

Translated English of Chinese Standard: GB/T31258-2024

www.ChineseStandard.net → Buy True-PDF → Auto-delivery.

Sales@ChineseStandard.net

GB

NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 97.200.40

CCS Y 57

GB/T 31258-2024

Replacing GB/T 31258-2014

Specification of Zip Line

滑索通用技术条件

Issued on: March 15, 2024

Implemented on: March 1, 2025

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

Table of Contents

Foreword.....	3
1 Scope.....	6
2 Normative References.....	6
3 Terms and Definitions.....	7
4 Basic Requirements	10
5 Inspection, Testing and Test.....	20
6 Accompanying Documents, Marking, Packaging, Transportation and Storage	24
Appendix A (normative) Calculation of Ice-wrapped Load of Steel Wire Ropes	26
Appendix B (informative) Tension Calculation of Load Bearing Ropes Fixed at Both Ends.....	28

Specification of Zip Line

1 Scope

This document specifies the technical requirements, inspection, testing and test, accompanying documents, marking, packaging, transportation and storage of large-scale amusement facility zip line.

This document is applicable to the design, manufacture, installation, modification, repair, test, inspection and testing of zip lines that carry no more than 4 people on single manned equipment.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 191 Packaging - Pictorial Markings for Handling of Goods

GB 5725 Safety Nets

GB 8408-2018 Large-scale Amusement Device Safety Code

GB/T 8918 Steel Wire Ropes for Important Purposes

GB/T 9075 Code for Examination and Discard of Ropes for Ropeway

GB/T 9969 General Principles for Preparation of Instructions for Use of Industrial Products

GB/T 13384 General Specifications for Packing of Mechanical and Electrical Product

GB/T 20050-2020 Inspection and Testing Specifications of Large-scale Amusement Device - General Principles

GB/T 20306-2017 Amusement Devices Terminology

GB/T 26722 Steel Wire Ropes for Ropeway

GB/T 34370.9 Nondestructive Testing of Amusement Equipment - Part 9: Magnetic Flux Leakage Testing

GB 50007 Code for Design of Building Foundation

GB 50009 Load Code for the Design of Building Structures

The straight-line distance between the support points of the load bearing ropes at the upper and lower stations.

4 Basic Requirements

4.1 Basic Design Requirements

4.1.1 The zip line shall satisfy the provisions of GB 8408-2018. The design shall be correctly calculated, have a reasonable structure and be able to ensure the safety of passengers. The main technical parameters are length, running speed, height difference of the load bearing rope, number of passengers carried by each track, and number of zip line tracks, etc.

4.1.2 The design documents of the zip line shall at least include the design calculation, design instructions, usage and maintenance instructions, risk assessment report, design test verification outline and a complete set of design drawings that comply with relevant national standards.

4.1.3 The risk assessment at least includes stress-bearing structures and stress-bearing parts, equipment operating environment, obstacles around the equipment, human factors, accidental factors and emergency rescue, etc. The assessment content at least includes the stagnation of the passenger during taxiing, the failure of the traction device, and the failure of the passenger riding device and the restraint device, etc.

4.1.4 In addition to satisfying the relevant requirements of GB 8408-2018 and GB/T 9969, the usage and maintenance instructions also include at least the following requirements.

- a) Two or more pulleys are not allowed to slide at the same time on the same load bearing rope.
- b) When out of service, the pulleys shall be removed or locked.
- c) When encountering weather such as: rain, snow, frost and fog, etc., the load bearing rope is wrapped in ice, or the wind speed is greater than 8 m/s, the zip line shall stop running.
- d) There shall be operable emergency rescue measures and rescue equipment.
- e) Regular safety inspections (daily inspection, weekly inspection, monthly inspection and annual inspection).
- f) The requirements for the operating personnel allocation are as follows:
 - 1) The number of operating personnel on duty at the departure station shall not be less than the number of zip line tracks in operation. The operating personnel shall guide and supervise tourists to put on or sit on the manned equipment in the prescribed posture, and check and confirm the passenger restraint devices;
 - 2) The arrival station shall be equipped with operating personnel to assist tourists

in leaving the manned equipment.

NOTE: the operating personnel mentioned in this document refers to those who have obtained the “Special Equipment Safety Management and Operator Certificate”.

- g) The operating personnel shall be equipped with safety protection devices to prevent them from accidentally falling.
- h) Specify the design service life of steel wire ropes (load bearing ropes and recovery ropes), pulleys, manned equipment, and fixed wire rope metal structures, etc.

