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Code for installation acceptance of electric lifts

电梯安装验收规范

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Code for installation acceptance of electric lifts

1 Scope

This document specifies the conditions, items, requirements, and rules for acceptance after completion of lift installation.

This document is applicable to traction lifts with a rated speed not exceeding 6.0 m/s and positive drive lifts with a rated speed not exceeding 0.63 m/s. For traction lifts with a rated speed exceeding 6.0 m/s, refer to this document for implementation, and the inapplicable parts shall be determined by the manufacturer (supplier) and the buyer through negotiation.

This document does not apply to hydraulic lifts, dumbwaiters, home lifts, goods lifts, and inclined lifts.

2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for referenced documents with dates, only the versions corresponding to the dates are applicable to this document; for referenced documents without dates, the latest versions (including all amendments) are applicable to this document.

GB/T 4208 Degrees of protection provided by enclosure (IP code)

GB/T 5226.1-2019 Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements

GB/T 7024 Terminology of lifts, escalators, passenger conveyors

GB/T 7588.1-2020 Safety rules for the construction and installation of lifts - Part 1: Passenger and goods passenger lifts

GB/T 10058-2023 Specification for electric lifts

GB/T 10059-2023 Testing methods for electric lifts

GB/T 16895.21-2020 Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock

GB/T 18894 Specification on electronic documents archiving and electronic

5.1.5 Phase-failure, phase mismatch protection and motor power cut-off inspection

5.1.5.1 According to the method specified in 5.1.1 of GB/T 10059-2023, disconnect any phase of the main power line, then the lift shall stop and remain in the stopped state. Exchange any two phases of the main power line, then the lift shall stop and remain in the stopped state, or can still run normally, run for inspection or in emergency electric operation in the direction before the phase line is exchanged.

5.1.5.2 Check the power supply circuit and control circuit of the lift machine motor directly powered by AC or DC power supply. At least two independent contactors shall be used for cutting off the power supply circuit, and the contacts of the contactors shall be connected in series. When the lift stops, simulate that the main contact of one of the contactors is not disconnected; at the latest, when the running direction changes next time, the fault shall be able to be detected and the car shall be prevented from running again. When the monitoring function fails, the car shall be prevented from running again.

5.1.5.3 Check the power supply circuit and control of the lift machine motor powered by the static element, which shall comply with the provisions of 5.9.2.5.4 of GB/T 7588.1-2020.

5.1.6 Electrical wiring and installation

5.1.6.1 Check the laying of the lift power line and control line. The lines should be laid separately or shielded. Check the metal casing (cover) of the electrical equipment that needs to be grounded in the design; it shall be equipped with an easily identifiable grounding terminal and be well grounded. Check the configuration of the grounding wire; the yellow and green two color insulated wires shall be directly connected to the grounding terminal, respectively. They shall not be connected in series before grounding.

Check the separate settings of the neutral conductor (N, zero wire) and the protective conductor (PE, ground wire) of the lift power supply.

5.1.6.2 Check the laying of wire tubes and wire troughs, which shall be straight, neat, and firm. Measure the fixed spacing of hoses and ends. The fixed spacing of hoses shall not be greater than 1 m, and the fixed spacing of ends shall not be greater than 0.1 m.

5.1.6.3 Check or review the data to confirm that the protection level of the protective enclosure (cover) of the electrical equipment in the well, machinery space and pulley room shall not be lower than IP2X specified in GB/T 4208. Check or review the data to confirm that the protection level of the connectors, terminals and connectors not set in the protective enclosure during connection and disconnection shall not be lower than IP2X, and they shall be properly fixed to prevent accidental loosening.

5.1.6.4 Verify that the additional protection and residual voltage protection shall comply with the requirements of 5.10.1.2.3 and 5.10.1.2.4 in GB/T 7588.1-2020.

5.1.6.5 Carry out the insulation resistance test between the energized conductor and the ground in accordance with the method specified in 6.11.1 of GB/T 10059-2023. The result shall comply with the provisions of 5.10.1.3.1 of GB/T 7588.1-2020.

