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Upholstered furniture: limits on the levels of volatile organic compounds
and decomposable aromatic amines in sofas

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Introduction

Chapter 4 of this Standard is mandatory. The other chapters are recommendations.

This Standard was drafted in accordance with Standard GB/T 1.1-2009.

Please note that parts of this document may involve patents. The issuing authority for this document does not bear responsibility for identifying those patents.

This Standard was proposed by the China National Light Industry Council.

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Upholstered furniture: limits on the levels of volatile organic compounds and decomposable aromatic amines in sofas

1. Scope

This Standard specifies the terms and definitions of volatile organic compounds used in indoor sofas and limits on the levels of decomposable aromatic amines, requirements, test methods and test rules.

This standard is applicable to all types of indoor sofa.

2. Normative references

The following documents are essential for the use of this document. For dated references, only that edition is applicable to this document. In the event of undated references, the latest edition (including any amendments) is applicable.

GB/T 18401, National General Safety Technical Code for Textile Products

GB/T 19942, Determination of Leather and Fur - Chemical tests - Prohibited Azo Colourants

GB/T 31106, Determination of Volatile Organic Compounds/Furniture

GB/T 31107 Furniture climate chamber VOC detection/General technical conditions

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 climate test chamber

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

Represented by V .

Note: Chamber lighting equipment, sensors and other occupied spaces are not included.

3.2 Loading ratio

Ratio of the total area of the sample exposed to the volume of the climate chamber.

Note: The total area of the sample exposed is the total surface area of the material exposed to the air. When the lower surface of the product is in close contact with the ground, the total surface area of the product does not include the lower surface.

3.3 Formaldehyde emission

The amount of formaldehyde emitted by a sofa in a test chamber that meets the loading ratio requirement for a specified period of time and under the climatic conditions specified in this standard.

3.4 Total volatile organic compounds (TVOC)

Volatile organic compounds with a retention time between n-hexane and n-hexadecane VOC when sampled using Tenax TA or Tenax GC and analysed using a non-polar column (polarity index of <10).

3.5 TVOC emission

The amount of TVOC released in a test chamber by a sofa for a specified period of time and under the climatic conditions specified in this standard.

3.6 Air exchange rate

The ratio of the amount of clean air entering the chamber per unit of time to the volume of the climate chamber.

3.7 Air velocity

Chamber airflow rate while the chamber is in no-load operation.

4. Requirements

The limit values of volatile organic compounds and decomposable aromatic amines used in sofas must comply with the requirements set out in Table 1.

Table 1: Limits on the levels of volatile organic compounds and decomposable aromatic amines used in sofas

No.	Category	Item	Limit value
1	Volatile organic compounds in sofas	Formaldehyde emission	$\leq 0.50 \text{ mg/m}^3$
		TVOC	$\leq 0.60 \text{ mg/m}^3$
2	Harmful substances in sofa fabrics	Decomposable aromatic amine dyes ^a	Prohibited ^b
^a See Appendix A for the types and names of prohibited decomposable aromatic amine dyes.			
^b Detection limit for decomposable aromatic amine textile dyes in accordance with GB 18401, detection limit for decomposable aromatic amine dyes in accordance with GB/T 19942.			

5. Test methods

5.1 Volatile organic substance

Determination of the volatile organic compounds is to be conducted in accordance with the rules set out in Appendix B.

5.2 Decomposable aromatic amine in fabrics

5.2.1 Sampling

The sample can be taken from the seat, armrest or back of the chair if the same fabric is used in those locations. If more than one fabric is used, a separate sample must be taken from each location.

5.2.2 Determination of decomposable aromatic amine dyes in textile fabrics

To be done in accordance with GB 18401.

5.2.3 Determination of decomposable aromatic amine dyes in fabrics such as leather and fur

To be done in accordance with GB/T 19942.

6. Test rules

6.1 Test sequence

Volatile organic compounds should be tested first, followed by decomposable aromatic amine dyes.

6.2 Batching, sampling principles and sample size

6.2.1 Batching

A batch is made up of products of the same kind and that are supplied to the users at the same time or products processed from the same batch of raw materials (mainly fabrics and filling material).

6.2.2 Sampling principles

If samples are taken from a manufacturer, they must be taken from finished products in the warehouse from the same batch on a random basis. The test sample and the backup sample must be taken at the same time. If samples are taken from a distributor, they must be taken from products that on the shop floor or in the storage from the same batch on a random basis. Backup samples do not have to be taken, if there are not enough products left after the test samples are taken.

6.2.3 Sample size

Two samples must be taken, including one test sample and one backup sample.

6.3 Determination of test results

A product is only compliant if it passes all the tests. It is determined as non-compliant, if it fails any one of the tests.

6.4 Retesting

Volatile organic material should not be retested.

