

Australian/New Zealand Standard™

Scaffolding

Part 4: Suspended scaffolding



This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee BD-036, Scaffolding. It was approved on behalf of the Council of Standards Australia on 24 June 2013 and on behalf of the Council of Standards New Zealand on 23 April 2013.

This Standard was published on 4 September 2013.

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RECONFIRMATION
OF
AS/NZS 1576.4:2013
Scaffolding
Part 4: Suspended scaffolding

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Approved for reconfirmation in New Zealand on behalf of the New Zealand Standards Approval Board on 18 April 2024.

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Australian/New Zealand Standard™

Scaffolding

Part 4: Suspended scaffolding

First published as AS 1576.4—1991.
Revised and redesignated as AS/NZS 1576.4:2013.

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ISBN 978 1 74342 568 8

PREFACE

This Standard was prepared by the Standards Australia Committee BD-036, Scaffolding, to supersede AS 1576.4—1991.

The objective of this Standard is to provide manufacturers and suppliers of suspended scaffolds and accessories with requirements for the proper operation of suspended scaffolds. Unlike independent scaffolds, suspended scaffolds have various rated capacities rather than being light, medium, heavy and special duty. Modular cradles may have different rated capacities, depending on the length of cradle.

The objective of this revision is to provide designers, manufacturers and suppliers of suspended scaffolds and accessories, up-to-date information and application on the equipment used currently in the suspended scaffold industry.

This edition incorporates the following major changes to the 1991 edition:

- (a) Rope factor of safety (as in AS 1418.2) has been reduced from 10 to 8 to align with European Standards. (All scaffold hoists are now imported and it is appropriate that the values used by the hoist designers be followed.)
- (b) Inclusion of a test to confirm the strength of a cradle assembly as an alternative to design by analysis (Appendix G).
- (c) Inclusion of mandatory secondary rope at each suspension point.
- (d) The following informative elements have been added and in some instances provide similar information to AS/NZS 4576, *Guidelines for scaffolding*:
 - (i) Examples of different configurations of suspended scaffolding (Appendix A).
 - (ii) Safety procedures for unattended cradles (Appendix B).
 - (iii) Operational guidance (Appendix C).
 - (iv) Advice on inspection and maintenance (Appendix D).
 - (v) Relevant matters to be checked before installation and use (Appendix E).
 - (vi) Flow chart outlining the different phases of the design, supply and use of suspended scaffolds (Appendix F).
 - (v) Cradle strength test (Appendix G).

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.

This Standard incorporates a Commentary on some Clauses. The Commentary directly follows the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a panel. The Commentary is intended to help readers understand the background to the clause but does not form part of the clause.

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Australian/New Zealand Standard Scaffolding

Part 4: Suspended scaffolding

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements for the materials and design of suspended scaffolding including the supporting structure. It includes guidance on the use of suspension rigs.

This Standard is complementary to AS/NZS 1576.1, but the requirements given herein take precedence over the corresponding requirements of AS/NZS 1576.1.

NOTES:

- 1 This Standard incorporates relevant text from AS/NZS 4576 for suspended scaffolding to provide industry guidance.
- 2 Examples of different configurations of suspended scaffolds are shown in Appendix A.
- 3 Safety precautions that should be taken for unattended cradles are given in Appendix B.
- 4 Operational guidance is given in Appendix C.
- 5 Guidance on inspection and maintenance of suspended scaffolding equipment is given in Appendix D.
- 6 Checklists for planning and installation are given in Appendix E.
- 7 A flow chart for the different phases of selecting, installing and using a suspended scaffold are given in Appendix F.
- 8 Cradle strength test is given in Appendix G.

This Standard is applicable to all types of suspended scaffolding regardless whether the suspension rig is fixed or has horizontal movement capability.

This Standard does not cover building maintenance units.

1.2 APPLICATION

This Standard shall be used in conjunction with AS/NZS 1576.1.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS

1418	Cranes, hoists and winches
1418.1	Part 1: General requirements
1418	Cranes (including hoists and winches)
1418.2	Part 2: Serial hoists and winches
1444	Wrought alloy steels—Standard and hardenability (H) series
1874	Aluminium and aluminium alloys—Ingots and castings
2317	Collared eyebolts

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AS/NZS	
1170	Structural design actions
1170.2	Part 2: Wind loads
1554	Structural steel welding
1554.1	Part 1: Welding of steel structures
1576	Scaffolding
1576.1	Part 1: General requirements
1576.2	Part 2: Couplers and accessories
1576.3	Part 3: Prefabricated and tube-and-coupler scaffolding
1577	Scaffold decking components
1594	Hot-rolled steel flat products
1665	Welding of aluminium structures
1734	Aluminium and aluminium alloys—Flat sheet, coiled sheet and plate
1866	Aluminium and aluminium alloys—Extruded rod, bar, solid and hollow shapes
1867	Aluminium and aluminium alloys—Drawn tubes
2269	Plywood—Structural (all parts)
3678	Structural steel—Hot-rolled plates, floor plates and slabs
3679	Structural steel
3679.1	Part 1: Hot-rolled bars and sections

1.4 DEFINITIONS

For the purposes of this Standard, the definitions given in AS/NZS 1576.1 and those below apply.

1.4.1 Anchor point

A secure point of attachment on a structure to which a fall-arrest system may be secured.

1.4.2 Articulated cradle

A cradle of several sections hinged together, enabling users to walk from one section to another [see Figure 1.5(B)].

