

Formaldehyde Emissions and Exemptions

Date: Revised August 6, 2012

Structural insulated panels (SIPs) are a popular option for sustainable construction. SIPs provide an energy-efficient and airtight building enclosure that helps maintain healthy indoor air quality for building occupants.

One of the primary components of most SIPs is oriented strand board (OSB). The following information from APA–The Engineered Wood Association addresses indoor air quality concerns related to OSB and explains why plywood and OSB manufactured to U.S. Product Standards PS 1 and PS 2 have such low emission levels that they are exempt from the leading formaldehyde emission standards and regulations.

What is Formaldehyde?

Formaldehyde is a simple chemical made of hydrogen, oxygen, and carbon. It occurs naturally, and is the product of many natural processes. It is made by our bodies and is in the air. Plants and animals also produce formaldehyde. It is in many fruits and vegetables, and is a byproduct of cooking certain vegetables, such as Brussels sprouts and cabbage. This chemical breaks down quickly and is metabolized to simple carbon dioxide. Our bodies readily break down the low levels to which we are exposed everyday.

Formaldehyde is also a product from combustion associated with the burning of kerosene and natural gas; automobile emissions; and cigarettes. It is an important industrial chemical used in the manufacture of numerous consumer products, including permanent press fabrics and even toothpaste.

How Much Formaldehyde is in Wood?

All wood species, and therefore all wood products, contain and emit small amounts of formaldehyde. Because formaldehyde occurs naturally in wood, there is no such thing as “formaldehyde-free” wood. An oak tree, for example, emits 0.009 parts per million (ppm) of formaldehyde. By itself, this is a very low quantity, but densely wooded areas can have much higher concentrations. It follows that any wood cut from that oak tree also contains small amounts of formaldehyde, as do all wood products.

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:

- **U.S. HUD Manufactured Housing Standard**

This standard specifies a 0.20 ppm emission limit for (non-structural) plywood using the ASTM E1333 method. Because of its extremely low formaldehyde emission levels, phenolic-bonded structural plywood is exempt from the testing and certification requirements of the standard. While there is no specific limit stated for OSB, it has been well accepted that the stated exemption for panels that use phenolic adhesives is applicable to OSB products meeting Voluntary Product Standard PS 2.



- **California Air Resources Board (CARB) Air Toxic Control Measure for Composite Wood Products**
This regulation, developed by a division of the California EPA and scheduled to take effect January 1, 2009, is considered the most stringent formaldehyde emissions regulation in the United States. In recognition of the different formaldehyde emission levels of different types of wood products, definition No. 8 of the regulation explicitly exempts “structural plywood,” “structural panels,” “structural composite lumber,” “oriented strand board,” “glued laminated timber,” and “prefabricated wood I-joists.”

SIPs and Formaldehyde Off Gassing

An independent test found that the amount of formaldehyde emitted by newly manufactured SIPs was below detectable levels, or less than 0.03 ppm. The test was performed by certified testing agency NTA, Inc. in accordance with ASTM E1333: Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

References

1. *APA Technical Report: Structural Wood Panels and Formaldehyde*, Form SPE-1040

