INTERNATIONAL STANDARD

ISO 12460-1

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Wood-based panels — Determination of formaldehyde release —

Part 1:
Formaldehyde emission by the 1-cubic-metre chamber method

Panneaux à base de bois — Détermination du dégagement de formaldéhyde —

Partie 1: Méthode du dégagement de formaldéhyde en chambre de 1 mètre cube

Reference number
ISO 12460-1:2007(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12460-1 was prepared by Technical Committee ISO/TC 89, *Wood-based panels*.

ISO 12460 consists of the following parts, under the general title *Wood-based panels — Determination of formaldehyde release*:

— *Part 1: Formaldehyde emission by the 1-cubic-metre chamber method*

— *Part 2: Small-scale chamber method*

— *Part 3: Gas analysis method*

— *Part 4: Desiccator method*

Introduction

The 1 m^3-chamber is the reference method for the determination of formaldehyde release. For factory production control, the following regional or national derived test methods are used:

— perforator method, as described in EN 120;

— dessicator method, as described in ISO 12460-4;

— gas analysis method, as described in ISO 12460-3;

— flask method, as described in EN 717-3;

— small-chamber method, as described in ISO 12460-2 (ASTM D6007).

Round-robin tests have shown good correlations between the 1 m^3 chamber, and large and small test chambers.

Wood-based panels — Determination of formaldehyde release —

Part 1: Formaldehyde emission by the 1-cubic-metre chamber method

1 Scope

This part of ISO 12460 specifies a 1 m^3 chamber method for the determination of the formaldehyde emission from wood-based panels under defined conditions, relating to typical conditions in real-life.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16000-3, *Indoor air — Determination of formaldehyde and other carbonyl compounds — Active sampling method*

ISO 16999, *Wood-based panels — Sampling and cutting of test pieces*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
volume of the chamber
total air volume of the unloaded chamber, including recirculating ventilation ducts

NOTE The volume of the chamber is expressed in units of cubic metres.

3.2
loading factor
ratio of the total surface area of the test piece, excluding the area of the edges, to the volume of the chamber

NOTE The loading factor is expressed in units of square metres per cubic metre.

3.3
air exchange rate
quotient of air volume going through the chamber per hour and the volume of the chamber

NOTE The air exchange rate is expressed in units of cubic metres of air per hour per cubic metre of volume of the chamber.

3.4
air velocity
velocity of the air near the surface of tested pieces in the chamber

NOTE The air velocity is expressed in units of metres per second.

3.5
steady-state
condition reached when the formaldehyde emission of the wood-based panels is quasi-constant under the test condition such that the formaldehyde concentration in the chamber remains constant

NOTE In practice, a true steady-state is not achievable because formaldehyde is emitted irreversibly. This part of ISO 12460 defines steady-state condition for the purpose of the test.

3.6
emission value
steady-state formaldehyde concentration in the chamber, obtained under constant temperature, relative humidity, loading factor and air exchange rate after a defined period of preconditioning

NOTE 1 The emission value is expressed in units of milligrams of formaldehyde per cubic metre air.

NOTE 2 At 23 °C and 1 013 hPa, the following relationships exist for the formaldehyde concentrations:

1 ppm[1)] (parts per million) = 1,24 mg/m^3;

1 mg/m^3 = 0,81 ppm (parts per million).

4 Principle

Preconditioned test pieces of known surface area, are placed in a 1 m^3 chamber, in which the temperature, relative humidity, air velocity and exchange rate are controlled at defined values. Formaldehyde emitted from the test pieces mixes with the air in the chamber. The air in the chamber is sampled periodically over a defined period. The formaldehyde concentration is determined by drawing air from the chamber through gas washing bottles containing water, which absorbs the formaldehyde. The formaldehyde concentration in the water is determined. The concentration of formaldehyde in the chamber atmosphere is calculated from the concentration in the water in the gas washing bottles and the volume of the sampled air. It is expressed in milligrams per cubic metre (mg/m^3). Sampling is periodically continued until the formaldehyde concentration in the chamber has reached a steady-state.

