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General requirements of

electric vehicle battery swap station

电动汽车电池更换站通用技术要求

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1 Scope

This Standard specifies the construction type, site selection, power supply system, charging and battery swap system, monitoring system, carriageways and parking spaces, civil engineering, safety and fire protection, marks, logos and others of the electric vehicle battery swap station.

This Standard is applicable to electric vehicle battery swap stations; it can also be referred by the electric vehicle battery distribution center for execution.

2 Normative references

The following documents are dispensable to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 14549 Quality of electric energy supply - Harmonics in public supply network

GB/T 29317 Terminology of electric vehicle charging/battery swap infrastructure

GB 50016 Code of design on building fire protection and prevention

GB 50034 Standard for lighting design of buildings

GB 50052 Code for design electric power supply systems

GB 50053 Code for design of 20kV and below substation

GB 50054 Code for design of low voltage electrical installations

GB 50057 Design code for protection of structures against lightning

GB 50140 Code for design of extinguisher distribution in buildings

DL/T 448 Technical administrative code of electric energy metering

DL/T 621 Grounding for AC electrical installations

DL/T 814 Function specification of distribution automation systems

DL 5027 Typical rules of fire protection for electric power installations

NB/T 33001 Specification for electric vehicle off-board conductive charger

3 Terms and definitions

The terms and definitions specified in GB/T 29317 are applicable to this document.

4 General principles

4.1 The battery swap station shall provide safe places to swap batteries for electric vehicle users; the swap and charging process of the battery box shall always be monitored.

4.2 The battery swap station shall be equipped with charging equipment, battery box swap, storage and transfer equipment, vehicle guidance system, battery detection and maintenance equipment, control room, distribution room, safety protection facilities, carriageway, parking space, operating room and other auxiliary facilities.

4.3 The arrangement of battery swap stations shall be convenient for the driving-in and driving-out of the electric vehicles and the operation of the battery box swap equipment.

5 Construction type

5.1 According to the served vehicle model, battery swap stations are generally divided into three types as follows:

a) Comprehensive battery swap stations: Battery swap stations provide services for electric commercial vehicles and electric passenger cars.

b) Battery swap stations for commercial vehicles: Battery swap stations provide services for electric commercial vehicles.

c) Battery swap stations for passenger cars: Battery swap stations provide services for electric passenger cars.

5.2 According to the function, battery swap stations are divided into Class A and Class B:

a) Class A battery swap stations: It has the ability to charge the battery box and to swap the battery box for users of electric vehicles.

b) Class B battery swap stations: It has the ability to swap the battery box for users of electric vehicles; the charging of the battery box is completed at the battery

8.2.3 The battery box shall be equipped with temperature adjustment function.

8.2.4 The battery box shall be equipped with the necessary mechanical strength and protection grade.

8.2.5 Structural parts mounted inside the battery box shall ensure the reliable series-parallel among battery cells.

8.3 Battery box connector

8.3.1 The battery box connector SHOULD be in the structure of strong and weak electricity separation, and has mis-plug prevention function.

8.3.2 The battery box connector shall contain positive pole, negative pole, earthing pole, communication, guidance, auxiliary power supply and other terminals.

8.3.3 The battery box connector shall have the necessary position correction function to ensure the accurate and reliable connection of terminals.

8.3.4 The necessary measures shall be taken for the battery box connector to ensure the safe and reliable electrical connection during the use process.

8.3.5 Under normal circumstances, the service life of the battery box connector shall not be less than 10 000 times.

8.4 Charging rack

8.4.1 The charging rack shall match with the battery box, and SHOULD be framework composition.

8.4.2 The mechanical strength of the charging rack shall meet the bearing requirements for the battery box.

8.4.3 The charging rack shall be equipped with the guidance function for the battery box and shall have the battery box limit, locking devices.

8.4.4 The charging rack shall have the function for displaying battery box in place, charging and fully charged.

8.4.5 The charging rack SHOULD be equipped with the corresponding device to cooperate with the battery box to adjust the battery temperature.

8.4.6 The charging rack shall be equipped with the necessary security alarm function.

8.5 Battery box storage rack

8.5.1 The battery box storage rack SHOULD match with the battery box, and adopt framework combination.

8.5.2 Mechanical strength of the battery box storage rack shall meet the bearing requirements for the battery box.

8.5.3 The battery box storage rack shall be equipped with the battery box limit, locking devices and SHOULD have the guidance function for the battery box.

8.6 Battery box swap equipment

8.6.1 The swap time for the battery box in the passenger car SHOULD not be more than 300s, while that of the commercial vehicle SHOULD not be more than 600s.

8.6.2 The battery box swap equipment shall be equipped with maximum power limit, anti-dumping and other functions.

8.6.3 The automatic or semi-automatic battery box swap equipment shall be equipped with manual operation and emergency shutdown functions.

8.6.4 In the process of loading, carrying and unloading the battery box, the battery box swap equipment shall ensure the safety of operating personnel, vehicle and equipment.

8.7 Battery box transfer equipment

8.7.1 The battery box transfer equipment shall be equipped with capacities for safe, efficient transfer and transporting the battery box.

8.7.2 During transferring the battery box, it is necessary to ensure the safety of operating personnel and equipment.

8.8 Vehicle guidance system

8.8.1 Battery swap stations SHOULD be equipped with vehicle guidance system.

8.8.2 The vehicle guidance system shall be provided with the vehicle guidance and positioning functions.

8.8.3 The vehicle guidance system can be composed of mechanical components, sensing equipment, control equipment and other components.

8.9 Battery box detection and maintenance equipment

8.9.1 The battery box detection and maintenance equipment shall be equipped with a detecting function for the overall voltage of the battery box, the voltage of each cell, internal cell temperature and capacity of the battery box.

8.9.2 The battery box detection and maintenance equipment shall be equipped with a detecting function for the insulating property of the battery box and shall be able to detect the insulating property of each cell battery or battery module.

9.8 The reliable security isolation facilities shall be used for the monitoring system when interconnecting with other information systems.

9.9 The monitoring system shall be equipped with an uninterruptible power supply.

10 Carriageway and parking space

10.1 According to the scale of the battery swap station and the layout of the equipment, the carriageway can be one-way or two-way lanes; the width of the one-way lane shall not be less than 3.5m and that of the two-way lane shall not be less than 6m.

10.2 The radius of turning circle for the roads in the station SHOULD be determined by the served vehicle models, and shall not be less than 9m.

10.3 The right number of temporary parking space SHOULD be set in the station.

10.4 The electric vehicle of which battery box is being swapped shall not impede the normal access or parking of other vehicles.

11 Civil engineering

11.1 The battery swap station shall include a building complex, carriageways inside and outside the station, temporary parking space, etc. The general layout shall be conducted in accordance with the process requirements and the construction scale and in combination with the terrain and traffic conditions.

11.2 The flat slope shall be used for the vertical layout of the site, and a smooth path for the site drainage SHOULD be ensured.

11.3 The municipal water shall be used in priority for the water supply in the station area. The waste water in the station shall be discharged to the municipal pipe network or used for station greening when it is qualified after processing; the water logging in the outdoor cable conduit shall be discharged to the nearest rainwater pipe network in the station.

11.4 The heating and ventilation shall meet the temperature control requirements for the charging and storage of battery box.

11.5 The charging area and battery box swap area shall be under ventilation conditions.

11.6 The electrical lighting shall conform to the relevant requirements of GB 50034.

12 Safety and fire protection

12.1 The battery swap station shall be in compliance with the relevant requirements of GB 50016, GB 50140 and DL 5027.

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