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Limit of hazardous substances of furniture

家具中有害物质限量

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Table of Contents

Limit of hazardous substances of furniture

1 Scope

This document specifies the limit requirements and test result determination of hazardous substances in furniture. It defines the terms and definitions and describes the test methods.

This document applies to all types of furniture products.

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.

GB 6675.4-2014, *Safety of toys -- Part 4: Migration of certain elements*

GB/T 27717, *Determination of dimethyl fumarate of furniture*

GB/T 28202, *Furniture industry terminology*

GB/T 31106, *Determination of volatile organic compounds in furniture*

GB/T 31107, *Environmental chamber for the determination of volatile organic compounds of furniture -- General technical requirements*

GB/T 38724, *Furniture hazardous substances -- Test method for radioactivity*

GB/T 40904, *Methods for the determination of prohibited substances in furniture products and related materials -- Azo dyes*

GB/T 40906, *Methods for the determination of prohibited substances in furniture products and related materials -- Certain phthalate esters*

GB/T 40908, *Methods for the determination of prohibited substances in furniture products and related materials -- Flame retardants*

GB/T 40971, *Methods for the determination of prohibited substance in furniture products and related materials -- Polycyclic aromatic hydrocarbons*

GB 28007, *Technical specifications for the safety of infants and children furniture*

ISO 16000-3, *Indoor air -- Part 3: Determination of formaldehyde and other*

carbonyl compounds in indoor and test chamber air -- Active sampling method

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 28202 and GB 28007 as well as the followings apply.

3.1 total volatile organic compounds; TVOC

Volatile organic compounds with retention times between n-hexane and n-hexadecane are analyzed using a Tenax GC or Tenax TA sampler and a non-polar column (polarity index less than 10).

[Source: GB/T 31106-2014, 3.2]

3.2 migrated hazardous elements

Antimony, arsenic, barium, cadmium, chromium, lead, mercury and selenium elements measured in furniture surface coatings by prescribed test methods.

3.3 phthalates

Esters (or a series of lipid substances) formed by the reaction of phthalic acid with alcohol.

NOTE: Its chemical structure is characterized by containing two symmetrical or asymmetrical formic acid hydrocarbon esters at the ortho position of the benzene ring. The phthalates in this document refer to the 6 phthalates in Annex A.

3.4 polycyclic aromatic hydrocarbons; PAH

Aromatic hydrocarbons containing two or more fused aromatic rings.

NOTE: The rings may also have short alkyl or cycloalkyl substituents. The PAHs in this document refer to the 18 PAHs in Annex B.

3.5 decomposable aromatic amine colourants

Dyes (with azo groups) that can decompose and release one or more aromatic amines that are or may be carcinogenic to humans in textiles or leather and fur products that come into direct contact with the human body.

NOTE: Decomposable aromatic amine colourants in this document refer to dyes that can decompose to produce the 24 aromatic amines listed in Annex C.

Annex D

(normative)

Determination of formaldehyde, benzene, toluene, xylene and TVOC in soft furniture

D.1 Instruments and equipment

D.1.1 Climate chamber

It shall comply with the provisions of GB/T 31107.

D.1.2 Sampling instruments and equipment

They shall comply with the provisions of GB/T 31106.

D.2 Test procedure

D.2.1 Calculation of sample exposure area

Calculate the sample exposure area according to the provisions of Annex F. When the sample is adjustable, calculate according to the minimum adjustable sample area.

D.2.2 Preprocessing

Before the test, measure and record the total area of the sample to be tested (exposed area). Pre-treat the sample to be tested.

The preprocessing time is (120±2)h.

The preprocessing environmental conditions are:

- Temperature: (23±2)℃;

- Relative humidity: (50±10)%;

- The distance between samples is not less than 300 mm.

D.2.3 Preparation before the test

The load rate during the test is 0.30 m^2/m^3 ~ 0.70 m^2/m^3. The standard load rate is 0.5 m^2/m^3. When the sample load rate is not equal to 0.5 m^2/m^3, the area load rate of the sample is calculated according to formula (D.1):

$$L = \frac{a}{V} \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (D.1)$$

Where,

L - area load rate of the sample, in square meters per cubic meter (m^2/m^3);

a - sample exposure area, in square meters (m^2);

V - climate chamber capacity, in cubic meters (m^3).

The climate chamber is opened for no-load operation to ensure that the environment inside the chamber meets the temperature, relative humidity, air flow velocity, and background concentration of hazardous substances required for the test at the beginning of the test.

Background concentration of hazardous substances in the climate chamber: formaldehyde less than or equal to 0.006 mg/m^3; benzene, toluene and xylene are all less than or equal to 0.005 mg/m^3; TVOC less than or equal to 0.05 mg/m^3.

