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**Determination of the emission of
formaldehyde from building boards —
Desiccator method**

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Act. This edition replaces the previous edition (**JIS A 1460:2015**), which has been technically revised.

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Determination of the emission of formaldehyde from building boards — Desiccator method

1 Scope

This Japanese Industrial Standard specifies the method for determining the quantity of formaldehyde emitted from building boards (hereafter referred to as boards) using desiccators.

The comparison table between previous and current editions of this Standard on technically significant revisions is given in Annex B.

2 Normative references

Part or all of the provisions of the following standards, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS A 1902-1 *Determination of the emission of volatile organic compounds and aldehydes by building products — Sampling, preparation of test specimens and testing condition — Part 1 : Boards, wallpaper and floor materials*

JIS K 0050 *General rules for chemical analysis*

JIS K 0557 *Water used for industrial water and wastewater analysis*

JIS K 0970 *Piston pipettes*

JIS K 8001 *General rules for test methods of reagents*

JIS K 8005 *Reference materials for volumetric analysis*

JIS K 8027 *Acetylacetone (Reagent)*

JIS K 8051 *3-Methyl-1-butanol (Reagent)*

JIS K 8180 *Hydrochloric acid (Reagent)*

JIS K 8355 *Acetic acid (Reagent)*

JIS K 8359 *Ammonium acetate (Reagent)*

JIS K 8576 *Sodium hydroxide (Reagent)*

JIS K 8625 *Sodium carbonate (Reagent)*

JIS K 8637 *Sodium thiosulfate pentahydrate (Reagent)*

JIS K 8659 *Starch, soluble (Reagent)*

JIS K 8872 *Formaldehyde solution (Reagent)*

JIS K 8913 *Potassium iodide (Reagent)*

JIS K 8920 *Iodine (Reagent)*

JIS K 8951 *Sulfuric acid (Reagent)*

JIS R 3503 *Glass apparatus for chemical analysis*

JIS R 3505 *Volumetric glassware*

JIS Z 8401 *Rounding of numbers*

JIS Z 8703 *Standard atmospheric conditions for testing*

ISO 13130 *Laboratory glassware — Desiccators*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

3.1

formaldehyde emission

average value of two determination results (i.e. of two sets of test pieces) of formaldehyde concentration

3.2

formaldehyde concentration

concentration of formaldehyde absorbed in water in an emission test

3.3

boards

rigid plate-form products to be used as interior materials, that are either a single or combined product

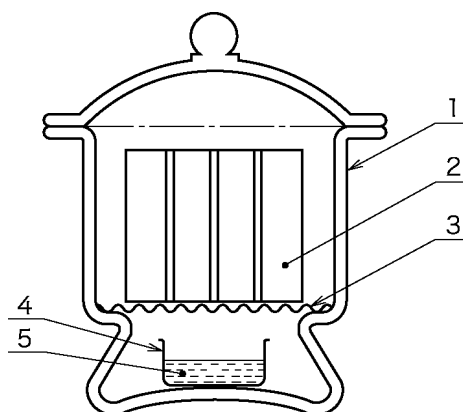
Note to entry 1 Material standards related to boards for building products are as follows : **JIS A 5404, JIS A 5440, JIS A 5905, JIS A 5908 and JIS A 6901.**

(Derived from 3.1 of JIS A 1902-1 : 2015)

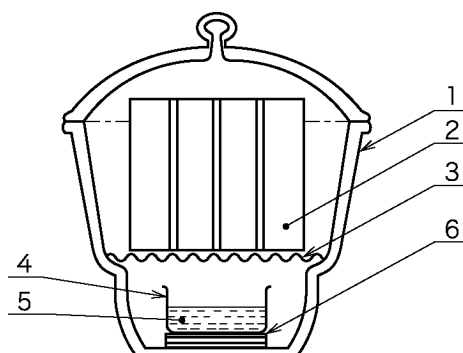
4 Principle of test

The desiccator method to determine the quantity of formaldehyde emitted from building boards is carried out by using the glass desiccator as shown in Figure 1. Emission of formaldehyde is determined by placing test specimens, cut out from the board under test to a specified surface area, in a water-filled desiccator at a controlled temperature and measuring the concentration of emitted formaldehyde absorbed in water after 24 h.