NOTE 1 The chamber method can also be used for the testing of formaldehyde emitting products other than wood-based panels.

NOTE 2 The influences of temperature, relative humidity, loading factor and air exchange rate on the formaldehyde concentration in the chamber atmosphere can be described by the Andersen formula [10]. An interrelation between the structure of the test pieces, especially of their surfaces and the air velocity is also apparent but cannot be exactly described by a formula.

1) "ppm" is a unit deprecated by ISO.

5 Reagents

Reagents and water of recognized analytical purity shall be used for the analysis.

5.1 Acetylacetone solution.

4 ml acetyl acetone are added to a 1 000 ml volumetric flask and made up to the mark with water.

5.2 Ammonium acetate solution.

200 g ammonium acetate are dissolved in water in a 1 000 ml volumetric flask and made up to the mark.

Commercially prepared solutions may be used.

5.3 Standard iodine solution, $c(I_2) = 0{,}05$ mol/l.

5.4 Standard sodium thiosulfate solution, $c(Na_2S_2O_3) = 0{,}1$ mol/l.

5.5 Standard sodium hydroxide solution, $c(NaOH) = 1$ mol/l.

5.6 Standard sulfuric acid solution, $c(H_2SO_4) = 1$ mol/l.

5.7 Starch solution, 1 % by mass.

6 Apparatus

6.1 Test chamber construction

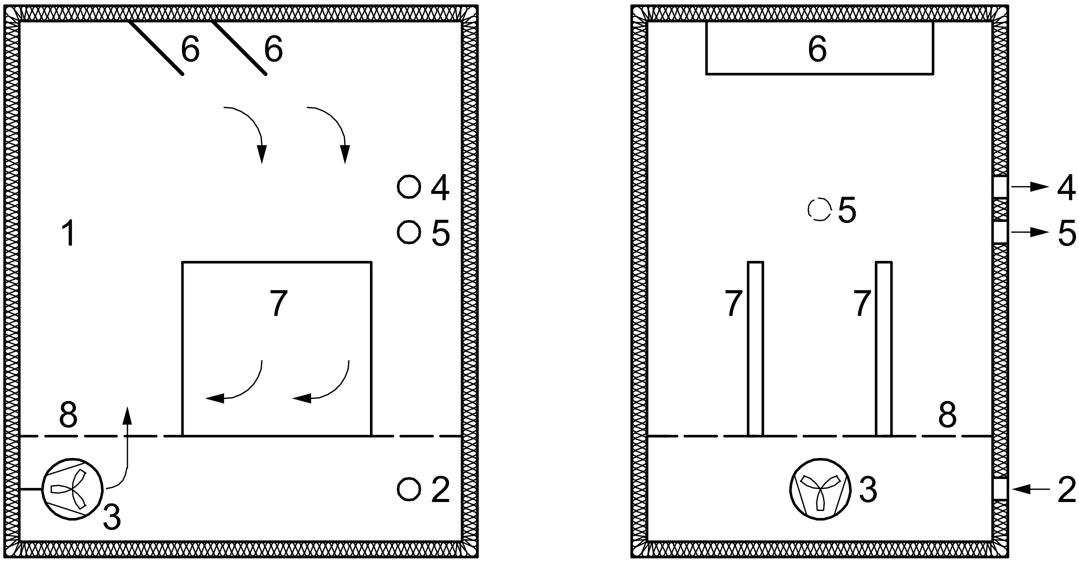
6.1.1 Chamber volume and operation

Chambers of this type have a total volume of 1 m^3 and are operated with intensive circular air flow; see Figures 1, 2 and 3.

The climatic test conditions (temperature and relative humidity) are established by using preconditioned inlet air. It is necessary that chambers operated in this way have effective wall insulation.

