylene (1,1)</td>
<td>75-35-4</td>
<td>35</td>
</tr>
<tr>
<td>9</td>
<td>Dimethylformamide (N,N-)</td>
<td>68-12-2</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>Dioxane (1,4-)</td>
<td>123-91-1</td>
<td>1,500</td>
</tr>
<tr>
<td>11</td>
<td>Epichlorohydrin</td>
<td>106-89-8</td>
<td>1.5</td>
</tr>
<tr>
<td>12</td>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>1,000</td>
</tr>
<tr>
<td>13</td>
<td>Ethylene glycol</td>
<td>107-21-1</td>
<td>200</td>
</tr>
<tr>
<td>14</td>
<td>Ethylene glycol monoethyl ether</td>
<td>110-80-5</td>
<td>35</td>
</tr>
<tr>
<td>15</td>
<td>Ethylene glycol monoethyl ether acetate</td>
<td>111-15-9</td>
<td>150</td>
</tr>
<tr>
<td>16</td>
<td>Ethylene glycol monomethyl ether</td>
<td>109-86-4</td>
<td>30</td>
</tr>
<tr>
<td>17</td>
<td>Ethylene glycol monomethyl ether acetate</td>
<td>110-49-6</td>
<td>45</td>
</tr>
<tr>
<td>18</td>
<td>Formaldehyde</td>
<td>50-00-0</td>
<td>9 $^c$</td>
</tr>
<tr>
<td>19</td>
<td>Hexane (n-)</td>
<td>110-54-3</td>
<td>3,500</td>
</tr>
<tr>
<td>20</td>
<td>Isophorone</td>
<td>78-59-1</td>
<td>1,000</td>
</tr>
<tr>
<td>21</td>
<td>Isopropanol</td>
<td>67-63-0</td>
<td>3,500</td>
</tr>
<tr>
<td>22</td>
<td>Methyl chloroform</td>
<td>71-55-6</td>
<td>500</td>
</tr>
<tr>
<td>23</td>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>200</td>
</tr>
<tr>
<td>24</td>
<td>Methyl t-butyl ether</td>
<td>1634-04-4</td>
<td>4,000</td>
</tr>
<tr>
<td>25</td>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>4.5</td>
</tr>
<tr>
<td>26</td>
<td>Phenol</td>
<td>108-95-2</td>
<td>100</td>
</tr>
<tr>
<td>27</td>
<td>Propylene glycol monomethyl ether</td>
<td>107-98-2</td>
<td>3,500</td>
</tr>
<tr>
<td>28</td>
<td>Styrene</td>
<td>100-42-5</td>
<td>450</td>
</tr>
<tr>
<td>29</td>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>17.5</td>
</tr>
<tr>
<td>30</td>
<td>Toluene</td>
<td>108-88-3</td>
<td>150</td>
</tr>
<tr>
<td>31</td>
<td>Trichloroethylene</td>
<td>79-01-6</td>
<td>300</td>
</tr>
<tr>
<td>32</td>
<td><strong>Vinyl acetate</strong></td>
<td>108-05-4</td>
<td>100</td>
</tr>
<tr>
<td>33-35</td>
<td>Xylenes, technical mixture</td>
<td>108-38-3</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>(m-, o-, p-xylene combined)</td>
<td>95-47-6, 106-42-3</td>
<td></td>
</tr>
</tbody>
</table>

---

$^a$ Refer to [http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html](http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html). All maximum allowable concentrations are one-half the corresponding CREL adopted by Cal/EPA OEHHA with the exception of formaldehyde. For any future changes in the CREL list by OEHHA, values in Table 4.1 shall continue to apply until these changes are published in the Standard Method.

$^b$ Benzene has a CREL of 3 $\mu g/m^3$ (June 2014); guidance value established by this Standard Method at 30 $\mu g/m^3$ before March 31st, 2017 and at 1.5 $\mu g/m^3$ starting from April 1st, 2017. See Addendum 2017-01 for details.

$^c$ Formaldehyde has a CREL of 9 $\mu g/m^3$ (December 2008); guidance value established by this Standard Method at 16.5 $\mu g/m^3$ before Dec 31st, 2011 and at 9 $\mu g/m^3$ starting from Jan 1st, 2012.
EQ CREDIT: LOW-EMITTING MATERIALS

BD+C
1–3 points
This credit applies to
• New Construction (1–3 points)
• Core & Shell (1–3 points)
• Schools (1–3 points)
• Retail (1–3 points)
• Data Centers (1–3 points)
• Warehouses & Distribution Centers (1–3 points)
• Hospitality (1–3 points)
• Healthcare (1–3 points)

Intent
To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Requirements
NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Use materials on the building interior (everything within the waterproofing membrane) that meet the low-emitting criteria below. Points are awarded according to Table 1:

<table>
<thead>
<tr>
<th>Table 1. Points for low-emitting materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 product categories</td>
<td>1 point</td>
</tr>
<tr>
<td>3 product categories</td>
<td>2 points</td>
</tr>
<tr>
<td>4 product categories</td>
<td>3 points</td>
</tr>
<tr>
<td>5 product categories</td>
<td>3 points + exemplary performance</td>
</tr>
<tr>
<td>Reach 90% threshold in at least three product categories</td>
<td>Exemplary performance or 1 additional point if only 1 or 2 points achieved above.</td>
</tr>
</tbody>
</table>

Paints and Coatings
At least 75% of all paints and coatings, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.

The paints and coatings product category includes all interior paints and coatings applied on site.

Adhesives and Sealants
At least 75% of all adhesives and sealants, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation.

The adhesives and sealants product category includes all interior adhesives and sealants applied on site.

Flooring
At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.
The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayments, and other floor coverings. Subflooring is excluded.

Wall panels

At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments.

Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded.

Ceilings

At least 90% of all ceilings, by cost or surface area, meet the VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.

Overhead structural elements (exposed, finished, and unfinished) are excluded.

Insulation

At least 75% of all insulation, by cost or surface area, meets the VOC emissions evaluation.

The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.

Insulation for HVAC ducts and plumbing piping are excluded.

Furniture

At least 75% of all furniture in the project scope of work, by cost, meets the VOC furniture emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.

The furniture product category includes all stand-alone furniture items purchased for the project.

Composite Wood

At least 75% of all composite wood, by cost or surface area, meets the Formaldehyde emissions evaluation OR salvaged and reused materials criteria.

The composite wood product category includes all particleboard, medium density fiberboard, hardwood veneer plywood, and structural composite wood not included in the flooring, ceiling, wall panels, or furniture material categories.
This credit includes requirements for product manufacturing as well as project teams. It covers volatile organic compound (VOC) emissions in the indoor air and the VOC content of materials, as well as the testing methods by which indoor VOC emissions are determined. Different materials must meet different requirements to be considered compliant for this credit. The building interior and exterior are organized in seven categories, each with different thresholds of compliance. The building interior is defined as everything within the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials.

