

Australian Standard™

Cranes (including hoists and winches)

Part 7: Builders' hoists and associated equipment

This Australian Standard was prepared by Committee ME/5, Cranes. It was approved on behalf of the Council of Standards Australia on 20 August 1999 and published on 5 October 1999.

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Association of Consulting Engineers Australia
Australian Chamber of Commerce and Industry
Australian Elevator Association
Australian Institute for Non-Destructive Testing
Bureau of Steel Manufacturers of Australia
Construction and Mining Equipment of Australia
Crane Industry Council of Australia
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Australian Standard™

Cranes (including hoists and winches)

Part 7: Builders' hoists and associated equipment

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME/5, Cranes, to supersede AS 1418.7—1988.

This Standard is a result of consensus among representatives of the Joint Committee to produce it as an Australian Standard.

This edition incorporates the following changes:

- (a) The format has been revised in accordance with Standards Australia's procedures.
- (b) 'Equipment' has been qualified by the addition of 'associated' in the title to more accurately reflect the content of the Standard.
- (c) The content has been amended to allow for—
 - (i) the new edition of [AS 1418.1](#), *Cranes (including hoists and winches)* Part 1: *General requirements*, published in 1994;
 - (ii) technological advances; and
 - (iii) the development of draft European Standards prEN 12158-1, *Builders hoists* Part 1: *Hoists with accessible platforms*, and prEN 12159, *Builders hoists for persons and materials with vertically guided cage*.
- (d) All operational and maintenance matters have been removed from this Standard and placed in Amendment No. 1 to [AS 2550.7](#)—1996, *Cranes—Safe use*, Part 7: *Builders' hoists and associated equipment*.
- (e) The Appendix on 'Statutory Approval' has been removed in response to the changing role of regulatory authorities.
- (f) The requirements specific to jib attachments have been deleted.
- (g) Editorial changes.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard
Cranes (including hoists and winches)

Part 7: Builders' hoists and associated equipment

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements for temporary hoists for use in the building industry. It does not apply to tower cranes (see [AS 1418.4](#)), mobile and vehicle loading cranes (see [AS 1418.5](#)), mining hoists, mast climbing work platforms (see [AS 1418.16](#)), rope-guided hoists, conveyors (see [AS 1755](#)) and elevating work platforms (see [AS 1418.10](#)).

NOTE: See Appendix A for guidance on information to be supplied with tender.

Guidance on the requirements for operation, inspection and maintenance to ensure safe use of builders' hoists and associated equipment is given in [AS 2550.7](#).

1.2 NEW DESIGNS AND INNOVATION

This Standard does not preclude the use of novel materials, designs, methods of assembly, procedures and the like which do not comply with a specific requirement of the Standard, or are not mentioned in it, but which can be shown to give equivalent or superior results to those specified.

1.3 APPLICATION

The hoists shall comply with the general requirements for design in Section 2 and the specific requirements in Section 3 for materials hoists and concrete skip hoists or in Section 4 for personnel and material hoists, according to the type of hoist.

This Standard is complementary to [AS 1418.1](#), but the requirements herein shall take precedence over corresponding requirements in that Standard.

NOTE: This Standard applies to new builders' hoists designed and built after its publication date. It is not intended to apply retrospectively to builders' hoists designed and built before that date.

1.4 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1138	Thimbles for wire rope
1391	Methods for tensile testing of metals
1418	Cranes (including hoists and winches)
1418.1	Part 1: General requirements
1418.4	Part 4: Tower cranes
1418.5	Part 5: Mobile and vehicle-loading cranes
1418.10	Part 10: Elevating work platforms
1418.16	Part 16: Mast climbing work platforms
1657	Fixed platforms, walkways, stairways and ladders—Design, construction and installation

