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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Replacing GB 8624-2006

Classification for burning behavior of building materials and products

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Foreword

Chapter 4, Chapter 5 and 6.1 of this standard are compulsory; the rest are recommendatory.

This standard was drafted according to the rules given in GB/T 1.1-2009.

This standard replaces GB 8624-2006 "Classification for burning behavior of building materials and products". Compared with GB 8624-2006, the main technical changes, except the editorial modifications, are as follows:

- Modify the Foreword, Introduction and part of Terms and Definitions. Delete the Symbols and Abbreviations;
- Modify the division and classification criteria of burning behavior grade (see Chapter 4 and 5; Chapter 4, 10 and 11 in Edition 2006).
- Add the burning behavior classification of building products (see 5.2);
- Delete the test methods; test principles and test sample preparation; classification test quantity; test of building products (except the flooring materials); test of flooring material; and application scope of this classification (see Chapters 5, 6, 7, 8, 9 and 13 of Edition 2006);
- Modify the grade mark of burning behavior, additional information and mark (see Chapter 6 and Appendix B; Chapters 4 and 12 in Edition 2006);
- Delete the contents of previous Appendix A, Appendix B and Appendix C. Supplement the contents of new Appendix A, Appendix B and Appendix C.

This standard is reference to EN 13501-1:2007 "Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests".

This standard was proposed by the Ministry of Public Security of the People's Republic of China.

This standard shall be under the jurisdiction of the Fireproof Materials Technical Subcommittee of National Technical Committee on Fire Protection of Standardization Administration of China (SAC/TC 13/SC 7).

Responsible drafting organization of this standard: Sichuan Fire Research Institute of Ministry of Public Security.

Participating drafting organizations of this standard: Technical Supervision and Research Center of the Building Materials Industry, China Building Materials Academy, Institute of Fire Prevention of China Academy of Building Research, Research Institute of Wood Industry of Chinese Academy of Forestry, Bayer Materials Science

(China) Co., Ltd., Armacell Thermal Insulation Materials (Guangzhou) Co., Ltd., Owens Corning (China) Investment Co., Ltd., Aeroflex International Co., Ltd. Shanghai Armstrong Building Products Co., Ltd., Huamei Group Co., Ltd., Changzhou Jingxue Insulation Technology Co., Ltd., Kingfa Science and Technology Co., Ltd., Wanhua Chemical Group Co., Ltd., and Feininger (Nanjing) Energy Saving Technology Co., Ltd.

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The previous editions of this standard are:

- GB 8624-1988, GB 8624-1997 and GB 8624-2006.

Introduction

GB 8624 was issued in 1988 for the first time. Then the first revision GB 8624-1997 was issued based on the West Germany standard DIN 4102-1:1981 "Fire behavior of building materials and building components; building materials; concepts, requirements and tests". As the Chinese classification criteria for burning behavior of building material, GB 8624-1997 had played an important role in the areas such as burning behavior evaluation and grading, fire safety design guidance, firefighting supervision, and implementation of code of design on building fire protection and prevention.

In 2006, with reference to EN 13501-1:2002 "Fire classification of construction products and building elements: Classification using test data from reaction to fire tests" drafted by European Committee for Standardization (CEN), GB 8624 was revised for the second time. Revision GB 8624-2006 was issued. Compared with Edition 1997, GB 8624-2006 had made relatively significant changes in the area of classification and criteria of the burning behavior of building materials and products; the burning behavior classification was changed from 4 grades - A, B₁, B₂, and B₃ to 7 grades - A1, A2, B, C, D, E and F.

Judged from the implementation situation of GB 8624-2006, there were problems such as the classification of burning behavior is too meticulous; it does not match with the current actual engineering construction in China. In order to enhance the applicability and compatibility, the third revision was made to GB 8624. This standard defines the basic classification of burning behavior of building materials – they are remained as A, B₁, B₂ and B₃. At the same time, it establishes the corresponding relationship with the European standard classification A1, A2, B, C, D, E and F; and adopts the classification criteria of European standard EN 13501-1:2007.

Classification for burning behavior of building materials and products

1 Scope

This standard specifies the terms and definitions, burning behavior grades, burning behavior grade criteria, burning behavior grade identification and inspection report of building materials and products.

This standard is applicable to burning behavior classification and judgment of building materials, decoration materials and products in construction engineering.