**Option 1. Product Category Calculations**
Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in Table 2.

### Table 1. Thresholds of compliance with emissions and content standards for 7 categories of materials

<table>
<thead>
<tr>
<th>Category</th>
<th>Threshold</th>
<th>Emissions and content requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior paints and coatings applied on site</td>
<td>At least 90%, by volume, for emissions; 100% for VOC content</td>
<td>General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings; VOC content requirements for wet applied products</td>
</tr>
<tr>
<td>Interior adhesives and sealants applied on site (including flooring adhesive)</td>
<td>At least 90%, by volume, for emissions; 100% for VOC content</td>
<td>General Emissions Evaluation; VOC content requirements for wet applied products</td>
</tr>
<tr>
<td>Flooring</td>
<td>100%</td>
<td>General Emissions Evaluation</td>
</tr>
<tr>
<td>Composite wood</td>
<td>100% not covered by other categories</td>
<td>Composite Wood Evaluation</td>
</tr>
<tr>
<td>Ceilings, walls, thermal, and acoustic insulation</td>
<td>100%</td>
<td>General Emissions Evaluation; Healthcare, Schools only Additional insulation requirements</td>
</tr>
<tr>
<td>Furniture (include in calculations if part of scope of work)</td>
<td>At least 90%, by cost</td>
<td>Furniture Evaluation</td>
</tr>
<tr>
<td>Healthcare and Schools Projects only: Exterior applied products</td>
<td>At least 90%, by volume</td>
<td>Exterior Applied Products</td>
</tr>
</tbody>
</table>

### Table 2. Points for number of compliant categories of products

<table>
<thead>
<tr>
<th>Compliant categories</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction, Core Shell, Retail, Data Centers, Warehouse and Distribution Centers, Hospitality projects without furniture</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>New Construction, Core Shell, Retail, Data Centers, Warehouse and Distribution Centers, Hospitality projects with furniture</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
Option 2: Budget Calculation Method

If some products in a category do not meet the criteria, project teams may use the budget calculation method (Table 3).

Table 3. Points for percentage compliance, under budget calculation method

<table>
<thead>
<tr>
<th>Percentage of Total</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 50% and &lt; 70%</td>
<td>1</td>
</tr>
<tr>
<td>≥ 70% and &lt; 90%</td>
<td>2</td>
</tr>
<tr>
<td>≥ 90%</td>
<td>3</td>
</tr>
</tbody>
</table>

The budget method organizes the building interior into six assemblies:
- flooring;
- ceilings;
- walls;
- thermal and acoustic insulation;
- furniture; and
- Healthcare, Schools only: exterior applied products.

Include furniture in the calculations if it is part of the scope of work. Walls, ceilings, and flooring are defined as building interior products; each layer of the assembly, including paints, coatings, adhesives, and sealants, must be evaluated for compliance. Insulation is tracked separately.

Determine the total percentage of compliant materials according to Equation 1.

**Equation 1. Total percentage compliance**

\[
\text{Total \% compliant for projects without furniture} = \frac{\text{% compliant walls} + \text{% compliant ceilings} + \text{% compliant flooring} + \text{% compliant insulation}}{4}
\]

\[
\text{Total \% compliant for projects with furniture} = \frac{\text{% compliant walls} + \text{% compliant ceilings} + \text{% compliant flooring} + \text{% compliant insulation} + \text{% compliant furniture}}{5}
\]

**Equation 2. System percentage compliant**

\[
\text{Flooring, walls, ceilings, insulation \% compliant} = \frac{\text{compliant surface area of layer 1} + \text{compliant surface area of layer 2} + \text{compliant surface area of layer 3} + \ldots}{\text{total surface area of layer 1} + \text{total surface area of layer 2} + \text{total surface area of layer 3} + \ldots} \times 100
\]
Calculate surface area of assembly layers based on the manufacturer's documentation for application.

If 90% of an assembly meets the criteria, the system counts as 100% compliant. If less than 50% of an assembly meets the criteria, the assembly counts as 0% compliant.

Manufacturers' claims. Both first-party and third-party statements of product compliance must follow the guidelines in CDPH SM V1.1–2010, Section 8. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 65.

Laboratory requirements. Laboratories that conduct the tests specified in this credit must be accredited under ISO/IEC 17025 for the test methods they use.

**Low-emitting criteria Emissions and Content Requirements**
To demonstrate compliance, a product or layer must meet all of the following requirements, as applicable.

**Inherently nonemitting sources.**
Products that are an inherently nonemitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include and has no integral organic-based surface coatings, binders, or sealants.

**Salvaged and reused materials**
Product is more than one year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the VOC emissions evaluation AND VOC content evaluation requirements.

**General VOC emissions evaluation.**
Option 1. Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.2-20170 and complies with the VOC limits in Table 4-1 of the method. Additionally, the range of total VOCs after 14 days (336 hours) was measured as specified in the CDPH Standard Method v1.2 and is reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more).

Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Products used in school classrooms must be evaluated using the classroom scenario, products used in other spaces must be evaluated using the default private office scenario, using the applicable exposure scenario. The default scenario is the private office scenario.

The statement of product compliance must include The manufacturer’s or third-party certification must state the exposure scenario(s) used to determine compliance. Claims of compliance for wet-applied products must state the amount of wet-applied product applied in mass per surface area (if applicable), the range of total VOCs, and follow guidelines in CDPH Standard Method v1.2-2017, Section 8. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 17065.

Manufacturers’ claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:

- 0.5 mg/m³ or less;
- between 0.5 and 5.0 mg/m³;
- 5.0 mg/m³ or more.
Option 2. Product has been tested according to EN 16516:2017 and complies with the LCI values from Table 1 of the German AgBB Testing and Evaluation Scheme (2015) and a formaldehyde limit of 10 micrograms per cubic meter. Additionally, the range of total VOCs after 28 days was measured as specified in EN 16516 and reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

The statement of product compliance must include the amount of wet-applied product applied in mass per surface area (if applicable) and the range of total VOCs. Organizations that certify manufacturers’ claims must be accredited under ISO Guide 17065.

Projects outside the U.S. may use products tested and deemed compliant in accordance with either (1) the CDPH standard method (2010) or (2) the German AgBB Testing and Evaluation Scheme (2010). Test products either with (1) the CDPH Standard Method (2010), (2) the German AgBB Testing and Evaluation Scheme (2010), (3) ISO 16000-3: 2010, ISO 16000-6: 2011, ISO 16000-9: 2006, ISO 16000-11:2006 either in conjunction with AgBB, or with French legislation on VOC emission class labeling, or (4) the DIBt testing method (2010). If the applied testing method does not specify testing details for a product group for which the CDPH standard method does provide details, use the specifications in the CDPH standard method. U.S. projects must follow the CDPH standard method.

