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General technical specification for mobile laboratory shelter

移动实验室实验舱通用技术规范

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General technical specification for mobile laboratory shelter

1 Scope

This Standard specifies the terms and definitions, classification, technical requirements, test methods, inspection rules, packaging, marking, storage, transportation, technical documents and other general technical requirements for mobile laboratory shelters.

This Standard applies to mobile laboratory shelters (hereinafter referred to as "shelters") used on land.

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 referenced document (including any amendments) applies.

GB 1589-2004, *Limits of dimensions, axle load and masses for road vehicles*

GB 7258-2012, *Safety specifications for power-driven vehicles operating on roads*

GB/T 13306, *Plates*

GB 14023-2011, *Vehicles, boats and internal combustion engine -- Radio disturbance characteristics -- Limits and methods of measurement for the protection of off-board receivers*

GB 16297-2004, *General technical specification for mobile laboratory shelter*

GB/T 18655-2010, *Vehicles, boats and internal combustion engines -- Radio disturbance characteristics -- Limits and methods of measurement for the protection of on-board receivers*

GB 19489, *Laboratories -- General requirements for biosafety*

GB/T 23334, *Open-type roof escape hatch on bus*

GB/T 25480-2010, *Basic environmental conditions and testing methods for transportation and storage of instruments*

GB/T 29473-2012, *Classification, code and marking of mobile laboratory*

GB/T 29474-2012, *General technical specification for the interior decoration material of mobile laboratory*

GB/T 29479-2012, *General requirements of mobile laboratory*

GJB 2093-1994, *General test methods for military shelter*

GJB 6109-2007, *General specification for military shelter*

JT/T 389-2010, *Specification for van trailers*

QC/T 452-1999, *General technical conditions stay car*

QC/T 484-1999, *Automobile -- Paint Coating*

YY 0569, *Class II biological safety cabinets*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 29479-2012 and GB/T 29473-2012apply.

4 Classification

4.1 According to different modes of movement, the shelters are divided into self-propelled mobile shelters, trailer-type mobile shelters, and square shelter-type mobile shelters.

4.2 According to different functions, the shelters are divided into physical mobile shelters, chemical mobile shelters, biological mobile shelters, and comprehensive mobile shelters.

5 Technical requirements

5.1 Environmental adaptability

5.1.1 The shelter shall be able to work normally under the following conditions:

a) Ambient temperature: -40℃ ~ +40℃. If necessary, the adaptable ambient temperature of the shelter can be specified separately as needed. However, it shall be clearly marked on the shelter sign;

b) Relative air humidity: below 95% (ambient temperature is 25℃);

c) Highways of Class IV and above.

5.1.2 The shelter shall have good impact resistance. It shall be able to work normally after the impact test under the test conditions of peak acceleration of (100±20) m/s^2 and pulse duration of (16 ±2) ms.

5.6 Safety

5.6.1 The safety of self-propelled mobile shelters shall comply with the regulations of GB 7258-2012.

5.6.2 The safety of the trailer-mounted mobile shelter shall comply with the regulations of JT/T 389-2010.

5.6.3 The safety of the shelter-type mobile shelter shall comply with the regulations of GJB 6109-2007.

5.6.4 The safety of the shelter shall also meet the following requirements:

a) Emergency exits shall be designed to facilitate emergency exit of personnel;

b) Smoke alarms and fire extinguishers shall be equipped, as well as toxic and harmful gas alarms;

c) Leakage protection devices and grounding devices shall be equipped. When the ambient temperature is 15℃ ~35℃ and the relative humidity is 45%~75%, the cold insulation resistance value of each circuit of the electrical circuit to the ground and between each other shall not be less than 2 MΩ.

5.6.5 The safety of biological mobile shelters shall also comply with the regulations of GB 19489.

5.7 Design and structure

5.7.1 General requirements

The structure of the shelter shall meet the needs of different calibration and testing work. According to functional needs, the shelter shall adopt the design structure of “three areas, two barriers”. By designing two isolation barriers in the shelter, the auxiliary equipment area, experimental operation area, and data processing area are relatively independent to meet the development of various functional subsystems of the shelter. The layout design in each area shall also comply with ergonomics principles.

5.7.2 Dimensions

5.7.2.1 The outer size limits of self-propelled and towed shelters shall be in accordance with the provisions of GB 1589-2004. The outer dimensions of the square shelter are in accordance with the provisions of GJB 6109-2007.

5.7.2.2 The dimensional deviation and geometric tolerance of the shelter shall meet the following requirements.

a) Length: When the shelter length L≤4000 mm, the length limit deviation is ±5 mm;

When the shelter length L>4000 mm, the length deviation shall not exceed 0.15% of

the shelter length;

b) Width: the limit deviation is ±8 mm;

c) Height on the longitudinal center plane: the limit deviation is ±8 mm.

5.7.3 Doors, windows, openings

A reasonable number of doors, windows and openings shall be set up according to the needs of the professional shelter. All shall ensure flexible opening and closing and reliable operation. Limiting mechanisms or fixing devices shall be provided.

