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GB/T 18166-2008

Replacing GB 18166-2000

Specifications of amusement rides monorail category

架空游览车类游艺机通用技术条件

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Foreword

This standard replaces GB 18166-2000 “Specifications of amusement rides monorail category”. As compared with GB 18166-2000, the main changes of this standard are as follows:

- In Chapter 1 “Scope”, ADD the design, manufacture, alteration, inspection and installation of overhead amusement rides.
- ADD the following clauses: Chapter 5 “Drive Systems”, Chapter 6, “Electrical and control system”, Chapter 7 “Tracks and columns”, Chapter 8 “Vehicles”, Chapter 9 “Safety facilities”, AND Chapter 10 “Manufacture and installation”.
- CHANGE the original “technical requirements” to Chapter 4 “Basic design requirements”; ADD all kinds of loads to be considered in design; ADD the design calculations: including stress and stiffness calculation, fatigue strength, and so on.
- In Chapter 6 “Electrical and control system”, mainly ADD and MODIFY the following contents: ADD the requirements to be followed by the electrical and control system as well as the use of programmable controllers; ADD the requirements for transformers.
- In Chapter 7 “Track and column”, ADD the structural requirements of the track and column; ADD the temperature stress control requirements;
- In Chapter 8 “Vehicles”, ADD the requirements for foot pedal.
- In Chapter 9 “Safety facilities”, ADD the requirements for safety marking.
- In Chapter 11 “Test method”, DELETE the electrical parameter measurement.
- In Chapter 12 “Inspection rules”, ADD three serious product defects: lack of emergency button and button type failing to comply with requirements; safety handle and foot pedal damage and fail; lack of emergency rescue measures.
- ADD the provisions of Appendix A (normative) on “main parts”, “important shafts and pins”, and “important welds”.

Appendix A of this standard is a normative appendix.

Specifications of amusement rides monorail category

1 Scope

This standard specifies the general technical conditions and technical requirements of the amusement rides monorail category.

This standard applies to the design, manufacture, installation, alteration, maintenance, testing, inspection and use management of the amusement rides monorail category.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 1447 Fiber-reinforced plastics composites - Determination of tensile properties

GB/T 1449 Fiber-reinforced plastics composites - Determination of flexural properties

GB/T 1451 Fiber-reinforced plastics composites - Determination of Charpy impact properties

GB 5226.1 Safety of machinery - Electrical equipment of machines - Part 1: General requirements (GB 5226.1-2002, IEC 60204-1:2000, IDT)

GB/T 7403.1 Lead-acid traction batteries (GB/T 7403.1-2008, IEC 60254-1:2005, Lead-acid traction batteries - Part 1: General requirements and methods of test, MOD)

GB 8408-2008 Amusement device safety code

GB/T 15706 (all parts) Safety of machinery - Basic concepts and general principles for design

GB 16754 Safety of machinery - Emergency stop - Principles for design (GB 16754-1997, eqv ISO/IEC 13850:1995)

GB/T 16855.1 Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (GB/T 16855.1-2005, ISO 138491:1999, MOD)

GB 19212.1 Safety of power transformers, power supplies, reactors, and similar products - Part 1: General requirements and tests (GB 19212.1-2003, IEC 615581:1998, MOD)

GB/T 20438 (all parts) Functional safety of electrical / electronic / programmable electronic safety-related systems

GB 50017-2003 Code for design of steel structures

GB 50231 General code for construction and acceptance of mechanical equipment installation engineering

GB 50256 Code for construction and acceptance of electric device of crane electrical equipment installation engineering

3 General

3.1 The amusement rides monorail category the amusement rides running along the overhead track AND are driven by manpower, internal combustion engine and electricity, including those of the similar movement types (hereinafter shortly referred to as amusement ride).

3.2 The design, manufacture, installation, alternation, maintenance, test and use management of amusement rides shall follow this standard AND comply with the requirements of GB 8408-2008.

3.3 The design, manufacture, installation, and use of amusement rides shall ensure personal safety.

3.4 Other requirements not mentioned in this standard shall be carried out in accordance with the relevant national standards, norms and regulations.

4 Basic design requirements

4.1 Basic requirements

6.5.1 It is preferable for the electrical cable (wire) connection between vehicles to have electrical plug.

6.5.2 The slip cable and slider shall comply with the provisions of GB 50256.

6.6 The grounding system shall comply with the provisions of 6.6.1, 6.6.2 and 6.6.4 of GB 8408-2008; AND the insulation resistance between the track and the conductor rail shall be not less than 0.1 MΩ.