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 normative document (including all corrigenda) applies.

GB/T 2406.2 Plastics - Determination of Burning Behavior by Oxygen Index - Part 2: Ambient-temperature Test

GB/T 8408 Plastics - Determination of Burning Characteristics - Horizontal and Vertical Test

GB/T 5169.16 Fire Hazard Testing for Electric and Electronic Products - Part 16: Test Flames - 50W Horizontal and Vertical Flame Test Methods

GB/T 6454 Textiles - Burning Behavior - Oxygen Index Method

GB/T 5455 Textiles - Burning Behavior - Vertical Method

GB/T 5464 Non-combustibility Test Method of Building Materials

GB/T 5907 Fundamental Terminology of Fire Protection: Part 1

GB/T 8333 Test Method for Flammability of Rigid Cellular Plastic - Vertical Burning Method

GB/T 8626 Test Method of Flammability for Building Materials

GB/T 8627 Test Method for Density of Smoke from the Burning or Decomposition of Building Materials

GB/T 11785 Reaction to Fire Tests for Floorings - Determination of the Burning

Behavior Using a Radiant Heat Source

GB/T 14402 Reaction to Fire Tests for Building Materials and Products - Determination of the Heat of Combustion

GB/T 16172 Test Method for Heat Release Rate of Building Mate

GB/T 17596 Textiles - Commercial Laundering Procedure for Textile Fabrics Prior to Flammability Testing

GB 17927.1 Upholstered furniture - Assessment of the Resistance to Ignition of Mattress and Sofa - Part 1: Smouldering Cigarette

GB/T 20284 Single Burning Item Test for Building Materials and Products

GB/T 20285 Toxic Classification of Fire Effluents Hazard for Materials

GB/T 27904 Testing Method for Fire Characteristics of Furniture and Subassemblies Exposed to Flaming Ignition Source

3 Terms and Definitions

For the purposes of this document, the following terms and definitions AND those defined in GB/T 5907 apply.

3.1 Product

The building material, composite material or module of which the information is required.

3.2 Material

The mixture of single substance or uniform distribution, such as metal, stone, wood, concrete, mineral fiber and polymer.

3.3 Linear pipe thermal insulation product

Round pipeline product with insulating property, such as rubber and plastic insulating pipe and fiber glass insulating pipe.

3.4 Homogeneous product

Product that is composed of single material or with uniform density and composition inside.

3.5 Non-homogeneous product

The product not in accordance with the definition of homogeneous product and composed of one or more categories of substantial or non-substantial component(s).

sample burning. It is used in the classification of burning behavior.

3.16 FIGRA_{0.2MJ}

Fire growth rate index where the released heat of sample burning reaches 0.2 MJ.

3.17 FIGRA_{0.4MJ}

The fire growth rate index when the released heat of sample burning reaches 0.4 MJ.

3.18 Smoke growth rate index

SMOGRA

The maximum ratio between the smoke production rate and the corresponding time of the sample burning.

3.19 Smoke toxicity

The degree of damage/harm caused by toxic and hazardous substances in smoke.

3.20 Damaged material

The material that is ignited, carbonized, smelt or damaged in other ways, under heat effect.

3.21 Calorific value

The heat that is generated from complete combustion of material of a unit mass, expressed in J/kg.

3.22 Gross calorific value

All the heat that is released, when a unit mass of material is burned completely; and all the water vapor in the combustion products is condensed into water.

3.23 Sustained flaming

The flame that lasts more than 4s, on test sample surface or above.

4 Burning Behavior Grade

Grades of Burning Behavior of Building Materials and Products are shown in Table 1.

Table 1 Grades of Burning Behavior of Building Materials and Products

Burning behavior grade	Name
A	Incombustible material (products)
B ₁	Flame retardant materials (products)
B ₂	Combustible materials (products)
B ₃	Inflammable materials (products)

Table 5 Grades of and Classification Criteria for Burning Behavior of Curtain, and Decorative Fabrics for Furniture Product, etc.

