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Storage/Retrieval machine - Safety code

巷道堆垛起重机 安全规范

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Storage/Retrieval machine - Safety code

1 Scope

This Standard specifies the safety requirements for the design, manufacture and use of storage/retrieval machine.

This Standard applies to the storage/retrieval machine in three-dimensional warehouses (hereinafter referred to as the stacker).

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 2893, *Safety colors*

GB 2894, *Safety signs and guideline for the use*

GB/T 3323-2005, *Radiographic examination of fusion welded joints in metallic materials*

GB/T 3811, *Design rules for cranes*

GB/T 4205, *Basic and safety principles for man-machine interface (MMI), marking and identification - Actuating principles*

GB/T 5972, *Cranes - Wire ropes - Care and maintenance, inspection and discard*

GB 6067.1-2010, *Safety rules for lifting appliances - Part 1: General*

GB 8918, *Steel wire ropes for important purpose*

GB 15052, *Cranes - Safety signs and hazard pictorials - General principles*

GB 50254, *Code for construction and acceptance of low-voltage apparatus - Electric equipment installation engineering*

3 General requirements

3.1 The strength, rigidity and stability of the stacker and its parts and components shall meet the requirements of GB/T 3811.

3.2 For main stress components, such as the following beams, columns, upper beams, cargo platforms, hoisting mechanisms, the quality of the butt welds shall comply with the requirements of Class II welds in GB/T 3323-2005.

3.3 Welding of structural parts shall comply with the provisions of GB 6067.1.

3.4 It shall take measure to prevent detachable connecting parts from self-loosening.

3.5 It shall take anti-rust measures for the metal structure and parts of the stacker.

3.6 The installation of the electrical equipment of the stacker shall comply with the provisions of GB 50254.

4 Safety requirements for structural design

4.1 General requirements

The stacker shall be provided with devices to prevent overturning and derailment.

4.2 Requirements for cab design

4.2.1 The driver's cab shall have a good view for easy operation and maintenance.

4.2.2 The window material installed in the driver's cab shall be made of safe shock-proof material. It shall have good transparency.

4.2.3 The floor of the driver's cab shall be made of non-slip and insulating materials.

4.2.4 The headroom of the driver's cab shall not be less than 1.9m. The width of the door shall not be less than 0.5m.

4.2.5 The driver's cab door is not allowed to open outwards or downwards. Doors must be fitted with locks or latches that interlock with the action of the stacker.

4.2.6 For the stacker with a lifting height of more than 5m, it must be equipped with devices that the driver can safely leave the cab from a high position, such as ladders, emergency exits.

4.2.7 The driver's cab shall not be made of flammable materials.

4.2.8 The lighting of the driver's cab must enable the driver to complete the normal operation of the console. The illumination shall not be lower than 301x.

4.2.9 Emergency lighting shall be provided in the driver's cab.

4.2.10 The driver's cab must be equipped with an emergency stop button and a fire

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b) The safety factor of the wire rope strength with lifting cab shall not be less than 9.

4.7.3 The load-bearing wire rope shall be scrapped according to the provisions of GB/T 5972.

4.7.4 When selecting a load-bearing wire rope, the pulley shall be provided with a device to prevent the wire rope from falling off the pulley groove.

4.7.5 When selecting a load-bearing chain, ensure that the chain drives smoothly on the sprocket. Prevent jumping. Effective safety devices shall be set up and shall comply with the provisions of GB/T 3811.

4.7.6 The fixing device at the end of the chain shall be safe and reliable. It shall be able to withstand 2.5 times the chain tension without permanent deformation. The no-load end of the chain shall be fixed firmly to ensure that it will not fall off.

4.8 Requirements for electrical equipment safety

4.8.1 The installation of the electrical equipment of the stacker must comply with the provisions of GB 50254.

4.8.2 A power switch shall be set on the stacker.

4.8.3 The wires and cables on the stacker shall not be exposed. Protective measures shall be taken. When the stacker's power line and control line swing, it shall not exceed the stacker's contour line in the width direction of the roadway. Do not rub against other objects during moving.

4.8.4 The selected electrical equipment and devices shall have a certificate of conformity. It must meet the design performance requirements, use environment and working conditions requirements.

4.8.5 The metal structure of the stacker and the metal casing or pipe groove of all electrical equipment shall be reliably grounded.

4.8.6 The running track and running rail of the stacker must be grounded. The grounding wire shall be flat steel (round steel) with a cross-sectional area of not less than 150mm^2 or copper wire of 10mm^2.

4.8.7 The grounding resistance of the stacker shall not be greater than 4Ω.

5 Safety requirements for the operation of two or more

stackers in the same lane

5.1 The stacker must be provided with an isolating switch to cut off the power supply of the stacker. If there are two stackers running in the same roadway, power supply systems shall be set up respectively.