5.1.7 Contactor and contactor relay

Check the type of contactor and contactor relay, which shall be AC-15 or DC-13 as specified in 5.10.3.1 of GB/T 7588.1-2020. Check the installation of the contactor and contactor relay, which shall be fixed reliably and wired firmly. Check the device identification, which shall be consistent with the electrical schematic.

5.1.8 Equipment installation

5.1.8.1 Measure the gap BETWEEN the suspension devices in the machine room and the pulley room AND each side of the floor hole, which should be 20 mm~40 mm. Check the setting of the ring frame around the hole leading to the well. Measure the height of the ring frame around the hole leading to the well; it shall be at least 50 mm higher than the floor or the ground after completion.

5.1.8.2 Review the information submitted by the construction unit to confirm that the length of the machine supporting beam for the lift machine embedded in the load-bearing wall shall not be less than the design value of the manufacturer.

5.1.8.3 When the overspeed governor is installed vertically to the horizontal plane, relative to the horizontal plane, the verticality of the end face of the overspeed governor rope sheave rim should not be greater than 2/1000; the verticality of the rim end faces of the traction sheave and deflector sheave, relative to the horizontal plane, should not be greater than 4/1000 under no-load or full-load conditions. When the overspeed governor is installed obliquely to the horizontal plane, it shall comply with the design requirements of the lift manufacturer.

5.1.8.4 Check and measure the installation position and deviation of the lift machine, guide device and suspension device, they all shall comply with the installation and construction requirements of the lift manufacturer.

5.1.8.5 Check the installation and operation of the overspeed governor. The action speed setting seal shall be intact, the installation position shall be correct, the base shall be firm, and the operation shall be smooth.

5.1.10 Protection of rotating parts

5.1.10.1 Check the setting of protective devices of traction sheave, pulley, sprocket, overspeed governor and tension pulley, which shall comply with the provisions of 5.5.7 of GB/T 7588.1-2020.

5.1.10.2 Check the setting of the protective device to prevent foreign matter from entering between the coated rope (belt) and the traction wheel and pulley, and verify or review the supporting documents [such as test (inspection) report] to confirm that the device can prevent sand particles with a diameter of not less than 2.5 mm from entering.

5.1.10.3 Check the protection of accessible rotating parts, which shall comply with the requirements of 5.9.1.2 of GB/T 7588.1-2020.

5.1.10.4 Check that the outer side of rotating parts such as brake pulleys, hand wheels, overspeed governor pulleys and unprotected traction sheaves are at least partially painted yellow. Check that the mechanical operating parts of the manual release brake are at least partially painted red.

5.1.11 Protection of motors and other electrical equipment

5.1.11.1 Review the power supply circuit diagram of the motor directly powered by AC or DC power supply to confirm that it has a short-circuit protection function.

5.1.11.2 Review the power supply circuit diagram of the motor and confirm that the overheat protection function complies with the requirements of 5.10.4.2 and 5.10.4.3 of GB/T 7588.1-2020.

5.1.11.3 Review the circuit diagrams of other electrical equipment and confirm that the protection functions comply with the requirements of 7.1~7.4 of GB/T 5226.1-2019.

5.1.12 Motor running time limiter

5.1.12.1 When the following two situations are simulated, the running time limiter of the traction lift motor shall cut off the power supply to the lift machine and keep it in the power-off state within the time specified in 5.1.12.2:

- a) When the lift is started, the lift machine does not rotate;
- b) The downward-moving car or counterweight stops due to an obstacle, causing the wire rope or coated rope (belt) to slip on the traction sheave.

5.1.12.2 Measure the action time t of the motor running time limiter in accordance with the method specified in 5.1.13.1 of GB/T 10059-2023. The time shall meet the

following requirements:

- a) When the lift's full running time is not less than 35 seconds, $t \leq 45$ seconds;
- b) When the lift's full running time is less than 35 seconds and greater than 10 seconds, $t \leq$ full running time plus 10 seconds;
- c) When the lift's full running time is no more than 10 seconds, $t \leq 20$ seconds;
- d) When a motor running time limiter is used as a protection against continuous relative slip between the traction sheave and the coated rope (belt), in addition to meeting the relevant requirements of items a)~c), t shall not exceed the limit value given by the manufacturer.

