



# Green Guide

Understanding formaldehyde regulations  
around the world



Since 1935, Franklin Adhesives & Polymers™ has led the way in the innovation of adhesives for wood and wood products. Manufacturers in more than 60 countries have come to trust our products to provide them the high productivity and top quality they demand. They know they can rely on our longstanding experience and deep commitment to the development of practical, hardworking solutions for real needs on the plant floor.



“Our goal is to provide knowledge about formaldehyde and the associated regulations impacting our customers.”

Franklin Adhesives & Polymers takes great pride in the quality of products we manufacture for our customers. We also realize we have a legal and ethical responsibility to provide products that comply with global standards and strive to protect our natural resources. Our goal is to provide knowledge about formaldehyde and the associated regulations that are impacting the building materials market and our customers. If you have any questions about any of the below information, please do not hesitate to contact us.



## Formaldehyde

Formaldehyde is a naturally occurring, man-made chemical compound used to manufacture many products. In its natural form, it is a gas, and inhalation is the primary route of entry into the body. In the atmosphere, formaldehyde gas is commonly formed when hydrocarbons are broken down, so gasoline and its emissions are a likely source of daily exposure. In nature, formaldehyde is formed as plant matter decays and in part comes from the chemical metabolism of foliage. It is no surprise that it is found in untreated wood. Formaldehyde is also manufactured in large quantities and typically sold as a liquid in solution. It can be found in literally thousands of common consumer products from deodorant, make-up and bathroom cleansers to carpets, clothing, insulation and furniture. We are constantly exposed to it.



## LEED

LEED, which stands for Leadership in Energy and Environmental Design, is a set of building project guidelines published by an organization known as the Green Building Council. These are guidelines, not regulations, that have been widely accepted in today's world of green building. They publish several different sets of guidelines depending upon the type of building project. For example, there is a set of guidelines for new building construction, one for building renovation, one for schools and many more. For adhesives, these guidelines tend to focus on the low VOCs in the product, and they ban the use of urea-formaldehyde adhesives in composite wood products.

The LEED building rating system requires the use of a consultant to help rate a building project for one of four levels of certification (Platinum, Gold, Silver or Certified). LEED offers programs in several areas of building, both commercial and residential. Rating systems & guidelines can be downloaded from [www.usgbc.org](http://www.usgbc.org).

## CARB



In the United States, formaldehyde is regulated by a number of agencies. Perhaps the biggest and the most recent standard to regulate formaldehyde came in April of 2007. The California Air Resources Board (CARB) passed a law limiting the amount of formaldehyde emissions from composite wood products. Aimed at the larger manufacturers of particleboard, medium density fiberboard (MDF) and interior plywood, this standard will restrict formaldehyde to very low limits.

### Phase I Emissions Standards:

By January 2009    Hardwood Plywood-Veneer Core = 0.08 ppm  
Particleboard = 0.18 ppm  
Medium Density Fiberboard = 0.21 ppm

By July 2009        Hardwood Plywood Composite Core = 0.08 ppm

### Phase 2 Emissions Standards:

By January 2010    Hardwood Plywood-Veneer Core = 0.05 ppm

By January 2011    Particleboard = 0.09 ppm  
Medium Density Fiberboard = 0.11 ppm

By January 2012    Hardwood Plywood-Composite Core = 0.05 ppm

All testing must be conducted in accordance to ASTM E1333 (Large Chamber Test Method). This applies to panel manufacturers, distributors, importers, fabricators and retailers of hardwood, plywood, particleboard and medium-density fiberboard as well as finished goods containing those products that would be sold or supplied to California.

Research conducted during the promulgation of the standard clearly showed that polyvinyl acetate, soy-based and MDI based adhesives had negligible levels of formaldehyde, if any, during the chamber testing. This standard allows manufacturers of hardwood plywood who use NAF based resins to submit an application for an exemption from the requirements of section 93120.3 (b).

