Green Building Practice Summary 3/17/2011

Sector: Commercial

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: 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

The best data for costs for low VOC sealants and adhesives; resilient flooring; and paints, stains, varnishes and other site-applied finishes comes from case studies in the health care industry. According to “Building Healthy Hospitals” an EPA P2 Project 2007

http://www.epa.gov/region9/waste/p2/pdf/IAQFinalOct12.pdf, noting the following cost premiums:

- Adhesives – 5 to 20%
- Carpeted flooring – 10-20% initially, but depending on the type can yield significant cost savings over useful life
- Caulk – 5-20%
- Finishes applied to woodwork, casing and other applications – 10-50%, but increasingly commonly available and cost competitive
- Interior paints – minimally more costly, paint quality is primary cost factor
- Sealants – 20-50%, but increasingly commonly available and cost competitive

Local suppliers of prefabricated cabinets with low VOC composite wood product materials have a higher cost impact; currently special order. Costs are 25%-40% more than standard cabinets due to low demand, demand thus far on LEED projects only.

Lost Opportunity

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

Implementation

Availability of Products and/or Services

Low VOC sealants and adhesives; resilient flooring; and paints, stains, varnishes and other site-applied finishes are readily available.

Low urea formaldehyde emissions plywood products are readily available; see Engineered Wood Association at www.apawood.org.

Documented low VOC composite wood product materials for cabinets are available through suppliers such as SkyBlend™; other resources through the ESP (Environmental Stewardship Program) by the Kitchen Cabinet Manufacturer's Association, see: www.greencabinetsource.org.

Practicality

Practical to require Low VOC sealants and adhesives; resilient flooring; and paints, stains, varnishes and other site-applied finishes.

As demand for low VOC cabinetry increases, costs are likely to decrease.

Certification Issues

None

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
- Certificate of compliance form

Training Needs – Industry

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

Training Needs – Staff

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

Background

Current Practice

Structural wood panels and plywood have been regulated for some time. Otherwise currently no maximum VOC limits required in construction by current building codes.

Context

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short-and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. 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.

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 eye 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 a lot more data on health effects of VOCs in commercial environments than residential environments because there are so many variables in homes and their occupants.

Industrial hygienists and environmental health professionals are currently very concerned about the trend toward green building and weatherization as some strategies create higher exposures to occupants. This is an issue that is gaining support and could lead to liability issues and other repercussions down the road.

The quest for energy efficiency—dating back to the 1970s—has often closed buildings off to fresh air, forcing reliance on building-ventilation systems for clean air. The EPA estimates that indoor VOC levels can grow up to 10-times higher than outdoor levels, especially during construction and renovation projects.

The biggest emitters of VOCs are formaldehyde-based products. Cabinetry is typically a major source of indoor formaldehyde exposure. 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, one of the best known VOCs, is one of the few indoor air pollutants that can be readily measured.

Fiberglass insulation may contain urea or phenol formaldehyde binders. Recent studies indicate that phenol formaldehyde products expose occupants to emissions that exceed recognized standards. For alternatives that do not contain urea or phenol formaldehyde see: www.ecoblueinc.net; www.jm.com; and www.bondedlogic.com.

No federal standards have been set for VOCs in non industrial settings. OSHA regulates formaldehyde, a specific VOC, as a carcinogen. OSHA has adopted a Permissible Exposure Level (PEL) of .75 parts per million (ppm), and an action level of 0.5 ppm.

California has led the charge regulating VOCs in many consumer products—notably California Department of Public Health (CDPH) Section 01350. A number of northeastern states also regulate VOCs with the goal of improving indoor air quality.

The California Air Resources Board's (CARB) Airborne Toxic Control Measure (ATCM) to control formaldehyde emissions from composite wood specifically focuses on three products: hardwood plywood, particleboard, and medium density fiberboard.

Related Green Building Practices

Healthy indoor air is the result of a systems approach. These practices go hand-in-hand. Effective air-sealing building envelope creates healthy indoor air quality in combination with:

- Building Flush-out

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 building by occupants after final inspection and/or Certificate of Occupancy.
- Higher cost for compliant pre-fabricated cabinets.
- Compliance will be very difficult to verify.

Sources

"Building Codes and IAQ" by the Cadmus Group, September 2010 prepared for the EPA
http://www.epa.gov/iaq/pdfs/building_codes_and_iaq.pdf

CRI – GREEN LABEL PLUS
http://www.carpet-rug.org/commercial-customers/green-building-and-the-environment/green-label-plus/

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
http://www.calrecycle.ca.gov/greenbuilding/Specs/Section01350/

CALIFORNIA AIR RESOURCES BOARD
Indoor Air Quality
http://www.arb.ca.gov/research/indoor/indoor.htm

GREEN GUARD ENIRONMENTAL INSTITUTE
www.greenguard.org
Institute does testing for all interior finishing products

AIR QUALITY SCIENCES IAQ RESOURCE CENTER.
http://www.aerias.org/DesktopDefault.aspx?tabindex=5&tabid=97 A well-respected resource for up-to-date information about IAQ and other occupant health issues.

SPRAY FOAM INSULATION CALCULATOR
http://foamboulder.com/calculator/spray-foam-energy-calculator.asp