NATIONAL STANDARDS OF THE PEOPLE'S REPUBLIC OF CHINA

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Upholstered furniture - Limits for volatile organic compounds, decomposable aromatic amine and flame retardants in mattresses

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(draft standard for approval)

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Preface

Part 4 of this standard is compulsory, the remaining parts are recommendations only. This standard is drafted in accordance with GB/T 1.1 - -2009.

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.

This standard is proposed by the China Light Industry Council. The drafting of this standard is managed by the National Standardisation Technical Committee for Furniture (SAC/TC 480).

Organisations responsible for the drafting of this standard: Shanghai Institute of Quality Inspection and Technical Research, Chengdu Institute of Product Quality; National Centre for Quality Supervision & Inspection of Furniture and Indoor Equipment (Chengdu); Zhejiang Furniture and Hardware Research Institute; Shenzhen Academy of Metrology & Quality Inspection, Chengdu Shuanghu furniture Ltd; Dongguan DeRucci Interior Products Ltd; Hunan Stardom furniture development Ltd; Chengdu Quanyou furniture Ltd; Shenzhen Yuanfangyuan Industry Development Ltd.

The organisations that contributed to the drafting of this standard are as follows: Xilinmen Furniture Development Ltd, Hebei Lianle Beds Ltd, Guizhou Natural Technology Ltd, Ningbo Mengshen Mattress Co Ltd, Hefei Vanbo Mattresses Ltd, Jinbang Qilin Bedroom Furniture Ltd, Yantai Jisi Furniture LTd, Shanghai Slumberland Soft Furnishing Ltd, Jinyadian Bedroom Furniture (Shenzhen) Ltd, Shanghai Dreamland Mattress Co Ltd, Geoby Children's Products Ltd, Shenyang Mengbao Furniture Ltd, Shanghai Aishu Mattress Co Ltd, Kunshan Innovative Testing Instruments Co Ltd.

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Upholstered furniture - Limits for volatile organic compounds, decomposable aromatic amine and flame retardants in mattresses

1. Scope

This standard sets out terms, definitions, requirements, testing methods and testing rules with regard to limits of volatile organic compounds, decomposable aromatic amine and flame retardants in mattresses for indoor use.

This standard applies to all mattress products for indoor use with the exception of water-bed mattresses and inflatable mattresses made of PVC or PVC leather etc.

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) applies to this standard.

GB/T 18204.26-2000 Methods for determining formaldehyde levels in air of public places

GB/T 18401 National general safety technical code for textile products

GB/T 18883-2002 Indoor air quality standard

GB/T 18885- 2009 Technical specifications of ecological textiles

GB/T 19942 Chemical tests for leather and fur - Determination of banned azo colourants

3. Terms and definitions

The terms and definitions listed below and those used in GB/T 18883-2002 and GB/T 18885-2009 apply to this standard.

3.1 Mattress

Soft bedding item comprising a core made from springy (or other) materials with a textile (or other) cover.

3.2 unpleasant odour

an odour emitted by a mattress that makes people uncomfortable.

3.3 peculiar odour

As indicated in Annex D.7.1 of this standard.

4 Requirements

Limits for volatile organic compounds, decomposable aromatic amine and flame retardants in mattresses should conform to requirements in Table 1.

Table 1 Requirements relating to limits for volatile organic compounds, decomposable aromatic amine and flame retardants in mattresses

Substance tested	Name of harmful substance	Limit	Remarks
harmful substances in mattress material	decomposable aromatic amine dyes *a	banned *b	no direct contact with skin
	banned flame retardant *a	banned *b	
harmful volatile substances in mattress	Formaldehyde emission	≤0.10mg/m^3	
	TVOC (total volatile organic compound)	≤0.60 mg/m^3	
	unpleasant odour	≤3 level	
	peculiar odour	none	
*a See Annex A for the types and names of banned decomposable aromatic amine dyes and flame retardants. *b Tests for decomposable aromatic amine dyes used in fabric should be carried out in accordance with GB 18401; tests for decomposable aromatic amine dyes used in leather and fur should be carried out in accordance with GB/T 19942.			

5 Testing method

5.1 When testing for banned decomposable aromatic amine dyes, samples are taken directly from the mattress fabric; mattress fabric is tested according to GB 18401; leather and other related products are tested according to GB/T 19942.