**VOC content evaluation**

Product meets the VOC content limits outlined in one of the applicable standards and for projects in North America, methylene chloride and perchloroethylene may not be intentionally added.

Statement of product compliance must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

- **Paints and coatings:**
  - California Air Resource Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings
  - South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016
  - Hong Kong Air pollution control (VOC) Regulation for regulated architectural paints (January 2010)
- **Adhesives and sealants:**
  - SCAQMD Rule 1168, October 6, 2017
  - Canadian VOC Concentration Limits for Architectural Coatings (SOR/2009-264)
  - Hong Kong Air Pollution Control (VOC) Regulation for regulated adhesives and regulated sealants (April 2012)
  - Free of solvents, as defined in TRGS 610 (January 2011)

**Additional VOC content requirements for wet-applied products.** In addition to meeting the general requirements for VOC emissions (above), on-site wet-applied products must not contain excessive levels of VOCs, for the health of the installers and other tradesworkers who are exposed to these products. To demonstrate compliance, a product or layer must meet the following requirements, as applicable. Disclosure of VOC content must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation.

- All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
• All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

• For projects outside the U.S., all paints, coatings, adhesives, and sealants wet-applied on site must either meet the technical requirements of the above regulations, or comply with applicable national VOC control regulations, such as the European Decopaint Directive (2004/42/EC), the Canadian VOC Concentration Limits for Architectural Coatings, or the Hong Kong Air Pollution Control (VOC) Regulation.

• If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

• If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.

• For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

**Composite Wood Formaldehyde Emissions Evaluation.**

Composite wood, as defined by the California Air Resources Board, Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, must be documented to have low formaldehyde emissions that meet the Product meets one of the following:

- EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or
- EPA TSCA Title VI or CARB ATCM formaldehyde requirements for no added formaldehyde resins (NAF).

- Tested per EN 717-1:2014 for formaldehyde emissions and complies with emissions class E1.

- Structural composite wood product made with moisture resistant adhesives meeting ASTM 2559, no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following industry standards:
  - Plywood: compliant in accordance with Voluntary Product Standard - Structural Plywood (PS 1-09), Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10), or one of the standards considered by CARB to be equivalent to PS 1 or PS 2: (AS/NZS 2269, EN 636 3S (including CE label), Canadian Standards Association CSA O121 for Douglas fir plywood, CSA O151 for Canadian softwood plywood, for CSA O153 Poplar plywood, or CSAO325 for Construction sheathing).
  - Oriented strand board: specified with the Exposure 1 or Exterior bond classification in accordance with Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10).
  - Glued laminated timber: compliant in accordance with Structural Glued Laminated Timber (ANSI A190.1-2012).

Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
**Furniture Eemissions Evaluation.**

New furniture and furnishing items must be tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 (R2016) and comply with ANSI/BIFMA e3-2014e1. Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost). If 75% of the furniture also complies with Section 7.6.3 in addition to 7.6.2, the category counts for exemplary level (90%). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Seating products must be evaluated using the seating scenario. Classroom furniture must be evaluated using the standard school classroom scenario. Other products should be evaluated using either the concentration modeling approach or the emissions factor approach. Model the test results using the open plan or private office scenario, or seating scenario in ANSI/BIFMA M7.1, as appropriate. The open plan scenario is more stringent. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. For classroom furniture, use the standard school classroom model in CDPH Standard Method v1.1. Documentation submitted for furniture must indicate the modeling scenario used to determine compliance.

Statements of product compliance must include the exposure scenario(s). Organizations that certify manufacturers’ claims must be accredited under ISO Guide 17065.

Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

**Healthcare, Schools only**

Additional insulation requirements. Batt insulation products may contain no added formaldehyde, including urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.

**Exterior applied products.** Adhesives, sealants, coatings, roofing, and waterproofing materials applied on site must meet the VOC limits of California Air Resources Board (CARB)-2007 Suggested Control Measure (SCM) for Architectural Coatings, and South Coast Air Quality Management District (SCAQMD), Rule 1168, effective July 1, 2005. Small containers of adhesives and sealants subject to state or federal consumer product VOC regulations are exempt.

Projects outside North America may use either the jurisdictional VOC content requirements or comply with the European Decopaint Directive (2004/42/EC, to be updated to most current version when available) Phase II, for water-borne coatings, as analyzed according to ISO-11880 parts 1 and 2, instead of the CARB and SCAQMD regulatory standards.

Two materials are prohibited and do not count toward total percentage compliance: hot-mopped asphalt for roofing, and coal-tar sealants for parking lots and other paved surfaces.
EQ CREDIT: INDOOR AIR QUALITY ASSESSMENT

BD+C
1–2 points
This credit applies to
• New Construction (1–2 points)
• Schools (1–2 points)
• Retail (1–2 points)
• Data Centers (1–2 points)
• Warehouses & Distribution Centers (1–2 points)
• Hospitality (1–2 points)
• Healthcare (1–2 points)

Intent
To establish better quality indoor air in the building after construction and during occupancy.

Requirements

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE
Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

Option 1. Flush-Out (1 point)
Path 1. Before Occupancy
Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot (4 267 140 liters of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

OR

Path 2. During Occupancy
If occupancy is desired before the flush-out is completed, the space may be occupied only after delivery of a minimum of 3,500 cubic feet of outdoor air per square foot (1 066 260 liters of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

OR

Option 2. Air Testing (1-2 points)
After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in Path 1. Particulate matter
and inorganic gases (for 1 point) and/or Path 2. Volatile organic compounds (for 1 point). Retail projects may conduct the testing within 14 days of occupancy.

using protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated.

Path 1. Particulate Matter and Inorganic Gases (1 point)

Test for the particulate matter (PM) and inorganic gases listed in Table 1, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed in the table.

Table 1. Particulate Matter and inorganic gases

<table>
<thead>
<tr>
<th>Contaminant (CAS#)</th>
<th>Concentration Limit (µg/m³)</th>
<th>Allowed Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide (CO)</td>
<td>9 ppm; no more than 2 ppm above outdoor levels</td>
<td>ISO 4224  EPA Compendium Method IP-3  GB/T 18883-2002 for projects in China</td>
</tr>
<tr>
<td>PM 10</td>
<td>ISO 14644-1:2015, cleanroom class of 8 or lower</td>
<td>Particulate monitoring device with accuracy greater of 5 micrograms/m³ or 20% of reading and resolution (5 min average data) +/- 5 µg/m³</td>
</tr>
<tr>
<td>PM 2.5</td>
<td>12 µg/m³ or 35 µg/m³³**</td>
<td>Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb</td>
</tr>
<tr>
<td>Ozone</td>
<td>0.07 ppm</td>
<td>ISO 13964  ASTM D5149 — 02  EPA designated methods for Ozone</td>
</tr>
</tbody>
</table>

³Projects in areas with high ambient levels of PM2.5 (known EPA nonattainment areas for PM2.5, or local equivalent) must meet the 35 µg/m³ limit, all other projects should meet the 12 µg/m³ limit.

