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Specifications of amusement rides fly tower category

飞行塔类游乐设施通用技术条件

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1 Scope

This Standard specifies the general rules, technical requirements, inspection, testing and test requirements, accompanying documents, marks, packaging, transport and storage of amusement rides fly tower category.

This Standard is applicable to amusement rides fly tower category.

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/T 191, *Packaging and storage marks*

GB/T 755, *Rotating electrical machines - Rating and performance*

GB/T 1184, *Geometrical tolerancing. Geometrical tolerance for features without individual tolerance indications*

GB/T 1804, *General Tolerances - Tolerances for Linear and Angular Dimensions without Individual Tolerance Indications*

GB/T 5226.1, *Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements*

GB 8408, *Large-scale amusement device safety code*

GB/T 8918, *Quality steel wire ropes*

GB/T 8923 (all parts), *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness*

GB/T 9286-1998, *Paints and varnishes - Cross cut test for films*

GB/T 13384, *General specifications for packing of mechanical and electrical product*

GB/T 13912, *Metallic Coatings - Hot Dip Galvanized Coatings on Fabricated*

5.2.2 The mounting surface of the anchor bolts shall be higher than the surrounding ground to avoid corrosion caused by standing water. Make sure that the bolt exceeds the nut by 2 to 3 times the pitch.

5.2.3 The perpendicularity tolerance of the center line of the tower structure to the installation datum horizontal plane shall not be greater than 1/1000.

5.2.4 The connection between the guide rail and the tower body shall be firm. There shall be no jamming during operation.

5.2.5 The height difference of the rail surface of the guide rail at the joint shall not be more than 1mm, the gap shall not be more than 2mm, and the lateral displacement shall not be more than 1mm.

5.2.6 The radial clearance between the guide wheel and the guide rail, for the single rail, shall not be greater than 5mm; for the double rail, shall not be greater than 10mm.

5.2.7 Non-destructive testing shall be carried out for important shafts (pin shafts) and important welds. Non-destructive testing methods and requirements are implemented in accordance with GB/T 34370. Important shaft (pin shaft) components shall be set with a unique inspection mark when leaving the factory, and 100% non-destructive testing shall be carried out. Important welds and important shafts (pin shafts) shall be confirmed by the design organization after safety evaluation. For the examples of common types of important shafts (pin shafts) and important welds, see Annex A.

5.2.8 For important shafts (pin shafts), the surface roughness of the mating surface shall meet the design requirements and shall not be less than 3.2μm.

5.2.9 Dimensional tolerances and geometric tolerances of parts and components shall meet the requirements of process documents. Unmarked dimensional tolerances and geometric tolerances of machined parts shall meet the relevant requirements of GB/T 1804 and GB/T 1184. Unmarked dimensional tolerances and geometric tolerances of the welded structure shall meet the relevant requirements of GB/T 19804.

5.2.10 The passenger part shall be stable when starting, lifting, rotating and stopping. There shall be no abnormal noise and stuck phenomenon during operation.

5.2.11 For the chains or wire ropes used to suspend the seat, when one of them is disconnected, the seat shall be able to maintain balance and ensure the safety of passengers. When necessary, two safety devices shall be installed.

5.2.12 In the hydraulic or pneumatic system, there shall be an overpressure protection device that does not exceed 1.2 times the rated working pressure.

5.3.1 The passenger device shall clearly indicate the rated number of passengers and the carrying weight.

5.3.2 When the passenger part is lifted and lowered by the oil cylinder or air cylinder, there shall be buffer measures or protective measures.

5.3.3 Floor-standing pods shall have cushioning devices at the landing feet.

5.3.4 The frame of the passenger part shall be made of metal structural materials. The seats shall be made of soft materials.

5.3.5 The steel wire rope used for hanging the passenger part shall meet the relevant regulations of GB/T 8918. Mechanical performance report of steel wire rope shall be provided with the equipment.

5.3.6 The amusement rides fly tower category that the acceleration is designed in area 4 and area 5 according to GB 8408, shall set two independent passenger restraint devices or a fail-safe restraint device. The restraint device shall be a safety bar. At least two sets of locking devices shall be installed on the safety bar. The locking device shall be easy to check.

5.3.7 When rotary flying chair series are in operation, the restraint device shall not be opened by the passengers. When necessary, safety devices shall be installed to prevent passengers from opening by themselves.

