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National Standards of the People's Republic of China

GB 18584 ——XX XX

Replacing GB 18584-2001

Limits on the level of volatile organic compounds and the migration of heavy metals in wooden furniture

(English title given in the Chinese original: Limit of volatile organic compounds and migration of heavy metal of wood based

furniture)

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(draft standard for approval)

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Contents

INTRODUCTION

Parts 4 and 5 of this standard are compulsory. The remaining parts are recommendations only.

This standard is drafted in accordance with GB/T 1.1 - 2009.

This standard replaces GB 18584-2001 Indoor decorating and refurbishing materials - Limit of harmful substances of wood based furniture. This standard contains the following changes compared to GB 18584-2001:

- amendment of limits on the emission of formaldehyde from wooden furniture and its testing method; - addition of limits on benzene, toluene, xylene and TVOC and their testing methods

- amendment of testing method for the migration of elements

- addition of Annex A.

- addition of references.

Please note that some contents of this standard may be protected by patents. The issuing body of this standard is not responsible for identifying these patents. The drafting of this standard is initiated by the China National Light Industry Council.

The drafting of this standard is managed by the National Standardisation Technical Committee for Furniture (SAC/TC 480).

The organisations responsible for drafting this standard are as follows: Shanghai Institute of Quality Supervision and Inspection, Shenzhen Academy of Metrology and Quality Inspection, National Centre for Furniture and Indoor Environmental Quality Supervision and Inspection, Chengdu Product Quality Supervision and Inspection Institute, Zhejiang Furniture and Hardware Institute, Guangdong Product Quality Supervision and Inspection Institute, Guangdong Landbond Furniture Ltd, Shenzhen Huayuanxuan Furniture Ltd, Shenzhen Yuanfangyuan Industrial Development Ltd, Shanghai Vohringer Wood Industry Ltd, Asia Yazhen Furniture Ltd, Hunan Xinggang Home Development Ltd, Shenzhen Dafuhao Industrial Development Ltd.

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This standard replaces the following standards:

- GB 18584-2001

Limits on the level of volatile organic compounds and the migration of heavy metals in wooden furniture

1 Scope

This standard sets out limits, testing methods and testing rules for volatile organic compounds (such as benzene, toluene, xylene and TVOC) and the migration of heavy metals in wooden furniture.

This standard is applicable to testing for and evaluating volatile organic compounds and the migration of heavy metals in indoor wooden furniture.

2 Normative reference documents

The reference documents listed below are essential to the application of this standard. If the reference document is listed with its date of issue, only that version applies to this standard. If the reference document is listed without a date of issue, the latest version (including all amendments) of that document applies to this standard. GB 6675.4-2014 Safety of toys - part 4: migration of certain elements GB/T 31106-2014 Testing for volatile organic compounds in furniture GB/T 31107 General testing conditions for environmental test chamber used in the tests for volatile organic compounds in furniture

3. Terms and definitions

The terms and definitions listed below and those used in GB/T 31106-2014 and GB/T 31107 apply to this standard.

3.1

Volume of environmental test chamber

The total volume of air in a vacant test chamber that can be replaced by fresh air.

This volume is represented by 'V'.

Note: space occupied by lighting equipments and sensors etc. are not included.

3.2

Volume loading ratio

The ratio of the volume of wooden furniture to the volume of the environmental test chamber.

This volume is represented by 'a'.

3.3

Background concentration

The concentration of formaldehyde, benzene, toluene, xylene and TVOC in a vacant test chamber.

3.4

Air change ratio

The ratio of the amount of fresh air entering the test chamber per unit of time to the volume of the test chamber.

This rate is represented by 'n'.

3.5

Air velocity

The flow speed of air in a vacant test chamber.

3.6

Formaldehyde emission level

The amount of formaldehyde emitted by a piece of wooden furniture measured using the method provided in part 5 of this standard.

3.7

Level of migration of heavy metals

The amount of lead, cadmium, chromium, and mercury detected in the coating of wooden furniture using the testing method provided in this standard.

4 Requirements

4.1 Limits on formaldehyde, benzene, toluene, xylene and TVOC in wooden furniture

must comply with the requirements set out in Table 1.

Table 1 Limits on formaldehyde, benzene, toluene, xylene and TVOC in wooden furniture

Feature tested	Limit (mg/m^3)
Formaldehyde emission	≤0.10
Benzene	≤0.11
Toluene	≤0.20
Xylene	≤0.20
TVOC	≤0.60

4.1 Limits on migration of heavy metals in wooden furniture

must comply with the requirements set out in Table 2.

