

Green Building Practice Summary 03/17/2011

Sector: Residential

Category/Practice: IEQ / Low-VOC Materials

Proposed GB Practice

Description

Construction materials, floor coverings and site-applied finishes (including sealants and adhesives), resilient flooring, carpeting and pad, site-applied paints, stains and varnishes, structural wood panels, hardwood veneer plywood, particle board and fiber board building products, and insulation are required to meet specified volatile organic compound (VOC) emissions limits in accordance with California Department of Public Health (CDPH) 01350; GREENGUARD Environmental Institute GGPS.001 standard for building materials and finishes; and, Green Seal® standards.

Applicability

New Construction: Applies

Existing Buildings/Additions: Applies to addition portion only

Existing Buildings/Alterations: Applies with limited scope:

- Only to new construction within alteration
- Only to sealants and adhesives, resilient flooring, paints, stains, varnishes and other site-applied finishes.

Intent

Improve indoor air quality for construction workers and occupants.

Benefits and Costs

Triple Bottom Line Benefits

People: Improved health for construction workers and occupants.

Economic: No direct economic benefits. Improved health can potentially reduce health-care costs.

Environment:

- Improved outdoor air quality.
- Fewer toxic compounds purchased likely leads to reduced pollution at the manufacturer level

Costs Passed to Owner

Incremental costs for compliant low-VOC materials versus conventional materials appears to be quite low, per each material. Cumulatively, the incremental cost is estimated to be “Medium” (\$200 to \$400).

Lost Opportunity

- Construction worker exposure to VOCs during application may have long-term health consequences.
- Many construction materials used when the building is built are with the building over its life.

Implementation

Availability of Products and/or Services

Availability of compliant low-VOC materials is as follows:

- Sealants and adhesives: readily available
- Resilient flooring: readily available
- Carpeting: readily available
- Paints, stains, varnishes and other site-applied finishes: readily available
- Structural wood panels, hardwood veneer plywood, particle board, and fiber board building products: readily available (see Engineered Wood Association, www.apawood.org)
- Insulation: Low VOC fiberglass insulation from several major manufacturers readily available; cellulose insulation; and bio-based GREENGUARD certified polyurethane spray foam all readily available.

Practicality

It has been difficult to locate data regarding the relative durability of low-VOC materials compared with conventional materials they replace. There is a chance that some of the healthier materials may not hold up as well, meaning more maintenance may be required.

Certification Issues

None. The referenced standards are developed and administered elsewhere by state governments and industry trade associations.

Enforcement Procedures

Permit application/plan review: Require initial documentation via standardized checklist form developed by the City.

Field inspection: Documentation demonstrating compliance is required with delivery of materials and must be available for inspection.

Certificate of Occupancy: See above.

Support Materials Needs

- Standardized checklist form for initial submittal
- Form for documenting compliance

Training Needs – Industry

Training should cover health impacts and compliant material sources, costs, performance and identification.

Training Needs – Staff

Submittal review

Background**Current Practice**

A wide variety of materials are used in construction. Low-VOC materials are used on a voluntary basis by informed citizens and contractors who have health concerns. There is no data regarding VOC levels in Fort Collins housing.

Context

People in the US spend an average of 65 percent of their time at home and as much as 90 percent of their time indoors, according to a May 1999 national survey conducted by the American Lung Association. Additionally, 90 percent of owners questioned in this survey were not aware that poor indoor air could be a problem. Another national survey conducted in 2000 found that about 95 percent of people who responded to that survey said they thought the quality of air in their homes was either somewhat or very important.

The increase in awareness is due in part to educational efforts by the US Environmental Protection Agency (EPA) and other public interest groups. The US Department of Health and Human Services and the Surgeon General's Office, for example, established a Healthy People Initiative. Their conference report estimated that 25 percent of preventable illness worldwide can be attributable to poor environmental quality, and that air pollution alone is associated with 50,000 premature deaths and more than \$40 billion dollars in health-related costs. Indoor air pollution is one of the environmental causes of these illnesses.

Source: <http://www.aerias.org/DesktopDefault.aspx?tabindex=3&tabid=79>

VOCs include a variety of chemicals, some of which may have short-and long-term adverse health effects, emitted as gases from certain solids or liquids. VOCs are emitted by a wide array of products numbering in the thousands. Examples include paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers and photographic solutions.

