

Australian Standard[®]

Lifts, escalators and moving walks

Part 9: Special purpose industrial lifts

This Australian Standard was prepared by Committee ME/4, Lift Installations. It was approved on behalf of the Council of Standards Australia on 26 November 1993 and published on 21 February 1994.

The following interests are represented on Committee ME/4:

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Association of Consulting Engineers, Australia
Association of Independent Lift Companies
Australian Assembly of Fire Authorities
Australian Chamber of Commerce and Industry
Australian Uniform Building Regulations Co-ordinating council
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This Standard was issued in draft form for comment as DR 92177.

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First published as AS 1735.9—1994.
Incorporating:
Amdt 1—1998

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 8790 3



Documents

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PREFACE

This Standard was prepared by the Standards Australia Committee on Lift Installations.

This Standard is Part 9 of the series, AS 1735 *Lifts, escalators and moving walks (known as the SAA Lift Code)*, the other parts of which are as follows:

- Part 1: General requirements
- Part 2: Passenger and goods lifts—Electric
- Part 3: Passenger and goods lifts—Electrohydraulic
- Part 4: Service lifts—Power-operated
- Part 5: Escalators
- Part 6: Moving walks
- Part 7: Stairway lifts
- Part 8: Inclined lifts
- Part 10: Tests
- Part 11: Fire-rated landing doors
- Part 12: Facilities for persons with disabilities
- Part 13: Lifts for persons with limited mobility—Manually powered
- Part 14: Lifts for people with limited mobility—Restricted use—Low-rise platforms
- Part 15: Lifts for people with limited mobility—Restricted use—Non-automatically controlled
- Part 16: Lifts for people with limited mobility—Restricted use—Automatically controlled

This Standard covers the requirements for special purpose industrial lifts that provide guided transportation for personnel, their tools and equipment on a range of structures and variety of locations.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard**Lifts, escalators and moving walks****Part 9: Special purpose industrial lifts**

SECTION 1 SCOPE AND GENERAL

This Standard sets out requirements for permanently installed special purpose industrial lifts that provide guided transportation of authorized personnel, their tools and equipment, and materials for maintenance of plant.

NOTE: Such lifts are typically installed on structures such as bridge towers, chimneys, cranes, dams, silos, power stations, radio antennas, underground facilities, and similar structures.

This Standard is complementary to AS 1735.1, but the requirements of this Standard take precedence over corresponding requirements of AS 1735.1.

SECTION 2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1530 Methods for fire tests on building materials, components and structures
- 1530.1 Part 1: Combustibility test for materials
- 1735 Lifts, escalators and moving walks
- 1735.1 Part 1: General requirements
- 1735.2 Part 2: Passenger and goods lifts—Electric
- 1735.3 Part 3: Passenger and goods lifts—Electrohydraulic
- 1735.10 Part 10: Tests
- 3000 Electrical installations—Buildings, structures and premises (known as SAA Wiring Rules)
- 3600 Concrete structures
- 3678 Structural Steel—Hot-rolled plates, floor plates and slabs
- 3990 Mechanical equipment—Steelwork

BS

- 436 Spur and helical gears
- 436.2 Part 2: Basic rack form, modules and accuracy (1 to 50 metric module)
- 436.3 Part 3: Method for calculating of contact and root bending stress limitations for metallic involute gears

SECTION 3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 1735.1 apply.

NOTE: The definitions for lift allow a rack-and-pinion driven lift to travel along a non-vertical (including curved) path, provided the car follows a permanently supporting structure over the full length of travel.

SECTION 4 STRENGTH OF BUILDING CONSTRUCTION

The supporting structure of a lift, whether it forms part of a building construction or is freestanding, shall comply with AS 3600 and AS 3900, as appropriate.

SECTION 5 MACHINE ROOMS AND MACHINERY SPACES

5.1 GENERAL Machine rooms and machinery spaces shall comply with the relevant requirements of Section 5 of AS 1735.2, except as otherwise indicated within this Section.

5.2 LOCATION OF EQUIPMENT The driving-machine, control mechanism and all parts of the equipment of a lift shall be housed in the machine room, except for—

- (a) those parts which must necessarily be placed elsewhere to perform their function effectively; and
- (b) the machine and control mechanism for rack-and-pinion drives, which may be located on or in the lift car.

Machine space is deemed to be the machine room for the purpose of circuit-breaker and main current limit switch location as required by AS 1735.2.

SECTION 6 ACCESS TO OVERHEAD EQUIPMENT

Access to overhead equipment shall comply with Section 6 of AS 1735.2.

SECTION 7 MACHINES

7.1 GENERAL Machines shall comply with the relevant requirements of Section 7 of AS 1735.2 and AS 1735.3, except as otherwise indicated within this Section.

7.2 TYPES Driving machines shall be of the following types:

- (a) Traction.
- (b) Drum, subject to all of the following conditions:
 - (i) The lift is not provided with counterweights.
 - (ii) The rated speed of the lift car is not more than 1.0 m/s.
 - (iii) The travel of the lift car is not more than 30 m.
 - (iv) Only a single layer of rope is wound on the drum (see Section 19).
- (c) Rack-and-pinion, subject to the rated speed of the lift car being not more than 2.0 m/s.
- (d) Electrohydraulic, in accordance with AS 1735.3.

7.3 BOLTS TRANSMITTING TORQUE Bolts or other means, used to transmit torque between any driving sheave, pinion, the gearing and their support, shall be tightly fitted without play. Set screws or threaded portions of bolts or screws shall not be used to transmit torque.