5.4 Electrical control system

5.4.1 Safety-related electrical control systems shall comply with the fail-safe principle. The design shall at least consider signal acquisition errors, control line disconnection, power supply line disconnection, short circuit, leakage and other faults to guide safety.

5.4.2 The electrical system shall meet the requirements of GB/T 5226.1.

5.4.3 The safety function of the control system shall adopt the relevant requirements of GB/T 16855.1. The control system that uses electrical and electronic programmable devices shall adopt the relevant requirements of GB/T 20438.

5.4.4 When the altitude of the place of use exceeds 1000m, the motor capacity shall be checked according to the provisions of GB/T 755. When it exceeds 2000m, electrical components shall be checked.

5.4.5 When the equipment height is greater than 45m, aviation obstacle warning lights shall be installed. Warning lights shall meet the requirements of MH/T 6012.

main electrical control system.

5.5.5 It shall be verified whether emergency rescue equipment, methods, procedures, passenger guidance measures, emergency rescue time and emergency drill frequency meet the requirements of design and related laws, regulations, and standards. Keep original records of emergency rescue related verification. The original record shall be an image and video record. At the same time, the above content shall be clarified in the operation and maintenance manual.

5.6 Surface protection

5.6.1 Appropriate surface protection measures shall be taken for the metal structure of amusement facilities, such as anti-rust paint, hot (dip) galvanizing and so on or stainless-steel materials.

5.6.2 Use anti-rust paint for surface protection of metal structures. De-rusting treatment shall be carried out before painting to reach level $\mathrm{Sa2}\frac{1}{2}$ in GB/T 8923. The components other than the main force-bearing components shall reach level Sa2 or St2 (hand rust removal). The paint surface shall be uniform, detailed, bright, complete and consistent in color. There shall be no defects such as roughness, leaking paint, wrong paint, wrinkles, pinholes and severe sagging. It is recommended that the total thickness of the paint film is not less than 80μm. The paint film adhesion shall meet the quality requirements of level 1 specified in GB/T 9286-1998.

5.6.3 The use of hot (dip) galvanizing for surface protection of metal structures shall meet the relevant regulations of GB/T 13912.

5.7 Whole machine

5.7.1 Before and after the operation test, the entire amusement device shall be visually inspected. The whole machine shall be in good appearance and no damage.

5.7.2 Among the main technical parameters, the static parameters such as the height of the equipment, the turning diameter, the number of cabins, and the number of passengers per cabin and so on shall meet the design requirements. The deviation of dynamic parameters such as rotational speed and operating speed from the design value shall be -10%~5%.

5.7.3 The equipment with the designed acceleration zone in area 3, area 4, and area 5 shall undergo acceleration test. The deviation between the test value and the design value (including impact coefficient) shall be controlled within 5%.

5.7.4 The function and performance of the whole machine shall meet the design

6.2.2 Mechanical structure test and transmission mechanism test: respectively under no-load, partial-load, and full-load working conditions, no less than 3 tests for each condition shall be carried out. The mechanical structure and transmission mechanism shall have no obvious shaking, slipping, stalling, noise, permanent deformation and so on.

6.2.3 Lift-fall test: respectively under no-load, partial-load, and full-load working conditions, during the lifting and falling movement, observe whether the operation is stable and whether the lifting and falling functions can be realized. No less than 3 tests shall be carried out for each working condition.

6.2.4 Rotation test: respectively under no-load, partial-load, and full-load working conditions, during the rotation movement, observe whether the operation is stable and whether the rotation function can be realized. No less than 3 tests shall be carried out for each working condition.

6.2.5 Suspended seat balance test: respectively under no-load, partial-load, and full-load working conditions, after simulating to loose any chain or wire rope, run in automatic mode. During the movement, observe whether the seat can maintain balance and ensure the safety of passengers. No less than 3 tests shall be carried out for each working condition.

6.2.6 Overvoltage protection device test: respectively under no-load, partial-load, and full-load working conditions, during exercise, observe whether the overpressure protection device is effective in the hydraulic or pneumatic system. If necessary, perform third-party verification. No less than 3 tests shall be carried out for each working condition.