AND/OR

Path 2. Volatile Organic Compounds (1 point)

Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH Standard Method v1.2 2017 section 3.9.4, or alternative calculation method as long as full method description is included in test report. If the TVOC levels exceed 500 µg/m³, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary.

Additionally, test for the individual volatile organic compounds listed in Table 2 using an allowed test method and demonstrate the contaminants do not exceed the concentration limits listed in the table. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.
Exemplary performance is available for projects that test for the additional target volatile organic compounds specified in CDPH Standard Method v1.2-2017, Table 4-1 and do not exceed the full CREL levels for these compounds adopted by Cal/EPA OEHHA in effect on June 2016.

Table 2. Volatile organic compounds

<table>
<thead>
<tr>
<th>Contaminant (CAS#)</th>
<th>Concentration Limit (µg/m³)</th>
<th>Allowed Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde 50-00-0</td>
<td>20 µg/m³ (16 ppb)</td>
<td>ISO 16000-3. 4; EPA TO-11a, EPA comp. IP-6A; ASTM D5197-16</td>
</tr>
<tr>
<td>Acetaldehyde 75-07-0</td>
<td>140 µg/m³</td>
<td>ISO 16000-6</td>
</tr>
<tr>
<td>Benzene 71-43-2</td>
<td>3 µg/m³</td>
<td>EPA IP-1, EPA TO-17, EPA TO-15</td>
</tr>
<tr>
<td>Hexane (n-) 110-54-3</td>
<td>7000 µg/m³</td>
<td>ISO 16017-1, 2; ASTM D6196-15</td>
</tr>
<tr>
<td>Naphthalene 91-20-3</td>
<td>9 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Phenol 108-95-2</td>
<td>200 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Styrene 100-42-5</td>
<td>900 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Tetrachloroethylene 127-18-4</td>
<td>35 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Toluene 108-88-3</td>
<td>300 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Vinyl acetate 108-05-4</td>
<td>200 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Dichlorobenzene (1,4-) 106-46-7</td>
<td>800 µg/m³</td>
<td></td>
</tr>
<tr>
<td>Xylenes-total 108-38-3, 95-47-6, and 106-42-3</td>
<td>700 µg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Demonstrate that contaminants do not exceed the concentration levels listed in Table 1.

Table 1. Maximum concentration levels, by contaminant and testing method

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Maximum concentration</th>
<th>ASTM and U.S. EPA methods</th>
<th>ISO method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM10 (for all buildings)</td>
<td>50 µg/m³; Healthcare only: 20 µg/m³</td>
<td>EPA Compendium Method IP-10</td>
<td>ISO-7798</td>
</tr>
<tr>
<td>PM2.5 (for buildings in EPA nonattainment areas for PM2.5, or local equivalent)</td>
<td>15 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)</td>
<td>0.075 ppm</td>
<td>ASTM D1499-02</td>
<td>ISO-13964</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>9 ppm; no more than 2 ppm above outdoor levels</td>
<td>EPA Compendium Method IP-3</td>
<td>ISO-4224</td>
</tr>
<tr>
<td>Total volatile organic compounds (TVOCs)</td>
<td>500 µg/m³; Healthcare only: 200 µg/m³</td>
<td>EPA TO-1, TO-17, or EPA Compendium Method IP-1</td>
<td>ISO-16000-6</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>27 ppb</td>
<td></td>
<td>ISO-16000-3</td>
</tr>
<tr>
<td>Target volatile organic compounds*</td>
<td>Healthcare only: 16.3 ppb</td>
<td>ASTM D5197, EPA TO-11, or EPA Compendium Method IP-6</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------</td>
<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1 Acetaldehyde</td>
<td>140 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Benzene</td>
<td>3 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Carbon disulfide</td>
<td>800 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Carbon tetrachloride</td>
<td>40 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Chlorobenzene</td>
<td>4000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Chloroform</td>
<td>300 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Dichlorobenzene (1,4-)</td>
<td>800 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Dichloroethylene (1,1)</td>
<td>70 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Dimethylformamide (N,N-)</td>
<td>80 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Dioxane (1,4-)</td>
<td>3000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Epichlorohydrin</td>
<td>3 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Ethylbenzene</td>
<td>2000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Ethylene glycol</td>
<td>400 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Ethylene glycol monoethyl ether</td>
<td>70 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Ethylene glycol monoethyl ether acetate</td>
<td>300 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Ethylene glycol monomethyl ether</td>
<td>60 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Ethylene glycol monomethyl ether acetate</td>
<td>90 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Hexane (n-)</td>
<td>2000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Isophorone</td>
<td>2000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Isopropanol</td>
<td>2000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Methyl chloroform</td>
<td>1000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 Methylene chloride</td>
<td>400 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Methyl t-butyl ether</td>
<td>8000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Naphthalene</td>
<td>9 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Phenol</td>
<td>200 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Propylene glycol monomethyl ether</td>
<td>2000 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Styrene</td>
<td>900 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Tetrachloroethylene (Perchloroethylene)</td>
<td>35 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Toluene</td>
<td>300 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 Trichloroethylene</td>
<td>600 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Vinyl acetate</td>
<td>200 μg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33-35 Xylenes, technical mixture (m-, o-, p-xylene combined)</td>
<td>700 μg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ppb = parts per billion; ppm = parts per million; μg/cm³ = micrograms per cubic meter
*The target volatile organic compounds are from CDPH Standard Method v1.1, Table 4.1. The Maximum concentration limits for these target compounds are the full CREL adopted by Cal/EPA OEHHA in effect on June 2014 http://oehha.ca.gov/air/allrels.html.

Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test.

For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.
Existing references to other IEQ requirements for products/materiaks in Environment Code Chapter 7, Section 706 (Excerpted)

(i) **Toxics Reduction and Pollution Prevention.**

(1) For all municipal new construction, major renovation and tenant improvement projects that include furniture within the project scope, or for purchases made by or on behalf of City departments for these projects, the purchased furniture shall comply with regulations promulgated under this Chapter pertaining to the following environmental attributes, subject to verification by the Department of the Environment:

(A) Added flame retardant chemicals;
(B) Emissions of volatile organic compounds (VOCs);
(C) Use of certified wood;
(D) Polyvinyl chloride (PVC) content;
(E) Antimicrobial chemicals;
(F) Fluorinated chemicals;
(G) Required ecolabels; and
(H) Other environmental attributes, consistent with this Chapter.

