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Flame resistance of commercial bus interior materials

营运客车内饰材料阻燃特性

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Table of Contents

Foreword	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Technical requirements.....	7
5 Test method.....	10
6 Transition period requirements for implementation.....	11
Appendix A (Normative) Sampling requirements of test sample	12
Appendix B (Normative) Test method and judgment requirements of melting behavior	14
Appendix C (Normative) Test method and judgment requirements of capability to repel fuel or lubricant.....	18
References	20

Flame resistance of commercial bus interior materials

1 Scope

This document specifies the technical requirements, test methods, implementation transition period requirements, for the flame retardant properties of interior materials for commercial bus.

This document is applicable to the evaluation of flame retardant properties of grade B and grade III bus interior materials, in category M₂ and category M₃.

This document does not apply to school buses.

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text. Among them, for dated references, only the version corresponding to the date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB/T 2406.2-2009 Plastics - Determination of burning behavior by oxygen index - Part 2: Ambient-temperature test

GB/T 5454 Textiles-Burning behavior - Oxygen index method

GB 8410 Flammability of automotive interior materials

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 10707 Rubber - Determination of the burning

GB/T 11785 Reaction to fire tests for floorings - Determination of the burning behavior using a radiant heat source

GB/T 15089 Classification of power-driven vehicles and trailers

GB/T 20285 Toxic classification of fire effluents hazard for materials

GB/T 32086 Requirement of vertical flammability characteristic and test method for certain category automobile interior material

JT/T 1094 Safety specifications for commercial bus

3 Terms and definitions

The terms and definitions, as defined in GB/T 15089 and JT/T 1094, as well as the following terms and definitions, apply to this document.

3.1

Oxygen index

Under the specified test conditions, when the mixed gas of oxygen and nitrogen at a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ is introduced, the minimum oxygen concentration, that can just maintain the combustion of the material, expressed in volume fraction.

[Source: GB/T 2406.2-2009, 3.1, modified]

3.2

Density of smoke

The measure of the amount of smoke, which is produced by a material, under specified test conditions, expressed by the attenuation of light intensity passing through the smoke.

[Source: GB 38262-2019, 3.5]

3.3

Smoke toxicity

The degree of damage or injury, which is caused by the toxic and harmful substances in the smoke.

[Source: GB 8624-2012, 3.19, modified]

3.4

Melting behavior

The characteristics of melting droplets, foaming and other phenomena of material, under the impact of thermal radiation.

3.5

Capability to repel fuel or lubricant

The ability of the material to remain non-wetted, under the action of contact with

fuel oil.

3.6

Commercial bus interior materials

Single material or composite materials, which are used in commercial bus.

Note: The interior materials of commercial bus do not include electrical components (such as air-conditioning assembly control switches, wire harnesses, electrical control panels, navigators, radios, DVD modules, driving instrument clusters, and other electrical modules), lamps, steering wheels, airbags (curtain), body damping pads, sandwich panels whose outer layer is made of metal materials and whose inner layer is made of non-metallic materials.

3.7

Single material

A homogeneous monolithic material, which is composed of the same material.

Note: If different materials are intermittently joined together (such as sewing, welding, riveting), this material is not considered to be a composite material, BUT each material is a single material.

[Source: GB 8410-2006, 2.3, modified]

3.8

Composite material

The material, which is formed by two or more layers of similar or different materials, the surfaces of which are fully and tightly bonded together by different methods such as welding and bonding.

[Source: GB 8410-2006, 2.2, modified]

4 Technical requirements

4.1 Material classification

The interior materials of commercial bus shall be classified according to the applied materials in Table 1, included interior materials, used parts.

4.2.2 The size of the interior material shall be measured according to the largest rectangle, which is covered by the projection of its components assembled in the vehicle facing the occupant direction.