While formaldehyde-free adhesives are certainly going to be preferred to other adhesives to meet the new CARB standard, it is not mandatory that all adhesives used be formaldehyde-free. Many low-emitting formaldehyde adhesives will pass the strictest limits of the new CARB standard. One key point, however, is that chamber testing is performed on wood with the adhesive; the wood almost always contains some natural amount of residual formaldehyde. By using a formaldehyde-free adhesive, a manufacturer can eliminate the possibility that formaldehyde emissions might come from the adhesive in the composite wood. It provides the assurance that the adhesive is not going to contribute to the testing results. This is the peace of mind many hardwood plywood product manufacturers and fabricators seek. Fortunately, Franklin considered this in the development of its newest line of wood adhesives; we now have adhesives that will meet this need.

## Europe's Formaldehyde Regulations

Most of the European nations have passed laws that regulate formaldehyde, now known as the E1 emissions class. Standards such as EN 312, EN 622-5 and EN 300 all require that the 0.1 mg/m<sup>3</sup>/h level be met. Testing for this mainly uses the Perforator Test Method (found in EN 120) and gas analysis (found in EN 717-1). In 2004, the European Standard EN 13986 established Emission Classes E1 and E2 for use in construction (the E1 level is most common). These standards basically require testing to be done on formaldehyde containing wood products used in construction. In 2006, these same methods and the associated limits became effective for panel production. The limits are listed below:

### Emissions Class E1 and E2

- Uncoated Particleboard/OSB/MDF = Less than 8 mg/100 g dry board (~0.10 ppm)
- Uncoated Hardwood Plywood/solid wood panels/LVL = Less than 0.13 mg/m<sup>3</sup>/h (~0.14 ppm)
- Coated Particleboard, OSB, MDF, etc = Less than 0.13 mg/m<sup>3</sup>/h (~0.14 ppm)



## Japan's Formaldehyde Regulations

In 2002 the Japanese Industry Standards (JIS) Committee amended the Japanese Building Standard Code in response to public health concerns over poor indoor air quality, what many call Sick Building Syndrome. Under the revised standard, all new habitable building construction in Japan requires that there be technical standards in place to regulate the air quality. One of the restrictions placed on building materials is the allowable level of formaldehyde emissions. As of July 2003, testing and certification requirements have been established for products that contain formaldehyde, namely composite wood building materials. The new standard also makes ventilation systems mandatory in all habitable buildings. A few of the building materials include: plywood, wood flooring, structural panels, laminated veneer lumber, adhesives, paints and many others. Because it is very difficult, if not impossible, to eliminate formaldehyde from a building completely, the standard employs a tiered rating system based on the amount of formaldehyde emission a building material gives off. These are from "one-star" to "four-star" ratings, with the four-stars rating representing the lowest amount of formaldehyde emission. All testing must be done in accordance to either JIS A 1460-2001 (Building Boards Determination of Formaldehyde Emission – Desiccator Method) or JIS A 1901-2003 (Determination of the Emission of Volatile Organic Compounds and Aldehydes for Building Products – Small Chamber Method). The acceptable levels for formaldehyde emissions are listed below:

<b>One-Star</b>	★ 5.0 to 7.0 mg/L
<b>Two-Star</b>	★★ 1.5 to 2.1 mg/L
<b>Three-Star</b>	★★★ 0.5 to 0.7 mg/L
<b>Four-Star</b>	★★★★ 0.3 to 0.4 mg/L

Typically only Three-Star or Four-Star levels are accepted unless the building's ventilation system has taken formaldehyde exposures into account.

All products must also be approved by the Japanese Ministry through an extensive application process that includes providing of desiccator data (JIS 1460) at minimum.