1.4.3 Attachment point

The point on a cradle or boatswain's chair for the independent attachment of the scaffolding hoist(s)/suspension rope(s) and secondary rope(s)/cradle fall-arrest devices.

1.4.4 Bay length

The horizontal distance between the centres of any two longitudinally adjacent support points on a cradle.

1.4.5 Boatswain's chair

A chair or similar platform designed for a person to sit in.

1.4.6 Cable reeler

A storage drum onto which an electric cable is reeled.

1.4.7 Counterweight

A weight or series of weights used to counterbalance the forces on the suspension rig against overturning.

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The portion of a suspended scaffold that incorporates a suspended platform.

NOTE: A cradle is also known as a gondola, swing stage or boat.

1.4.9 Cradle-attached hoist

A scaffolding hoist that is attached to the cradle.

1.4.10 Cradle restraint system

A system that attaches the cradle to the mullions or other fixtures on the building or structure and which limits the lateral movement of the cradle due to wind; also known as a stabilizing system.

1.4.11 Cradle secondary rope device

A protective device acting directly on a secondary rope, which automatically stops and holds the cradle in the event of overspeed in the down direction resulting from a failure of the hoist or the suspension rope.

1.4.12 Deck unit

A framed assembly, incorporating a walking surface, that is capable of connecting to its support structure in such a way as to not be inadvertently dislodged.

NOTE: One or more deck units are used side by side and end to end to form a working platform within a cradle.

1.4.13 Design rope tension (DRT)

The maximum tension in a suspension rope at the connection to the suspension rig when the hoist load-limiting device activates.

1.4.14 Double rope suspension system

A method of suspending a cradle using two hoists and two suspension ropes, excluding secondary ropes, at each suspension point.

1.4.15 Fixed cradle

A cradle that does not traverse horizontally but is capable of being raised and lowered.

1.4.16 Fulcrum point

The point of pivoting about which the balancing moments of the suspension rig are calculated.

1.4.17 Inboard

The horizontal distance between the fulcrum point and the fixing point (prop or tie-down) or the centre of gravity of the suspension rig, including any counterweights [see Figure 1.5(A)].

1.4.18 Inboard portion of the suspension rig

That portion of the suspension rig that is on the inside of the fulcrum point [see Figure 1.5(A)].

1.4.19 Individual cradle

A working platform supported at two locations.

1.4.20 Installer

A person who erects, alters or dismantles a suspended scaffold and its supporting components to provide an operating suspended scaffold.

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A device that limits the lifting capacity of a scaffolding hoist to a specified load below the stalling load of the motor.

1.4.22 Manual handle/lever/wheel

A manual device, not being a brake, on the hoist that enables the cradle to be manually raised or lowered.

1.4.23 Needle

A structural member that extends from the suspension point to the extreme inboard end of the supporting structure; also known as suspension beam.

1.4.24 No-power descent

A manually operated brake release system that allows controlled descent of a power-operated cradle when power is not available.

1.4.25 Outboard

The horizontal distance between the fulcrum point and the suspension point.

1.4.26 Parapet clamp

A structure attached to the roof parapet and dependent on the parapet for location and anchorage.

1.4.27 Projection

That portion of the suspension rig that is on the outside of the fulcrum point [see Figure 1.5(A)].

1.4.28 Protective system

A system that will arrest descent in the event of the failure of the primary system of hoist and/or suspension rope.

1.4.29 Rated load of cradle

The maximum load that the cradle is designed to carry for an installation.

1.4.30 Rope reeler

A storage drum onto, or basket into, which a suspension rope or secondary rope is reeled.

1.4.31 Scaffolding hoist

A lifting appliance, manually operated or power operated, used to raise or lower a boatswain's chair, cradle or work cage.

1.4.32 Secondary rope

A rope, rigged as part of a protective system, that will support the boatswain's chair, cradle or work cage in the event of failure of the primary system of hoist and/or suspension rope.

1.4.33 Suspended scaffold

A scaffold that incorporates a platform suspended by flexible steel wire ropes, which is capable of being raised or lowered when in use by means of powered or manually operated scaffolding hoists; also known as 'swing stage'.

NOTE: A suspended scaffold may incorporate boatswain's chair, cradle, work cage, articulated cradles or multi-level cradles.

1.4.34 Suspension point

That point where the suspension rope or secondary rope are connected to the suspension rig.

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That portion of the installation (including the traversing track if fitted) that supports and positions the cradle [see Figure 1.5(A)].

1.4.36 Suspension-rig-attached hoist

A scaffolding hoist that is mounted on the suspension rig.

1.4.37 Suspension ropes

Ropes carrying the weight of the suspended scaffold, including its live load.

1.4.38 Tilt-limiting device

A device that detects and limits the longitudinal slope of the cradle when it exceeds a preset angle.

1.4.39 Traversing

Moving a suspended scaffold laterally across the face of the building or structure.

1.4.40 Traversing ropes

Ropes rigged for the purpose of traversing the suspended scaffold, but not carrying its weight.

1.4.41 Traversing stop

The attachment to any point of a rail or track to limit traversing.

1.4.42 Traversing suspension rig

A suspension rig mounted on wheels or castors.

1.4.43 Tripping limit

The load that causes the load-limiting device to operate.

1.4.44 Trolley

A wheeled mechanism intended to support a suspended scaffold and capable of travelling along a trolley track.

1.4.45 User

The person(s) authorized to utilize the installed suspended scaffold.

1.4.46 Vertical limit device

A device to limit travel at preset upper and lower points.