5.1.12.3 The method for restoring the normal operation of the lift shall be verified in accordance with the method specified in 5.1.13.2 of GB/T 10059-2023. The normal operation of the lift shall be restored only by manual reset. After the disconnected power supply is restored, the lift machine does not need to remain in the stopped position.

5.1.12.4 Verify the function of the motor running time limiter in accordance with the method specified in 5.1.13.3 of GB/T 10059-2023. The operation of the motor running time limiter shall not affect the maintenance operation and emergency motor operation.

5.1.13 Emergency operation

5.1.13.1 Simulate a power outage or malfunction of the lift and the car stops outside the unlocking zone to verify that the measures to move the car into the unlocking zone are effective.

5.1.13.2 Verify that the emergency operation function of the manual release brake complies with the provisions of 5.9.2.2.2.9 of GB/T 7588.1-2020. If the car moves to the nearby landing using the manual operation specified in 5.9.2.2.2.9b) of GB/T 7588.1-2020, verify that the manual operation complies with the provisions of 5.9.2.3.1 of GB/T 7588.1-2020.

5.1.13.3 Simulate emergency operation and verify that it shall be easy to observe the car reaching the unlocking zone through observation holes, markings on the suspension device or other means.

5.1.13.4 If the manual operating force required to move the car with rated load upward is greater than 400 N, or the mechanical device specified in 5.9.2.3.1a) of GB/T 7588.1-2020 is not installed, it shall be confirmed that an emergency electric operation control device that complies with 5.12.1.6 of GB/T 7588.1-2020 is installed.

5.1.13.5 Check the location of the emergency operating device, which shall comply

5.2.4 Guide rails

5.2.4.1 Check the layout and structural type of the car and counterweight (or balancing weight) guide rails. They shall be guided by at least two rigid steel guide rails. For the counterweight (or balancing weight) guide rails without safety gears, formed metal plates can be used and shall be protected against corrosion.

Review the data to confirm that the guide rails used comply with the requirements of the design calculation documents.

5.2.4.2 Check the configuration of the rail brackets for each guide rail. Each guide rail shall have at least two rail brackets. The number of brackets for non-standard length rails installed at the upper and lower ends of the well shall meet the design requirements. The distance between the brackets of the guide rails should not be greater than 2.5 m. If this requirement cannot be met, the calculation documents shall be reviewed to confirm that the installed guide rails meet the requirements of 5.7.2 of GB/T 7588.1-2020.

5.2.4.3 The depth of embedded parts of fixed guide rail brackets into the wall shall be confirmed by reviewing the information submitted by the construction unit and should not be less than 120 mm.

The guide rail bracket installed with building anchor bolts can only be used on concrete well components with sufficient strength. Check the installation method of the building anchor bolts, which shall be perpendicular to the wall surface, and measure the spacing between the anchor bolts and the distance between the anchor bolts and the edge of the component, which shall meet the use requirements of the building anchor bolts.

For guide rail brackets connected by welding, check the welds and there shall be no obvious defects.

5.2.4.4 Measure the guide travel of the car and counterweight (or balancing weight), they shall comply with the provisions of 5.2.5.6 of GB/T 7588.1-2020.

5.2.4.5 Measure the deviation of the working surface (including the side and top surfaces) of each row of guide rails relative to the installation reference line within every 5 m. The deviation shall not exceed the following values:

- a) For guide rails of the car and the counterweight guide rails equipped with safety gears, the deviation is 0.6 mm;
- b) For T-type counterweight guide rails without safety gears, the deviation is 1.0 mm.

For lifts with vertical guide rails, when testing the guide rails after the lift is installed,

continuous testing shall be carried out in sections of every 5 m relative to the plumb line (at least 3 times), and the relative maximum deviation among the measured values shall be no more than twice the value specified above.