6.7 There shall be a short-circuit protection device on the electric amusement ride.

6.8 Battery-powered amusement ride

6.8.1 The battery shall be fixed firmly.

6.8.2 The battery shall be sealed well AND free from leakage or seepage; AND the technical performance of the lead-acid battery shall comply with the provisions of GB/T 7403.1.

6.8.3 Under the rated load, the continuous working hours of the battery based on actual working conditions shall be not less than 4 h.

6.9 Decorative lighting

6.9.1 When the decorative lighting voltage is easy to be accessible by the passengers, it shall use the safety voltage of not more than 48 V.

6.9.2 When the decorative lighting voltage which is hard to be accessible by the passengers uses the unsafe voltage, it shall use leakage circuit protection device.

7 Track and column

7.1 The structural design of the track and column shall comply with the requirements of Chapter 8 of GB 50017-2003.

7.2 The distance between the columns of the amusement ride track shall be reasonably configured, the transition between the tracks of different curvature radius shall be smooth to ensure smooth operation of vehicles, AND it is not allowed abnormal shaking of the track and column during operation; the track design shall consider the impact of ambient temperature changes onto the stress, AND the deformation caused by stressed shall be able to be released.

- c) The clearance between the side wheel and the side of the track AND the clearance between the bottom wheel and the track shall be adjusted properly.

8.4.3 When using the rubber solid wheel or nylon wheel, the mechanical properties of materials shall comply with the provisions of GB 8408-2008. When using the rubber inflatable wheel, the inflatable pressure shall be moderate.

8.5 The footrest of the overhead bike shall comply with the following requirements:

- a) The pedal surface shall be reliably installed, AND have anti-slip measures;
- b) The upper and lower surfaces of the pedals shall have treads AND be flexible to flip.

8.6 The amusement ride driven by the internal combustion engine shall comply with the following requirements:

- a) The oil tank seal shall be reliable AND free from oil seepage;
- b) The reducer, clutch, and muffler shall be under good working conditions.

9 Safety facilities

9.1 amusement ride shall be subjected to appropriate safety analysis and safety assessment, with the safety assessment content and scope in line with the requirements of 7.1.2 in GB 8408-2008. There shall be appropriate safety measures in respect of the safety of passengers.

9.2 The safety signs shall be set to comply with the provisions of 7.1.6 in GB 8408-2008.

9.3 The safety fence, platform and operating room shall be set to comply with the provisions of 7.8 in GB 8408-2008.

9.4 The safety distance shall comply with the provisions of 7.9.3 in GB 8408-2008.

9.5 The vehicle anti-collision and buffer device shall comply with the provisions of 7.3.1 in GB 8408-2008.

- a) CONDUCT test run at rated load before the test;
- b) DETERMINE the stain value of each point under the working conditions as listed in Table 1;
- c) REPEAT the test for not less than 3 times for each working condition.

11.9.3 The stress value test shall comply with the following requirements:

- a) As for the stress generated under the action of its own weight, the relevant units shall provide its calculated value;
- b) The stress value of each test point shall be the sum of the tested stress value under the effect of load AND the calculated stress value under the action of the deadweight.

11.9.4 Safety criteria for stress values

$$\text{Safety coefficient} = \frac{\text{Breaking strength of material}}{\text{Maximum stress at the test point}}$$

The maximum stress value of each test point shall comply with the safety coefficient value given in Table 2 of 4.5.2 in GB 8408-2008.

11.10 After the each test has been completed, it shall compile a test report with clear conclusions AND complying with relevant provisions.

12 Inspection rules

The product defects failing to comply with the standard requirements are divided into heavy defects and light defects, with the heavy defects as shown in Table 2. If each sample has more than 1 (inclusive) heavy defects OR more than 5 (inclusive) light defects, it is a disqualified product.

Table 2 Heavy defect items

Standard clause number	Defects
5.2	There is obvious slip during start and running, AND the drive system does not run normally. There is abnormal vibration, shock, heating, sound, and jamming during the whole machine operation.
11.8	In each operation test, the parts have permanent deformation or damage.
9.10	The brake device damages or fails.
6.2	The control system fails to comply with the operation conditions and passenger safety requirements of the amusement ride.

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