This determination is based on the Hantzsch reaction in which the formaldehyde reacts with ammonium ions and acetylacetone to yield diacetyldihydrolutidine (DDL) with the development of orange colour.



a) Desiccator specified in JIS R 3503



b) Desiccator specified in ISO 13130

Key

- 1 : desiccator
- 2 : test piece (see Figure 2)
- 3 : stainless steel wire grid
- 4 : glass crystallizing dish
- 5 : water
- 6 : glass plate

Figure 1 Apparatus for desiccator method (configuration diagram)

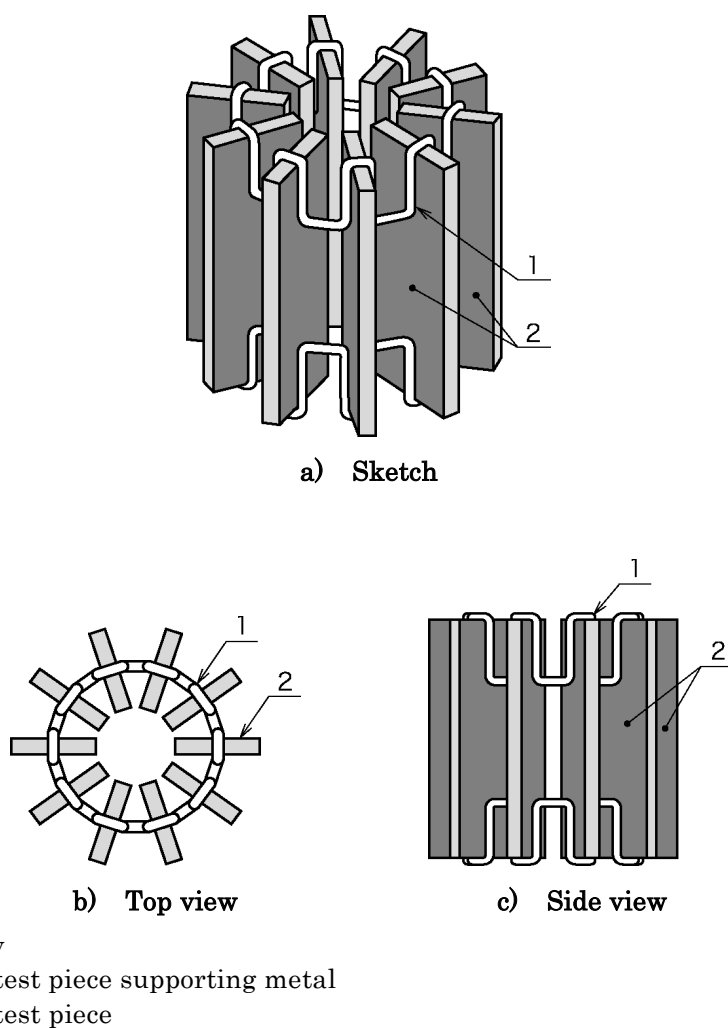


Figure 2 Supporting of test pieces (example)

5 General conditions

5.1 Test atmosphere

The testing laboratory shall be maintained at a temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ according to the standard atmospheric conditions specified in **JIS Z 8703**.

5.2 Common conditions

The common conditions shall be as follows.

- General requirements of chemical analyses** General requirements of chemical analyses are specified in **JIS K 0050**.
- Water** For the analysis specified in this Standard, water of A2 to A4 specified in **JIS K 0557** or ion-exchanged water or distilled water at least equivalent thereto in quality shall be used.

6 Apparatus and instruments

The apparatus and instruments shall be as follows.

- a) **Temperature and humidity measuring apparatuses** A thermometer capable of measuring the temperature of air with 0.1 °C precision, and a hygrometer capable of measuring the relative humidity with 5 % precision.
- b) **Spectrophotometer**, capable of measuring the absorbance at the wavelength range of 410 nm to 415 nm, preferably equipped with an absorption cell having an optical path length of 50 mm or more.
- c) **Thermostatic water bath**, used for analysis, capable of maintaining the temperature at $65\text{ °C} \pm 2\text{ °C}$.
- d) **Chemical balance**, having a weighing capacity of 100 g to 200 g and measuring to 0.1 mg.
- e) **Desiccator**, with a knobbed lid, airtight, and of 240 mm nominal size specified in **JIS R 3503** (designation in **JIS R 3503** : Desiccator 240 mm), or of Type 2 (Non-vacuum), Series A and nominal diameter 250 mm specified in **ISO 13130** (designation in **ISO 13130** : Desiccator **ISO 13130** — 250 — 2A).
- f) **Glass crystallizing dish**, for containing water, with an outside diameter of 120 mm $\pm$ 5 mm, an inside diameter of 115 mm $\pm$ 1 mm and a depth of 60 mm $\pm$ 2 mm

One with a spout is preferable.

