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Requirements and test methods relating to the spray-suppression systems of motor vehicles and their trailers

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Foreword

All technical content of this Standard is compulsory.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuer of this document shall not be held responsible for identifying any or all such patent rights.

This Standard was proposed by and shall be under the jurisdiction of the Ministry of Industry and Information Technology of the People's Republic of China

The drafting organizations of this Standard: Dongfeng Motor Corporation, National Passenger Car Quality Supervision and Inspection Center, China FAW Group Corporation R&D Center, China Quality Certification Center, Hubei Qixing Autobody Co., Ltd.

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Requirements and test methods relating to the spray-suppression systems of motor vehicles and their trailers

1 Scope

This Standard specifies the performance requirements and test methods of the spray-suppression systems of motor vehicles and their trailers.

This Standard applies to:

- a) the spray-suppression systems which are installed on the vehicles of categories N and O;
- b) the complete vehicles of categories N and O on which the spray-suppression systems defined in 3.1 are installed;
- c) the wheels which is covered by driver's cab for the vehicle chassis having a driver's cab;
- d) the vehicles of category N₁, and the vehicles of category N₂ whose designed permissible maximum laden mass is not greater than 7 500 kg. The requirements of this Standard may be deemed to have been met if they are installed with the wheel guards specified in GB 7063.

This Standard does not apply to the vehicles of category G which are defined in GB/T 15089.

The installation of the spray-suppression devices defined in 3.2 of this Standard is voluntary for the following vehicles; and if these vehicles are installed with the spray-suppression devices, then the requirements of this Standard shall be met:

- a) the categories N₁, O₁, O₂ vehicles of which the permissible maximum laden mass is not greater than 7 500 kg;
- b) for the vehicle chassis having a driver's cab, the wheels which are not covered by driver's cab;
- c) the chassis having no driver's cab;
- d) the vehicles on which it is impossible to install the spray-suppression devices under normal service conditions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to This Standard.

GB/T 3730.1, *Motor vehicles and trailers - Types - Terms and definitions*

GB 7063, *The wheel guards of motor vehicles*

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

3 Terms and Definitions

For the purposes of this document, the following terms and definitions and those defined in GB/T 3730.1 and GB/T 15089 apply.

3.1

spray-suppression system

A system which is used to reduce water sprayed from tires during vehicle operation. A spray-suppression system usually comprises mud guard, outer valance and rain flap.

3.2

spray-suppression device

It is a part of spray-suppression system which includes the following two parts:

3.2.1 air/water separator

It constitutes a part of outer valance and/or rain flap, which can let air through and reduce water mist spray.

3.2.2

energy absorber

A part of mud guard, and/or outer valance, and/or rain flap, which can absorb the energy of water spray to reduce water mist spray.

3.3

mud guard

6.1.2.4 When vehicles are running, no opening of spray overflow is allowed, which is located within outer valances or between outer valances and other parts of mud guards.

6.1.2.5 When outer valances comprise different components in relative movement, the compliance with the requirements of 6.1.2.3 and 6.1.2.4 is not necessary in local areas.

6.1.2.6 For semitrailer towing vehicles whose chassis is low, i.e. the height of saddle is not greater than 1 100 mm, the compliance with the requirements of 6.1.1.1a), 6.1.1.3 and 6.1.2.4 is not necessary.

When a towing vehicle is connected with a trailer, it is not necessary for mud guards and outer valances to cover the top of rear axle tires to prevent damages of the spray-suppression devices.

Within the tire areas where the vertical lines going through wheel center are greater than 60° in both forward and backward directions, mud guards and outer valances of vehicles shall meet the requirements of 6.1.1 and 6.1.2.

When these vehicles are operating in the status of towing semitrailers, the design of vehicles shall ensure they meet the requirements of 6.1.2. The manufacturer can take appropriate measures for mud guards and outer valances to conform to the requirements of this Clause, e.g. a detachable part is contained.

6.1.3 Rain flap

6.1.3.1 The width of rain flaps shall meet the requirements of 6.1.1.1c) for “ q ”; except that rain flaps are located within mud guards, the width of rain flaps then is not smaller than the width of the tread of tires. The width of rain flaps beneath mud guards shall meet the requirements of this clause, with the deviation of each side not greater than 10 mm.

6.1.3.2 The orientations of rain flaps shall be basically vertical.

6.1.3.3 The distance between the lower edge of rain flaps and the ground is not greater than 200 mm (see Figure C.4).

When the radial distance R_v of the lower edge of the last axle's outer valances is not greater than the radius of tires which are installed on the axle, the distance may be improved to 300 mm.

If rain flaps technically influence the performance of suspension, the maximum height of their lower end may be improved to 300 mm.

6.1.3.4 The horizontal distance between rain flaps and last edge of tires shall not exceed 300 mm.

6.1.3.5 For multiple axles that the distance “ d ” between adjacent axle tires is less than 250 mm, only the last group of wheels shall be installed with rain flaps. When the

installed which meet the requirements of 4.1.