(2) For all municipal new construction, major renovation and tenant improvement projects, and for purchases made by or on behalf of City departments for such projects, interior surfaces, including but not limited to countertops, doorknobs, handles, wall paints, and carpet, where these features are included within the project scope, shall comply with regulations promulgated under this Chapter pertaining to the following attributes, subject to verification by the Department of the Environment:

(A) Emissions of volatile organic compounds (VOCs);
(B) Fluorinated chemicals;
(C) Recycled content and recyclability;
(D) Antimicrobial chemicals;
(E) Required ecolabels; and
(F) Other environmental attributes, consistent with this Chapter.
San Francisco Department of the Environment Regulation #SFE 2018-01-PPO/GBRCBO
Adopting Approved Alternative Products for Sustainable Carpet for City Departments

(Environmentally Preferable Purchasing/Precautionary Purchasing Ordinance No. 115-05 and Green Building Requirements for Municipal Buildings Ordinance No. 52-17)

Regulation Effective Date: March 9, 2018

A. Authorization

The Environmentally Preferable Purchasing/Precautionary Purchasing Ordinance was signed by the Mayor on June 17, 2005, and became effective July 18, 2005. It is codified as Chapter 2 of the Environment Code ("Chapter 2"). Chapter 2 contains a comprehensive system to identify and purchase environmentally preferable products, and applies to all commodity purchases by city departments governed by Chapter 21 of the Administrative Code. Chapter 2 also requires the Director of the Department of the Environment ("Director") to consolidate existing environmentally preferable purchasing requirements from other Code sections into regulations.

The Green Building Requirements for Municipal Buildings Ordinance (GBRMB Ordinance) was signed by Mayor Lee on March 17, 2017 and became effective on April 16, 2017. The GBRMB Ordinance amended various sections of Chapter 7 of the Environment Code ("Chapter 7"), which is is implemented by the Department of the Environment ("Department"), with oversight by the Municipal Green Building Task Force. Chapter 7 requires LEED Gold Certification for municipal construction projects; provides for collection, storage and loading of recyclable and compostable materials for City departments; requires diverting debris generated at City construction and/or demolition projects from landfill; establishes water conservation and energy efficient lighting retrofit and indoor environmental quality requirements; and requires that purchases of certain products made by or on behalf of City departments, including carpet, comply with regulations pertaining to certain environmental attributes.

The Director of the Department of the Environment promulgates these regulations pursuant to her authority to adopt regulations necessary to implement Chapters 2 and 7 of the Environment Code, as set forth in Environment Code Sections 203(d) and 703(b), respectively.

B. Scope

These regulations apply to all purchases of carpet for installation in municipal construction projects, as defined in Chapter 7, Section 701, and to other purchases of carpet by City Departments under Chapter 2, Section 204. These regulations set forth the minimum requirements for environmentally preferable carpet products approved for City purchase. These regulations do not duplicate Chapters 2 or 7 and must be read together with those chapters of the Environment Code, including the definitions, requirements pertaining to waivers, and enforcement mechanisms set forth in those ordinances. Unless otherwise defined below, terms used in this regulation shall have the same meanings as in Chapters 2 and 7.

Products compliant with these regulations are synonymous with the "approved alternatives list" per Chapter 2. These compliant products are listed as "REQUIRED" on the City's green purchasing website at SFApproved.org.

C. Definitions

**Antimicrobial chemicals:** Chemicals intended to disinfect, sanitize, reduce, or mitigate growth or development of microbiological organisms, or protect inanimate objects, industrial processes or systems, surfaces, water, or other chemical substances from contamination, fouling, or deterioration caused by bacteria, viruses, fungi, protozoa, algae, or slime.

**Broadloom carpet:** Carpet that is woven on a wide loom or is machine-tufted, shipped in rolls.
**Flame retardant chemicals**: Any chemical or chemical compound for which a functional use is to resist or inhibit the spread of fire. Flame retardant chemicals include, but are not limited to, antimony-based, halogenated, phosphorous-based, nitrogen-based, and nanoscale flame retardants, flame retardant chemicals listed as “designated chemicals” pursuant to Section 105440 of the California Health and Safety Code, as amended; and any chemical or chemical compound for which “flame retardant” appears on the substance Safety Data Sheet (SDS) pursuant to Section 1910.1200(g) of Title 29 of the Code of Federal Regulations, as amended. “Added flame retardant chemicals” means flame retardant chemicals that are present in any covered product or component thereof at levels above 1,000 ppm.

**Per- and Poly-Fluoroalkyl Substances (PFASs, often referred to as PFCs)**: A category of compounds that includes long- and short-chain per- and poly-fluorinated alkyl compounds, fluorinated sulfonate compounds, and fluorinated polymers. PFASs include any compound that meets any one of the following definitions:

- **Perfluoroalkyl substances**: Compounds for which all hydrogen atoms on all carbon atoms (except for carbons associated with functional groups) have been replaced by fluorine atoms.
- **Polyfluoroalkyl substances**: Compounds for which hydrogen atoms on at least one, but not all, carbon atoms have been replaced by fluorine atoms.
- **Fluoropolymers**: Carbon-only polymer backbone with fluorine atoms directly bound to the polymer backbone.
- **Perfluoropolyethers**: Carbon and oxygen polymer backbone with fluorine atoms directly bound to carbon atoms.
- **Side-chain fluorinated polymers**: Variable composition non-fluorinated polymer backbone with fluorinated side chains.

**Volatile Organic Compounds (VOCs)**: VOCs are defined by the California Standard Method for Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers as carbon-containing compounds (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates and ammonium carbonate) with vapor pressures at standard conditions approximately ranging between those for n-pentane through n-heptadecane. Formaldehyde and acetaldehyde are considered to be VOCs.

**D. Requirements**

All carpet purchases for City projects shall comply with the below requirements or must have received a waiver granting approval prior to purchase (see Section E, below). Carpet purchased pursuant to a waiver must still meet the VOC requirements under Item D.2(c), below.

1. **Prohibited products**: The following products are prohibited from purchase.
   (a) Broadloom carpets, unless their installation qualifies as a waived category in Item E.2 below and meets the broadloom requirements under Item D.3 below;
   (b) Cushion-backed carpet tiles.