5.2 Samples of banned flame retardants should be taken directly from mattress fabric and tested according to GB/T 18885-2009.

5.3 Tests for formaldehyde emission are carried out according to directions in Annex B.

5.4 Tests for TVOC are carried out according to directions in Annex C.

5.5 Tests for unpleasant and peculiar odours are carried out according to directions in Annex D.

6 Testing rules

6.1 Testing sequence –

tests for volatile organic compounds should be carried out first, followed by the other tests.

6.2 Batching, sampling principles and sample size

6.2.1 Batching

Generally, a product of the same batch means the same kind of product, made by the same manufacture at the same time; or products made from the same batch of material (this usually refers to surface covering 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. A sufficient quantity of samples must be taken to provide a test sample and a backup sample; if samples are taken from a distributor, they must be taken from products on the shop floor or in 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 are taken - one test sample and one backup sample.

6.3 Determining test results

If a product passes all the tests of the standard, it is determined to be compliant, if not, it is determined to be non-compliant.

6.4 Rules for re-testing

Volatile organic compounds should not be re-tested. If there is any doubt as to the test results, a re-test may be applied for. A re-test can be done using original sample. If the original sample is no longer suitable for testing, the sealed backup sample should be used. The re-test result should be determined according to part 6.3. The results should be marked 'compliant (following re-test)' or 'non-compliant (following re-test)'.

Annex A

(normative annex)

Types and names of banned decomposable aromatic amine dyes and flame retardants in mattresses

A.1 Outline

This Annex sets out the types and names of banned decomposable aromatic amine dyes and flame retardants in this standard.

A.2 See Table A.1 for banned decomposable aromatic amine dyes

Table A.1 decomposable aromatic amine dyes

Item	Name (Chinese)	Name (English)	CAS Number
1	4-氨基联苯	4-Aminobiphenyl	92-67-1
2	联苯胺	Benzidine	92-87-5
3	4-氯-邻甲基苯胺	4-Chloro-o-toluidine	95-69-2
4	2-萘胺	2-Naphthylamine	91-59-8
5	邻氨基偶氮甲苯	o-Aminoazotoluene	97-56-3
6	2-氨基-4 硝基甲苯	2-Amino-4-nitrotoluene	99-55-8
7	对氯苯胺	p-Chloroaniline	106-47-8
8	2，4-二氨基苯甲醚	2，4-Diaminoanisole	615-05-4
9	4，4'-二氨基二苯甲烷	4'-Diaminodiphenylmethane	101-77-9
10	3，3'-二氯联苯胺	3，3'-Dichlorobenzidine	91-94-1
11	3，3'-二甲氧基联苯胺	3，3'-Dimethoxybenzidine	119-90-4
12	3，3'-二甲基联苯胺	3，3'-Dimethylbenzidine	119-93-7
13	3，3'-二甲基-4，4'-二氨基二苯甲烷	3，3'-Dimethyl-4，4'-diaminobiphenylmethane	838-88-0
14	2-甲氧基-5 甲基苯胺	2-Methoxy-5-methylaniline	120-71-8
15	4，4'-亚甲基-二-(2-氯苯胺)	4，4'-Methylene-bis-(2-chloroaniline)	101-14-4
16	4，4'-二氨基二苯醚	4，4'-Oxydianiline	101-80-4
17	4，4'-二氨基二苯硫醚	4，4'-Thiodianiline	139-65-1
18	邻甲苯胺	o-Toluidine	95-53-4
19	2，4-二氨基甲苯	2，4-Toluylendiamine	95-80-7
20	2，4，5-三甲基苯胺	2，4，5-Trimethylaniline	137-17-7
21	邻甲氧基苯胺	o-Anisidine	90-04-0
22	2，4-二甲基苯胺	2，4-Xylidine	95-68-1
23	2，6 二甲基苯胺	2，6-Xylidine	87-62-7
24	4-氨基偶氮苯	4-Aminoazobenzene	60-09-3