5.7.4 Door lock

All door locks must be flexible to open and close. When locked from outside the shelter, the door can be opened from inside the shelter without tools.

5.7.5 Base plate load

The base plate bears the following static loads without plastic deformation or damage:

a) Uniform load: 1.5 kN/m^2;

b) Concentrated load: when the area is 500 mm×500 mm, the load is 3 kN.

5.7.6 Roof plate load

The roof plate bears the following static loads without plastic deformation or damage:

a) Uniformly distributed load: 1 kN/m^2;

b) Concentrated load: when the area is 300 mm×600 mm, the load is 1.5 kN.

5.7.7 Foot pedal

The shelter shall be equipped with auxiliary facilities for entering the shelter and getting to the roof. There shall be no plastic deformation or damage when bearing a vertical downward static load of 1.8 kN.

5.7.8 Leveling mechanism

Necessary supporting and balancing devices shall be provided. The accuracy can ensure the relative balance of the shelter during experimental operations.

5.7.9 Flooring and interior decoration

The decoration inside the shelter shall comply with the requirements of GB/T 29474-2012.

5.7.10 Materials

higher than 28℃.

5.10.3 Set up the temperature and humidity control system according to the test function requirements.

5.11 Water supply and drainage device

5.11.1 According to the needs of shelters with different functions, choose to equip them with water supply and drainage devices.

5.11.2 It shall be equipped with clean water tanks and sewage tanks, both equipped with water level display and alarm systems. There is a water filling port on the top of the clean water tank. There is a drain port at the bottom of the sewage tank to connect the anti-corrosion sewage pipe and the drain valve. An extension pipeline is provided for waste liquid discharge as needed.

5.11.3 It shall be equipped with a standard municipal water pipe quick interface and a special water-adding gun, as well as an extended water pipe of more than 30 m.

5.11.4 It shall be equipped with a test tube flushing pistol, emergency eyewash device, and emergency shower device if necessary.

5.11.5 Evacuation devices shall be provided. It shall have heat preservation and anti-freeze functions when necessary.

5.12 "Three wastes" treatment device

5.12.1 Set up reasonable exhaust gas collection and treatment devices as needed to ensure that the exhaust gas emissions from the shelter comply with the regulations of GB 16297-2004.

5.12.2 The shelter shall be equipped with clearly marked special containers for storing waste liquids, waste and other toxic and harmful wastes.

5.13 Disinfection device

The shelter shall be equipped with sterilization and disinfection devices.

5.14 Lighting devices

Reasonable working lighting and emergency lighting fixtures shall be installed in the shelter, to ensure that the illumination value of the work surface lighting is not less than 300 lx. The illumination value of emergency lighting shall not be less than 15 lx. The illuminance value of professional area lighting shall be determined according to needs.

5.15 Electrical installation

5.15.1 Power system

The shelter shall be equipped with 3 sets of power supply systems or interfaces, including external mains power supply, UPS power supply, and generator power supply. The power shall be able to meet the power supply needs of the experimental equipment during normal use. When there is no external mains power, it can provide continuous and stable power supply for no less than 4 hours through the on-board generator or UPS.

5.15.2 Power distribution system

5.15.2.1 A centralized control distribution box shall be used with protection functions such as voltage stabilization, short circuit, open circuit, overload, overvoltage, undervoltage, and leakage. Each power supply shall have a separate control switch and be controlled separately.

5.15.2.2 The power distribution system shall be equipped with a main power switch. The connections between electrical components and between electrical components and the shelter shall be firm and reliable. Protect against mechanical damage or corrosion.

5.15.2.3 All types of power cords and signal lines shall be routed in wire troughs. The wire troughs shall be neat, beautiful and durable.

5.15.2.4 A reasonable number of AC sockets and DC sockets shall be configured according to the needs of the professional shelter. Indicate the appropriate logo.

5.15.3 Grounding and lightning protection

The shelter shall be designed with effective grounding devices and lightning protection devices to ensure the safety of instruments, equipment and shelters in field operations. When the instrument is not working, the grounding device is required to be connected to the grounding chain mopping the ground. When the instrument is working, the grounding device is required to be connected to the external power supply ground wire or ground solder. At the same time, anti-static grounding shall be provided.

5.16 Intelligent system

5.16.1 The shelter shall be equipped with intelligent systems such as shelter automatic control system, information management system, video surveillance system, office automation system, automatic fire alarm system, and wireless data transmission system according to the needs of different functional shelters.

5.16.2 The shelter shall adopt new technologies such as the Internet of Things and automated control according to the needs of different functional shelters, so as to realize real-time monitoring of environmental indicators such as temperature, humidity, and atmospheric pressure in key parts of the shelter, AND to realize ventilation, water supply, drainage, lighting, power distribution, etc. controlled centrally.

5.17 Special facilities

Relevant special facilities and corresponding cabinet systems shall be equipped

a) Temperature is 15℃ ~35℃;

b) Relative humidity is 20%~80%;

c) The air pressure is 70 kPa~103 kPa.