5.2 Anti-collision device must be installed when two stackers run in the same tunnel. The minimum safe distance between the two stackers (the distance after the final stop) shall be greater than 1m.

5.3 When two stackers run in the same tunnel, a buffer device shall be installed between the two stackers.

6 Requirements for protective devices

6.1 Speed-limiting anti-fall device

6.1.1 The stacker must be equipped with a speed-limiting anti-fall device.

6.1.2 When the descending speed of the cargo platform exceeds 1.15 times the specified rated speed due to the failure of the brake or the breaking of the load wire rope (chain), the cargo platform shall be able to stop the descending motion immediately and cut off the control circuit. The function of the speed-limiting anti-fall device is realized by the overspeed protection device or the broken rope protection device.

6.1.3 When the lifting height of the cargo platform of the stacker exceeds 3m, an overspeed protection device and catcher must be installed.

6.1.4 The control of each mechanism and electrical system of the overspeed protection device and catcher shall be able to act independently and reliably.

6.1.5 When the descending speed of the cargo platform (or cab) exceeds 1.15 times the rated speed, the overspeed protection device and catcher shall work immediately.

6.1.6 The braking force produced by the catcher shall not be less than 1.25 times the full load of the braked part.

6.1.7 When the wire rope is used as the traction part of the overspeed protection device, its diameter shall not be less than 6mm.

6.1.8 The fixing of the traction wire rope of the overspeed protection device shall be safe and reliable.

6.1.9 When the tension of the traction wire rope of the overspeed protection device is weakened, it shall be able to automatically cut off the power supply of the hoisting

limiter shall be installed so that the upper limit limiter shall not act. The installation position of the lower limit limiter shall be such that when the cargo platform descends with the rated load, after the lower limit limiter acts, it shall not land on the lower beam.

6.5.3 Above the upper limit limiter, a hoisting emergency terminal limiter that can cut off the main power supply of the stacker shall be installed. After the cargo platform is stopped, the gap with the upper beam shall be greater than 50mm.

6.6 Running end limiter

6.6.1 The running end limiter shall contain at least one electrical (end limit switch) and mechanical (vehicle block, buffer) or other form of end limiter.

6.6.2 Act on a travel end limiter (such as vehicle block). The horizontal force along the running direction of the stacker shall be calculated according to the actual collision speed (but not less than 70% of the rated running speed) after the deceleration of the stacker.

6.6.3 When the switch of the running end limiter is activated, the minimum distance between the buffer of the lower beam of the stacker and the vehicle block shall be greater than the braking distance of the rated running speed of the stacker.

6.6.4 The buffers at both ends of the lower beam of the stacker shall have good performance of absorbing kinetic energy and reducing impact. The collision load acting on the buffer shall be calculated according to the actual collision speed after deceleration. The minimum shall not be less than 70% of the rated operating speed.

6.6.5 Buffers shall be provided between the cargo platform, the lower beam and the upper beam respectively.

6.7 Speed limiter (forced speed change switch)

When the stacker walks or lifts to the speed limiter, it shall be able to automatically switch to low speed.

6.8 Fork telescopic travel limiter

When the fork is extended to the maximum stroke or reset to the center, the limiter shall be able to act on its own.

6.9 Fork overtravel stop (fork overtravel stop)

The stacker shall be equipped with a fork travel stop that prevents the telescopic fork from disengaging from the fixed fork.

6.10 Emergency stop button

The stacker must be equipped with an emergency stop button. In an emergency, the main power supply of the stacker shall be able to be cut off.

6.11 Electrical interlock protection

6.11.1 When the door of the driver's cab on the stacker is not closed, the power of the stacker shall not be turned on.

6.11.2 The stacker operated from multiple locations shall be interlocked to ensure that the stacker can only be operated from one location at a time.

6.11.3 There shall be an interlock between each control mode to ensure that at a certain time, only one control mode of manual, semi-automatic and automatic control is allowed.

6.11.4 Interlocks shall be provided for the horizontal operation of the stacker, the vertical lift of the cargo platform and the telescopic fork. When the fork is out of the original position, the operation of the stacker and the high-speed lifting and lowering that affect the safety are not allowed.

6.11.5 The control circuit shall have the following conventional interlocking and protection: voltage loss protection, zero position protection of operation switch, motor forward and reverse interlocking, interlocking of different speed levels, short circuit and overcurrent protection.

6.12 Sound and light alarm device

The stacker must be equipped with a corresponding alarm device that can distinguish the working, standby and fault states of the stacker.

6.13 Detection device for cargo abnormal position

The stacker shall be equipped with a detection device for the shape and position of the cargo.

6.14 Cargo position detector

The automatically controlled stacker shall be equipped with a cargo position detector. Ensure that the presence or absence of cargo at the destination address is detected before the fork is operated.

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