

FORMALDEHYDE - INDOOR AIR QUALITY

INTRODUCTION

Formaldehyde is a volatile organic compound (VOC). It is a naturally occurring organic chemical in the form of a pungent, colourless gas at room temperature which is found at low concentrations in the environment. Formaldehyde has been used for many years in the manufacture of building materials including adhesive resins for products such as plywood, reconstituted wood-based panels and laminated timber, as well as sheet vinyl flooring, wallpaper and paint.

EFFECTS OF FORMALDEHYDE ON BUILDING OCCUPANTS

Modern buildings are tightly sealed to conserve energy. This may result in fewer air changes and consequently contaminants, such as VOCs, can remain trapped indoors. This effect is known as *Sick Building Syndrome*.

The emission of formaldehyde from building materials may be irritating to the eyes and nose. Materials having high formaldehyde levels are not permitted in museums and art galleries due to the potential effect upon exhibits of formic acid produced by the oxidation of formaldehyde.

Formaldehyde is classified by the International Agency for Research on Cancer as a carcinogen; however, scientists have concluded that the common uses of formaldehyde in consumer products and other applications does not pose a risk to health. ⁽¹⁾

CONTROL OF FORMALDEHYDE IN BUILDINGS

The release of formaldehyde from wood-based products is influenced by factors including binder type, temperature, humidity, product thickness and percentage concentration. Under the provisions of the European Standard EN 13986, the formaldehyde released from wood-based panels used in internal applications is classified as either Class E1 or Class E2.

Different types of surface finish such as powder coat, paint, vinyl resin systems, phenolic saturated film, melamine saturated paper, PVA and multiple topcoat wet processes can act as barriers to formaldehyde emissions. Studies ⁽²⁾ have shown that some finishes are more effective than others. Powdercoat, phenolic and vinyl treatments appear to be the most effective with multiple topcoats the least effective.

STATUTORY REQUIREMENTS

The main objective of the Commonwealth *Work Health and Safety Act 2011* is a

balanced and nationally consistent framework to secure the health and safety of workers and workplaces by protecting workers and others against harm to their health, safety and welfare through the elimination or minimisation of risks arising from work.

The *National Construction Code (NCC)* Volume Two adopts by reference AS/NZS 2269.0, which regulates the limits for formaldehyde in structural plywood.

AUSTRALIAN STANDARDS

There are several standards relating to the presence of formaldehyde in buildings:

Material performance requirements

AS/NZS 2269.0 provides minimum performance requirements and specifications for the manufacture and application of structural plywood. It also defines formaldehyde emission classes when tested to AS/NZS 2098.11.

AS/NZS 2270 provides minimum performance requirements and specifications for the manufacture of appearance and non-appearance grades of plywood and blockboard used in non-structural interior applications. It also defines formaldehyde emission classes when tested to AS/NZS 2098.11.

AS/NZS 2271 provides minimum performance requirements and specifications for the manufacture of appearance grades of plywood and blockboard used in non-structural applications. It also defines formaldehyde emission classes when tested to AS/NZS 2098.11.

Determining emissions

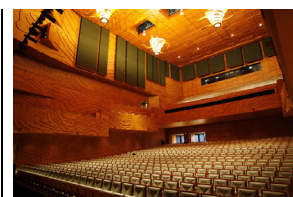
AS 2365.6 provides a standardised method for the sampling and analysis of indoor air to determine the formaldehyde content.

AS/NZS 2098.11 and AS/NZS 4357.4 provide methods for testing to determine the formaldehyde emission classes. Both standards allow products to be tested in the same condition that they are supplied to the market, for example with edge and/or surface finish.

AS/NZS 4266.1 specifies methods for determining the quantity of formaldehyde emitted from reconstituted wood-based panels.

Product certification

AS 1859.1, AS/NZS 1859.2 and AS/NZS 1860.1 require products to be marked as complying with the formaldehyde emission classification as tested in accordance with AS/NZS 4266.



Formaldehyde is used in the adhesive resins of timber products such as plywood

Relevant standards

Australian

AS/NZS 1859 *Reconstituted wood-based panels - Specifications*.

Part 1 - *Particleboard*.

Part 2 - *Dry process fibreboard*.

AS/NZS 1860.1 *Particleboard flooring - Specifications*.

AS/NZS 2098.11 *Methods of test for veneer and plywood - Determination of formaldehyde emissions for plywood*.