A.3 See Table A.2 for banned flame retardants

Table A.2 banned flame retardants

Item	Name (Chinese)	Name (English)	Dye index No	CAS Number
1	多溴联苯	Polybrominated biphenyles(PBB)		59536-65-1
2	三-（2,3-二溴丙基）-磷 Acid esters	Tri-(2,3-dibromo-propy)-phosphate(TRIS)		126-72-7
3	三-（氮环丙基）-膦化氧	Tris-(azir-idinyl)-phos-phinoxide(TEPA)		5455-55-1
4	五溴二苯醚	Pentabromodiphenylether(pentaBDE)		32534-81-9
5	八溴联苯醚	Octabromodiphenylether(octaBDE)		32536-52-0

Annex B

(normative annex)

Testing for formaldehyde emissions in mattresses

B.1 Principles

The formaldehyde and phenol reagent react to form piperazine. In acid solution, piperazine is oxidized by ferric ions and forms a turquoise compound. The emission rate is calculated by comparing the extent of colour change.

B.2 Reagents and materials

Must comply with the requirements regarding the spectrophotometric method (with phenol reagents) in standard GB/T 18204.26-2000.

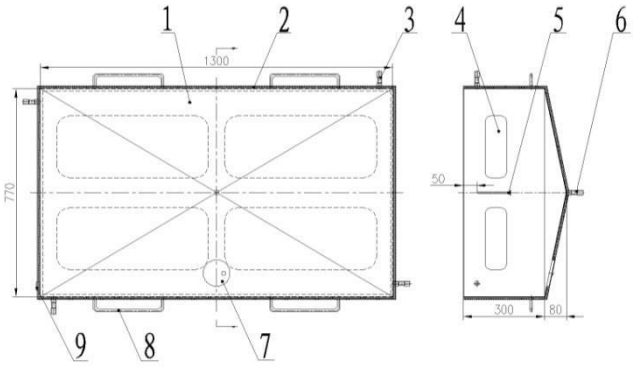
B.3 Apparatus and equipment

B.3.1 formaldehyde/TVOC collector

The enclosure of the collector should be made from material with a zero or low formaldehyde absorption rate (such as stainless steel, glass etc.) Four one-way inlet valves with an inner diameter of 10mm are fitted (one on each of the four sides of the enclosure, 50mm from the edge and the bottom). A one-way outlet valve with an inner diameter of 10mm is at the centre of the upper part of the enclosure, which is also used as a sampling port. An closable opening with a diameter of 100mm is fitted on one side of the outlet valve - this is called the olfactory-test opening and is used for conducting the olfactory test. The opening should be along the centre line, and its centre 150mm from the edge. The outer layer of the enclosure should be made of a heat-insulating material which does not release harmful volatile substances such as formaldehyde or TVOC, with a heat conduction rate of 0.03W/(m K)-0.04/(m K) and a thickness of 10mm. The collector should not weigh more than 250 kg.

The inside of the collector is fitted with 4 flat heating plates which remain at a constant temperature and allow even heat distribution (the heat difference measured at any two points on the heating plate should not be more than 0.5°C) . The heating plates are rectangular 5600mm x 230mm x 50mm, and are fitted on the inside, 1/3 of the way up from the bottom of the collector, 100mm from the edge. The heating plate should be made from a metal with high heat-conduction properties (such as aluminium alloy) , with heat sensors fitted above to measure and control the temperature. Heat plate wattage should be sufficient to raise the inner temperature of the collector from 23°C to 30°C in 20-30 minutes.

When the collector is in operation, the heat plates must remain at a constant temperature of 36°C ± 1°C, and the inner temperature of the collector must remain at 30°C ± 1°C (the temperature is tested at the centre of the collector 50mm away from the surface of the mattress) The shape, dimensions and structure of the collector can be seen in Chart B.1.



1- collector 2- insulating layer 3- one-way inlet valve 4- heating plate 5- heat sensor 6- one-way outlet valve 7- olfactory test opening 8- handle 9- heat controller port

Chart B.1 Formaldehyde/TVOC collector

B.3.2 Testing shelf

A shelf with a height 220mm-250mm; of a dimension suitable for testing samples (should not be smaller than sample) , made of pure wood or stainless steel; parts, joints, and surface must not contain glue or paint. See Chart B.2 for structure:

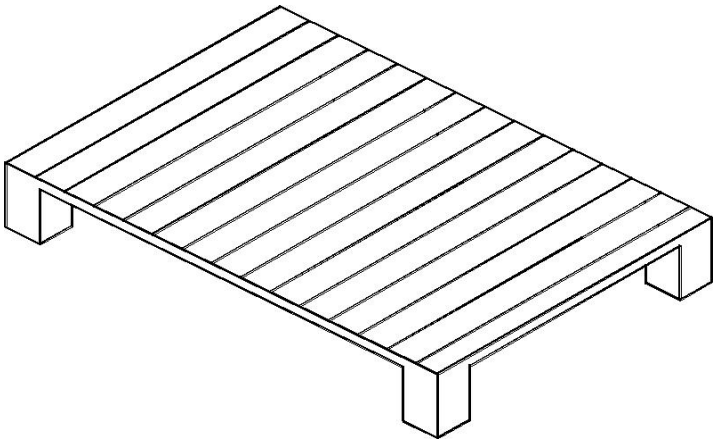


Chart B.2 Testing shelf

B.3.3 Other apparatus and equipment

Other apparatus and equipment must conform to the requirements of the spectrophotometric method (with phenol reagents) in standard GB/T 18204.26-2000.

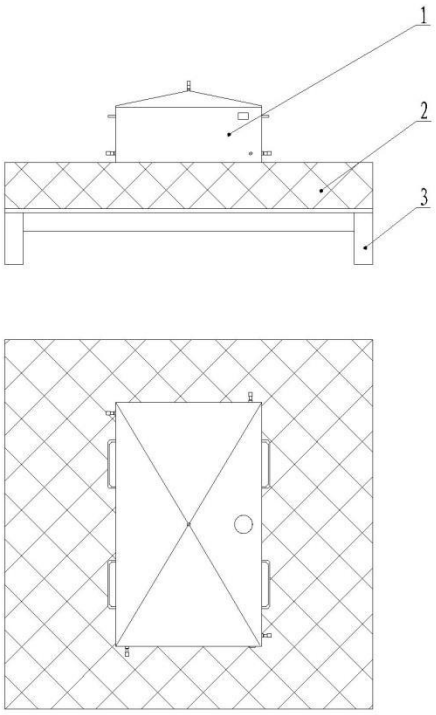
B.4 Conditions in the testing room

Temperature 23°C ± 5°C, relative humidity 50% ± 5%, the concentration of formaldehyde in the room must be less than 0.04mg/m3, TVOC concentration must be less than 0.06mg/m3. The testing room should have an area between 10-15m2 and a height of 3m ± 0.5m.

B.5 Collection and sampling of formaldehyde

The inner surface of the formaldehyde/TVOC collector should be clean prior to testing. Clean the inner surface with alkaline cleaner, before wiping with distilled water and drying using heat. The collector can also be cleaned using thermal desorption.

Place the mattress in the testing room on the testing shelf, with the thickest side (or that has the most cushioning) facing upwards (it is often the case that one side has an extra layer of coconut fibre cushioning making it thicker). Close windows and doors. Leave the mattress in place for 2 hours. Place the collector in the centre of the mattress so that the collector sits flush against the surface of the mattress, creating a seal between it and the collector, as in Chart B.3. Turn on the collector, and set the heater to 36°C, and the interior temperature to 30°C. When the air temperature in the collector reaches 30°C ± 1°C, start timing and 10 minutes later conduct the olfactory test. Wait for 150 minutes ± 2 minutes after completing the olfactory test, then collect formaldehyde samples. Collect 10-15L of gas using a large bubble absorber containing 5ml of absorbing fluid, released at 0.25-0.50L/min; record the temperature and air pressure at the sampling point.



Description: 1 - testing shelf 2- mattress 3- formaldehyde/TVOC collector

Chart B.3 diagram of collector

B.6 Formaldehyde determination

Follow the analysis procedure in Article 6 of GB/T 18204.26-2000.

B.7 Calculating results

Calculations are done according to Article 7 of GB/T 18204.26-2000. The formaldehyde concentration is the result minus the background concentration taken in the room without the sample.

Annex C

(normative annex)

Testing for TVOC in mattresses

C.1 Principles

Tenax TA or Tenax GC absorption tubes are used to collect air samples of a certain quantity taken a given area of the surface of the mattress, resulting in the volatile organic compounds in the air being retained in the absorption tube. After collecting the sample, thermal desorption equipment is used to heat the absorption tube, releasing the gas which is then injected into a gas chromatograph. The type is determined using retention time and the quantity is determined using peak area readings.