4.1.5 Zip line routes and sites shall not be built in military restricted areas, power line protected areas, mountain vents, or areas where avalanches, landslides, collapses, caves, storms, tsunamis, floods and fires, etc. may threaten the safety of zipline operation.

4.1.6 The load selection for the design calculation of the zip line shall comply with the provisions of 6.1.2 in GB 8408-2018. Depending on the riding mode, the windward area of a single human body in the prone zip line shall be $0.3 \text{ m}^2 \sim 0.5 \text{ m}^2$; the windward area of a single human body in the seated zip line shall be $0.5 \text{ m}^2 \sim 0.8 \text{ m}^2$. If the manned equipment is a cockpit type, the maximum windward area of the cockpit shall be adopted. The impact coefficient is not lower than 1.1 (taking into account the pulley, manned equipment and live load). If it belongs to the ice-wrapped area, the ice-wrapped operating conditions shall be considered in accordance with the provisions of GB 50135. The calculation of the ice-wrapped load of the steel wire rope shall comply with the provisions of Appendix A. In the ice-wrapped condition, the steel wire rope shall not be broken, and the metal structure of the fixed steel wire rope shall not become unstable.

4.1.7 When designing the zip line, in accordance with the fixing method listed in Table 8 of GB 8408-2018, the end fixing efficiency shall be considered, and the safety factor of each component shall satisfy the following requirements:

- a) The safety factor of all components of the load bearing rope, traction rope and pulley shall not be less than 5;
- b) The safety factor of the metal structural components of the fixed steel wire rope shall not be less than 3.5;
- c) The safety factor of the anchor point weld of the steel wire rope of the load bearing rope shall not be less than 5;
- d) The safety factor against overturning shall be selected in accordance with the provisions of Table 3 in GB 8408-2018.

4.1.8 The tower shall be designed in accordance with the provisions of GB 50017.

4.1.9 The zip line shall have rescue plane and rescue equipment for any foreseeable situation, and it shall be equipped with effective rescue equipment that can reach any position where the

Where,

L ---the string length of the strided distance, expressed in (m).

4.2.8 Newly installed steel wire ropes shall have quality certificates. Before installation, the diameter, structure, surface and twisting conditions of the steel wire ropes, as well as the rope core and packaging quality, etc. shall be checked. The steel wire ropes shall not be broken, staggered, bent, rusted and scratched; the strands shall not have defects, such as: uneven tightness, collapse and bulging, etc., and the fiber core shall not be dry or rotten.

4.2.9 During the installation process, the steel wire ropes shall be prevented from looping, loose strands, kinking, bending, extrusion and deformation, adhering to debris and friction on hard objects, and shall not be soaked in water.

4.2.10 The replaced steel wire ropes shall be of the same type and specification as the originally installed steel wire ropes. The properties of the replaced steel wire ropes shall not be lower than those of the original steel wire ropes.

4.2.11 During use, the surface of the steel wire ropes shall be inspected at least monthly, so as to find damage to the steel wire ropes in a timely manner. The broken wires and wear of the steel wire ropes shall comply with the relevant requirements of Table 15 in GB 8408-2018, and there shall be no serious corrosion. If problems are found during surface inspection or if the wire ropes are damaged due to lightning strikes or collision by foreign objects, etc., the steel wire ropes shall be immediately subjected to non-destructive testing and evaluation, and they can only be used after passing the testing.

4.2.12 Under normal circumstances, the load bearing ropes and traction ropes should be replaced every 4 years. If they continued to be used after reaching the specified service life, non-destructive testing shall be carried out every year in accordance with GB/T 34370.9. Only steel wire ropes that have passed the inspection in accordance with GB/T 9075 can continue to be used. Those that reach the scrap standard shall be replaced in time.

4.2.13 The ratio of the bending diameter of the traction ropes to the diameter of the steel wire ropes is not less than 30. The ratio of the bending diameter of the steel wire ropes used for the load bearing ropes and recovery devices to the diameter of the steel wire ropes is not less than 20.

4.3 Taxiing Equipment

4.3.1 The taxiing equipment consists of pulleys and manned equipment. The common types of taxiing equipment are shown in Figure 4. The manned equipment includes passenger restraint devices, hanging webbings, lock buckles and passenger cabins, etc. The hanging part shall be provided with secondary protection.

3---single hanging point.

Figure 6 -- Schematic Diagram of Hanging Point Type

4.3.9 The connection mode of the hanging webbings shall be safe and reliable. If stitching joint is adopted, the stitching length shall not be lower than twice its width.