Table 2 Limits on migration of heavy metals in wooden furniture

Feature tested	Limit (mg/kg)
Lead	≤90

Cadmium	≤75
Chromium	≤60
Mercury	≤60

5 Testing method

5.1 Rationale

5.1.1 Rationale for the test for formaldehyde, benzene, toluene, xylene and TVOC in wooden furniture

Place the product in a test chamber that meets the required volume loading ratio; create an environment similar to the one the product would be used in and conduct the test. Once the required time has elapsed, take samples of the air in the test chamber and test for levels of formaldehyde, benzene, toluene, xylene and TVOC using the method provided in this standard.

5.1.2 Rationale for the test for migration of heavy metals in wooden furniture

Use a skiving machine to scrape the coating of the product; dissolve any samples obtained in acid solution in order to create a reaction similar to one where coating is swallowed and digested. Conduct a chemical analysis to determine the levels of migration of lead, cadmium, chromium and mercury in the solution.

5.2 Test apparatus

5.2.1 Environmental test chamber

must comply with the rules set out in standard GB/T 31107.

5.2.2 Sampling equipment

must comply with the rules set out in 4.1.3 of standard GB/T 31106-2014.

5.2.3 Solution and apparatus for the test on the migration of heavy metals

must comply with the rules set out in part 6 of standard GB 6675.4-2014.

5.3 Test procedures

5.3.1 Test for formaldehyde, benzene, toluene, xylene and TVOC

5.3.1.1 Calculating the volume of a product

The volume is calculated using the method provided in Annex A. If the sample is adjustable, use the minimum volume.

5.3.1.2 Pre-treatment

Before testing, assemble and unfold the product. For adjustable products, assemble, open or adjust the product in a way that the harmful substances would be fully released into the environment. Products usually undergo pre-treatment assembled. The surfaces of all components of the product should be exposed to the environment as much as possible. The length of time for pre-treatment is (120±2) h.

Pre-treatment must be conducted under the following conditions:

- temperature (23±2)°C;

- relative humidity (45±10) %;

- distance between products no less than 300mm;

- concentration of formaldehyde and TVOC between products must not exceed the following levels: formaldehyde ≤ 0.10mg/m^3, TVOC ≤ 0.60mg/m^3.

5.3.1.3 Choosing an environmental test chamber

The volume loading ratio of a test chamber must be within (0.075～0.3). A test chamber with a volume loading ratio closest to 0.15 is the most suitable choice. If the volume loading ratio is 0.15, the air change ratio is 1 (meaning that the amount of fresh air enters the test chamber in 1 hour equates to the volume of the test chamber). If the volume loading ratio is not 0.15, the air change ratio must be calculated by using the formula below:

$$n = Q / V = a /0.15 \quad \text{……(1)}$$

where:

n - air change ratio (accurate to 0.01);

Q - the amount of fresh air enters the test chamber per hour (m^3/h);

V - volume of the test chamber (m^3);

a - volume loading ratio

5.3.1.4 Test for background concentration

Collect a sample of the air in the test chamber one hour before placing the product in it. Test and record the level of formaldehyde, benzene, toluene, xylene and TVOC in accordance with the rules set out in GB/T 31106-2014. The background concentration must meet the following criteria: formaldehyde ≤ 0.006mg/m^3, benzene ≤ 0.005mg/m^3, toluene ≤ 0.005mg/m^3, xylene ≤ 0.005mg/m^3, TVOC ≤ 0.05mg/m^3.

5.3.1.5 Collecting formaldehyde and VOC samples

A product must be tested in the test chamber within an hour of undergoing pre-treatment. Assemble and unfold the product. For adjustable products, assemble, open or adjust the product in a way that the harmful substances would be fully released into the environment. Products usually

undergo tests assembled. The surfaces of all components of the product must be exposed as much as possible in the test chamber.

During a test, the conditions of the test chamber must meet the following criteria:

- temperature (23±2)°C;

- relative humidity (45±5)%;

- air change ratio (value obtained using formula (1));

- air velocity (0.1～0.3) m/s;

- level of formaldehyde, benzene, toluene, xylene and TVOC in the inward flow air must meet the following criteria: formaldehyde ≤ 0.006mg/m^3, each VOC ≤ 0.005mg/m^3, TVOC ≤ 0.05mg/m^3.