- g) **Glass plate**, to be placed under the glass crystallizing dish, having a circular shape 120 mm $\pm$ 5 mm in diameter.
- h) **Volumetric flask**, specified in **JIS R 3505**.
- i) **Volumetric pipette**, specified in **JIS R 3505** (calibrated at 20 °C), or a piston pipette¹⁾ specified in **JIS K 0970** or an automatic pipette having an equivalent or better precision to these.

Note ¹⁾ May be referred to as a micro pipette in the market.

- j) **Burette**, specified in **JIS R 3505** or an automatic metering device²⁾ having an equivalent or better precision to this.

Note ²⁾ Commercially available as an automatic titrator.

- k) **Flask with a ground stopper** An Erlenmeyer flask with an interchangeable ground joint specified in **JIS R 3503**.
- l) **Test piece supporting metal**, for fixing test pieces in the desiccator, made of stainless steel.
- m) **Stainless steel wire grid**, for placing the test piece supporting metal in a desiccator, having a diameter of 230 mm to 240 mm, and of stainless steel wire woven such that the distance between parallel pieces of wire is not less than 15 mm.
- n) **Measuring cylinder**, specified in **JIS R 3505**.

7 Preparation of reagents

The reagents used shall be prepared as follows.

For reagents **a)** to **f)**, and **h)**, the total volume need not be as given below as long as the specified concentration is obtained.

a) 0.05 mol/L iodine solution, prepared according to either of the following. This solution shall be stored in a tightly sealed, light-shielded vessel kept in a dark place.

- 1) Dissolve 40 g of potassium iodide specified in **JIS K 8913** in 25 ml of water, add 13 g of iodine specified in **JIS K 8920** to this to dissolve, transfer to a 1 000 ml volumetric flask, add three drops of hydrochloric acid (guaranteed grade) specified in **JIS K 8180**, dilute to the mark with water and mix.
- 2) Use a 0.05 mol/L iodine solution for volumetric analysis ³⁾ prepared according to **JA.6.4 w)** of **JIS K 8001**.

Note ³⁾ Commercially available as 0.05 mol/L iodine solution for volumetric analysis.

b) 0.1 mol/L sodium thiosulfate solution, prepared according to either of the following.

- 1) Dissolve 26 g of sodium thiosulfate pentahydrate specified in **JIS K 8637** and 0.2 g of sodium carbonate (as preservative agent) specified in **JIS K 8625** in 1 000 ml of water free from dissolved oxygen, and after leaving to stand for two days, standardize according to **JA.6.4 t) 2)** of **JIS K 8001** using potassium iodate specified in **JIS K 8005**.

The preservative agent shall be a suitable volume of 3-methyl-1-butanol specified in **JIS K 8051**, used with or without sodium carbonate.

- 2) Using a volumetric pipette and volumetric flask, dilute accurately 0.1 mol/L sodium thiosulfate solution for volumetric analysis prepared according to **JA.6.4 t) 2)** of **JIS K 8001** or sodium thiosulfate solution for volumetric analysis with a higher concentration than 0.1 mol/L, and standardize this solution according to **JA.6.4 t) 2)** of **JIS K 8001** using potassium iodate specified in **JIS K 8005**.
- 3) Use a 0.1 mol/L sodium thiosulfate solution for volumetric analysis with a calibrated concentration, available as a certified reference material ⁴⁾.

Note ⁴⁾ Certified reference materials are provided by national measurement organizations such as National Metrology Institute of Japan (NMIJ), the National Institute of Standards and Technology (NIST), or the producers of certified reference materials.

c) 1 mol/L sodium hydroxide solution, prepared according to either of the following.

- 1) Dissolve 40 g of sodium hydroxide specified in **JIS K 8576** in 200 ml of water, transfer to a 1 000 ml volumetric flask, dilute to the mark with water and mix.
- 2) Use a 1 mol/L sodium hydroxide solution for volumetric analysis prepared according to **JA.6.4 r) 1)** of **JIS K 8001**.

d) Sulfuric acid (1 mol/L) Dissolve 56 ml of sulfuric acid specified in **JIS K 8951** in