2. **Carpet tiles shall**:
   (a) Be commercial hard-backed carpet tiles;
   (b) Be Cradle to Cradle Certified™ (C2CC) Silver or higher under v3.1 or newer;
   (c) Meet Carpet and Rug Institute (CRI) Green Label Plus certification or other certifications of compliance with the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, also known as CDPH/EHLB Standard Method v1.1 or California Specification 01350 (referred to herein as “VOC requirements”);
   (d) Have an Environmental Product Declaration® (EPD) following a US or international carpet product category rule (PCR) that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and has at least a cradle to gate scope;
   (e) Have a compliant Health Product Declaration® (HPD) with content characterized, screened, and inventoried to at least 1,000 ppm under v2.0 or newer; or a Living Building Challenge Compliant (LBCC) Declare™ label;
   (f) Contain no intentionally added:
      i) Antimicrobials at or above 100 parts per million (ppm)
      ii) Flame retardant chemicals
iii) PFASs, such as those commonly used as stain, water, or oil resistance treatments

(g) Contain a minimum of 45% total recycled content, of which at least 10% shall be post-consumer;

(h) Carpet yarn shall be:
   i) Type 6 or 6,6 cationic nylon
   ii) 100% solution-dyed

(i) Carpet backing shall be free of:
   i) Coal fly-ash
   ii) Polyvinyl chloride (PVC)
   iii) Polyurethane
   iv) Synthetic styrene butadiene latex

3. **Broadloom carpets** are prohibited unless they meet the criteria for waived categories in Item E.2 below. If exempted, broadloom products must be commercial-grade carpets, and must meet the same criteria as carpet tiles in Item D.2 above, with the exception of the recycled content requirement D.2(g).

4. **Carpet tile adhesives**
   (a) Shall meet:
      i) CRI Green Label Plus certification
      ii) California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers (also known as CDPH/EHLB Standard Method v1.1 or California Specification 01350)
   (b) Carpet tile tape adhesives shall also have a Bronze level or higher Material Health Certificate (MHC) from Cradle to Cradle Products Innovation Institute (C2CPII) under v3.1 or newer;
   (c) Carpet tile wet adhesives shall also:
      i) Have a Silver level or higher MHC from C2CPII under v3.1 or newer
      ii) Meet South Coast Air Quality Management District (SCAQMD) Rule 1168 (2005) for wet adhesives (< 50g/l)

5. **Broadloom adhesives** shall meet CRI Green Label Plus certification.

6. **Products and packaging** must comply with all federal, state and local regulations. In particular, California's Toxics in Packaging Prevention Act (Health and Safety Code - HSC Division 20, Chapter 6.5, Article 10.4) requires that packaging shall not contain any intentionally introduced cadmium, lead, mercury, or hexavalent chromium. In addition, this law limits the incidental presence of these regulated metals to not more than 100 parts per million (ppm) by weight.

E. **Waivers**

1. **An approved waiver is required for the purchase of any carpet product that is not compliant with the standards set forth in this regulation (under Environment Code Chapter 2 or 7).** Except as noted below in Item E.2, City Departments must request waivers in the following manner:
   (a) For approval of purchases under Chapter 7 of the Environment Code (e.g., public works, construction, or improvement projects) that do not comply with this regulation, City Departments must seek a waiver from the Municipal Green Building Task Force, according to Environment Code Chapter 7 Section 713, prior to making the purchase;
   (b) For approval of purchases under Chapter 2 of the Environment Code (commodities and services) that do not comply with this regulation, City Departments must seek a waiver from the Office of Contract Administration, according to Environment Code Chapter 2 Section 206, prior to making the purchase.

2. **An approved waiver is hereby granted for a purchase that falls within one of the below waived categories.** City Departments who determine that a carpet purchase pursuant to Chapter 2 or Chapter 7 falls within one of the
below waived categories of carpet purchase types need not submit a waiver request in accordance with Item E.1.

(a) Area rugs;
(b) Patch replacements for existing carpet;
(c) Renovations that require replacement carpet of a specific thickness, where replacement carpet that both is the required thickness and meets the requirements of Item D, cannot reasonably be obtained;
(d) Carpet for historic spaces, where the San Francisco Historic Preservation Commission or some other public policy body must approve the carpet, and carpet that complies with the requirements herein would necessarily fail to meet the standards of such a body.

3. All carpets must meet VOC requirements, regardless of waivers. Carpets purchased under an approved waiver (pursuant to Item E.1 or Item E.2 above) must still meet the VOC requirements under Item D.2(c) above, even though they are otherwise exempt from all other requirements set forth in this Item D.

F. Enforcement

This regulation has the full force and effect of law. A violation of this regulation is enforceable pursuant to Environment Code Section 208.

The Director of the Department of the Environment hereby adopts these regulations, effective as of the date specified below.

Deborah O. Raphael
Director, Department of the Environment

Approved:

[Signature]

Date: March 9, 2018
LEED BD+C: New Construction - LEED v4.1
Building Product Disclosure and Optimization - Material Ingredients
Materials and Resources
Possible 2 Points

Intent
To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Requirements
Option 1. Material Ingredient Reporting (1 point)
Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm).
(10 different permanently installed products from at least three different manufacturers for CS and Warehouses & Distribution Centers)

- Manufacturer Inventory. The manufacturer has published complete content inventory for the product following these guidelines:
  - A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).
  - Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:
    ▪ Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)
      ▪ The hazard screen must be applied to each trade secret ingredient and the inventory lists the hazard category for each of the health hazards included in Part 3 of GHS (e.g. “GHS Category 2 Carcinogen”).

- Health Product Declaration. The end use product has a published and complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.

- Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Bronze level or higher.

- Declare. The Declare product label must meet the following requirements:
  - Declare labels designated as Red List Free or Declared.
  - Declare labels designated as LBC Compliant that demonstrate content inventory to 0.1% (1000 ppm).

- Living Product Challenge. The included Declare product label must demonstrate content inventory to 0.1% (1000 ppm).

- ANSI/BIFMA e3 Furniture Sustainability Standard. The documentation from the assessor or scorecard from BIFMA must demonstrate the product earned at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012.

- Product Lens Certification
- Global Green TAG PHD labels issued after January 1, 2020

Any compliant reports above with third-party verification that includes the verification of content inventory are worth 1.5 products for credit achievement calculations. AND/OR
Option 2: Material Ingredient Optimization (1 point)
Use permanently installed products from at least three different manufacturers that document their material ingredient optimization using the paths below. Choose either 10 compliant products, or select products that constitute at least 10%, by cost, of the total value of permanently installed products in the project.

