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Architect: Perkins+Will Canada Architects Co.
Photo: Don Erhard

Wood Specification: Indoor Air Quality (Low Emitting Materials)

Bare wood can be considered to be hypo-allergenic because it does not emit toxic vapours. Solid wood products can be used in locations where occupants are known to have environmental sensitivities. Increasingly, coatings, resins, and binders used in wood products are available in low- or non-toxic formulations.

Why Indoor Air Quality Adds Value

- Despite the fact that solid wood is not a harmful material, it is frequently combined with products that can adversely affect occupant well-being. It is therefore important to fully understand the toxicity of the solvents, glues, sealants, flame retardants, resins, and preservatives used in and on some wood products.
- For example, urea formaldehyde (UF) is commonly found in resins associated with particleboard and medium density fibreboard (MDF) production. Urea formaldehyde has been classified as a known carcinogen by the World Health Organization. It also has a range of other health effects including being a bronchial irritant and an asthma trigger.
- Indoor air quality certification standards exist for composite wood products (e.g., flooring, cabinetry, panels) to verify that the products meet strict emission limits. These certification standards include GreenGuard® and Floorscore®.

Terminology

Indoor air quality:

the nature of air inside a building that affects the health and well-being of building occupants. Quality is considered acceptable when no known contaminants exist at harmful concentrations as determined by authorities, and when a substantial majority (80% or more) of the people exposed do not express dissatisfaction with it (American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.1-2007).

Volatile organic compounds (VOC):

carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vapourize at normal room temperatures.

Contaminants:

unwanted airborne elements that may reduce air quality (ASHRAE Standard 62.1 – 2007).

Off-gassing:

the emission of volatile organic compounds from synthetic and natural products.

Material safety data sheet (MSDS):

presents information about chemicals, chemical compounds, and chemical mixtures; provides the volatile organic compound concentration of a product, typically in grams per litre (g/L).

How to Include Low-emitting Materials in Design

- During the preliminary design stage, research non-toxic alternatives such as composite wood products that contain no added urea formaldehyde.
- For most green building rating systems, all composite wood products—including particleboard, MDF, plywood, wheat board, strawboard, panel, substrates, and door cores, and associated laminate adhesives—should contain no added urea formaldehyde resins.
- Identify target emission limits for products and stipulate performance standards in the project specifications (ideally, within the specific section applicable to a particular trade or supplier).
- Consider making the submission of indoor air quality compliance documentation a condition of product approval.
- Indicate what must be provided in the way of cut sheets, material safety data sheets, certificates, and test reports.
- Products such as plywood and oriented strand board (OSB) use the red/black-coloured phenol-formaldehyde resin. While formaldehyde is still present in this type of resin, there are almost no emissions compared to those containing urea formaldehyde.
- Strive to eliminate the use of toxic materials altogether through alternative installation strategies, such as using mechanical fasteners for flooring and paneling in lieu of glues (which also aids in future disassembly).
- Stress the importance of meeting indoor air quality requirements during tender and again when the contract is awarded. Include requirements in subcontracts and purchase orders.
- Communicate indoor air quality goals to the construction team to ensure successful implementation.

Resources

Environmental Choice EcoLogo Program (www.industries.ul.com/environment/): presents a listing of products and services that are EcoLogo certified and meet the applicable environmental standards; certified products are generally low in or have no VOCs.

Green Seal (www.greenseal.org): database of certified products and services; certified products are generally low in or have no VOCs.

South Coast Air Quality Management District (www.aqmd.gov): source-specific standards to reduce air quality impacts that are referenced by most rating systems.

FloorScore™ Program, Resilient Floor Covering Institute (www.rfci.com/): a program that certifies flooring products including wood flooring, developed together with Scientific Certification Systems.

GREENGUARD Indoor Air Quality Certification Program (www.greenguard.org/en/CertificationPrograms/CertificationPrograms_indoorAirQuality.aspx): indoor air quality certification standards for low-emitting materials.

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What to Ask Suppliers

- Early on in the planning phase, ask about the production of materials and obtain the relevant material safety data sheets describing the volatile organic compound and urea formaldehyde emissions of products.
- Make sure suppliers provide manufacturer contact information so companies can be contacted for additional information.
- If in doubt, request independently audited data from a reputable third-party agency such as the South Coast Air Quality Management District in southern California (www.aqmd.gov).

Examples of Volatile Organic Compound (VOC) Emission Limits Relevant to Wood Products

Adhesives: architectural applications	Volatile organic compound limit (g/L)
Wood flooring adhesive	100
Subfloor adhesive	50
Contact adhesive	80
Structural wood member adhesive	140
Drywall and panel adhesives	50
Multi-purpose construction adhesives	70
Top and trim adhesive	250
Substrate specific applications	
Wood	30
Architectural coatings	
Clear wood finishes:	
• Varnish	275
• Sanding sealers	275
• Lacquer	350
Flats	50
Stains, interior	250
Wood preservatives	350

Source: South Coast Air Quality Management District (southern California), Rule #1168 January 2005 and Rule #1113 September 2013

www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/table-of-contents



Photo: Michael Bednar

Formaldehyde Regulations and Structural Wood Products

Structural wood products such as plywood and oriented strand board (OSB) are manufactured to meet stringent product standards, including Voluntary Product Standard PS 1-07 for Structural Plywood and Voluntary Product Standard PS 2, Performance Standard for Wood-Based Structural-Use Panels. Because wood products produced under these standards are designed for construction applications governed by building codes, they are manufactured only with moisture-resistant adhesives that meet Exterior or Exposure 1 bond classifications. These adhesives, phenol formaldehyde and diphenylmethane diisocyanate (MDI), are chemically reacted into stable bonds during pressing. The final products have such low formaldehyde emission levels that they easily meet or are exempt from the world's leading formaldehyde emission standards and regulations.

Source: www.apawood.org/level_b.cfm?content=srv_env_form

Procedure

For most rating systems, low-emitting materials credits function on a pass or fail basis. Best practices in tracking indoor air quality hinge upon the maintenance of a list of each indoor product used on a project. Include the manufacturer's name, product name, and specific VOC data (g/L, less water) for each product, as well as the corresponding allowable VOC from the referenced standard.

All adhesives, sealants, paints, and coatings used on the interior of the building (inboard of the weatherproofing system and applied on site) must comply with the applicable VOC concentration limits and meet the certification standards. Shop-applied products are exempt from meeting the volatile organic compound limits.

A volatile organic compound budget procedure allows for specialty applications for which there is no low-VOC product option. It involves the comparison of a baseline case with a design case. The baseline application rate should not be greater than that used in the design case.

Design: maintain a list of each of the following wet products to be used on site:

- Adhesives and aerosol adhesives
- Sealants and sealant primers
- Paints and coatings

Tender: obtain MSDS or environmental information sheets from all subcontractors prior to using the products on site, with the product's VOC data in g/L. Check the referenced standard to ensure the materials are in compliance.

Construction: if the materials are not in compliance, return the relevant paperwork to the subcontractors and request substitutions that meet the referenced standard VOC limits. Non-complying products are not allowed on site.