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Safety gear for elevators

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Land, Infrastructure, Transport and Tourism through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Japan Elevator Association (JEA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Safety gear for elevators

1 Scope

This Japanese Industrial Standard specifies safety conditions for safety gears installed in traction type elevators, winding drum type elevators and hydraulic elevators.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7507 *Vernier, dial and digital callipers*

JIS B 7512 *Steel tape measures*

JIS B 7516 *Metal rules*

JIS B 7522 *Textile tape measures*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

3.1 safety gear

mechanical device installed in a car, counterweight or balancing weight which brakes the car, counterweight or balancing weight by gripping the guide rails when their speed increases abnormally

3.2 safety gear block

framing component which houses brake elements (e.g. safety gear gripping parts)

3.3 safety gear gripping parts

parts which exert braking force by gripping the guide rails

3.4 maximum permissible speed

maximum downward speed of the car, counterweight or balancing weight which satisfies the performance requirement of a safety gear

It applies to the speed at which the safety gear is tripped, and is set to 68 m/min or lower for rated speeds 45 m/min or less, and 1.4 times the rated speed or lower for rated speeds over 45 m/min.

3.5 maximum test mass

mass used in a test to determine the maximum mass the safety gear can effectively brake, which satisfies the safety gear performance requirement

3.6 minimum test mass

mass used in a test to determine the minimum mass the safety gear can effectively brake, which satisfies the safety gear performance requirement

3.7 permissible mass

specific value or range of mass, selected by the manufacturer within the range between the minimum and maximum test masses, and assigned to an actual product

This is the value marked on the body of a safety gear.

3.8 elevator

machine provided in a building, etc. in which a car, having a horizontal projected area over 1 m² or a ceiling height over 1.2 m, is ascended/descended to carry persons and/or objects

3.9 traction type elevator

elevator whose car and counterweight are connected by the main rope which is put around the driving sheave and is driven by friction of the main rope against the grooves of the driving sheave or flat surface of the drum

3.10 winding drum type elevator

elevator in which the ascending/descending of the car is enabled by the winding of the main rope attached to it that winds around the traction winding drum of the hoisting machine

3.11 hydraulic elevator

elevator in which the pumping of the pressure oil by the hydraulic pump to the cylinder of a hydraulic jack causes extension of the plunger and ascending of a car, and the returning of the oil back into the tank causes the descending of the car

3.12 incline elevator

elevator which, either partially or entirely through its hoistway, runs in a direction diagonal to the ground

3.13 hoisting machine

machine that consists of a motor, a brake and a driving sheave or a winding drum, and winds up the main rope

3.14 counterweight

in traction type elevators, the weight which, by being connected to the car via the main rope hanging on the driving sheave, generates traction by causing friction between the sheave and the rope around the sheave

3.15 balancing weight

mass which saves energy by balancing all or part of the mass of the car by being directly connected to the car or through the sheave

It is mainly used in winding drum type elevators.

3.16 overspeed governor

device which, when the speed of the car, counterweight or balancing weight attains an abnormal speed, automatically switches off the power to the hoisting machine and if the speed increases further, causes the safety gear to be tripped

If installed on a counterweight or balancing weight, it may be without the function of automatically switching off the power to the hoisting machine.

3.17 guide rails

rails to guide the hoistway of the car, counterweight or balancing weight

3.18 car frame

frame supporting a car room that is connected by a main rope and a fastening plate, or a sash pulley

It may be integral with the car room structure.

3.19 car

part of the elevator which carries the passengers and/or other loads, consisting of a car room, a car frame, a floor, etc.

3.20 rated speed

design speed of the car during constant travelling

3.21 rated load

allowable load specified based on the Building Standard Act [unit: kilogram (kg)]

This value is marked on the inside of the car room.

4 Quantity symbol and unit symbol

For the purpose of this Standard, the unit used for elevator speed, unless otherwise specified, is metre per minute (m/min). Further, the acceleration of free fall (standard gravity acceleration) is expressed with g_n , where $1 g_n = 9.8 \text{ m/s}^2$.

5 Classification

Safety gears are classified according to structure and function as given in Table 1.

Table 1 Classification

Classification	Description
Progressive safety gear	Safety gear which, after tripping, gradually increases its braking force to a certain limited degree and maintains that braking force to stop and retain the car or counterweight. One assembly of a pair of rail grip elements is installed: one on the left-hand side of the car frame and the other on the right-hand side.
Duplex safety gear	Safety gear having two assemblies of a pair of right-hand side and left-hand side rail grip elements installed in tandem on the car frame, which serves to stop and retain the car or counterweight.
Instantaneous safety gear	Safety gear which exerts the braking force immediately after tripping to stop and retain the car or counterweight.
Slack rope system safety gear	Safety gear which exerts the braking force immediately after tripping to stop and retain the car or counterweight. Its mechanism can cause actuation of the stopping operation without the aid of the overspeed governor in the event of breakage of all the main ropes or chains suspending the car or the counterweight. Breakage is detected from the slackness of any one or all of the main ropes or chains.

6 Performance

6.1 Progressive safety gear

The progressive safety gear, when tested according to **8.2** by simulating a free fall of the car loaded with a rated load, counterweight or balancing weight, shall satisfy the following.

- a) When tested at the maximum permissible speed specified by the manufacturer, the progressive safety gear shall be capable of stopping and retaining the object of the maximum test mass adjusted to the maximum value of permissible mass specified in clause **10** or greater, and that of the minimum test mass adjusted to the minimum value of permissible mass specified in clause **10** or smaller.
- b) The average retardation upon tripping of the safety gear shall lie between $0.2 g_n$ and $1 g_n$ inclusive. For incline elevators with an inclination angle of 63° or less, the average retardation in the horizontal direction upon tripping of the safety gear shall lie between $0.1 g_n$ and $0.5 g_n$ inclusive.
- c) After tripping of the safety gear, the safety gear block, springs and linkage device shall not generate deformations and breakages detrimental to the braking performance.
- d) After tripping of the safety gear, there shall be no breakages that can prevent the restoration of the system.

6.2 Duplex safety gear

The duplex safety gear, when tested according to **8.3**, shall satisfy the requirements given in **6.1 a)** to **d)**.

6.3 Instantaneous safety gear

The instantaneous safety gear, when tested by simulating a free fall of the car loaded with a rated load, counterweight or balancing weight, shall satisfy the following.

- a) The maximum test mass obtained by the test performed according to **8.4.2** shall be greater than the maximum value of permissible mass specified in clause **10**.
- b) When tested according to **8.4.3** at the maximum permissible speed specified by the manufacturer, the safety gear shall be capable of stopping and retaining an object of maximum test mass adjusted to the maximum value of permissible mass specified in clause **10** or greater, and after tripping, shall not generate any damages that can prevent the restoration of the system.

6.4 Slack rope system safety gear

The slack rope system safety gear, when tested according to **8.5** by simulating a breakage of all the main ropes or chains suspending a car loaded with a rated load, counterweight or balancing weight, and subsequent free fall, shall satisfy the following.

- a) At the maximum permissible speed specified by the manufacturer, the safety gear shall be capable of stopping and holding an object of maximum test mass adjusted to the maximum value of permissible mass specified in clause **10** or greater, or the maximum test mass obtained by the test performed according to **8.4.2** shall be greater than the maximum permissible mass specified in clause **10**.