AS	
1735	Lifts, escalators and moving walks
1735.2	Part 2: Passenger and goods lifts—Electric
1735.3	Part 3: Passenger and goods lifts —Electrohydraulic
1735.10(Int)	Part 10: Tests
1755	Conveyors—Design, construction, installation and operation—Safety requirements
1816	Metallic materials — Brinell hardness test
2549	Cranes (including hoists and winches) Glossary of terms
2550	Cranes—Safe use
2550.7	Part 7: Builders' hoists and associated equipment
2759	Steel wire rope — Application guide
3000	Electrical installations—Buildings, structures and premises (known as the SAA Wiring Rules)
4024	Safeguarding of machinery
4024.1	Part 1: General principles
AS/NZS	
ISO 8402	Quality management and quality assurance—Vocabulary
DIN	
3093	Wrought Aluminium alloy ferrule
3093.1	Part 1: Tubing blanks of oval section and constant wall thickness; Technical delivery conditions
3093.2	Part 2: Ferrule secured terminations; Safety requirements
EN	
573	Aluminium and Aluminium alloys—Chemical composition and form of wrought products
573-3	Part 3: Chemical composition

1.5 DEFINITIONS

For the purpose of this Standard the definitions given in [AS 2549](#) and those below apply.

1.5.1 Hoists

The use of the word 'hoist' herein shall mean 'builders' hoists and associated equipment, so far as is applicable to the text.

1.5.2 Safety gear

A mechanical device attached to the car/platform frame, or to the counterweight frame, to stop and hold the car/platform or counterweight under one or more of the following conditions:

- (a) Predetermined overspeed.
- (b) Free fall.
- (c) If the suspension ropes slacken.

1.6 SAFETY

The design of builders' hoists and associated equipment in relation to materials and construction shall eliminate, as far as practicable, the potential hazards associated with all specified operations.

NOTE: Examples of typical hazards associated with builders' hoists and associated equipment are listed in Appendix B.

SECTION 2 GENERAL REQUIREMENTS FOR DESIGN

2.1 BASIS OF DESIGN

The structural and mechanical design of the hoist, including assessment of loading, material selection and limitations of stress, deflection and fatigue loading, shall be carried out in accordance with [AS 1418.1](#) and shall take into consideration the loads and load combinations specified in Section 3 or Section 4 of this Standard, as appropriate. This Standard covers vertical applications only.

2.2 CLASSIFICATION OF HOIST

Hoist classification shall be a minimum of Class C6 in accordance with the requirements set out in [AS 1418.1](#), and the guidance on selection provided in the relevant appendix therein, except that the number of operating cycles shall be a minimum of 1 million.

2.3 DEFLECTION

Deflections under all conditions of loading shall be limited to magnitudes that:

- (a) eliminate lateral movement (spread) beyond that at which the hoist remains effectively guided;
- (b) minimize stress fluctuations in hoist structure connections;
- (c) eliminate misalignment of or interference between parts of the hoist; and
- (d) minimize cyclic vibration and related movements.

2.4 TIES

Except for material only hoists which are guyed in accordance with Clause 3.6.2, ties shall be provided where necessary to ensure that the hoist complies with the stability, strength, and deflection requirements of Section 3 or Section 4, as appropriate.

The ties shall be adequate to limit deflections (see Clause 2.3) and shall be located at the positions on the hoist structure at which allowance for lateral support has been made in the design of the hoist structure, and shall be adequate, during all conditions of operation, to—

- (a) maintain the tower in a fixed position;
- (b) prevent permanent distortion of the tower; and
- (c) prevent undue lateral movement of the part of the tower to which it is attached.

2.5 DRIVING MECHANISMS

All driving mechanisms shall be of the positive drive up drive down type which cannot be disengaged. Clutches or frictional devices shall not be used to transmit power to rope winding drums or traction sheaves.

Where failure of a flexible driving component would render the braking system (including the safety brake) ineffective, the brake shall be located on the loadside to the flexible driving component.

Each hoist shall have at least one drive unit exclusive to it.

The driving machinery and associated equipment shall be so positioned or guarded to protect persons from injury.

NOTE: Guidance on this is given in [AS 4024.1](#)

2.6 DRIVE UNIT ISOLATION

Means shall be provided to isolate the power supply of each drive unit (see [AS 1418.1](#)).

2.7 GUARDING

Guardrailings shall comply with [AS 1657](#).

Guarding around driving machines shall comply with [AS 4024.1](#).

2.8 RACK-AND-PINION DRIVE

Means shall be provided to maintain the rack and all the driving and safety device pinions in correct mesh under every condition of operation. Such means shall not rely solely upon the platform guide rollers or shoes.

Means shall be provided to ensure that in the event of failure of a roller or shoe the pitch circle diameter of the pinion shall never be more than two-thirds of the module out beyond the pitch line of the rack.