6.1.2 General provisions for test samples

a) The shelter submitted for testing shall comply with the provisions of the design drawings and the requirements of the corresponding documents. It can only be submitted after passing the inspection;

b) When the test is required to be carried out on the shelter, the shelter shall be equipped with doors, windows and permanent components to have structural integrity;

c) Instructions for application of test conditions: the test conditions specified in this chapter, unless otherwise specified, are applicable to all test methods of this Standard;

d) Regulations on suspending the test: during the test, if one of the following situations occurs, the test shall be suspended. Retest after correction:

1) When the safe conduct of the test cannot be guaranteed;

2) When there is a large gap between the main performance (base plate load-bearing performance, light and watertight performance) and the design indicators, and adjustments are invalid or the existing structure cannot meet the requirements.

6.1.3 Contents of test inspection

The test samples of the test chamber shall be inspected. If necessary, the number of inspections can be appropriately increased during the test. Check for the following defects:

a) Delamination, voids, warping, damage or damage, and permanent deformation of the shelter’s panels, doors, and test specimens;

b) Movable parts such as doors, windows, orifice covers are inflexible in opening and closing or locking is unreliable;

c) Bending, looseness, movement or damage of mounting parts and fasteners;

d) Rust or plating peeling off of metal parts;

e) Other defects.

6.2 Environmental adaptability

6.5.3.2 Test

Use a 500 V megger to measure the insulation resistance of each electrical circuit to ground and between circuits.

6.6 Design and structure

6.6.1 Dimensions

Use a steel coil (plate) ruler to measure the overall dimensions, deviation and diagonal deviation of the shelter.

6.6.2 Doors, windows and openings

Visually inspect door, window, and opening settings.

6.6.3 Door lock

After the hatch is locked from the outside, the personnel in the shelter can open the hatch without tools.

6.6.4 Bottom plate load

6.6.4.1 Test conditions

a) The uniform load is 1.5 kN/m^2;

b) The concentrated load is on an area of 500 mm×500 mm, with a static load of 3 kN;

c) The above action time is 30 min.

6.6.4.2 Test

After the shelter is supported and leveled by the supporting leveling mechanism, the test shall be carried out in accordance with the test conditions of 6.6.4.1. During loading, the bottom plate of the shelter shall be inspected.

6.6.5 Roof load

6.6.5.1 Test conditions

a) The uniform load is 1 kN/m^2;

b) The concentrated load is on an area of 300 mm×600 mm, with a static load of 1.5 kN;

c) The above action time is 30 min.

6.6.5.2 Test

After the shelter is supported and leveled by the supporting leveling mechanism, the test shall be carried out in accordance with the test conditions of 6.6.5.1. During loading, movable parts such as doors, windows, holes, openings, and covers of the shelter shall be inspected.

6.6.6 Foot pedal load

The foot pedal load test shall be carried out in accordance with the provisions of test method 204 in GJB 2093-1994.

6.6.7 Leveling mechanism

The leveling mechanism test shall be carried out in accordance with the provisions of test method 505 in GJB 2093-1994.

6.6.8 Flooring and interior decoration

Floor and interior decoration tests are carried out in accordance with the regulations of GB/T 29474-2012.

6.6.9 Materials

Check the material's certificate, appearance and relevant inspection reports. The results shall comply with the provisions of 5.7.10.

6.7 Air supply device

Visually inspect the air supply settings.

6.8 Ventilation device

Visually inspect the ventilation device settings.

6.9 Temperature regulating device

6.9.1 Heating device

The low temperature test of the heating device shall be carried out in accordance with the provisions of 3.12 in QC/T 452-1999.

6.9.2 Refrigeration device

The high temperature test of the refrigeration device shall be carried out in accordance with the provisions of 3.13 in QC/T 452-1999.

6.9.3 Thermohygrometer

Visually inspect the thermohygrometer settings.

8 Packaging, marking, storage, transportation, technical documentation

8.1 Packaging

Packaging shall meet the following requirements:

a) Lock all doors, windows and openings;

b) Shelter accessories shall be packed in canvas sleeves;

c) Temporary anti-corrosion measures shall be adopted for uncoated exposed metal surfaces.

8.2 Marks

Install at least one trademark or factory mark and sign that can be permanently maintained on a readily visible part of the outer surface of the shelter. The type of sign shall comply with the requirements of GB/T 13306. Signage content shall include:

a) Name and code of the mobile laboratory shelter;

b) Working area of the mobile laboratory shelter;

c) Ambient temperature conditions that the mobile laboratory shelter is adapted to;

d) Overall dimensions (length × width × height);

e) Total mass, curb weight;

f) Date of manufacture, exit-factory number;

g) Name of manufacturer.

8.3 Storage

Storage shall meet the following requirements:

a) All supporting equipment shall be packed or fixed;

b) It shall be stored horizontally in a dry, ventilated, corrosive-gas-free place equipped with fire-fighting equipment. It shall be maintained according to the instructions.

8.4 Transport

When the shelter is transported by rail (or waterway), it is towed onto and off the ship.

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