D.2.4 Test environment requirements

After the preprocessing, the samples are immediately transferred to the test climate chamber. The mattress samples shall be placed on the brackets, and other products shall be placed in the middle of the chamber in normal use. The bracket material shall not absorb or release volatile organic compounds. The bracket shall not affect the air circulation in the chamber. The air volume occupied is less than 1% of the chamber volume.

During the test, the test conditions in the climate chamber shall meet the following requirements:

- Temperature: (23±2)°C;

- Relative humidity: (50±5)%;

- Air exchange rate: $(1\pm0.05)h^{-1}$;

- Concentrations of formaldehyde, benzene, toluene, xylene and TVOC in the supplementary gas shall not be higher than the background concentration of hazardous substances in the climate chamber.

D.2.5 Test procedure requirements

The test is carried out according to the following provisions:

- Place the sample to be tested in the center of the climate chamber. Close the door. Define this time point as the initial time "±0";

- Keep the climate chamber in operation so that the airflow in the chamber circulates over all surfaces of the sample being tested.

NOTE 1: If the background concentration of gas in the test chamber is higher than the required index before placing the sample, it is necessary to re-ventilate the chamber until the concentration range drops to within the index range.

NOTE 2: The air pressure in the climate chamber shall be kept positive during gas collection. The volume of gas passing through the collection device shall be less than 80% of the volume of gas entering the climate chamber during the same period.

After the sample has been placed in the climate chamber for (20±0.5) h, air sampling shall be carried out in accordance with the provisions of GB/T 31106 and completed within 1 h.

D.2.6 Determination of formaldehyde, benzene, toluene, xylene and TVOC

The formaldehyde content is determined according to the method specified in ISO 16000-3.

The determination of benzene, toluene, xylene and TVOC shall be carried out in accordance with the provisions of GB/T 31106. Only benzene, toluene and xylene shall be quantified separately. The concentration of all other compounds with retention times between n-hexane and n-hexadecane (including n-hexane and n-hexadecane) shall be calculated according to the response coefficient of toluene. The sum of the concentrations of all volatile organic compound components with retention times between n-hexane and n-hexadecane (including n-hexane and n-hexadecane) is the TVOC concentration. The calculation results shall be expressed to 3 decimal places.

D.3 Result calculation

D.3.1 Concentrations of formaldehyde, benzene, toluene, xylene and TVOC in the climate chamber under test conditions

Calculate according to formula (D.2):

$$c_c = c_1 - c_0 \qquad \cdots\cdots (D.2)$$

Where,

c_c - concentrations of formaldehyde, benzene, toluene, xylene, and TVOC in the climate chamber under test conditions, in milligrams per cubic meter (mg/m^3);

c_1 - test results of formaldehyde, benzene, toluene, xylene, and TVOC concentrations in the climate chamber, in milligrams per cubic meter (mg/m^3);

Annex E

(normative)

Determination of formaldehyde, benzene, toluene, xylene and TVOC in wooden furniture and other furniture

E.1 Instruments and equipment

E.1.1 Climate chamber

It shall comply with the provisions of GB/T 31107.

E.1.2 Sampling instruments and equipment

They shall comply with the provisions of GB/T 31106.

E.2 Test procedure

E.2.1 Calculation of sample contour volume

Calculate the sample contour volume according to the provisions of Annex G. When the sample is adjustable, calculate it according to the minimum volume that the sample can be adjusted to for normal use.

E.2.2 Preprocessing

Before testing, assembled products, foldable products, and adjustable products shall be assembled, opened, and adjusted in the manner that is most conducive to the release of hazardous substances. Generally, the entire product is pretreated. All surfaces of product components shall be exposed to the preprocessing environment.

The preprocessing time is (120±2) h.

The preprocessing environmental conditions are:

- Temperature: (23±2)℃;

- Relative humidity: (50±10)%;

- The distance between samples is not less than 300 mm.

E.2.3 Preparation before the test

The volume loading rate of the climate chamber is 0.075 m^3/m^3 ~ 0.3 m^3/m^3. Select a suitable climate chamber based on the principle that the volume loading rate is closest to 0.15 m^3/m^3. When the sample volume loading rate is set to 0.15, the air exchange

After the sample is placed in the climate chamber for (20±0.5) h, air sampling is carried out according to the provisions of GB/T 31106. The sampling shall be completed within 1 h.

E.2.5 Determination of formaldehyde, benzene, toluene, xylene and TVOC

The formaldehyde content is determined according to the method specified in ISO 16000-3.