1.4.47 Work cage

A cradle that is operated by a single scaffolding hoist.

1.4.48 Working load limit (WLL)

The maximum unfactored load, including permanent and imposed actions, that the component or system has been designed to support.

1.4.49 Working platform

A platform on a scaffold that is positioned at a work location for supporting personnel, equipment and materials and used to provide a working area.

1.4.50 Scaffolding hoists

1.4.50.1 Drum hoist

A hoist with a drum onto which the suspension ropes are reeled in one or more layers.

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A hoist where the traction assembly consists of two pairs of jaws.

1.4.50.3 *Traction hoist*

A hoist through which the suspension wire rope is moved as a result of friction between the wire rope and the traction assembly with no tail load.

1.4.50.4 *Twin capstan drum hoist*

A hoist that lifts and lowers the suspension rope around two gear-driven grooved multi-wrap capstan drums and transferred to a wire rope winder designed to apply a 'tail load' to the capstan drum system.

1.4.51 Hoist attachment points

1.4.51.1 *Cradle-mounted hoist*

A hoist that is mounted on the cradle structure.

1.4.51.2 *Top-mounted hoist*

A hoist that is mounted on the suspension rig or trolley.

1.5 ALTERNATIVE DESIGN METHODS AND MATERIALS

Alternative design methods and materials, which are not specified in this Standard, may be used, provided it can be demonstrated that the resulting scaffolding equipment satisfies the requirements of this Standard.

Service life durability shall be a consideration in any assessment.

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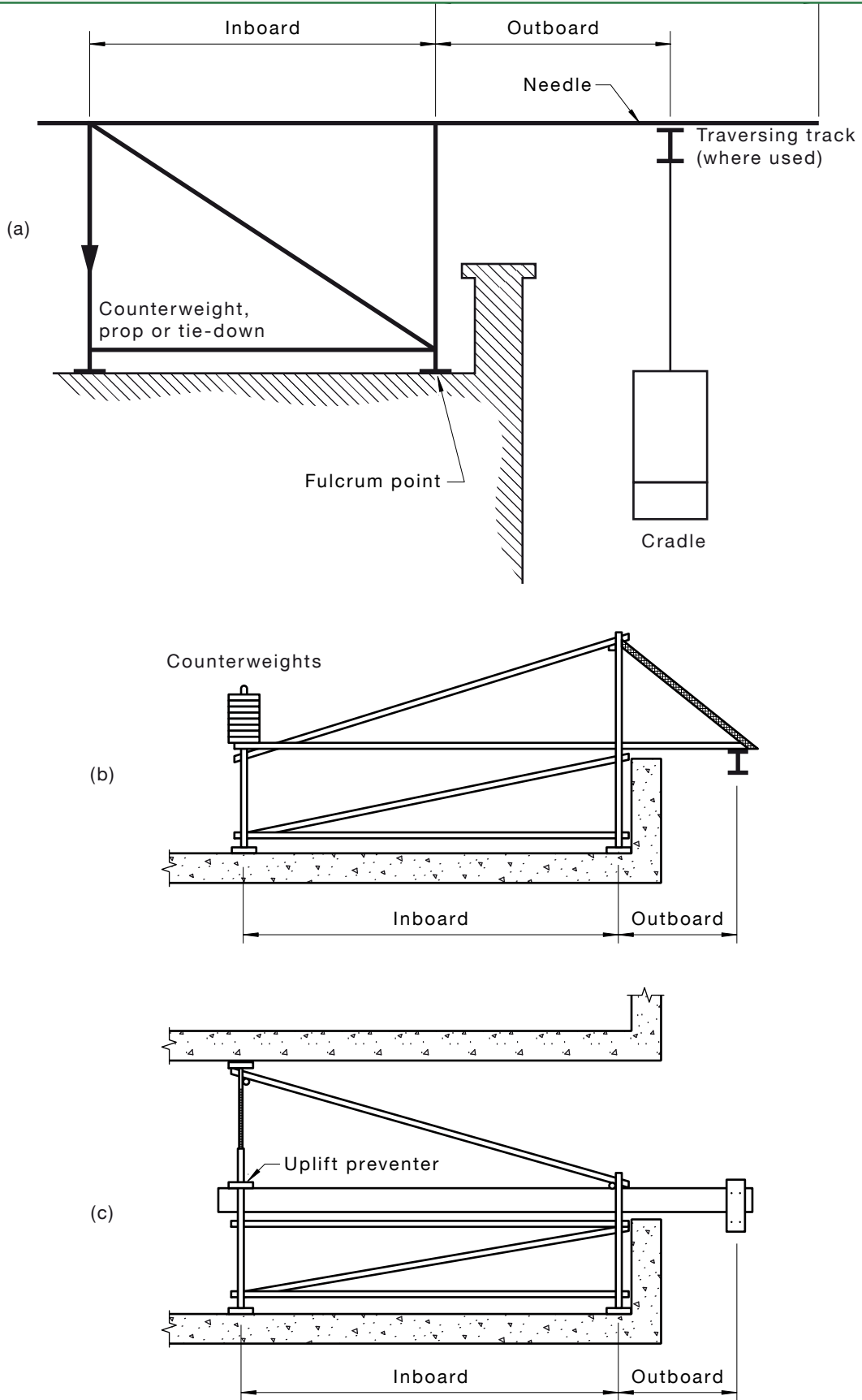