6.2.7 Braking device test: respectively under no-load, partial-load, and full-load working condition, during the movement, observe whether the braking system produces a large impact during an emergency stop. After braking stops, whether the moving parts and the loading system remain stationary and whether the passengers are in a safe state. No less than 3 tests shall be carried out for each working condition.

6.2.8 Buffer device test: respectively under no-load, partial-load, and full-load working condition, run the device in manual mode. During the movement, observe whether the buffering device at the limit position of the lifting device and the buffering device at the landing foot of the landing pod are working effectively. No less than 3 tests shall be carried out for each working condition.

6.3 Ride system

6.3.1 Before and after the test, the inspection and testing of the loading system shall be carried out. The content includes at least seat steel structure connection, safety bar and its locking device, seat belt and its fixed connection.

maximum value.

6.4 Electrical control system

6.4.1 The electrical control system shall be inspected and tested before and after the test. The content includes at least various electrical control components, circuits and their connections, and safety interlock functions and so on.

6.4.2 Start the test. Respectively under no-load, partial-load, and full-load working condition, after pressing the start button, the equipment shall be able to start as normal. Test no less than 3 times for each working condition.

6.4.3 Stop the test. Respectively under no-load, partial-load, and full-load working condition, press the equipment's stop button and the equipment shall be able to stop as normal. Test no less than 3 times for each working condition.

6.4.4 Emergency stop test: respectively under no-load, partial-load, and full-load working condition, respectively in the low medium and high areas of lifting-falling, test the function of each emergency stop button. After pressing the emergency stop button, the moving part shall slow down or stop in a safe position. After resetting the emergency stop button, the moving part shall remain in the original position. Test no less than 3 times for each working condition.

6.4.5 Interlock test: respectively under no-load, partial-load, and full-load working condition, the pre-order action of the field simulation equipment is not ready and subsequent actions shall not be initiated. Test safety lever closing, locking, automatic door opening and closing, movable platform movement and so on. Test no less than 3 times for each working condition.

6.4.6 False start test: respectively under no-load, partial-load, and full-load working condition, the pre-order action of the field simulation equipment is not ready. Press the start button, the equipment shall not start. Test no less than 3 times for each working condition.

6.4.7 Deceleration brake device test: respectively under no-load, partial-load, and full-load working condition, slow down the equipment. The braking device shall be stable and effective. The braking time shall meet the design requirements. Test no less than 3 times for each working condition.

6.4.8 Stall protection device test: respectively under no-load, partial-load, and full-load working condition, simulate the system stall state. Check whether the stall protection device installed in the manned cabin that is harmful to stalls or vertically lifts is sensitive, effective and safe. Test no less than 3 times for each working condition.

6.7.6 Eccentric load test: the eccentric load test shall be loaded according to the eccentric load during design. Continuously operate 1h. The equipment shall be able to operate as normal.

6.7.7 Full load operation test: under uniformly distributed rated load, continuous operation is not less than 8h per day. Continuous and no-failure cumulative operation test is not less than 80h. The equipment shall be able to operate as normal.

6.7.8 Acceleration test: under no-load, partial-load, and full-load conditions, at least 3 measurements shall be carried out for each working condition. Take the maximum value as the test value.

6.7.9 Stress test: under no-load, partial-load, and full-load conditions, at least three locations with large stress values, such as the tower body, the rotating body, and the passenger part, are selected for testing according to the design calculation book. During the test, repeat the test at least 3 times for each measuring point under the same working condition. Take the maximum value as the test value. The stress generated under the action of its own weight shall be provided by the manufacturing unit with its calculated value or actual measured value. The stress value of each measuring point shall be the sum of the test value under load and the calculated stress value under its own weight.

6.7.10 Break rope protection device test: under full load conditions, simulate triggering the rope break protection device. Part of the lifting movement of the passengers shall be stopped and the passengers shall be in a safe state. Test no less than 1 time.

6.7.11 Safe distance test: under no-load, partial-load, and full-load conditions, simulate the safety envelope contour. During the operation of the equipment, the safety envelope profile shall not be damaged. Test no less than 3 times for each working condition.

7 Accompanying documents, marks, packaging, transport and storage

7.1 Accompanying documents, marks

7.1.1 The product shall include at least the following random documents before delivery, and shall be placed in the control cabinet box or the host box:

a) Product conformity certificate;

b) Product use and maintenance instructions and drawings for maintenance;

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