C.2 Reagents and materials

Must comply with requirements in C.3 of Annex C of AGB/T 18883-2002.

C.3 Apparatus and equipment

Collector and testing shelf arranged as in B.3, other apparatus and equipment must comply with requirements in C.4 of Annex C of GB/T 18883-2002.

C.4 Conditions in the testing room

See B.4 on conditions in the testing room

C.5 Collection of TVOC

After collecting the formaldehyde sample, wait for 60 minutes ± 2 minutes, then collect TVOC sample. At a sampling flow rate of 0.25-0.50L/min, collect 5-10L using an Tenax TA absorption tube or a designated collection tube for use with a gas chromatograph.

C.6 TVOC determination

Must comply with requirements in C.6 of Annex C of GB/T 18883-2002.

C.7 Calculating results

Follow rules in C.7 of Annex C of GB/T 18883-2002. The TVOC sample concentration is the result minus the background concentration taken in the room without the sample.

Annex D

(normative annex)

Olfactory evaluation method for odours in mattresses

D.1 Principles

The mattress is placed in the specified environment and the odour emitted is evaluated using human olfaction.

D.2 Odour testers

D.2.1 Human olfaction requirements

Odour testers must be capable of distinguishing two samples with identical packaging, where one sample is pure water and the other a solution containing 0.5% alcohol. The odour is inhaled at a distance of 10mm from the sample. Odour testers must be able to distinguish the smell of high-boiling point petroleum, fishy smells, and the smell of aromatic hydrocarbon, as stated in the requirements of GSB 16-2523-2008 on peculiar smells in samples of fibres and products made from fibres.

D.2.2 Requirement regarding the number of testers

always an odd number; at least five

D.3 Samples for testing

the entire mattress is taken as sample after removing all outer packaging

D.4 Testing device

use a collector and testing shelf as directed in Annex B.

D.5 Testing procedure

D.5.1 Only testers that have satisfied the requirements in D.2.1 can participate. To ensure that test results are accurate, testers must not wear make-up, smoke or consume spicy foods. As testers may easily be affected by olfactory fatigue, they must be given sufficient breaks when testing multiple items.

D.5.2 During the test, the mattress and testing device are placed on the testing shelf as shown in B.5 of Annex B. When these are in place, heat the collector. When the heat reaches 30°C ± 1°C, this heat is maintained for 10 minutes, then the olfactory test is carried out.

D.5.3 The time between the first and last tester for each sample should not exceed 3 minutes. During the test, the nostrils should be next to the olfactory test opening, enabling a careful assessment of the odour emitted. Results should be recorded. During the testing process, testers should work independently, without discussing test results.

D.6 Determining and grading unpleasant odours

D.6.1 Grading

Unpleasant odour are given a grade of 1-5 based on the intensity of the odour (1 being most preferable and 5 being the least preferable):

a) Grade 1 = no odour;

b) Grade 2 = slight odour;

c) Grade 3 = tolerable odour;

d) Grade 4 = unpleasant odour

e) Grade 5 = unbearable odour.

D.6.2 Determination

If all testers reach the same result, that is the determined result. If results differ, the sample is determined as being compliant only if more than half of the testers graded the sample at 3 or less (the final grade assigned to the sample is the lowest passable grade given) . Otherwise the sample is determined as non-compliant (the final grade assigned to the sample is the highest non-passable grade given)

D.7 Types and determination of peculiar odours

D.7.1 Types

The different types of peculiar odour are:

a) stale;

b) high-boiling point petroleum (such as petrol or kerosene);

c) a fishy-smell, smell of unwashed mutton, smell of urine;

d) aromatic hydrocarbon.

D.7.2 Determining

If two-thirds or more of testers do not perceive a peculiar odour, the sample is determined as compliant; If two-thirds or more of testers perceive one or more of the above peculiar odours, the sample is determined as non-compliant. If two-thirds or more of testers perceive a peculiar smell, but less than two-thirds perceive the same type of peculiar smell, the number of testers should be increased to more than 7 and the test re-conducted until a definitive result is reached.