Material Ingredient Screening and Optimization Action Plan (value at 50% by cost or ½ product)
- The manufacturer has screened the product to at least 1,000 ppm and has provided a publicly available inventory meeting the requirements of Option 1 and completed a detailed action plan to mitigate or reduce known hazards using the principles of green chemistry. The action plan must be product-specific (not company, manufacturer or brand), and must include the following information:
  - Description of the screening or assessment platform used by manufacturer to complete the material ingredient screening and analysis.
  - Identification of the specific green chemistry principles targeted for implementation in the action plan.
  - Description of specific steps anticipated in implementation of the action plan. Include proposed changes in formulation or manufacturing processes that are planned as part of green chemistry optimization strategy.
  - Specific dates and a full timeline for completion of all the steps described in the action plan.

Advanced Inventory & Assessment (value at 100% by cost or 1 product):
- The end use product meets the requirements of any of the following:
  - Manufacturer Inventory or Health Product Declaration: The product has demonstrated a chemical inventory to at least 0.01% by weight (100 ppm) with no GreenScreen LT-1 hazards or GHS Category 1 hazards. The HPD or Manufacturer Inventory must be third party verified.
  - Manufacturer Inventory or HPD: The product has demonstrated a chemical inventory to at least 0.01% by weight (100ppm) and at least 75% by weight of product is assessed using GreenScreen Benchmark assessment. The remaining 25% by weight of product has been inventoried. The GreenScreen assessment must be publicly available. The HPD or Manufacturer Inventory must be third-party verified.
  - Declare labels designated as Red List Free that are third-party verified, or Living Product Challenge certified products that include a Red List Free Declare label.
  - Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Bronze level or higher.

Material Ingredient Optimization (value at 150% by cost or 1.5 products)
- The end use product has demonstrated a product inventory and assessment of ingredients using any of the following programs:
  - Manufacturer Inventory or HPD: The product has demonstrated a chemical inventory to at least 0.01% by weight (100ppm) and at least 95% by weight of product is assessed using GreenScreen Benchmark assessment. No Benchmark 1 hazards (BM-1) are present in the end use product. The remaining 5% by weight of product not assessed has been inventoried and screened using GreenScreen List Translator and no GreenScreen LT-1 hazards are present in the end use product. The documents must be third party verified.
  - Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Silver level or higher.
  - Living Product Challenge. Products certified to the Living Product Challenge which includes achievement of Imperative 09: Transparent Material Health.

International Alternative Compliance Path – REACH Optimization (value at 100% of cost or 1 product)
- End use products and materials have fully inventoried chemical ingredients to 100 ppm and assess each substance against the Authorization List – Annex XIV, the Restriction list – Annex XVII and the SVHC candidate list, (the version in effect June 2013,) proving that no such substance is included in the product. If the product contains no ingredients listed on the REACH Authorization, Restriction, and Candidate list.
- Global Green Tag International: product has a certified Product Health Declaration (PhD) report. Value at 100% or 1 product.

USGBC approved program.
- Products that comply with USGBC approved building product optimization criteria for material ingredient optimization and/or advanced inventory & assessment pathways.

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.
San Francisco Department of the Environment Regulations  
Precautionary Purchasing Ordinance (Ord. No. 115-05)

Adopting Approved Alternative Products for

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Compostable Plastic Bags</td>
<td>Regulation #SFE-13-02-PPO;</td>
</tr>
<tr>
<td>2) Electronic Equipment</td>
<td>Regulation #SFE-13-03-PPO;</td>
</tr>
<tr>
<td>3) Furniture (Upholstered)</td>
<td></td>
</tr>
<tr>
<td>4) Janitorial Cleaning Products</td>
<td>Regulation #SFE-13-04-PPO;</td>
</tr>
<tr>
<td>5) Janitorial Papers</td>
<td></td>
</tr>
<tr>
<td>6) Lighting Equipment</td>
<td>Regulation #SFE-13-07-PPO;</td>
</tr>
<tr>
<td>7) Office Supplies</td>
<td></td>
</tr>
<tr>
<td>8) Paints and Primers (Interior Latex for Wall and Ceiling)</td>
<td></td>
</tr>
<tr>
<td>9) Resilient Flooring</td>
<td></td>
</tr>
</tbody>
</table>

Effective XX/XX/XX

A. AUTHORIZATION

The Board of Supervisors and Mayor enacted the Precautionary Purchasing Ordinance, effective July 18, 2005 (the "Ordinance"). The Ordinance is codified as Chapter 2 of the Environment Code. The Ordinance created a comprehensive new system for the City to identify and use environmentally preferable products based on goals and criteria established by the Ordinance. The Ordinance required the Director of the Department of the Environment to consolidate existing environmentally preferable purchasing requirements from other Code sections into regulations. The new regulations described here are implemented pursuant to Environment Code Section 203(d).

B. DEFINITIONS

**Antimicrobial chemicals:** Chemicals intended to disinfect, sanitize, reduce, or mitigate growth or development of microbiological organisms, or protect inanimate objects, industrial processes or systems, surfaces, water, or other chemical substances from contamination, fouling, or deterioration caused by bacteria, viruses, fungi, protozoa, algae, or slime.

**Flame retardant chemicals:** Any chemical or chemical compound for which a functional use is to resist or inhibit the spread of fire. Flame retardant chemicals include, but are not limited to, halogenated, phosphorous-based, nitrogen-based, and nanoscale flame retardants, flame retardant chemicals listed as “designated chemicals” pursuant to Section 105440 of the Health and Safety Code, and any chemical or chemical compound for which “flame retardant” appears on the substance Safety Data Sheet (SDS) pursuant to Section 1910.1200(g) of Title 29 of the Code of Federal Regulations.

**Formaldehyde:** A colorless, flammable gas at room temperature, used to produce resins for composite wood products (e.g., plywood, particle board, medium density fiberboard), as an intermediate in the synthesis of other chemicals, and in some fabrics.

**Halogenated flame retardant chemical (also known as organohalogen flame retardant chemical):** Any chemical or chemical compound containing chlorine or bromine bonded to carbon for which a functional use is to resist or inhibit the spread of fire. This includes any chemical or chemical compound containing chlorine or bromine bonded to carbon for which “flame retardant” appears on the substance Safety Data Sheet (SDS) pursuant to Section 1910.1200(g) of Title 29 of the Code of Federal Regulations.

**Per- and poly-fluoroalkyl substances (PFASs):** a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.

**Volatile Organic Compounds (VOCs):** VOCs are defined by the California Standard Method for Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers as carbon-containing compounds (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates and ammonium carbonate) with vapor pressures at standard conditions approximately ranging between those for n-pentane through n-heptadecane. Formaldehyde and acetaldehyde are considered to be VOCs.
C. REQUIREMENTS

The attached regulations set forth the scope and requirements pertaining to these product categories, and are subject to the requirements of the Ordinance, including the definitions, requirements pertaining to waivers, and enforcement mechanisms set forth in the Ordinance. The regulations do not duplicate the Ordinance, and must be read together with it. Unless otherwise defined below, words used in these regulations shall have the same meanings as those words in the Ordinance.