The conditioning devices and the chamber should be operated under conditions, where condensation of water cannot occur on surfaces, i.e. the air temperature is kept above its dew point.

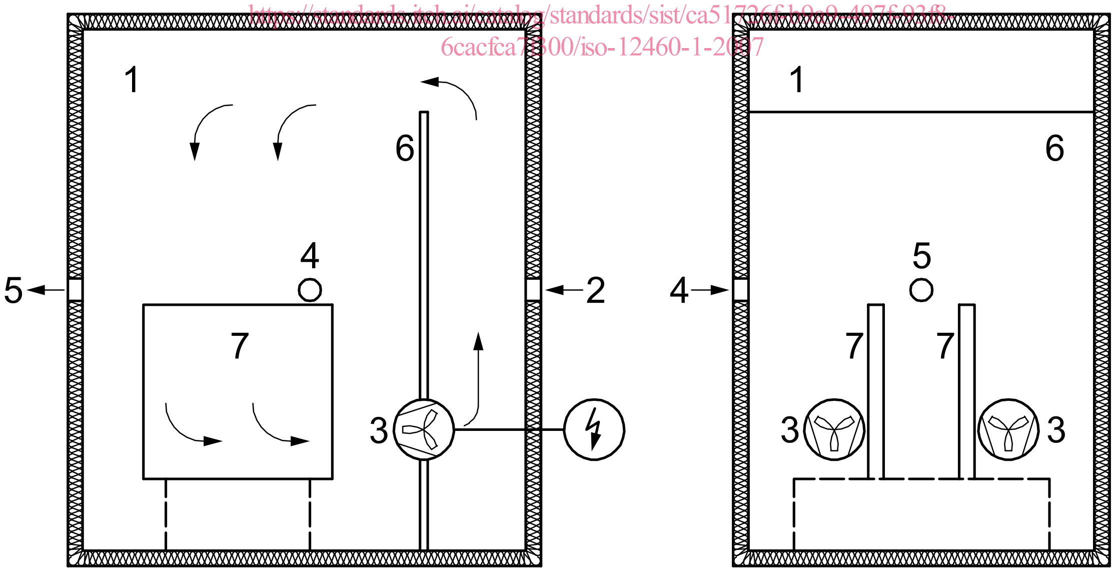
The temperature within the test chamber can also be established by placing the chamber in a larger compartment with controlled temperature. Test chambers operated in this way shall have no insulation.



Key

1 1 m^3 test chamber
2 air inlet
3 ventilation fan
4 inlet for monitoring equipment/sensors
5 air outlet
6 baffle plates
7 test pieces
8 perforated bottom

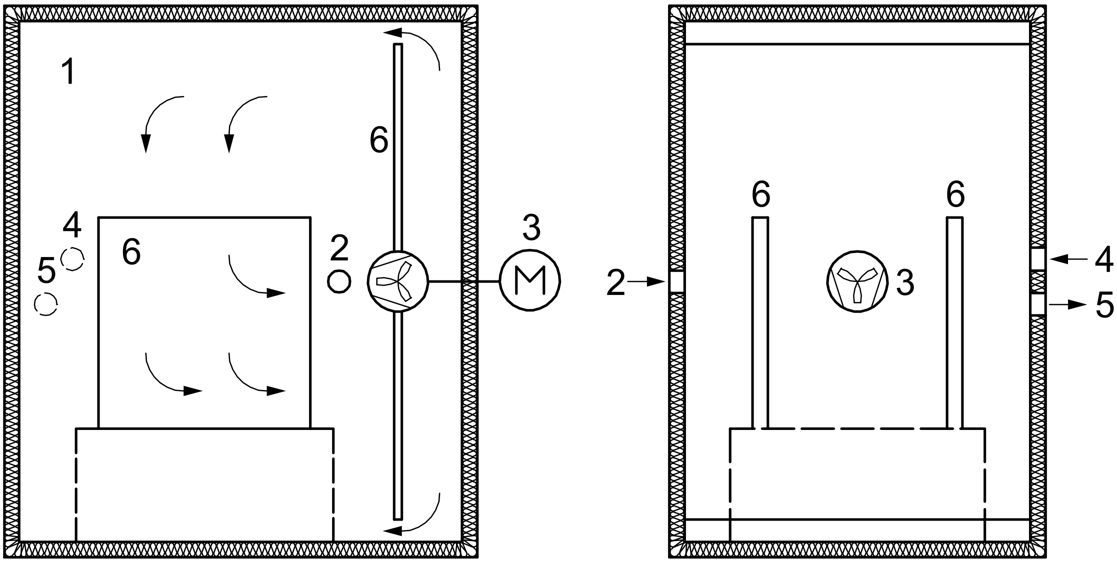
Figure 1 — Construction scheme for a 1 m^3 test chamber — Example 1



