

## Emissions

Materials to which descriptions apply:

Special products, furniture panels, flooring, building panels and raw boards

### Overview

An emission is defined as a release of a substance such as gas into the surrounding air. Cigarette smoke, building materials and furnishings are all examples of sources that can generate emissions. When present in certain amounts, there are various types of emissions that can cause allergic reactions and irritation – and some are even suspected to be carcinogenic. Elevated concentrations of emissions are often found in the aftermath of renovation work or new buildings being erected. Regularly ventilating these spaces and adding green plants to them can help reduce these concentrations more quickly. Some countries stipulate guide values and limit values for emissions as a means of preventing the risk that they will cause people to fall ill. There is a whole range of test methods available for detecting and measuring pollutants in indoor air.

The information below will look at VOC, formaldehyde and methods of testing for them.

### VOC

VOC is the abbreviated form of volatile organic compounds, which arise in gaseous form in the surrounding air. Examples of them include hydrocarbons and aldehydes. There are various sources of VOCs, but they can be broadly categorised into two major groups. One of these groups is made up of outdoor air sources, which are created by rotting and degradation processes. The other is made up of indoor air sources, created by factors such as furniture. The latter group has significant implications for health standards, particularly in Europe, and this extends to the wood materials industry and the products it creates. For this reason, the sources in this group are monitored through the application of guide values and various test methods, and are divided into categories. The sections below contain more information on this.

### Formaldehyde

Wood and wood materials emit a range of substances, including the chemical compound formaldehyde (methanal), which is believed to be carcinogenic to humans. It is classified as a simple aldehyde. Emission classes E1 to E3 provide information about the extent to which panel-shaped wood materials emit formaldehyde gases. Europe, the USA and Japan have put a range of regulations in place to control this. TSCA Title VI applies nationwide in the USA, restricting formaldehyde emissions for particle board to 0.09 ppm<sup>1</sup> and for MDF to 0.11 ppm (> 8 mm) or 0.13 ppm (≤ 8 mm) depending on the board thickness. This is measured using an American test chamber method in each case. Both the test method and the limit values were introduced in the state of California in 2009. In Europe, meanwhile, the E1 limit value of 0.1 ppm is the value that is most widely applied.

Formaldehyde-free bonded chipboard panels<sup>2</sup> are usually manufactured using polyurethane-based adhesives (PMDI). These are identified as “F0” or “NAF” (no-added formaldehyde<sup>3</sup>) adhesives.

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<sup>1</sup> ppm: parts per million, referring to the number of formaldehyde molecules per million other molecules

<sup>2</sup> As formaldehyde occurs naturally in wood, panels that are wood-based cannot be entirely free from it.

<sup>3</sup> Not subject to binding regulation in any EN standard.

## Overview of formaldehyde test methods

The table below provides an overview of various test methods used to determine formaldehyde content in wood materials. As the test conditions (loading factor, air exchange rate, temperature and air humidity) in cubic chambers may be different from those found at the California Air Resources Board (CARB), it is not possible to compare the ppm values directly even though the same unit is being used.

*Table 1: Overview of test methods for determining formaldehyde content/emissions*

Name	Perforator	Cubic chamber	Gas analysis	CARB	Desiccator
Measurement	Content	Emissions			
Standard	EN ISO 12460-5 (previously EN 120)	EN 717-1	EN ISO 12460-3 (previously EN 717-2)	ASTM D 6007-02	JIS 1460
Type/application	Secondary test method	Primary test method	Factory inspection of laminated wood material	Secondary test method	Primary test method
Unit used in result	mg/100 g atro	ppm	mg/(m <sup>2</sup> h)	ppm	mg/l
Limit values					
- Particle	6.5	0.1 (E1)		0.09	0.3 (F****)
- MDF <8 mm	8	0.1 (E1)		0.13	
- MDF >8 mm	8	0.1 (E1)		0.11	
- Laminated			3.5 (E1)		0.3

### E1

EN 13986 and the product standards EN 312 (for particle board) and EN 622 (for fibreboard) define the requirements for formaldehyde in panels made of wood materials. Based on the cubic chamber method, a limit value of 0.1 ppm (EN 717-1, primary test method, equilibrium concentration after 28 days) applies to E1. This can also be demonstrated through the use of a secondary test method in production.

### CARB

In California, emissions from wood materials are regulated by the California Air Resources Board (CARB). Wood materials need to satisfy the following requirements in order to be sold in compliance with CARB regulations:

- Initial testing by an accredited test institute; evidence that production inspection methods correlate with American test methods. At SWISS KRONO AG, this means a correlation between gas analysis measurement in accordance with ISO 12460-3 and chamber testing in accordance with ASTM D 6007-02
- Regular external monitoring by an accredited institute (four times a year)
- Batch traceability

CARB certification only applies to raw boards. As melamine coatings act as a barrier to formaldehyde, there is no need to test laminated wood materials separately. Ideally, formaldehyde-free bonded chipboard and very low-emission adhesives should be used. According to the CARB, fibreboard is subject to different limit values and loading factors in test chambers than particle board is.

### ISO 16000

ISO 16000 forms the basis for performing VOC measurements. Since December 2018, the German Chemicals Prohibition Ordinance (ChemVerbotsV) has looked to DIN EN 16516 as the point of reference for the primary test method used in cases involving formaldehyde. Gas chromatography and mass spectrometry are used to determine the concentrations of various substances. In contrast to EN 717-1 (which refers to an equilibrium concentration), the concentrations are measured after three, seven or 28

days. As it takes so long to conduct, this method is not suitable for production monitoring or inspection processes. The standard itself does not contain any limit values or evaluations concerning the harmfulness of measured substances. Instead, evaluations are provided in the German Committee for Health-related Evaluation of Building Products (AgBB) scheme through comparisons with LCI (lowest concentrations of interest) values.

#### External sources

[www.umweltbundesamt.de](http://www.umweltbundesamt.de)

DIN EN 16516:2018-01 – Construction products – Assessment of release of dangerous substances – Determination of emissions into indoor air; German version EN 16516:2017

#### Further references

DEVL (France)

<https://www.legifrance.gouv.fr/eli/arrete/2011/4/19/DEVL1104875A/jo>

<https://www.legifrance.gouv.fr/eli/decret/2011/3/23/DEVL1101903D/jo>

ChemVerbotsV

Harmonised standards

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

EN 14041 – Resilient, textile, laminate and modular multilayer floor coverings – Essential characteristics

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