D. ENFORCEMENT

These regulations have the full force and effect of law. A violation of these regulations is enforceable pursuant to Environment Code section 208. The Director of the Department of the Environment hereby adopts these regulations, effective as of XXXXDATEXXX.

Deborah O. Raphael
Director Department of the Environment

Approved:
Sign here
Date:

Regulation #SFE-13-06-PPO
Approved Alternative Products for: Furniture (Upholstered)

PURCHASING REQUIREMENTS FOR CITY DEPARTMENTS

1. Upholstered furniture, including fabrics used for the upholstery, must comply with restrictions on the following chemicals of concern. Upholstered furniture products that comply with these restrictions can be identified by consulting the Center for Environmental Health’s “Guide to Healthier Office Furniture,” ceh.org/products/office-furniture. Any furniture that meets the GreenScreen Certified standard for Furniture and Fabrics Version 1 or higher at the Bronze level and is listed on the GreenScreen Furniture and Fabric Certification list of certified products is considered compliant with these specifications. Salvaged and refurbished furniture more than one-year old at the time of reuse is also considered compliant, provided any site-applied paints, coatings, adhesives, and sealants meet the following requirements.

These criteria are incorporated into the ANSI/BIFMA c3-2019 Furniture Sustainability Standard, as credit 7.4.4-Targeted Chemical Elimination. Meeting this ANSI/BIFMA credit is considered equivalent to meeting these specifications.

2. Definitions

Component: The separate constituent parts of furniture, including, but not limited to, cover fabrics, barrier materials, resilient filling materials, decking materials, and plastic parts.

Upholstered furniture: As defined pursuant to California Business and Professions Code Section 19006. This does not include furniture used exclusively for the purpose of physical fitness and exercise.

3. Requirements
<table>
<thead>
<tr>
<th>Restricted Chemicals</th>
<th>Required Specification(s) for Upholstered Furniture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Flame retardant chemicals</td>
<td>1.1 Must be labeled as not containing flame retardant chemicals, consistent with the manner described in Section 19094 of the California Business and Professions Code.</td>
</tr>
<tr>
<td></td>
<td>1.2 Must have less than 1,000 parts per million of flame retardant in individual standard and optional components, excluding electrical components;</td>
</tr>
<tr>
<td></td>
<td>1.3 Where flame retardant chemicals are required to meet code or regulation (e.g., TB 133 or ASTM E 1537), upholstered furniture and its fabrics must have less than 1,000 parts per million of a halogenated flame retardant chemical by weight of the homogeneous material, excluding electrical components. Products that contain flame retardant chemicals that have been fully assessed using GreenScreen v1.2 (or newer) and meet the criteria for benchmark 2, 3, or 4 will be preferred.</td>
</tr>
<tr>
<td>2. Formaldehyde and Volatile Organic Compounds (VOC’s)</td>
<td>2.1 Must meet one of the following standards or certifications:</td>
</tr>
<tr>
<td></td>
<td>2.1.1 Comply with ANSI/BIFMA e3-2019 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach. Test results must be modeled using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate; or</td>
</tr>
<tr>
<td></td>
<td>2.1.2 Certified Greenguard Gold; or</td>
</tr>
<tr>
<td></td>
<td>2.1.3 Certified SCS Indoor Advantage Gold.</td>
</tr>
<tr>
<td></td>
<td>2.2 In addition, all composite wood materials in upholstered furniture must be certified and labeled as compliant to the US EPA TSCA Title VI label 40CFR 770 and the CARB ATCM #93120 Phase 2 of California’s Code of Regulations, Title 17 §93120.2 – Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.</td>
</tr>
<tr>
<td></td>
<td>Composite wood materials include: plywood, particleboard, or medium density fiberboard.</td>
</tr>
<tr>
<td>3. Per and Poly-Fluoroalkyl Substances (PFAS) used in stain/water/oil resistant treatments</td>
<td>3.1 Must be free of any long- and/or short-chain per- and poly-fluorinated alkyl compounds and fluorinated polymers used as stain, water, or oil resistant treatments at or above 100 ppm by weight of the homogenous material.</td>
</tr>
<tr>
<td>4. Antimicrobials</td>
<td>4.1 Must be free of any added or built-in chemical antimicrobials.</td>
</tr>
<tr>
<td></td>
<td>4.2 Exemption: antimicrobials added to raw materials for the sole purpose of preserving the product, with the exception of triclosan and triclocarban which are explicitly prohibited.</td>
</tr>
<tr>
<td>5. Polyvinyl Chloride (PVC)</td>
<td>5.1 Must contain less than 1% (one percent) of polyvinyl chloride (PVC) by weight, excluding electrical components.</td>
</tr>
</tbody>
</table>

**Regulation #SFE-XX-XX-PPO**

Approved Alternative Products for: Paints and Primers (Interior Latex for Wall and Ceiling)

**PURCHASING REQUIREMENTS FOR CITY DEPARTMENTS**

**Interior latex wall and ceiling paints and primers:**

1. Must be certified by one or more of the following:
   1.1. Master Painters Institute (MPI) Extreme Green
   1.2. Green Wise Gold
   1.3. Cradle to Cradle Certified Gold
2. Include all paint and primer types designated as “Latex, Interior” by MPI, except those designated as “Latex, Interior, High Performance Architectural.”
Regulation #SFE-XX-XX-PPO
Approved Alternative Products for: Resilient Flooring and Adhesives

PURCHASING REQUIREMENTS FOR CITY DEPARTMENTS

1. **Resilient flooring**, including its coatings and adhesives:
   1.1 Must not contain polyvinyl chloride (PVC); and
   1.2 Must comply with the most recent version of the Health Care Without Harm Flooring Criteria at the Silver or Gold level.

2. **Adhesive** used to install resilient flooring:
   2.1 Must be certified as meeting California 01350 (California Department of Public Health Standard Method v1.2-2017), GREENGUARD Gold, SCS Indoor Advantage Gold, FloorScore, Blue Angel for Low-Emission Floor Covering Adhesives, or Cradle to Cradle Certified Gold or Platinum; or
   2.2 The flooring must be attached mechanically without a chemical adhesive.

3. **Scope of regulation**:
   3.1 Resilient flooring includes interior:
       - Linoleum sheet and tile flooring
       - Molded rubber mat/slab flooring
       - PVC-free alternatives to vinyl sheet and tile flooring
       - Rubber sheet and tile flooring
       - Slip-resistant safety flooring
       - Sports flooring
   3.2 Resilient flooring does not include:
       - Accessories, such as edgings
       - Exterior resilient flooring
       - Resilient bases
       - Rubber runners
       - Stair coverings
       - Static control flooring