Means shall be provided to ensure that in the event of failure of a roller or shoe not less than 90% of the width of the rack shall be in lateral engagement with pinion teeth of full form.

The pinion teeth and the rack teeth shall be square to each other in all planes, within a tolerance of $\pm 0.5^\circ$.

Drive pinions and overspeed safety device pinions shall be positively fastened to their shafts. Methods involving friction and clamping shall not be used.

The safety device pinion shall be situated lower than the drive pinions.

The drive and safety device pinions shall be made from wear resistant material and shall be so dimensioned that there shall exist a safety factor of at least 4 with regard to the ultimate tensile stress of the pinion material and the actual stress induced in the pinion teeth from the total suspended static load, this load to consist of the dead weight of the platform plus rated load.

A safety factor of 4 shall also be ensured during erection and dismantling.

During erection and dismantling the advantage of a counterweight, if provided, shall not be taken into account.

The rack-and-pinion tooth module shall be not less than—

- (a) four (4) for drive systems where the counter roller or other mesh control feature reacts directly on the rack without the interposition of any other mast profiles; and
- (b) six (6) where the reaction of the counter roller or other mesh control feature is by means of another element of the mast, which is then in immediate contact with the rack.

The racks shall be securely attached. Joints in the rack shall be accurately aligned to avoid faulty meshing or damage to teeth.

Steps shall be taken to prevent the penetration of foreign bodies between each drive or safety pinion and the geared rack.

When more than one drive pinion is meshing with the rack, it shall only be permissible to share the design loads between the pinions if a self-adjusting measure is provided to guarantee load sharing under all running conditions.

For other gear devices such as pin ladders the same provisions shall be used and the same safety factors shall be ensured.

2.9 SAFETY GEAR

2.9.1 General

In addition to the principle drive unit, one of the following shall be provided:

- (a) A safety device to arrest a falling platform in the case of overspeed of personnel materials hoist and to ensure safety for personnel when loading or unloading materials.
- (b) A device which shall be independent of the driving-mechanism braking system and shall, when applied, be capable of holding the platform in position during loading and unloading operations and shall retain it in that position in the event of a rope breaking or other failure occurring. The device shall be mechanically interlocked so that—
 - (i) access of personnel to the hoist platform is prevented prior to application of the device;
 - (ii) the driving mechanism is rendered inoperative whilst the device is applied; and
 - (iii) the device cannot be released until access of personnel to the hoist platform is prevented after loading or unloading operations.
- (c) Safety gear in accordance with [AS 1735.2](#).

The safety device shall be capable of stopping and holding the platform in place with 1.25 times the rated load.

A safety device designed to grip more than one guide shall operate on all guides simultaneously.

2.9.2 Retardation

The safety device shall comply with the following requirements:

- (a) Where an overspeed device is used, retardation with any load on the platform up to the rated load shall be between 0.2 G and 1.0 G with no peak exceeding 2.5 G for more than 0.04 sec, or shall comply with [AS 1735.2](#).
- (b) Where an instantaneous device is used, stopping distance shall comply with the appropriate requirements set out in [AS 2550.7](#).

2.9.3 Release

The method for release of the safety device shall require the intervention of a competent person in order to return the hoist to normal operation.

2.9.4 Level

Under all conditions of loading, excluding overload, when the safety device(s) operates, the floor of the platform shall not incline by more than 3° from its normal position and shall recover without permanent deformation.

2.9.5 Operating conditions

Suitable provision shall be made to prevent the safety device from becoming inoperative due to the accumulation of extraneous materials or due to environmental conditions.

2.9.6 Springs

In safety devices where the braking action is achieved by means of springs, the springs shall be in the form of guided compression springs.

2.9.7 Additional requirements for platforms fitted with overspeed devices

Hoists fitted with an overspeed device shall meet the following additional requirements:

- (a) Movement of the car/platform by means of the normal controls shall be automatically prevented by an electric safety device as soon as the overspeed safety device is triggered.
- (b) Pulleys for overspeed governors shall be mounted independently of any shaft that carries the suspension rope pulleys.
- (c) Tampering with the triggered speed of a governor shall be prevented, e.g. with a seal.
- (d) The safety device shall be triggered mechanically. The triggering speed of the safety device shall not exceed the hoist's rated speed by more than 0.4 m/s.
- (e) The force exerted by the overspeed governor when triggered shall be at least the greater of the following two values:
 - (i) 30N;
 - or*
 - (ii) Twice that necessary to engage the safety device.