FIGURE 1.5(A) TYPICAL SUSPENSION RIGS

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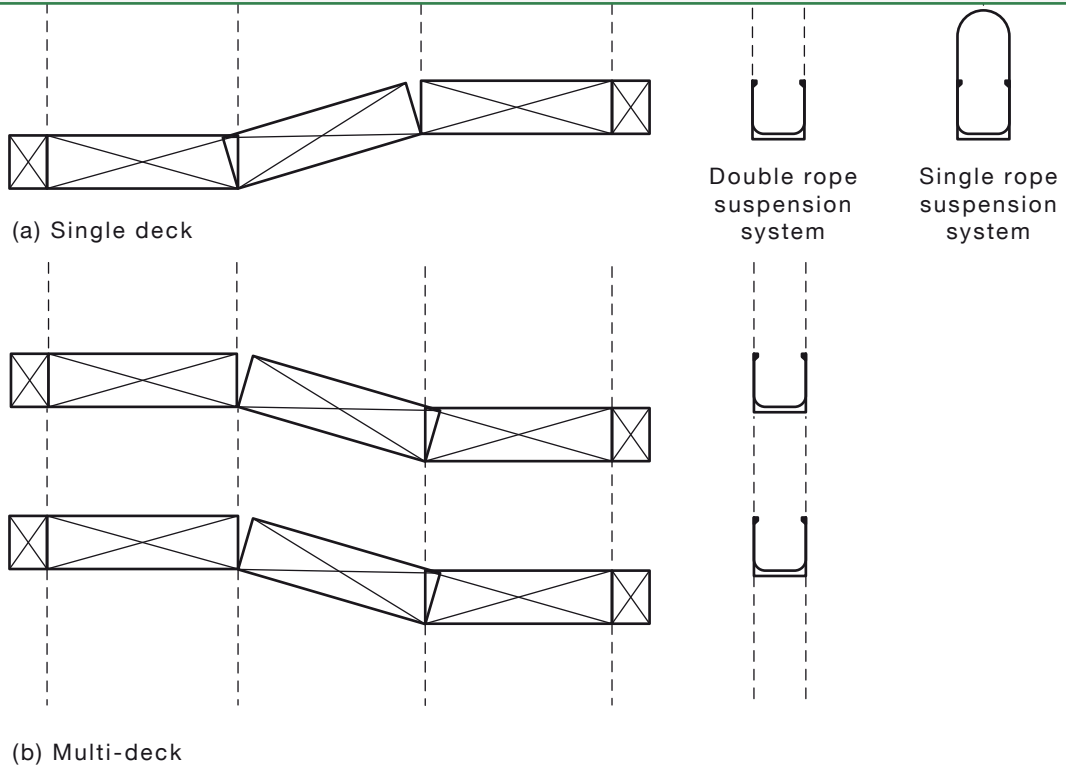


FIGURE 1.5(B) TYPICAL ARTICULATED CRADLES

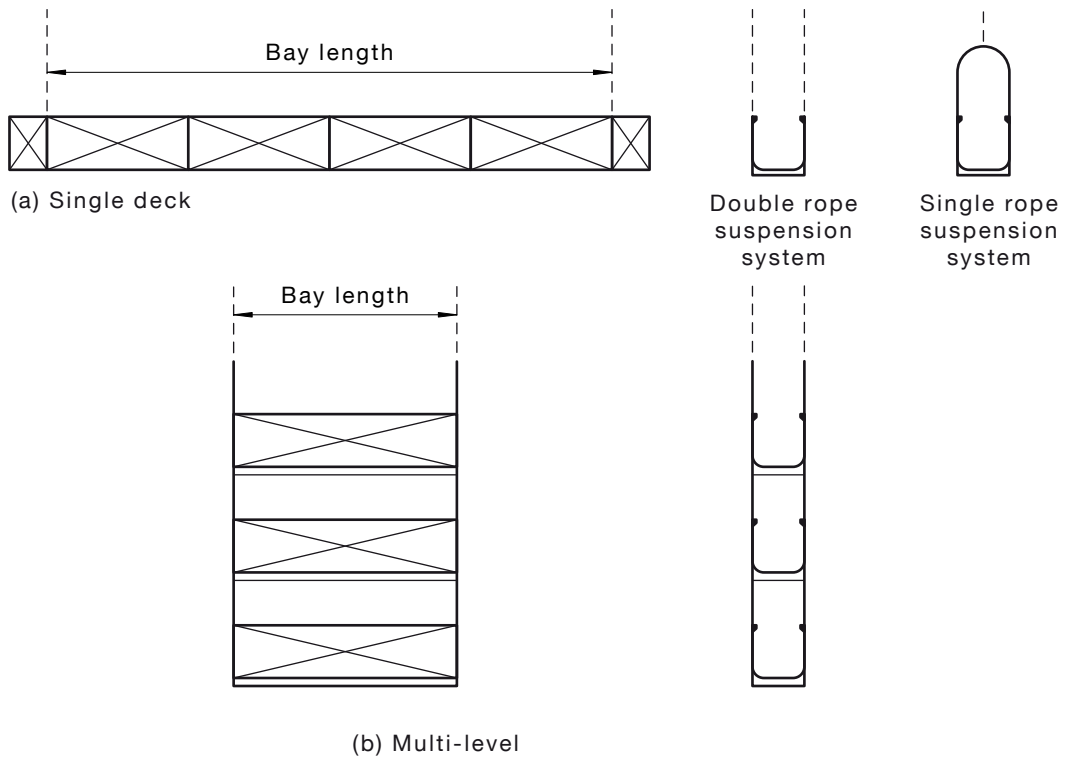


FIGURE 1.5(C) TYPICAL INDIVIDUAL CRADLES

1.6.1 General

Suspended scaffolding is described according to the system of attachment to the supporting structure, the horizontal movement of the cradle, the suspension system, and the type of cradle.