Tighter construction practices and the lack of controlled ventilation with outdoor air contribute to higher average indoor VOC levels. Concentrations of many VOCs are consistently higher indoors than outdoors (up to ten times higher), particularly during construction and renovation projects.

The health impacts of exposure to VOCs include eye, nose and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. Some VOCs can cause cancer in animals; some are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness (see www.epa.gov/iaq/voc.html#Health%20Effects).

There is much more data on health effects of VOCs in commercial environments than residential because there are so many variables in residential buildings and their occupants.

The biggest emitters of VOCs are formaldehyde-based products. Formaldehyde is classified as a “[Group 1 Carcinogen](#)” which is defined as an agent that “is definitely carcinogenic to humans” by the International Agency for Research on Cancer (IARC), and “a complete carcinogen” in the words of the Occupational Safety and Health Administration (OSHA). The National Toxicology Program also recently revised its characterization of formaldehyde to that of “known human carcinogen.” Formaldehyde is one of the few indoor air pollutants that can be readily measured.

California has been the leader in regulating VOCs in many consumer products. A number of northeastern states also regulate VOCs with the goal of improving indoor air quality. The EPA and a number of trade associations have developed standards for particular materials.

The proposed requirement references standards from several sources, including:

- California Department of Public Health (CDPH) Standard Practice 01350 for VOC testing.
- GREENGUARD: an ISO-IEC accredited third-party environmental organization that certifies products and materials for low chemical emissions and provides a resource for choosing healthier products and materials for indoor environments.
- Green Seal: a non-profit organization that uses science-based programs for consumers, purchasers and companies to utilize more environmentally-sustainable products.
- Carpet and Rug Institute (CRI) Green Label Plus Indoor Air Quality Program: an independent testing program that identifies carpet with very low emissions of VOCs to help improve indoor air quality.

In national green building rating or labeling programs, use of low-VOC materials is required (EPA Indoor Air Plus program) and/or rewarded (LEED/Homes, National Green Building Standard).

The proposed requirement is based on standards regarding the VOCs in materials themselves rather than occupant decisions. VOCs would still be subject to occupants’ lifestyles, items brought into the living space such as dry cleaning, fabrics, cleaning agents, and decisions on furnishings.

Related Green Building Practices

Healthy indoor air is the result of a systems approach. These practices go hand-in-hand:

- Tight construction
- Pollutant source control
- Spot ventilation
- Whole-building ventilation

Known Objections

- Construction materials meeting referenced standards may not perform as well (initial application, durability) as products currently in use.
- Some of these materials may have health impacts for applicator but not for the residents, because the off-gassing is largely complete when the material is cured.

- Any gains in indoor air quality gained with this proposal may be outweighed by furnishings and other materials brought into the living space by the residents after final inspection and/or Certificate of Occupancy.
- Compliance could be difficult to verify.

Sources

- NAHB Toolbase – residential low voc paints
www.toolbase.org/Technology-Inventory/Interior-Partitions-Ceilings/low-voc-paints
- “Building Codes and IAQ” by the Cadmus Group, September 2010 prepared for the EPA
www.epa.gov/iaq/pdfs/building_codes_and_iaq.pdf
- CRI – GREEN LABEL PLUS
www.carpet-rug.org/commercial-customers/green-building-and-the-environment/green-label-plus/
- CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
www.calrecycle.ca.gov/greenbuilding/Specs/Section01350/
- CALIFORNIA AIR RESOURCES BOARD (Indoor Air Quality)
www.arb.ca.gov/research/indoor/indoor.htm
- GREEN GUARD ENVIRONMENTAL INSTITUTE (testing for all interior finishing products)
www.greenguard.org
- AIR QUALITY SCIENCES IAQ RESOURCE CENTER (up-to-date information about IAQ and other occupant health issues)
www.aerias.org/DesktopDefault.aspx?tabindex=5&tabid=97 .
- “Building Healthy Hospitals” (2007 cost data from four hospital projects)
www.epa.gov/region9/waste/p2/pdf/IAQFinalOct12.pdf