Burning behavior Grade	Test method	Classification criteria
B ₁	GB/T 5454 GB/T 5455	Oxygen index $OI \geq 32.0\%$; Damaged length ≤ 150 mm, after flame time ≤ 5 s, smouldering time ≤ 15 s; The flaming droplets shall not cause combustion or smouldering to absorbent cotton
B ₂	GB/T 5454 GB/T 5455	Oxygen index $OI \geq 26.0\%$; Damaged length ≤ 200 mm, after flame time ≤ 15 s, smouldering time ≤ 30 s; The flaming droplets shall not cause combustion or smouldering to absorbent cotton
B ₃	No performance requirement	

5.2.3 The grades and classification criteria of burning behavior of wire and cable casing as well as enclosures and accessories of electrical equipment are shown in Table 6.

Table 6 Grades of and Classification Criteria for Burning Behavior of Wire and Cable Casing as well as Enclosures and Accessories of Electrical Equipment

Burning behavior grade	Product	Test method	Classification criteria
B ₁	Wire and cable casing	GB/T 2406.2 GB/T 2408 GB/T 8627	Oxygen index $OI \geq 32.0\%$; Vertical burning behavior: Grade V-0; Smoke density range $SDR \leq 75$
	Enclosures and accessories of electrical equipment	GB/T 5169.16	Vertical burning behavior: Grade V-0
B ₂	Wire and cable casing	GB/T 2406.2 GB/T 2408	Oxygen index $OI \geq 26.0\%$; Vertical burning behavior: Grade V-1
	Enclosures and accessories of electrical equipment	GB/T 5169.16	Vertical burning behavior: Grade V-1
B ₃	No performance requirement		

5.2.4 The grades and classification criteria for burning behavior of foamed plastics used for electrical apparatus and furniture products are shown in Table 7.

Table 7 Grades and Classification Criteria of Burning Behavior of Foamed Plastics for Electrical Apparatus and Furniture Products

Burning behavior grade	Test method	Classification criteria
B ₁	GB/T 16172 ^a	Heat release rate peak value of unit area ≤400 kW/m ² ;
	GB/T 8333	Mean burning time ≤30 s, Mean burning height ≤250 mm
B ₂	GB/T 8333	Mean burning time ≤30 s, Mean burning height ≤250 mm
B ₃	No performance requirement	
^a The irradiance setting is 30 kW/m ² .		

5.2.5 The grades of and classification criteria for burning behavior of soft and hard furniture are shown in Table 8.

- Number and date of inspection report;
- Entrusting party of the inspection report;
- Organization that issues the inspection report;
- Name and purpose of building materials and products;
- Detailed description of building materials and products, including detailed description or drawing for relevant components and assembly method;
- Test methods and test results;
- Classification methods;
- Conclusion: the burning behavior grade of building materials and products;
- Relevant instructions of inspection report, see Appendix C;
- Signatures of reporting superintendent and the organization's superintendent.

A.2.2 Sample holder

A.2.2.1 The sample holder is used for supporting the specimen. Its surface shall be even and free from burrs. The sample holder is made and welded by 40 mm-wide L-shaped steel. The outer dimensions shall not exceed the specimen edge by 5mm. For the sample holder, all its parts (except the two crosspieces) shall be fully opened; the width of each crosspiece is 25mm; and the crosspieces are located at 1/3 of the sample holder in the length direction. If the droop height of the positioned specimen exceeds 19 mm, the crosspiece quantity shall be increased to prevent the sample from drooping.

A.2.2.2 The height of sample holder is 115 mm. And the height is adjustable so that to adjust the distance between the combustor and supporting surface of sample holder to be no less than 25mm.

A.2.2.3 The sample holder is supported on the calcium silicate board or cement fibrolite plate; the board thickness is 13mm; and the length and the width are all greater than the specimen size by 200 mm; the plate surface shall be clean and free from residual combustible materials. If necessary, height adjustable supporting platform may be put under the sample holder.

A.2.3 Smoke exhaust system

The smoke exhaust system consists of exhaust fume-collecting hood and smoke exhaust pipe; and is used for absorbing all the smokes generated by mattress combustion. Gas sampling tube, thermocouple, differential pressure transmitter and smoke test system, etc. are arranged in the smoke exhaust pipe.

A.2.4 Ignition source

A.2.4.1 Summary

Ignition source includes two T-shaped combustors, as shown in Figure A.2 and Figure A.3. One of the T-shaped combustors (horizontal combustor) imposes flame upon the top surface of mattress, and the other T-shaped combustor (vertical combustor) imposes flame upon the side of the mattress. The combustor consists of stainless steel tubes with 12.7 mm in diameter and 0.89 mm in wall-thickness. Each combustor may adjust the distance from the specimen surface. The fuel gas is propane gas with the purity above 95%.