The air samples can be collected only after the product has been left in the test chamber for (20±0.5) hours and the samples must be collected in accordance with the rules set out in GB/T 31106-2014.

5.3.1.6 Test for formaldehyde, benzene, toluene, xylene and TVOC

The tests must be conducted in accordance with the rules set out in GB/T 31106-2014. The analysis must be conducted using the spectrophotometry (with Folin-Ciocalteu reagent) method set out in the same standard.

5.3.2 Test for the migration of heavy metals

5.3.2.1 Coating sampling

Coating samples must be taken from the outer surface of the product. If the coating is made up of different colours, each colour must be tested. The maximum migration level of each heavy metal is then analysed and adjusted.

5.3.2.2 Preparation and extraction of coating samples

Follow part 8.1 of standard GB 6675.4-2014.

5.3.2.3 Determining the migration level of heavy metals

Follow part 9 of standard GB 6675.4-2014.

5.4 Presenting test results

5.4.1 Formaldehyde emission level

The formaldehyde emission level of the product is calculated using the formula below:

$$C_f = C_{fc} - C_{0f} \quad \text{.....(2)}$$

where:

C_f - formaldehyde emission level of the product (mg/m^3);

C_{fc} - concentration of formaldehyde in the test chamber when testing is completed (mg/m^3);

C_{0f} - background concentration of formaldehyde (mg/m^3).

5.4.2 VOC emission level

The VOC emission level of the product is calculated using the formula below:

$$C_v = C_{vc} - C_{0v} \quad \text{.....(3)}$$

where:

C_v - amount of benzene, toluene, xylene and TVOC emitted by the product (mg/m^3);

C_{vc} - concentration of benzene, toluene, xylene and TVOC in the test chamber when testing is completed (mg/m^3);

C_{0v} - background concentration of benzene, toluene, xylene and TVOC (mg/m^3).

5.4.3 Analyse and adjust results for the migration of heavy metals

The results for the migration of heavy metals must be analysed and adjusted in accordance with the rules set out in part 4.2 of GB 6675.4-2014.

6 Testing rules

6.1 Order of the tests

Tests for formaldehyde, benzene, toluene, xylene and TVOC must be conducted first. The test for the migration of heavy metals must be conducted second.

6.2 Determining test results

A test is passed if the result of that test meets the requirement set out in part 4. A product is compliant with the limits on harmful substances if it has passed all the tests. If a product fails to pass any of the tests, it is not compliant with the limits on harmful substances.

6.3 Retest

Retests may not be carried out for formaldehyde or VOC in wooden furniture.

If the results for the migration of heavy metals are contested, re-tests may be carried out. If a re-test is carried out, the test report should state 'passed after re-test' or 'failed after re-test'.

Annex A

(normative annex)

Method for measuring and calculating the volume of wooden furniture

A.1 Apparatus for measuring

A steel ruler or tape measure (accurate to 1mm). If a measuring equipment is used, it must be accurate to $1mm^2$.

A.2 Methods for calculating the volume of wooden furniture

A.2.1 Cabinetry

Measure the maximum projected area and the maximum height of a cabinet. The product of the two is the volume of the cabinet.

A.2.2 Tables

Measure the maximum projected area and the maximum height of a table. The product of the two is the volume of the table.

A.2.3 Chairs

Measure the maximum projected area and the maximum height of the seat. The product of the two is the volume of the chair. The volume of the back and arm rests is disregarded.

A.2.4 Stools

Measure the maximum projected area and the maximum height of the seat. The product of the two is the volume of the stool.

A.2.5 Beds

Measure the maximum projected area of the bed frame and the height of the bed frame (excluding sections above the mattress surface). The product of the two is the volume of the bed. The volume of the sections of the bed frame that is above the mattress surface is disregarded.

References

[1] ISO 16000-9:2004 Indoor air-Part 9: Determination of the emission of volatile organic compounds from building products and furnishing-Emission test chamber method

[2] ENV 717-1:2004 Wood-based panels-Determination of formaldehyde release-Part 1: Formaldehyde emission by the chamber method

[3] ASTM E1333:1996(2002) Standard test method for determining formaldehyde concentrations in air and emission rates from wood products using a large chamber

[4] RAL-UZ38:2002 Low-emission wood products and wood-base products

[5] BIFMA M7.1-2005 Standard test method for determining VOC emissions from office furniture systems, components and seating