Key

1 1 m^3 test chamber
2 air inlet
3 ventilation fan with electric power supply
4 inlet for monitoring equipment/sensors
5 air outlet
6 partition
7 test pieces

Figure 2 — Construction scheme for a 1 m^3 test chamber — Example 2



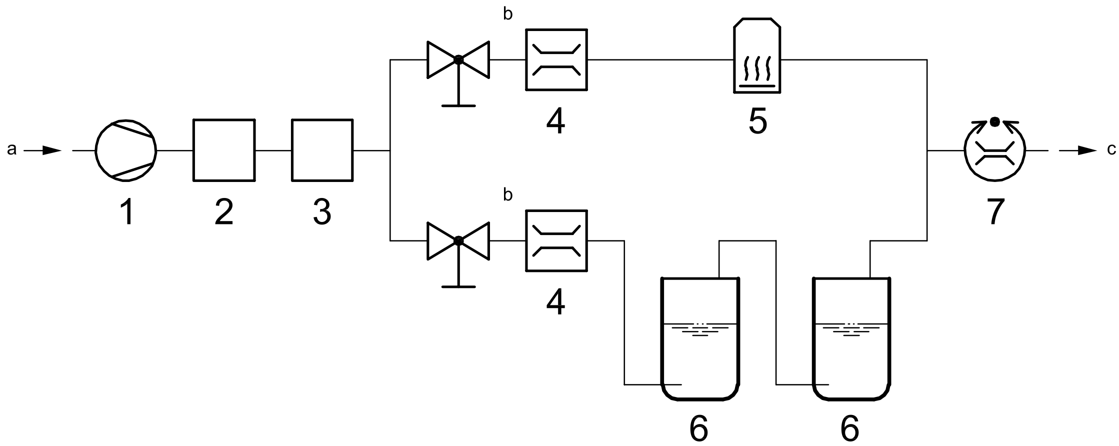
Key

1 1 m³ test chamber
2 air inlet
3 ventilation fan with external electric power
4 inlet for monitoring equipment/sensors
5 air outlet
6 test pieces

Figure 3 — Construction scheme for a 1 m³ test chamber — Example 3

Figure 4 shows an apparatus suitable to establish a relative humidity of (50 ± 3) %.

The volume of the inlet air is measured and adjusted by a gas pump or a compressed air system in connection with gas flow meters (see Figure 4) and can be measured by a calibrated gas meter in the outlet. The effective air exchange rate shall be regularly checked; see 8.3.4.



Key

1 gas pump
2 activated alumina filter (optional, see 8.4)
3 charcoal filter
4 gas flow meter and gas flow control
5 silica gel filter
6 washing bottle (humidification) with a minimum volume of 1 000 ml
7 flow controller or gas meter

a Air (in).
b 50 % air flow.
c To the chamber.

Figure 4 — Example of a device for establishing a controlled air flow with a relative humidity of 50 %