1.6.2 System of attachment to structure

The system of attachment to the supporting structure may be one of the following:

- (a) A system that relies on counterweights for its stability.
- (b) A system that is secured to the building or supporting structure.
- (c) A combination of systems described in Items (a) and (b).

1.6.3 Horizontal movement capability

The horizontal movement capability may be one of the following:

- (a) Fixed.
- (b) Traversing cradle.
- (c) Traversing suspension rig.

1.6.4 Suspension system

The suspension system shall include a hoisting system and a secondary rope system for each suspension rope, except where a double rope suspension system is used and either hoist at the suspension point is capable of supporting the full load without creating excessive cradle tilt.

The hoisting system may be one of the following:

- (a) *Hoist reeling* Where the hoist reels the wire rope on to a drum within the hoist.
- (b) *Hoist climbing* Where the hoist 'climbs' up the wire rope leaving a tail end of the rope hanging or reeled onto a separate device.

The secondary rope system shall arrest movement and support the cradle in the event of an overspeed in the downward direction or failure of the suspension rope. It may be incorporated into the hoist or separately connected to the cradle.

1.6.5 Types of cradles

The cradles may be one of the following:

- (a) *Articulated cradle*—the working area of which is a single deck or several decks linked to each other longitudinally by hinges.
- (b) *Individual cradle*—the working area of which is a single deck or multiple decks beneath each other.
- (c) *Boatswain's chair*.
- (d) *Work cage*.
- (e) *Special purpose cradle*.

NOTE: Examples of different configurations of suspended scaffolds are shown in Appendix A.

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The installer shall be provided with the following documented information:

- (a) Instructions for installation, dismantling, transportation, storage and maintenance.
- (b) A guide to safe working practices, including means of ensuring the stability of the installed scaffold.
- (c) Guidance on the type of connection to use when attaching overhead protection, guidance ties and other accessories.
- (d) Rated load of the cradle.
- (e) Method of connection of cradles, where the design permits this.
- (f) Any limitations on the use of the suspended scaffolding, including maximum operating wind speed.

1.8 SUPPLIER'S INFORMATION

The user shall be provided with the following documented information:

- (a) The checks to be carried out each day prior to use of the equipment, including—
 - (i) integrity of the suspension rig and that no counterweights have been interfered with or removed;
 - (ii) the condition of all power cables or hoses, limit switches, wire ropes and platform structural parts; and
 - (iii) ensuring there are no protrusions from the building that might contact the cradle during its operation.
- (b) Description of manual controls.
- (c) Means of stopping (particularly emergency stop).
- (d) Description of how to operate the no-power descent and, where fitted, the manual winching function.
- (e) Rated load of the cradle.
- (f) Actions to be taken in the event the secondary device is activated.
- (g) How to control undue swaying of the cradle.
- (h) Instructions for fault identification and location for remedying and restarting after intervention of any safety or control device.
- (i) Any limitations on the use of the suspended scaffolding, including maximum operating wind speed.
- (j) Emergency contact details.

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SECTION 2 MATERIALS AND COMPONENTS

2.1 SCOPE OF SECTION

This Section specifies the materials to be used in the construction of suspended scaffolding equipment.

2.2 STEEL

Steel components shall be manufactured from steel complying with AS 1444, AS/NZS 1594, AS/NZS 3678 or AS/NZS 3679.1, as appropriate.

2.3 ALUMINIUM

Aluminium components shall be manufactured from aluminium complying with AS 1734, AS 1866, AS/NZS 1867 or AS 1874, as appropriate.

2.4 SCAFFOLD TUBES AND COUPLERS

2.4.1 Tube

Steel and aluminium tube shall comply with AS/NZS 1576.1.

2.4.2 Couplers and accessories

Couplers and accessories shall comply with AS/NZS 1576.2.

2.5 SUSPENSION AND SECONDARY ROPES

Steel wire rope shall meet the specification of the manufacturer of the scaffolding hoist and the cradle secondary protective device. The specification shall include at least the rope diameter, rope lay, number of strands, the number of wires, core construction, tensile strength and surface finish.

2.6 SCAFFOLDING HOISTS

Scaffolding hoists shall comply with AS 1418.2.

2.7 COUNTERWEIGHTS

Counterweight material shall be durable, such that the weight shall remain constant under working conditions. Sand, water and other flowable materials shall not be used for counterweights.

The mass of the counterweight, in kilograms, shall be indelibly marked on the counterweight.