5.2.4.6 Check the joints of the working surfaces of the car guide rails and the counterweight guide rails with safety gears. There shall be no continuous gaps. Measure the local gap value; the gap value shall not be greater than 0.5 mm. Use a straight ruler with a straightness of 0.01/300 or other tools to measure the step at the joint of the working surface; it shall not be greater than 0.05 mm.

The gap at the working surface joint of the counterweight guide rail without safety gear shall not be greater than 1.0 mm, and the step at the working surface joint shall not be greater than 0.15 mm.

5.2.4.7 Measure the distance between the top surfaces of different areas of two rows of guide rails. The allowable deviation of the distance value is:

- a) Car guide rail: ${}^{\pm 2}_0$ mm;
- b) Counterweight guide rail: ${}^{\pm 3}_0$ mm.

5.2.4.8 Check the fixing method of the guide rail on the guide rail bracket. It shall be fixed with a pressing plate instead of directly connecting it to the guide rail bracket by welding or bolts.

5.2.4.9 Check the car guide rails and counterweight guide rails equipped with safety gears. Except for those installed in suspension, make sure that the guide rail seats at their lower ends are supported on solid ground.

5.2.5 Counterweight and balancing weight

5.2.5.1 If the counterweight (or balancing weight) consists of counterweight blocks, the counterweight blocks shall be intact and fixed in the frame to prevent displacement. Check that the device to prevent the composite counterweight block or the pressed counterweight block from falling after breaking is installed securely.

5.2.5.2 Check the markings for the number of counterweights. They shall be easily and quickly identifiable by indicating the number of counterweights or the total height.

5.2.6 Traveling cable

Check the installation position and method of the traveling cable to confirm that it meets the following requirements:

- a) Both ends of the cable shall be securely fixed;

5.2.8 Buffer

5.2.8.1 Check and confirm that buffers are provided at the extreme positions of the bottom travel of the car and counterweight. Check and confirm that positive drive lifts are provided with buffers that act at the upper extreme positions of the travel.

5.2.8.2 When the buffer is fixed on the car or counterweight (except when the counterweight protection grid extends to within 50 mm from the bottom of the pit), check and confirm that the buffer impact area on the pit floor is provided with a support, and the height of the support shall be not less than 300 mm.

5.2.8.3 Check and confirm that the rated speed of lifts using energy storage buffers shall not exceed 1.0 m/s.

5.2.8.4 Review the data to confirm that the total stroke of the linear energy storage buffer shall not be less than $0.135 v^2$ (m) and the minimum value is 65 mm.

The stroke of the hydraulic buffer shall not be less than $0.0674 v^2$ (m).

5.2.8.5 For lifts with a rated speed greater than 2.5 m/s and using reducing-stroke buffers, review the data and confirm that the speed and stroke of the buffers shall comply with the provisions of 5.8.2.2.2 of GB/T 7588.1-2020, and the total stroke shall not be less than 0.42 m.

5.2.8.6 If more than one buffer is used at the bottom of the car or counterweight travel, when the car is at the upper and lower terminal landing leveling positions, measure the deviation of the vertical distance between the top surface of each buffer and its striking plate respectively, and the value should not be greater than 2.0 mm.

5.2.8.7 When the car is at the top terminal landing leveling position, check the permanent mark posted near the counterweight buffer, which shall clearly indicate the maximum allowable vertical distance between the top surface of the counterweight buffer and its striking plate. The actual vertical distance measured shall not be greater than the maximum allowable vertical distance.

5.2.8.8 The verticality of the plunger (or piston rod) of the hydraulic buffer relative to the horizontal plane shall not be greater than 5/1000, unless the design requires inclined installation.

5.2.8.9 Check the electrical safety device of the hydraulic buffer; it shall comply with the provisions of 5.11.2 of GB/T 7588.1-2020. Verify the function of the electrical safety device. The lift cannot be started until the buffer returns to its normal position after operation.