6.2.3 Rain flap

Rain flaps shall extend to the lower part of mud guards and meet the requirements of 6.1.3.1 to 6.1.3.9.

6.3 Requirements for the air/water separation type of spray-suppression systems on axles where steered or non-steered wheels are installed

6.3.1 Mud guard

6.3.1.1 Mud guards shall meet the requirements of 6.1.1.1c).

6.3.1.2 For single axles or multiple axles that the distance “ d ” between adjacent axle tires is greater than 300 mm, mud guards shall meet the requirements of 6.1.1.1a).

6.3.1.3 If the distance “ d ” between adjacent axle tires is not greater than 300 mm, mud guards shall meet the requirements shown in Figure C.8.

6.3.2 Outer valance

6.3.2.1 The lower edge of outer valances shall be installed with an air/water separation spray-suppression device which meets the requirements of 4.2.

6.3.2.2 For single axles or multiple axles that the distance “ d ” between adjacent axle tires is greater than 300 mm (see Figures C.7 and C.8), the lower edge of the spray-suppression device installed to the outer valances shall have the following maximum dimensions and radii when measurement is conducted from wheel center:

- a) axles which are installed with steered or self-steered wheels: from the front edge (peak C at 30°) to the rear edge (peak A at 100 mm), $R_v \leq 1.05 R$;
- b) axles which are installed with non-steered wheels: from the front edge (peak C at 20°) to the rear edge (peak A at 100 mm), $R_v \leq 1.00 R$.

NOTE: R -- the radius of tires installed on vehicles; R_v -- the radial distance from the lower edge of outer valance to wheel center.

6.3.2.3 For multiple axles that the distance between adjacent axle tires not greater than 300 mm, the outer valances located in the areas between axles shall extend downwards in accordance with the trajectory specified in 6.3.1.3, not exceeding the horizontal straight line 100 mm of wheel center (see Figure C.8).

6.3.2.4 The depth of all points on the outer valances behind the vertical line going through wheel center shall extend 45 mm at least; and the depth of the valances before the line can be reduced gradually.

6.3.2.5 No opening is allowed between the inner or outer guards of outer valances and the mud guards, which let water spray through.

Annex A

(Normative)

Measuring method of the energy absorbing type of spray-suppression devices

A.1 Test objective and principle

A.1.1 Measure quantitatively the capability of the spray-suppression devices to trap water mist.

A.1.2 Use a series of nozzles to spray deionized water to the spray-suppression devices and simulate the flow quantity and velocity of water mist thrown up by tire surface from the ground to simulate the working conditions of vehicles in operation.

A.2 Test equipment

For the test equipment used in this annex see Figure A.1.

A.3 Test conditions

A.3.1 Test shall be conducted in a windless, closed space.

A.3.2 Environmental temperature and sample temperature shall be maintained at $(21 \pm 3)^{\circ}\text{C}$.

A.3.3 Deionized water shall be used in test.

A.3.4 Test sample for each test shall be soaked in advance.

A.4 Test process

A.4.1 Fix a test sample which is 500^{+0}_{-5} mm wide and 750 mm high to the vertical frame of test equipment; ensure test sample is located within the range of collector; and there is no obstacle before and after impact, which will deflect water flow.

A.4.2 Adjust the spray flow to (0.675 ± 0.01) L/s; spray at least 90 L and at most 120 L of deionized water to test sample; and during test, the horizontal distance from water blowholes to test sample is (500 ± 2) mm (see Figure A.1).

A.4.3 Let water on test sample drip into the water collector and calculate the percentage of water collection in this test.

A.4.4 In accordance with the requirements of A.4.2 and A.4.3, repeat test for 5 times and calculate the average percentage of water collection for 5 tests.

Annex B

(Normative)

Measuring method of the air/water separation type of spray-suppression devices

B.1 Test objective and principle

In order to test the effectiveness of porous material to collect water, water is sprayed by an air/water pressure sprayer.

The equipment for test shall be capable of simulating the service environment of material, i.e. it is the corresponding flow quantity and velocity of the water spray generated by tires if the equipment is installed on vehicles.

B.2 Test equipment

B.2.1 Test equipment in this annex is as shown in Figure B.1.

B.2.2 Mist sprayer shall meet the following criteria:

- pressure at nozzle: $0.5^{+0.05}_0$ MPa;
- nozzle diameter (5 ± 0.1) mm;
- flow velocity: $1 \text{ L}/(60 \pm 5) \text{ s}$;
- shape of mist spray: rounded, diameter about (50 ± 5) mm;
- distance from nozzle to sample: (200 ± 5) mm.

B.3 Test conditions

B.3.1 Test shall be conducted in a windless, closed space.

B.3.2 Environmental temperature and sample temperature shall be maintained at $(21 \pm 3)^\circ\text{C}$.

B.3.3 Deionized water shall be used in test.

B.3.4 Test sample for each test shall be soaked in advance.

B.4 Test process

B.4.1 Fix a sample of effective area $305 \text{ mm} \times 100 \text{ mm}$ vertically to the test stand; and check and confirm that there is any gap between sample and upper curved plate and that the collector is placed correctly.

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