2.8 STRUCTURAL PLYWOOD

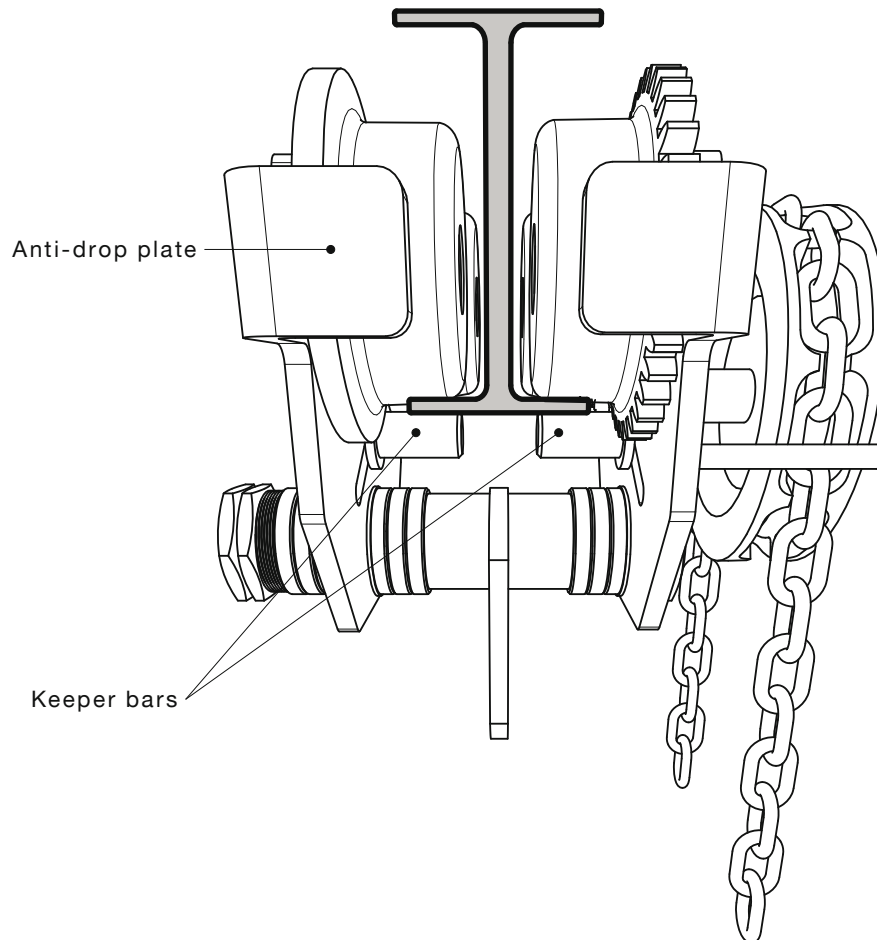
Structural plywood shall comply with AS/NZS 2269 series.

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Trolleys, monorail or traversing shall comply with AS 1418.2 and the following requirements:

- (a) Where intended for use in multiples, the trolley installation shall incorporate a link to maintain the intended separation.
- (b) The WLL shall be not less than 1.25 times the maximum rope tension.

NOTE: For a typical chain drive trolley, see Figure 2.9.



NOTE: To prevent a chain-driven trolley from dislodging due to uplift when operating the drive chain, lower keeper bar(s) or plate(s) should be used. Trolleys that are not fitted with such a system should be removed from service. Guidance should be obtained from manufacturers and designers on effective systems to use.

FIGURE 2.9 TYPICAL CHAIN DRIVE TROLLEY

SECTION 3 SYSTEM DESIGN

3.1 SCOPE OF SECTION

This Section specifies the parameters that need to be applied to produce a safe suspended scaffold that is fit for its intended purpose.

C3.1 *A system design is the design of the suspended scaffolding system, including its constituent components, which may be combined to form a suspended scaffold for a particular installation.*

Another form of design relates to design for a particular installation of a suspended scaffold, based on its intended usage and all the anticipated loads. This will result in either the use of system components or purpose-designed components for the installation, resulting in specific load capacities being set for that installation. This form of design is specified in Section 4.

3.2 VERTICAL SPEED

The vertical speed of any suspended scaffold shall not exceed 18 m/min and be nominally uniform for each hoist connected to the cradle.

3.3 CRADLE

3.3.1 Marking

The rated load, in kilograms, shall be marked legibly on the cradle, in a place where it is clearly visible to persons in the cradle. The rated load shall specify any limitation on the grouping of live loads (see Clause 4.2).

3.3.2 Width

The width of the platform shall be not less than 450 mm at any point.

3.3.3 Cantilever extensions

Cantilever extensions to the cradle shall be limited in length and configuration to that allowed by the cradle design.

3.3.4 Decking

The decking of the platform may comprise one or more deck units. It shall have a slip-resistant surface in accordance with AS/NZS 1577 and be positively retained so that it cannot be displaced by operational or environmental actions (e.g. wind). The decking shall be closely boarded, planked, or plated and shall not have any gaps through which materials could fall, except where specific operational requirements may require an open mesh deck. Drainage holes of maximum diameter 10 mm shall be provided to prevent a build-up of rainwater on the floor of the cradle.

3.3.5 Edge protection

Edge protection shall be designed in accordance with AS/NZS 1576.1 and fitted to the perimeter of the platform.

Where there is a need for the inner edge protection to be altered or removed whilst suspended, the cradle shall be specifically designed to ensure retention of its structural integrity.

Before the inner edge protection is opened, removed or altered, the cradle shall be attached to the structure in such a manner as to prevent any gap increase between the cradle and the adjacent structure.

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panel, which shall be specifically designed for the purpose. The continuity of guardrails and midrails shall be retained, at all times, between the cradle and adjacent structure.

Due to the specialized nature of such an occurrence, the means used to ensure continuity of edge protection shall be designed specifically to provide this protection.

3.3.6 Suspension link

The design of the link used to attach the hoist to the cradle shall take into account any forces resulting from out of level of the cradle in any direction.