7.4 BRAKES Every lift machine shall be provided with a braking system complying with the following:

- (a) The brake shall be mechanically applied and electrically held off.
- (b) During normal operation, the brake shall not be released unless power is applied to the lift motor.
- (c) The brake shall remain effective in the event of any—
 - (i) single fault (including any electrical, mechanical or other type of fault);
 - (ii) residual magnetism; or
 - (iii) interruption of power supply to the lift motor.
- (d) While the car is supporting its rated load and travelling downwards at rated speed, and while the car is empty and travelling upwards at rated speed, lifts shall be capable of slowing down and stopping by the emergency application of the brake.
- (e) Where a lift has a rated speed of 1.0 m/s or less, it shall be capable of either stopping or slowing down to a speed of not more than 20 percent of rated speed, in the event of any single failure of the braking system.
- (f) Toggles shall not be used for the normal operation of the brake.
- (g) Where springs are used to apply brake shoes, the springs shall be in compression and adequately guided and supported. In the event of failure of any one spring, the braking effect shall not be reduced by more than 55 percent.
- (h) Frictional devices shall not be interposed between the brake drum and the traction sheave, winding drum or pinion.
- (i) Brake linings shall be—
 - (i) of material deemed not combustible when tested in accordance with AS 1530, Part 1; and

- (ii) secured to the brake shoe so that normal wear will not weaken their fixings.
- (j) Where dynamic braking is provided, the mechanical brake shall be capable of stopping and holding the lift car with 125 percent of its rated load from a test speed between 5 and 10 percent of rated speed.
Where dynamic braking is not provided, each brake shoe or each independent brake shall be capable of stopping and holding 105 percent of rated load from a test speed of full rated speed.
- (k) The braking system provided shall be such that a single fault or failure in the braking system will not prevent the application of braking force when required. To achieve this, either—
 - (i) two independent brake systems shall be installed on each lift; or
 - (ii) one brake system shall be installed comprising two independent braking devices that do not rely on each other or prevent each other from applying braking force when required.
- (l) Except for the disc and cone type brakes that are self adjusting as they wear, braking systems, after adjustment in accordance with Item (j) above, shall have a marker hole drilled behind the locking nut. The nut and lock nut shall be on the spring side of this marker hole at all times. A split pin shall be provided in the marker hole to indicate the minimum brake spring setting.
- (m) Brakes shall have not less than two brake shoes or pads.

7.5 EMERGENCY HAND WINDING

7.5.1 Driving machines in machine rooms An emergency brake release device shall be provided for each type of machine in the machine room. The device shall allow the brake to be released and held off by hand force. The brake shall immediately reapply as soon as the hand force is released.

Where driving machines are provided with emergency hand-winding facilities and with brake release means, the hand-winding means shall be either of the smooth disc type or interlocked so as to interrupt the control circuit in one of the following ways:

- (a) By mounting the device on the machine.
- (b) By removing some part of the machine, to allow the device to be mounted.

7.5.2 Rack-and-pinion drives Where a rack-and-pinion drive is mounted in or on the lift car, a release device shall be provided within the lift car, and the speed of the car shall be limited to less than the governor-tripping speed.

7.6 RACK-AND-PINION DRIVES

7.6.1 General Each rack-and-pinion drive shall consist of at least one driving pinion mounted on the car. The pinions shall mesh with a stationary rack that is mounted on the supporting structure. Each lift car shall be provided with two back-up rollers that act on the same section of the rack as the driving pinion to keep the driving pinion in mesh with the rack. Where more than one driving pinion is provided, one back-up roller at least shall be provided for each driving pinion. Drives utilizing a two-sided rack and having two driving pinions opposite each other and acting as back-up rollers are deemed to have met this requirement.

Any separation in any direction of pinion teeth from full engagement with the rack shall not exceed 25 percent of full engagement, subject to a maximum of 6.4 mm. Positive mechanical means shall be provided to maintain engagement of the pinion teeth with the rack during

safety gear operation, during buffer engagement, and in the event of a guide roller or bearing failure.

A close-fitting guard shall be fitted to guard against foreign material being lodged between the teeth of the rack and the pinion. Clearances between moving parts and the guard shall not exceed 5 mm.

All racks and pinions shall be manufactured in accordance with the dimensional requirements of BS 436.2 and designed in accordance with BS 436.3.

7.6.2 Racks Under static full load conditions, racks shall have a factor of safety of not less than 10 and rack fixings shall have a factor of safety of not less than 8, based on ultimate strength.

Racks shall—

- (a) be of steel;
- (b) consist of mechanical pins or machined teeth;
- (c) deflect not more than 2 mm under normal operating conditions; and
- (d) be fixed to the structure by three or more fixings for each length of rack.

A fixing shall be located within 200 mm of each end of each length of rack.

The distance between fixings supporting each length of rack shall not exceed 1000 mm.

Fixing bolts shall have a nominal size of not less than 12 mm.

Joints between rack sections shall be accurately located by means of dowel pins or a similar method.

7.6.3 Pinions Pinions shall—

- (a) have a factor of safety of not less than 8, based on ultimate strength, and based on full static load in the car with only 75 percent tooth engagement;
- (b) be of a machined steel or bronze;
- (c) have not less than 15 teeth with a tooth size of not less than modular 7;
- (d) where not of a single unit construction, have torque transmitted via one or more keys, or splines; and
- (e) be retained on the drive shaft by not less than two independent means that do not transmit torque, one of which is on the shaft.