The determination of benzene, toluene, xylene and TVOC shall be carried out in accordance with the provisions of GB/T 31106. Only benzene, toluene and xylene shall be quantified separately. The concentration of all other compounds with retention times between n-hexane and n-hexadecane (including n-hexane and n-hexadecane) shall be calculated according to the response coefficient of toluene. The sum of the concentrations of all volatile organic compound components with retention times between n-hexane and n-hexadecane (including n-hexane and n-hexadecane) is the TVOC concentration. The calculation results shall be expressed to 3 decimal places.

E.3 Result calculation

E.3.1 Concentrations of formaldehyde, benzene, toluene, xylene and TVOC in the climate chamber under test conditions

Calculate according to formula (E.2):

$$c_c = c_1 - c_0 \qquad \cdots\cdots (E.2)$$

Where,

c_c - concentrations of formaldehyde, benzene, toluene, xylene, and TVOC in the climate chamber under test conditions, in milligrams per cubic meter (mg/m^3);

c_1 - test results of formaldehyde, benzene, toluene, xylene, and TVOC concentrations in the climate chamber, in milligrams per cubic meter (mg/m^3);

c_0 - test results of background formaldehyde, benzene, toluene, xylene, and TVOC concentrations in the climate chamber, in milligrams per cubic meter (mg/m^3).

E.3.2 Release concentrations of formaldehyde, benzene, toluene, xylene and TVOC in wooden furniture and other furniture

Calculate according to formula (E.3):

$$c = c_c \qquad \cdots\cdots (E.3)$$

Annex F

(normative)

Measurement method of exposed area of soft furniture

F.1 Measurement principles

The exposed area of soft furniture specified in this document is the total surface area of the sample in contact with the ambient air. Metal and plastic parts are not included. It can be measured by direct measurement, film measurement, scanning, digital imaging, etc. The result is accurate to 0.01 m^2.

F.2 Measurement method

F.2.1 Direct measurement

Directly measure the size of the exposed part with a steel ruler or tape measure with a graduation value of 1 mm. Use mathematical formulas or drawing software to calculate the exposed area of soft furniture.

F.2.2 Film measurement

Attach the plastic film to the surface of the sample. Use a marker to outline the exposed area. Flatten the plastic film. Measure the dimensions with a steel ruler or tape measure with a graduation of 1 mm. Use mathematical formulas or drawing software to calculate the exposed area of the upholstered furniture.

F.2.3 Laser scanning or digital imaging measurement

Use a laser scanner to collect point cloud data of all parts of the sample. Scan around and on the top of the sample. Later, the point cloud is aligned and spliced. Eliminate redundant non-target point clouds. Calculate the exposed area of soft furniture through the scanner software. Or use an optical digital imaging system to capture sample information. Calculate the exposed area of soft furniture through post-processing software.

F.3 Measurement methods

F.3.1 Mattress type

F.3.1.1 Ordinary square mattress

Measure the length, width and height of the mattress. Calculate the surface area, back area and edge area. Add them together to get the exposed area. Ignore the effect of the hem and rounded corners.

F.3.1.2 Round and other shaped mattresses

Measure the dimensions of each part of the bed surface. Divide the plane into sectors, squares, etc. Calculate the surface area, back area, and edge area, respectively. Add them up to get the exposed area. Ignore the effect of the edge.

F.3.2 Sofas

The exposed surfaces of sofas are mainly the seat, backrest, edge, bottom, armrests, etc. When measuring, each area can be divided into shapes that are convenient for calculation. Measure and calculate separately.

If the bottom of the product is in close contact with the ground, it is not included in the exposed area. If the bottom of the product does not touch the ground, the bottom area is included in the exposed area. Regardless of whether the bottom surface is sealed or not, it is calculated based on the plane area within the bottom edge range.

Movable parts such as cushions are considered part of the entire sofa. Both the front and back sides are included in the exposed area.

The front and back of the backrest of the product are included in the exposed area. The removable backrest is tested in the installed complete state. The front, back and surrounding edges of the integrated backrest are not clearly separated and can be measured and calculated together.

The contact surface between the legs, feet and the ground shall not be counted. The parts that are fixed by bonding or other means and are bonded to the product are not counted in the exposed area. The edges and seams are negligible.

F.3.3 Soft chairs and stools

The exposed area measurement of soft chairs and stools includes the seat, bottom, front and back of the backrest, legs, etc. The carved and hollow parts are ignored.

Other requirements are the same as sofas.

NOTE: Soft chairs and stools refer to chairs and stools that are made of elastic filling materials such as foam plastics and latex sponges, and covered with soft surface materials such as textile fabrics and leather.

F.3.4 Soft beds

The exposed area measurement of soft beds includes the bed surface, bottom surface, edges, and headboard.

Other requirements are the same as sofas.

F.3.5 Other soft furniture

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