4.2.3 Interior parts, that meet the following minimum size requirements, shall be tested for flame retardancy:

- a) Interior parts, which have a width not less than 100 mm and a length not less than 356 mm;
- b) The same type of interior parts used inside the vehicle, which has a width of not less than 100 mm, the length of less than 356 mm but not less than 138 mm, meanwhile has an accumulative use length of not less than 1000 mm;
- c) The same type of interior parts used inside the vehicle, which has a width of not less than 100 mm but not less than 20 mm, the length of less than 356 mm, meanwhile has an accumulative use length of not less than 2000 mm.

4.2.4 If the interior parts contain cavities, meanwhile the parts without cavities do not meet the minimum size requirements, the test can be exempted.

4.2.5 When the interior parts can be separated into single material and composite material, the test results of the separated materials shall be judged according to the requirements in Table 2.

Example:

If the side panel is composed of PVC skin wrapped PP sheet, the PVC skin after splitting shall be judged according to the technical requirements of "Others" in Item 5 "Leather material" of Table 2; the PP sheet shall be judged according to the technical requirements of Item 1 "Interior panel" in Table 2.

4.2.6 When interior materials of the same material, process, thickness, manufacturer are used in multiple parts, the technical requirements shall cover the maximum limit requirements for all parts of the interior material.

5 Test method

5.1 Sampling of test samples

Sampling shall be carried out, according to the provisions of Appendix A.

5.2 Horizontal combustion

Carry out the test, according to the provisions of GB 8410.

5.3 Vertical combustion

Carry out the test, according to the provisions of GB/T 32086.

5.4 Oxygen index

5.4.1 Textile materials shall be tested, according to the provisions of GB/T 5454.

5.4.2 Rubber materials shall be tested, according to the provisions of GB/T 10707.

5.4.3 Plastics, fiber-reinforced plastics, leather materials and other materials shall be tested, according to the provisions of GB/T 2406.2.

5.4.4 To carry out the oxygen index test of the interior material, it may use the simplified method C in Chapter 10 of GB/T 2406.2-2009, meanwhile explain it in the test report.

5.5 Smoke density

Carry out the test, according to the provisions of GB/T 8627. The test result is expressed by the smoke density level.

5.6 Combustion performance level

Carry out the test, according to the provisions of GB/T 11785 and GB/T 8626.

5.7 Levels of smoke production characteristics

Carry out the test, according to the provisions of GB/T 11785.

5.8 Smoke toxicity level

Carry out the test, according to the provisions of GB/T 20285.

5.9 Melting properties

Carry out the test, according to the provisions of Appendix B.

5.10 Capability to repel fuel or lubricant

Carry out the test, according to the provisions of Appendix C.

6 Transition period requirements for implementation

Models that have obtained type approval will be implemented on the 13th month, from the date of implementation of this document.

specimen support shall be a metal ring.

B.1.3 Stainless steel grid

The structure of the stainless steel grid is as shown in Figure B.1. The size shall meet the following requirements:

- a) Mesh size: A square with a side length of 2.1 mm;
- b) Diameter of stainless steel wire: 0.7 mm.

B.1.4 Containers

B.1.4.1 The container is a cylindrical tube, which has an inner diameter of 118 mm and a depth of 12 mm. See Figure B.1 for the structure. Absorbent cotton shall be laid flat in the container.

B.1.4.2 The electric heater is installed on the top of the support, with the radiating surface facing down, meanwhile the radiating surface shall be able to completely cover the surface of the specimen. The electric heater shall have a corresponding displacement device, to realize slow removal and reset; the electric heater, specimen holder and container shall be kept on the same vertical plane.

B.2 Electric heater

B.2.1 Confirmation of electric heater

Electric heaters shall be verified by a pyranometer with a measuring range not exceeding 10 W/cm^2 . The irradiated surface of the pyranometer is round and flat, which has a surface diameter of not more than 10 mm, meanwhile it is coated with a heat-resistant matte black coating. The bolometer shall be placed in a circular polished metal panel, which has a diameter of 25 mm. The bolometer shall have a water cooling system; the bolometer accuracy shall not exceed $\pm 3\%$.