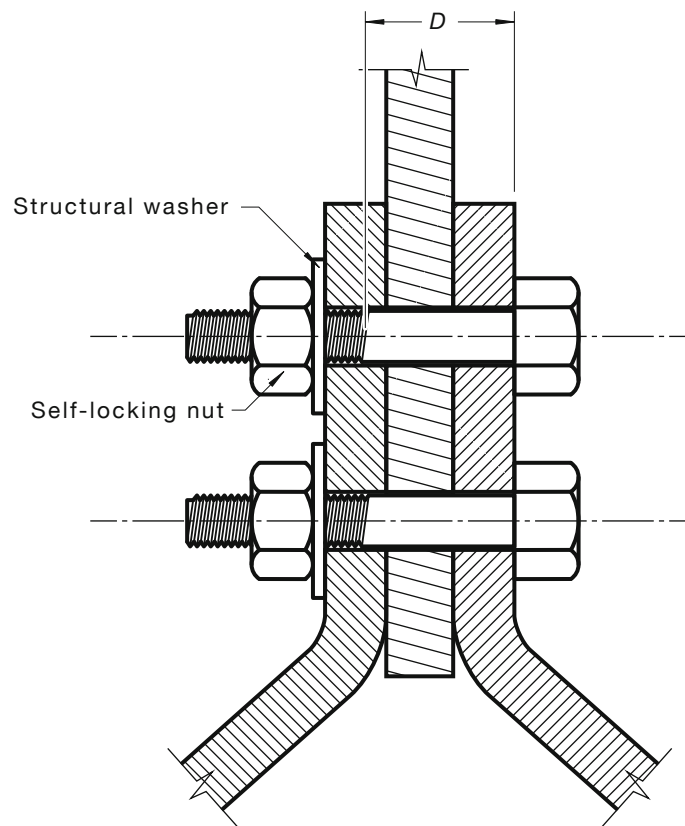
The suspension link and its connections shall withstand, without permanent deformation, a static load three times the WLL of the hoist. The suspension link shall incorporate a minimum of two (2) connection elements.

Bolts, connecting pins (or similar connecting elements) connecting the cradle suspension point to the scaffolding hoist shall comply with the hoist designer's specifications.

Where bolts are used, they shall comply with the following:

- The bolts shall have an unthreaded shank length such that no threads on the bolt shall be in the shear plane of connection members.
- Nuts on the bolts shall be provided with a feature that prevents the nuts from becoming unintentionally disengaged (e.g. self-locking nut).
- When tightened, the bolt shall not prevent design movement of the connection.

NOTE: An example of a suspension link by bolting is shown in Figure 3.3.6.



NOTE: No thread within distance 'D' on bolts.

FIGURE 3.3.6 EXAMPLE OF A SUSPENSION LINK CONNECTION BY BOLTING

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Articulated cradles shall be designed to take into account the configurations and resulting loads.

The hinged area shall be designed with a flexible cover over the hinge area to ensure there is no gap through which objects could fall. Edge protection shall be designed such that it is not reduced at the hinge portion of the cradle and shall not produce a crush point.

3.3.8 Other shapes

Various shaped cradles may be used. The configurations and the required suspension rig shall be specifically designed for each shape. In addition to the requirements of Clause 3.1, the design shall take into account the following:

- (a) Hoist location to maintain stability in horizontal plane.
- (b) Structural strength of the cradle.
- (c) Access within the cradle.
- (d) Additional loads that may be applied to individual hoists.

3.3.9 Boatswain's chair

The shape of a boatswain's chair shall ensure that the user is able to operate the scaffolding hoist in a safe manner as well as in an emergency or power failure.

3.3.10 Multi-deck cradles

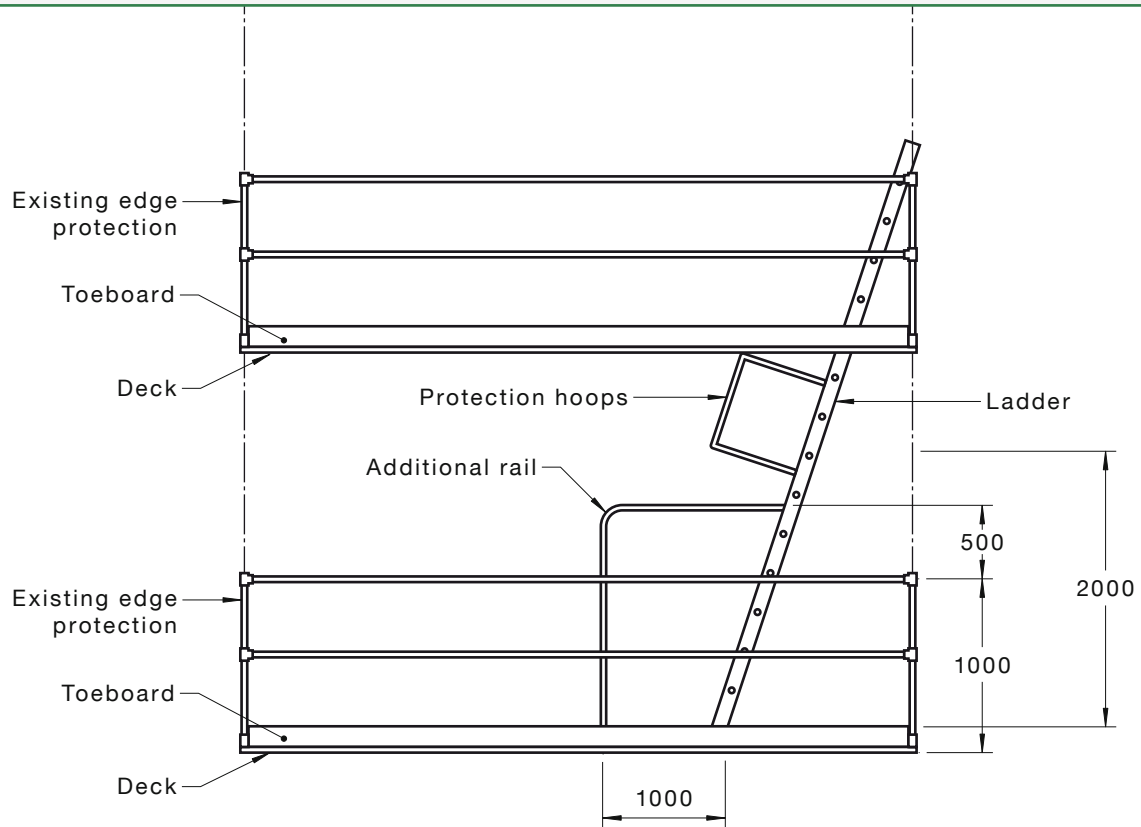
Movement of the cradle upwards or downwards shall require a positive action on the part of a user on other occupied levels, in addition to that by a user at the main control box.