AS/NZS 2269.0 *Plywood - Structural - Specifications*.

AS/NZS 2270 *Plywood and blockboard for interior use*.

AS/NZS 2271 *Plywood and blockboard for exterior use*.

AS 2365.6 *Methods for the sampling and analysis of indoor air - Determination of formaldehyde - Impinger sampling - Chromotropic acid method*.

AS/NZS 4266.1 *Reconstituted wood-based panels - Methods of testing - Base panels*.

AS/NZS 4357 *Structural laminated veneer lumber*.

Part 0 - *Specifications*.

Part 4 - *Determination of formaldehyde emissions*.

European

EN 13986 *Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking*.

References

(1) FORMACARE, Barcelona 21.09.2007

chemicalwatch.com

(2) Barry A. & Corneau D, 2003.

Effectiveness of Barriers to Minimise VOC Emissions Including Formaldehyde
www.academia.edu

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NATSPEC AND MANDATORY REQUIREMENTS FOR FORMALDEHYDE

NATSPEC worksections reference the various standards as follows:

0185 *Timber products, finishes and treatment*

- Requires LVL certification to AS/NZS 4357.0.
- Requires timber panel product certification to AS/NZS 2270.
- Requires reconstituted wood-based panel certification to the AS/NZS 1859 series.

0381 *Structural timber*

- Provides guidance on the formaldehyde emission class for LVL by referring to AS/NZS 4357.0.
- Requires structural plywood flooring to conform to AS/NZS 2269.0.

0382 *Light timber framing*

- Requires formaldehyde emission class of LVLs to conform to AS/NZS 4357.0.
- Requires the formaldehyde emission class of structural plywood to conform to AS/NZS 2269.0.

0383 *Decking, sheet and panel flooring*

- Requires plywood flooring to conform to AS/NZS 2269.0 and nominates formaldehyde emissions class of E₁.
- Requires particleboard flooring to conform to AS/NZS 1860.1 and nominates formaldehyde emissions class of E₁.

0511 *Lining*

- Prompts for nominating formaldehyde emission class for plywood and blockboard to AS/NZS 2270 and AS/NZS 2271.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.

0525 *Cubicle systems*

- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.

0551 *Joinery*

- Provides prompts for nominating formaldehyde emission class for plywood to AS/NZS 2270 and AS/NZS 2271.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.
- Requires decorative over-laid panels to be certified to AS/NZS 2270 or AS/NZS 1859.2 depending upon the materials used.

0553 *Stainless steel benching*

- Provides prompts for nominating formaldehyde emission class for plywood to AS/NZS 2271.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Requires plywood and reconstituted wood panels to be certified to AS/NZS 2271 or AS 1859.1 depending upon the materials used.

0571 *Workstations*

- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Provides prompts for nominating formaldehyde emission class for plywood to AS/NZS 2270 and AS/NZS 2271.

0572 *Miscellaneous furniture*

- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Provides prompts for nominating formaldehyde emission class for plywood to AS/NZS 2270 and AS/NZS 2271.

0641 *Applied wall finishes*

- Prompts for nominating formaldehyde emission class for plywood and blockboard to AS/NZS 2270 and AS/NZS 2271.
- Prompts for nominating formaldehyde emission class for particleboard to AS 1859.1.
- Prompts for nominating formaldehyde emission class for dry process fibreboard to AS/NZS 1859.2.

0654 *Multilayered board flooring*

- Requires plywood formaldehyde emission to AS/NZS 2269.0 Class E₁.
- Requires particleboard formaldehyde emissions to AS/NZS 1860.1 Class E₁.
- Requires reconstituted wood-based panels formaldehyde emissions to the AS/NZS 1859 series Class E₁.

0655 *Timber flooring*

- Requires plywood formaldehyde emission to AS/NZS 2269.0 Class E₁.
- Requires particleboard formaldehyde emissions to AS/NZS 1860.1 Class E.

Note AS/NZS 1859 series and AS/NZS 1860.1 use E₁ not E₁



Formaldehyde can be emitted from many common building products such as reconstituted wood-based panels, paints and flooring.

Additional information

EWPA Technical Note
Formaldehyde Emissions from Plywood and Laminated Veneer Lumber
www.ewp.asn.au

Wood Panel Industries Federation
Panel Guide
www.wpif.org.uk

World Health Organisation
WHO Guidelines for indoor air quality: Selected pollutants
www.euro.who.int

Green Building Council of Australia
www.new.gbca.org.au