4.3.10 The power traction zip lines and reciprocating zip lines shall be equipped with rope breakage protection devices to prevent the pulley from rapidly falling after the rope is broken and causing danger.

4.3.11 When the manned equipment adopts the cockpit type, exposed sharp edges, corners, burrs and dangerous protrusions are not allowed in any accessible places. The seat size and cockpit door shall comply with the requirements of GB 8408-2018. Passenger restraint devices that cannot be opened by passengers themselves shall be installed. The cockpit door shall be equipped with two locking devices or one locking device with a safety device. When a semi-enclosed cockpit is adopted, the distance between the seat surface and the relative running obstacle above is not less than 1,400 mm. If the cockpit has windows, blocking objects shall be added at the windows, and the gap between the blocking objects shall not be greater than 120 mm.

4.4 Braking (deceleration) Device and Buffer Pad

4.4.1 The maximum pulling-in speed of the pulley (based on the entrance of the arrival station) shall not be greater than 6 m/s.

4.4.2 Each zip line arrival station shall be equipped with no less than two sets of independent automatic braking devices. The braking devices shall enable passengers to smoothly and safely arrive at the arrival station. Before the pulley is braked, the running speed shall be tested in accordance with the provisions of this document. When it reaches the buffer pad, the running speed of the pulley shall be less than 1 m/s. After the pulley enters the arrival station, measures shall be taken to prevent the pulley from rebounding beyond the range of the platform.

4.4.3 The braking device shall be able to effectively attenuate the impact on passengers. The absolute value of the acceleration when the pulley passes the braking device shall not exceed 5 m/s^2 , and the swing angle of the passenger's body shall not be greater than 45° .

4.4.4 The arrival station of the unpowered zip lines shall be equipped with a buffer pad, and the arrival station of the power traction zip lines shall be equipped with appropriate protection devices in accordance with the requirements of 6.9 in GB 8408-2018. The fixing mode of the buffer pad shall be reliable, and its type shall effectively play a buffering and protective role; the buffer pad should be filled with soft sponge material, the size (height $\times$ width) shall not be less than $2 \text{ m} \times 2 \text{ m}$, and the thickness shall not be less than 400 mm.

4.5 Recovery Device

4.5.1 The recovery device shall be equipped with a limit device, an anti-over-rolling device, a

device to prevent the rope from falling off the pulley, and a device to prevent the rope from being bent or entangled.

4.5.2 The recovery device shall be set up with barriers isolated from the passenger sliding area, so as to prevent tourists from accidentally breaking into the recovery device area.

4.6 Departure and Arrival Stations

4.6.1 The departure and arrival stations shall be set up to facilitate the gathering and evacuation of passengers, and emergency passages should be considered; the departure station shall have enough space, and a waiting area and a departure area shall be respectively set up; reliable barriers shall be set up in the waiting area and departure area, and irrelevant personnel shall not enter the departure area.

NOTE: the departure area refers to the area where tourists board the load bearing object and start sliding after they are ready to slide.

4.6.2 Safety signs and passenger instructions shall be set up in the departure station waiting area. Passenger instructions shall clearly indicate the passenger's riding restrictions and correct riding postures, and include requirements to prevent hair, clothing, etc. from being caught in the pulley and not to allow hands to touch the load bearing ropes or traction ropes.

4.6.3 Each zip line at the departure station shall be equipped with two sets of independent normally closed passenger release devices.

4.6.4 Safety doors shall be installed at the departure station for unpowered zip lines. The opening direction of the safety doors shall not be the same as the direction of the travel of the passengers. When the zip lines are not in operation, the safety doors shall be locked.

4.6.5 When the height difference between the platform entrance and exit of the departure and arrival stations of the zip lines and the adjacent ground (or water surface) is greater than 2 m, a safety flat net shall be installed. The installation of the safety flat net shall be fixed and reliable, and its mechanical properties shall comply with the relevant requirements of GB 5725. Its length shall be respectively increased by 1 m on the left and right sides based on the platform opening size, and the extension length outside the platform shall be no less than 2 m.

4.6.6 Anemometers shall be installed at both the departure and arrival stations. The anemometers shall have a data display device and alarm function that are convenient for the operating personnel to observe.

4.6.7 A zip line stopping area shall be set up at the arrival station. The length of the stopping area of the unpowered zip lines (the area where the pulley reaches the buffer pads through the braking device) shall not be less than 6 m.

4.6.8 Both the departure and arrival stations shall be equipped with communication equipment, for example, walkie-talkies or dedicated telephones.

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----