A.2.4.2 Horizontal combustor

The length of the T-shaped head of horizontal combustor is 305 mm; and both ends of the horizontal combustor are sealed. 17 pores are made on each end of the T-shaped head and evenly distributed on the 135 mm-long steel pipe from the place 8.5 mm away from the center of the T-shaped head of combustor, with 8.5 mm in pore spacing. The pore diameter is 1.45 mm ~1.53 mm. The pore direction shall form 5° angle with the horizontal plane, as shown in Figure A.2.

A.2.4.3 Vertical combustor

The T-shaped head of vertical combustor is similar to that of the horizontal combustor with 254mm in total length. 14 pores are made on each end of the T-shaped head and evenly distributed on the 110 mm-long steel pipe from the place 8.5 mm away from the center of the T-shaped head of combustor, with 8.5 mm in pore spacing. The pore diameter is 1.45 mm ~1.53 mm. The pore direction shall form 5° angle with the horizontal plane, as shown in Figure A.3.

A.2.4.4 Eternal flame ignitor

An eternal flame ignitor is arranged on each T-shaped combustor head; the ignitor is 3mm-long copper pipe which is supplied with fuel gas independently. The ignition end is set at the center of T-shaped head, within a range of 10 mm. The size of the ignitor flame is adjustable; it shall avoid to directly act on the specimen, before beginning of the test.

A.3 Specimen

The specimen size shall be consistent with the actual mattress used; the test sample is an integral mattress (including bed supporter). The total height between the mattress top and the ground surface shall not be greater than 910 mm.

A.4 Test

A.4.1 Test environment

The test room shall possess large enough room so that the influence of the calorific radiation to surrounding objects may be avoided. The air flow shall be kept uniformly and stably in the test room so that the influence of the ambient air flow to the test results may be avoided; the air velocity at the place 0.5 m away from the specimen top shall be ensured not exceeding 0.5 m/s.

A.4.2 Condition adjustment

Condition adjustment shall be conducted for the specimen for at least 48h in the environment with a temperature of 23°C± 2°C and a humidity of 50 % ± 5%, before test. The package shall be removed before condition adjustment; test shall be conducted after the specimen is taken out from the condition adjustment room for 20 min.

A.4.3 Fuel gas flow

Appendix C

(Informative)

Relevant Explanation of Inspection Report

C.1 Real application of building materials and products

The test installation shall be determined according to the end use application status; the product burning behavior grade is relevant to the real application status; the tested substrate and installation mode shall be determined according to the end use application conditions of the product. Standard substrate shall be selected for test; when nonstandard substrate for real application or representing real application is selected, the application field shall be defined specified, i.e. the test results are only applicable to products adopting identical substrate in real application. For products bonding to substrate, the application of test results shall be determined by bonding mode; the bonding mode and the property and consumption of bonding agent shall be provided by the test entrusting organization.

C.2 Specimen thickness

For products with various thicknesses in real application, when the parameters such as density that may affect the burning behavior are unchanged, if the maximum thickness and minimum thickness of burning behavior grades of products are the same, then it is deemed that the products of medium thickness also satisfy the burning behavior grade. Otherwise the products of each thickness shall be determined.

C.3 Special instruction

For the following materials: concrete, mineral wool, fiberglass, lime, metal (iron, steel, copper), plaster, parget without organic mixture, calcium silicate material, natural stone, stone slab, glass and ceramic - any of the materials with the homodisperse organic matter content not exceeding 1% (mass and volume) is considered to meet the requirements of Grade A1, exempted from test. As for a material or product composited by one or more above-mentioned materials in a layer-form, it is deemed to meet the requirements of Grade A1, when the glue content does not exceed 0.1 % (mass and volume).

Bibliography

- [1] GB/T 25207 Fire Tests - Full-scale Room Test for Surface Products
- [2] ISO 12949 Test Method for Measuring the Heat Release Rate of Mattress
- [3] EN 13501-1; 2007 Fire Classification of Construction Products and Building Elements - Part 1: Classification Using Data from Reaction to Fire Tests

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