2.10 BRAKING SYSTEM

2.10.1 General

Every hoist shall be provided with a braking system that operates automatically in the event of—

- (a) loss of the main power supply; and
- (b) loss of the supply to electric or hydraulic control circuits.

Brakes shall comply with the relevant requirements of [AS 1418.1](#).

The braking system shall have at least one electro-mechanical or hydromechanical brake (friction type), but, in addition, may have other braking systems (e.g. electric or hydraulic).

Where used, band brakes shall be fail safe.

The components to which the brake operates shall be positively coupled to the traction sheave or drum, or sprocket, or drive pinion, or screw.

Belts for coupling the motor or motors to the component on which the electro-mechanical brake operates shall not be used.

The brake(s) on its own shall be capable of stopping the machine when the platform is travelling at its rated speed with 1.25 times the rated load.

In addition, where an overspeed device is used, the brakes on their own shall be capable of stopping the machine when travelling at the triggered speed of the overspeed governor with the rated load.

The action of the brake shall be exerted by compression springs. At rated load, the springs shall be adequately supported and shall not be stressed in excess of 80% of the torsional elastic limit of the material.

Brake linings shall be of asbestos free and incombustible material and shall be so secured that normal wear does not weaken their fixing. The wearing surface of brake drums or discs shall be smooth.

Brakes shall be provided with means of adjustment to account for the wear of the friction surfaces.

All hoists shall be capable of being lowered manually. The manual lowering device used shall require the operator to apply a continuous force during the lowering operation.

Driving machine brakes shall not be electrically released until power has been applied to the driving motor(s).

2.10.2 One brake

A single failure in the braking system shall not allow the platform to move away from the floor.

Where only one brake is used, all the mechanical components of the brake that take part in the application of the braking action on the drum or disc shall be constructed and installed in such a way that if a failure in one of them occurs, sufficient braking effort to slow down the platform, when containing rated load, would continue to be exercised.

In normal operation, a continuous supply of electric current or hydraulic pressure shall be required to hold off the brake.

2.10.3 Rack-and-pinion hoists

For rack-and-pinion hoists that incorporate an electro-mechanical brake, the interruption of the current shall be effected by at least two independent electrical devices, whether or not integral with those that cause the interruption of the current feeding the hoist machine.

2.10.4 Hydro-mechanical brakes

For hoists that incorporate a hydro-mechanical brake, the interruption of the hydraulic pressure shall be effected by at least two independent valves, whether or not integral with those that cause the interruption of the hydraulic power feeding the hoist machine.

2.11 OVERLOAD DETECTION DEVICE

2.11.1 General

Except where allowed in Clause 2.11.2, an overload detection device shall be provided. The overload detection device shall give a clear signal once overload occurs at the control panel and shall interrupt the normal control of the platform before the load reaches 105% of the rated load. Once 110% of rated capacity is reached, the control circuit shall be interrupted to prevent use of the hoist. The control circuit should reconnect automatically once the load is decreased below 110% of rated capacity.

The overload detection device shall be fail to safe. There shall be no provision for the user to cancel the warning.

Overload detection shall be carried out each time the platform is stationary and should be functional during operation.

The design and installation of overload indicators and detectors shall take into account the need to test the hoist with overloads without dismantling and without affecting the performance of the indicator or detector.

In order to provide the routine verification, the overload indicator shall be such that its operation (but not necessarily its accuracy) may be checked without applying overload to the platform.

If interruption of the power occurs, all data and calibration of the indicators shall be retained.

Devices shall be sufficiently robust in construction and shall be protected to prevent damage from shock, vibration and the general use of hoists including erection, operation, dismantling and maintenance as well as environmental influences.

2.11.2 Exception

An overload detection device may be omitted when all of the following requirements are met:

- (a) All design calculations shall be based on a load of at least 1.5 times the rated load.
- (b) The braking system shall be capable of stopping the cage with 1.5 times the rated load from the triggering speed of the overspeed governor, and maintaining it stopped.
- (c) The overspeed safety device shall be capable of stopping, and holding in place, the cage with 2.0 times its rated load.
- (d) Lifting capacity of the drive system shall be designed with a limit of no more than 1.5 times the rated load at the rated voltage.