5.2.8.10 Check the filling volume of the hydraulic buffer, which shall comply with the

design requirements of the manufacturer.

5.2.8.11 Check the nameplate of the non-metallic non-linear energy storage buffer, review and confirm that the product batch number, specification parameters and product number are within the applicable scope of the type examination certificate, and confirm that the design service life is not less than the life given in the type examination certificate.

5.2.9 Pit

5.2.9.1 Check and confirm that the way to enter the pit is through the pit passage door or the ladder installed in the well. Check and measure the setting and size of the pit passage door and ladder, which shall comply with the requirements of 5.2.2.4 of GB/T 7588.1-2020.

5.2.9.2 Check the electrical equipment installed in the pit, it shall at least include a stop device, inspection operation control device, power socket and well lighting operation device that comply with the provisions of 5.2.1.5.1 of GB/T 7588.1-2020.

5.2.9.3 Check the protection grid in the counterweight (or balancing weight) operating area, and check, measure or review supporting documents [such as test (inspection) reports] to confirm that the setting of the protection grid complies with the provisions of 5.2.5.5.1 of GB/T 7588.1-2020.

5.2.9.4 In a well-equipped with multiple lifts, check the protection grid settings between the moving parts of different lifts, and check, measure or review supporting documents [such as test (inspection) reports] to confirm that the protection grid settings comply with the provisions of 5.2.5.5.2 of GB/T 7588.1-2020.

5.2.9.5 If there is space below the well that can be reached by personnel, check and confirm the setting of the safety gear on the counterweight (or balancing weight).

5.3 Requirements for machines installed in different locations

5.3.1 Machine in the machine room

5.3.1.1 If the traction sheave is installed in the well, check and confirm that the inspection, testing and maintenance of the traction sheave can be carried out in the machine room. The opening between the machine room and the well should be as small as possible.

5.3.1.2 Check the layout of the machine room and measure the dimensions of the working area of the machine room, which shall comply with the requirements of 5.1.2.1

measured in accordance with the methods specified in 5.1.19 of GB/T 10059-2023 and shall comply with the provisions of 5.2.6.6 of GB/T 7588.1-2020.

5.3.5 Structure and equipment in the pulley room

Check and measure the opening setting and space of the pulley room, which shall comply with the requirements of 5.2.6.7 in GB/T 7588.1-2020.

5.4 Car

5.4.1 Car overall

5.4.1.1 The clear height of the car entrance and the interior of the car shall not be less than 2.0 m.

5.4.1.2 Measure the available car area of the lift, check the markings of the rated load and number of passengers in the car, confirm that the relationship between the available car area and the rated load complies with the provisions of 5.4.2.1 and 5.4.2.2 of GB/T 7588.1-2020, and confirm that the relationship between the number of passengers and the available car area and the relationship with the rated load both comply with the provisions of 5.4.2.3 of GB/T 7588.1-2020.

5.4.1.3 Check the signs or nameplates in the passenger lift car and confirm that the relationship between the content of the signs or nameplates and the available car area complies with the requirements of 5.4.2.3 of GB/T 7588.1-2020.

5.4.1.4 When the lift is operating normally, the horizontality of the car floor shall be measured respectively when the car is empty and when the rated load is evenly distributed; the deviation shall not exceed 3/1000.

5.4.1.5 Check the setting of the ventilation holes on the upper and lower parts of the car, and check the data to confirm that the effective area of the upper and lower ventilation holes is not less than 1% of the available car area. Use a rigid straight rod with a diameter of 10 mm to test, and it shall not be possible to pass the straight rod through the car wall from the car by the ventilation hole.

5.4.1.6 Check the setting of the electrical lighting devices in the car and measure the illumination of the electrical lighting devices. The setting and illumination shall comply with the requirements of 5.4.10 of GB/T 7588.1-2020.

5.4.1.7 For cars with power-driven automatic doors, verify the function of the door opening button on the car operation panel, which shall be able to open the door when it is closed.

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