B.2.2 Validation period

The power of the electric heater is 3 W/cm^2 ; it shall be confirmed once it has been used for 50 hours. If the power deviation is greater than 0.06 W/cm^2 during confirmation, the electric heater shall be readjusted and confirmed.

B.2.3 Validation process

The instrument is placed in an environment which has no air circulation (air velocity does not exceed 0.2 m/s). Place the bolometer at the position, where the specimen is placed in the instrument, to ensure that the bolometer is located in the center of the radiation surface. Turn on the power and control the input power of the electric heater to 3 W/cm^2 as required. If the bolometer shows 3 W/cm^2 continuously within 5 minutes without adjusting the power, the electric heater is considered to be stable.

B.3 Specimen

B.3.1 Specimen size

B.3.1.1 The size of the specimen is 70 mm in length, 70 mm in width, no more than 13 mm in thickness.

B.3.1.2 When the thickness of the interior material exceeds 13 mm:

- a) When the interior material is a single material, use mechanical methods to cut from the non-exposed surface, so that the thickness of the specimen including the exposed surface is 13 mm, AND the number of specimens is 4;
- b) When the interior material is a composite material, mechanical methods shall be used to sample from the front and back. The front sampling shall be cut from the non-exposed surface, so that the thickness of the specimen including the exposed surface is 13 mm; the reverse sampling shall be cut from the exposed surface, so that the thickness of the specimen including the non-exposed surface is 13 mm. The number of specimens is 4 on the front and 4 on the back.

B.3.1.3 Before the test, each specimen shall be weighed and recorded; the mass of each specimen shall not be less than 2 g. If the mass is less than 2 g, the mass of the specimen can be made to meet the test requirements by stacking; meanwhile the mass of the specimen after stacking can be recorded.

B.3.2 Specimen pretreatment

Before the test, the specimen shall be placed at least 24 h, under the conditions of temperature $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and relative humidity $50\% \pm 5\%$.

B.3.3 Absorbent cotton pretreatment

Before the test, the absorbent cotton shall be placed for at least 24 hours at a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and a relative humidity of not more than 20%.

B.4 Test method

B.4.1 Place the specimen on the support. Ensure that the distance -- between the specimen on the support and the radiation surface is 30 mm. At the same time, adjust the container containing the absorbent cotton, to keep the distance -- between the top of the absorbent cotton and the bottom of the support grid -- at 300 mm.

B.4.2 Before the test, first rotate the electric heater away from the specimen, to ensure that the specimen is not radiated; then turn on the electric heater. When the radiation power reaches 3 W/cm^2 , set the test time for 5 minutes. Then rotate the electric heater, to directly above the specimen. Start timekeeping.

B.4.3 During the test, if the specimen does not burn within 5 minutes, the test ends. If

The test liquid shall be No.0 diesel.

C.2.3 Specimen pretreatment

The specimen is placed at a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and a relative humidity of $50\% \pm 5\%$, for 24 hours. Then the test is carried out immediately.

C.3 Test environment

The entire test process shall be carried out in an environment with a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and a relative humidity of $50\% \pm 5\%$.

C.4 Test method

C.4.1 The specimen shall be weighed before the test.

C.4.2 Place the exposed surface of the specimen upwards, on the base of the equipment. Place the metal cylinder at the center of the specimen. Apply sufficient pressure through the stud, to make the metal cylinder tightly bonded to the specimen.

C.4.3 Inject the test liquid into the metal cylinder, to a height of 20 mm. Then let it stand for 24 hours. The liquid shall not leak during the test.

C.4.4 After the test, take out the test liquid first. Then loosen the stud, to remove the metal cylinder. Finally take out the specimen. If a residue of the test liquid is found on the specimen, it shall be removed without compressing the specimen. The specimen shall be weighed, after removing the residue.

C.5 Result determination

If the mass of the specimen, after the test, increases by no more than 1 g, as compared with the mass of the specimen, before the test, it is judged as qualified.

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