## Overview of Standards and Testing Methods

Standard	Product(s)	Test method	Numerical value
CARB Phase 1	Hardwood Plywood-VC	ASTM E1333	0.08 ppm
	Hardwood Plywood-CC	ASTM E1333	0.08 ppm
CARB Phase 2	Hardwood Plywood-VC	ASTM E1333	0.05 ppm
	Hardwood Plywood-CC	ASTM E1333	0.05 ppm
Europe's E-1 Std.	Hardwood Plywood	EN 717-1	0.12 mg/m3 (0.14 ppm)
Japan's Three Star	Particleboard	EN 717-1	0.12 mg/m3 (0.14 ppm)
	Medium Density Fiberboard	EN 120	8 mg/100g (0.10 ppm)
	All Products	JIS A-1460	0.5 mg/L (0.07 ppm)
Japan's Four Star	All Products	JIS A-1460	0.3 mg/L (0.04 ppm)

## Australia's Green Building Program

Australia's Green Building program is known as Green Star. Relatively new and patterned after the European BREEAM and U.S. LEED programs, it is managed by the Australian Green Building Council (AuGBC). It was developed mainly for office buildings but currently has rating systems for residential, schools, and health facilities under development. It works much the same way as LEED. For adhesives (Section IEQ-13), Green Star requires that 95% of the adhesives and sealants used be either low-VOC or low-emitting and that composite woods have low formaldehyde levels.

Other countries currently developing green building rating systems include: Argentina, Brazil, Chile, China, Egypt, Germany, Greece, Guatemala, Hong Kong, Israel, Korea, Nigeria, Panama, Philippines, Switzerland, Turkey and Vietnam.

## Our Green Products

Based on our knowledge of VOCs and formaldehyde, we feel confident most of our frequently used products would qualify for LEED credit 4.1 and if used to produce hardwood plywood would pass phase 2 CARB standards. Our table illustrates some of our raw adhesives that would perform well in testing and not contribute to formaldehyde chamber emissions or high VOC levels. This table serves only as a guide. CARB as well as other international regulations, require the composite wood manufacturer to conduct third party testing of your substrate with the adhesive you are using to show passage of the regulation. The test is not designed for the raw adhesive.

If you would like further guidance on using our products to meet CARB standards or additional testing information, please feel free to contact us at 1.614.443.0241.

This brochure was printed from the most current information available at the time. Please refer to the most recent CARB and LEED guidelines for complete accuracy.

Product	LEED	CARB
Assembly High Tack	✓	✓
Multibond 2000	✓	✓
Multibond 2015	✓	✓
Multibond AP-2	✓	✓
Multibond EZ-1	✓	✓
Multibond X-016	✓	✓
Multibond MX-90	✓	✓
Multibond 4000 FF	✓	✓
Multibond SK-8	✓	✓
Reactite EP-925	✓	✓
Titebond 50	✓	✓
Titebond Original Wood Glue	✓	✓
Titebond Regular	✓	✓

Not all products are available in all geographic regions. Call for more detailed information. The table does not represent a complete product listing.



Franklin Adhesives & Polymers, a division of Franklin International, manufactures adhesives for the domestic and global wood furniture, millwork and engineered-lamination markets; and provides pressure sensitive adhesives for office products and food packaging. The division also supplies specialty polymers to various companies to formulate, use as fiberglass binders and non-woven modifiers and binders. Franklin Adhesives & Polymers supplies product and local service in more than 60 countries on six continents across the globe, and recently opened a plant in Guangzhou, China, to serve the Pacific Rim more efficiently.

Franklin Adhesives & Polymers remains committed to pioneering environmentally safe products that also maintain high performance characteristics. The division introduced the first 100 percent formaldehyde-free, water-resistant wood adhesive; and also proudly announced that three of its pressure sensitive adhesives have been certified by the U.S. Forest Products Laboratory to be easily removable from paper during the recycling process.

**Franklin Adhesives & Polymers**

A division of Franklin International  
2020 Bruck Street  
Columbus, OH USA 43207

**T** 1.800.877.4583 or 1.614.443.0241

**E** [Marketing@franklininternational.com](mailto:Marketing@franklininternational.com)

**W** [www.franklinadhesivesandpolymers.com](http://www.franklinadhesivesandpolymers.com)



Franklin International is making a commitment to understand and reduce its ecological footprint.