SECTION 3 MATERIALS HOISTS AND CONCRETE SKIP HOISTS

3.1 SCOPE OF SECTION

This Section applies to builders' hoists and associated equipment of the rope and rack and pinion types for the handling of concrete, construction materials, tools and equipment, and the like, but not to hoists for the transport of personnel or operated by a hoist driver on the platform (see Section 4).

3.2 LOAD RATING

3.2.1 Materials hoist

Each materials hoist shall be rated in terms of—

- (a) rated capacity, in kilograms or tonnes;
- (b) hoisting speed (raising and lowering), in metres per second; and
- (c) classification (see Clause 2.2).

3.2.2 Concrete skip hoist

Each concrete skip hoist shall be rated in terms of—

- (a) volume capacity of bucket, in cubic metres (of concrete);
- (b) hoisting speed (raising and lowering), in metres per second; and
- (c) classification (see Clause 2.2).

3.3 LOADS

3.3.1 Rated load

For design purposes, the rated capacity of a concrete skip hoist shall be the mass of concrete required to fill the rated volume of the bucket (see Clause 3.2).

3.3.2 Gravitational loads

Gravitational loads shall be the gravitational forces due to each part of the hoist, supporting structure and other similar forces applied to the hoist or part of hoist under consideration.

3.3.3 Inertial loads

Inertial loads shall be the inertial forces due to the acceleration or deceleration of moving parts of the hoist and its load.

3.3.4 Incidental forces

Wind-loading forces, thermal effects and other incidental loadings shall be determined in accordance with the relevant clauses of [AS 1418.1](#).

3.4 LOAD COMBINATIONS

The hoist and hoist-supporting structure shall be designed to withstand the application of the vector combination of the loadings specified in [AS 1418.1](#) which produces the highest stress condition in the part of the hoist or supporting structure under consideration.

The hoist and hoist-supporting structure shall be designed to withstand the vector combination of loads applicable with operation of safety gear specified in Clause 2.9.

3.5 DESIGN AND CONSTRUCTION

3.5.1 Design

The design of a materials hoist or concrete skip hoist shall comply with Section 2 and this Clause as appropriate.

3.5.2 Mechanism

3.5.2.1 Mechanism design

The mechanism that drives the hoisting motion shall comply with the requirements for crane mechanisms in [AS 1418.1](#).

3.5.2.2 Design life of mechanism

The mechanism shall be designed for a minimum life of 10 years, determined by the operating time and the load condition applied during that operating time.

The state of loading and class of utilization for determining the mechanism classification shall be obtained in accordance with [AS 1418.1](#).

3.5.3 Rope-reeving system

The rope-reeving system of each hoist-driving mechanism shall comply with [AS 1418.1](#) and with the following requirements:

- (a) The hoist-rope diameter shall be not less than 8 mm.
- (b) Except where the rope is attached to a drum, rope terminations shall be effected by hand splicing in accordance with [AS 2759](#) by a competent person or by an appropriate swaged ferrule, wedge-type socket or other suitable means.

Rope terminations shall not be effected by epoxy, bulldog grips or metallic or epoxy sockets.
- (c) Where swaged ferrules are applied, they shall comply with Appendix C.

3.5.4 Platform

3.5.4.1 Floor loading

The platform shall be designed to withstand each of the following loadings separately (ignoring inertial effects):

- (a) The gravitational effect of the rated load uniformly distributed over each half of the floor area (i.e., front half, rear half, side halves).
- (b) The gravitational effect of the largest concentrated load which the hoist is intended to handle but not less than 1130 N in an area 300 mm × 300 mm (or 0.09 m²) acting anywhere on the platform.

3.5.4.2 Platform-sill loading

The platform sill shall be designed to withstand each of the following loadings separately (ignoring inertial effects):

- (a) The gravitational effect of 25% of the rated load concentrated at the centre of the sill.
- (b) The gravitational effect of the largest concentrated load which the hoist is intended to handle but not less than 1130 N.

3.5.4.3 Clearance around platform

The horizontal running clearance between the edge of the platform and any other face or projection shall be not less than 25 mm.