

Concern about the possible health effects of formaldehyde emitted from wood-based panel products manufactured with urea-formaldehyde (UF) and melamine-formaldehyde (MF) binding resins has led to the development and increasing use of low emission products. The potential formaldehyde emission by wood-based panels is determined by a standard test ISO WD 12460 – TC 89/WG 5 N 117 following the current requirements in international product standards. This article describes the use of chamber tests to measure formaldehyde emission under normal temperature and humidity (Figure 1).

The major source of formaldehyde in everyday life is in building and furniture materials, such as particleboard, plywood and medium density fibreboard (MDF). Formaldehyde is also used in some upholstery in automotive furnishing and furniture. The UF and MF resins used release formaldehyde in contact with water, e.g. water vapour breaks down the bonds to release the formaldehyde which evaporates as gas. Formaldehyde is irritating to human, causing headache, dizziness, nausea, respiratory, eye and skin irritation.

## FORMALDEHYDE EMISSION TESTING SERVICES

The test used at the Malaysian Palm Oil Board (MPOB) for formaldehyde emission is ISO WD 12460 – TC 89/WG 5 N 117 Wood-based Panels Determination of Formaldehyde Release for Formaldehyde Emission by the 1 m<sup>3</sup>-chamber Method (ISO TC 89 N117, 2003).

Figure 2 shows the 1 m<sup>3</sup> test chamber. For the test, pre-conditioned pieces of 50 cm x 50 cm area are placed in the chamber with the conditions - temperature, relative humidity air velocity and air



Figure 1. Formaldehyde emission test chamber.

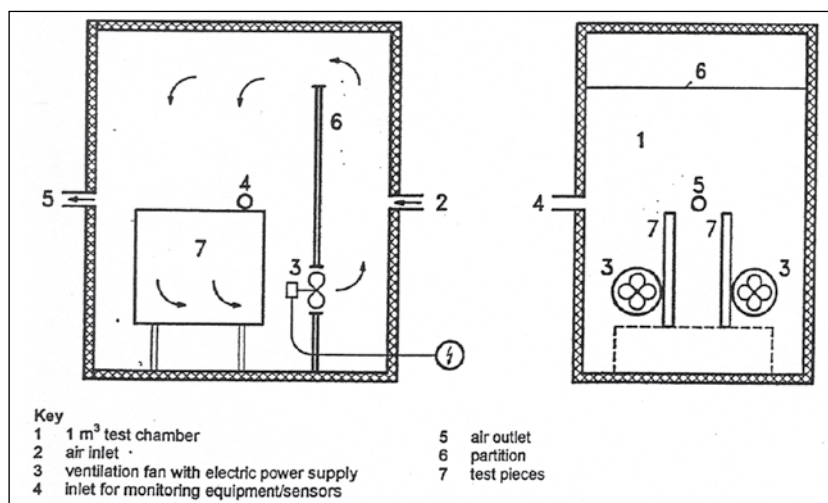


Figure 2. Illustration of the 1 m<sup>3</sup> test chamber for formaldehyde emission.

exchange rate-controlled. Formaldehyde is emitted and evaporates as gas. The air in the chamber is sampled for a specified time, and drawn through water (in gas washing bottles) to absorb the formaldehyde. The formaldehyde concentration in the water is determined, from which the concentration of formaldehyde in the chamber atmosphere can be calculated and expressed in milligrams per cubic metre ( $\text{mg m}^{-3}$ ). Sampling is done periodically until the formaldehyde concentration in the air chamber reaches a steady state. The conditions set for the emission chamber are shown in *Table 1*. *Table 2* shows the maximum emission levels for different classes of materials.

**TABLE 1. CONDITIONS SET FOR 1 m<sup>3</sup> TEST CHAMBER TO DETERMINE FORMALDEHYDE EMISSION**

Internal volume of chamber	: 1 m <sup>3</sup> (nominal)
Temperature	: 23 + 0.5°C
Relative humidity	: 45 + 2%
Air exchange rate	: 1 change hr <sup>-1</sup>
Loading	: 1 m <sup>2</sup> board surface per m <sup>3</sup> of chamber volume
Number and size of samples per test	: 2 pieces of 50 cm x 50 cm

**TABLE 2. CLASSIFICATION OF MATERIALS FOR FORMALDEHYDE EMISSIONS**

E1	< 0.1 ppm
E2	> 0.1 ppm – 1.0 ppm
E3	> 1.0 ppm – 2.3 ppm

### EXPECTED BENEFIT

The chamber has been set up in the MDF pilot plant in the Biomass Technology Centre (BTC) for testing bio-composites. Samples should be delivered in 50 cm x 50 cm size with a written request for the formaldehyde emission test. The results will be ready in about 30 days depending on the number of samples. A comprehensive report will be given with the appropriate recommendations on request.

### REFERENCE

ISO TC 89 N117 (2003). Wood-based panels. Determination of formaldehyde release-formaldehyde emission by the 1 m<sup>3</sup>-chamber method.

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