If there is any doubt as to the test results for decomposable aromatic amine dyes, they should be retested. Retest the original sample or the backup sample, review the results in accordance with 6.3, and state "Retesting passed" or "Retesting failed" in the test report.

Appendix A

(For information purposes)

Types and names of prohibited decomposable aromatic amine dyes

A.1 The decomposable aromatic amine dyes shown in Table A.1 are prohibited.

Table A.1 Prohibited decomposable aromatic amine dyes

No.	Name	CAS No.
1	4-Aminobiphenyl	92-67-1
2	Benzidine	92-87-5
3	4-Chloro-o-toluidine	95-69-2
4	2-Naphthylamine	91-59-8
5	o-Aminoazotoluene	97-56-3
6	2-Amino-4-nitrotoluene	99-55-8
7	p-Chloroaniline	106-47-8
8	2, 4-Diaminoaniso	615-05-4
9	4, 4'-Diaminodiphenylmethane	101-77-9
10	3, 3'Dichlorobenzidine	91-94-1
11	3' 3-Dimethoxybenzidine	119-90-4
12	3, 3'-Dimethylbenzidine	119-93-7
13	3' 3-Dimethyl-4, 4'-diaminobiphenylmethane	838-88-0
14	2-Methoxy-5-methylaniline	120-71-8
15	4, 4'-Methylene-bis-(2-chloroaniline)	101-14-4
16	4, 4'-Oxydianiline	101-80-4
17	4, 4'-Thiodianiline	139-65-1
18	o-Toluidine	95-53-4
19	2, 4-Toluylendiamine	95-80-7

20	2, 4, 5-Trimethylaniline	137-17-7
21	o-Anisidine	90-04-0
22	2, 4-Xylidine	95-68-1
23	2, 6-Xylidine	87-62-7
24	4-Aminoazobenzene	60-09-3

Appendix B

(Normative appendix)

Determination of volatile organic compounds

B.1 Instruments and equipment

B.1.1 Climate chamber

Must comply with the provisions of GB/T 31107.

B.1.2 Sampling instruments and equipment

Must comply with the provisions of GB/T 31106.

B.2 Test procedure

B.2.1 Pretreatment

Before performing the test, measure and record the total area of the sample, and pretreat the sample. The pretreatment methods and requirements are as follows:

Pretreatment time: 120 ± 2 hours.

Environmental conditions during pretreatment:

- Temperature: $23 \pm 2^{\circ}\text{C}$;
- Relative humidity: $45 \pm 10\%$;
- Distance between samples: not less than 300 mm;
- Concentration of formaldehyde and TVOC between products must not exceed the following levels: formaldehyde: $\leq 0.050\text{mg/m}^3$; TVOC: $\leq 0.60\text{mg/m}^3$.

B.2.2 Pre-test preparation

During the test, the loading ratio must be $0.4 \pm 0.04 \text{ m}^2/\text{m}^3$.

The inner wall of the climate chamber must be cleaned using an alkaline cleaning solution, and then dried.

Operate climate chambers with a zero load, to ensure that the chamber meets the required test temperature, relative humidity, air velocity and background concentrations of harmful compounds.

The level of harmful compounds in the inward flow air must not be higher than the background concentration of those compounds in the climate chamber.

B.2.3 Requirements for the test environment

The following environmental indicators must remain constant in the climate chamber during the test:

- Temperature: $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$;
- Relative humidity: $45 \pm 5\%$;
- Air exchange rate: $1 \pm 0.05 \text{ h}$;
- Level of formaldehyde, benzene, toluene, xylene and TVOC in the inward flow air must meet the following standard: formaldehyde $\leq 0.006\text{mg}/\text{m}^3$, single VOC $\leq 0.005\text{mg}/\text{m}^3$, TVOC $\leq 0.05\text{mg}/\text{m}^3$.

B.2.4 Test procedure requirements

The test must be performed in accordance with the following:

- Place the test sample in the centre of the chamber and close the door. This moment in time is defined as time " ± 0 ";
- Keep the climate chamber running, so that the chamber air circulates all over the surface of the sample;
- After 20 hours, collect double air samples from the chamber air outlet.

Note 1: If, prior to the test sample being placed in the chamber, the background concentration in the chamber is higher than the required level, the ventilation process must be repeated until the concentration range falls to within the target range.

Note 2: The chamber must maintain normal air pressure when the samples are taken. The air that passes through the collection device must be at least 20% less than the total volume of air flowing into the chamber during the test.

B.2.5 Sample collection and determination

B.2.5.1 Formaldehyde sample collection and determination

To be conducted in accordance with Standard GB/T 31106. The level of formaldehyde is determined using the phenol reagent spectrophotometry method stated in the standard.

B.2.5.2 TVOC sample collection and determination

To be conducted in accordance with GB/T 31106.