Where a multi-deck cradle system is required to pass obstructions, each level shall have a readily accessible emergency stop.

Multi-deck cradles shall have provision for access between each level. A hatch shall be provided to cover the access to a ladder between levels. The hatch shall open upwards, and shall not obstruct entry to the ladder or remain in the open position.

The minimum clear height between levels of the cradle shall be not less than 2 m. Where the distance between cradle levels is greater than 2.5 m, protection hoops shall be provided for the access ladder and shall start at 2 m height above the deck of the lower cradle. Edge protection rails shall extend to within 500 mm of the underside of the protection hoops and for a distance of not less than 1 m from the base of the ladder as shown in Figure 3.3.10.

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DIMENSION IN MILLIMETRES

FIGURE 3.3.10 ACCESS BETWEEN DECKS

3.4 ROPE

3.4.1 General

Suspension and secondary ropes shall comply with the following:

- (a) The minimum diameter of the wire rope shall be not less than 8 mm.
- (b) The safety factor of the wire rope, based on the minimum breaking load, shall be not less than—
 - (i) for hand-operated scaffolding hoists 7; and
 - (ii) for power-operated scaffolding hoists 8.

3.4.2 Rope tensions

3.4.2.1 General

The design rope tension (DRT) is the maximum load applied at the suspension point by the suspension rope or the secondary rope. Rope tension shall be determined in accordance with Clause 3.4.2.3.

3.4.2.2 Suspension rope

The suspension rope maximum tension for a suspended scaffold may be different at each suspension point (e.g. for a cantilevered cradle.) In this case, the rope tension shall be calculated for each suspension point and used for the design or selection of the needle, the suspension rig and the counterweights.

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given hoist, the design rope tension at the needle shall be the same; only the calculation for the load-limiting device settings shall be different.

There are three typical locations for the load-limiting device, within the hoist just below the hoist or at the needle suspension point (see Figure 3.4.2.2). The location will influence the load-limiting device setting required to provide the same maximum load on the hoist.

3.4.2.3 *Rope tension determined by load-limiting device locations*

3.4.2.3.1 *Load-limiting device within or below hoist*

When fitted within or below the hoist, the load-limiting device will not sense the self-weight of the hoist, the rope and the rope stabilizing weight.

3.4.2.3.2 *Load-limiting device at the suspension point*

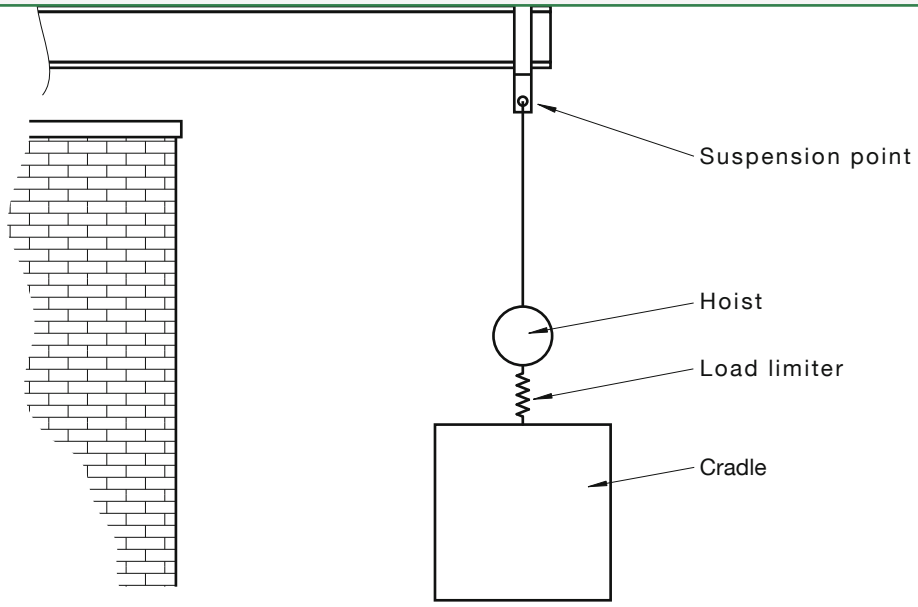
When fitted at the needle, the load-limiting device will sense all the loads suspended from the needle. To achieve the same load on the hoist, the load-limiting device at the needle shall be set to a higher value.

NOTE: For example, consider the following arrangement as shown in Case A in Figure 3.4.2.2, where the load-limiting device is placed at or below the hoist, as follows:

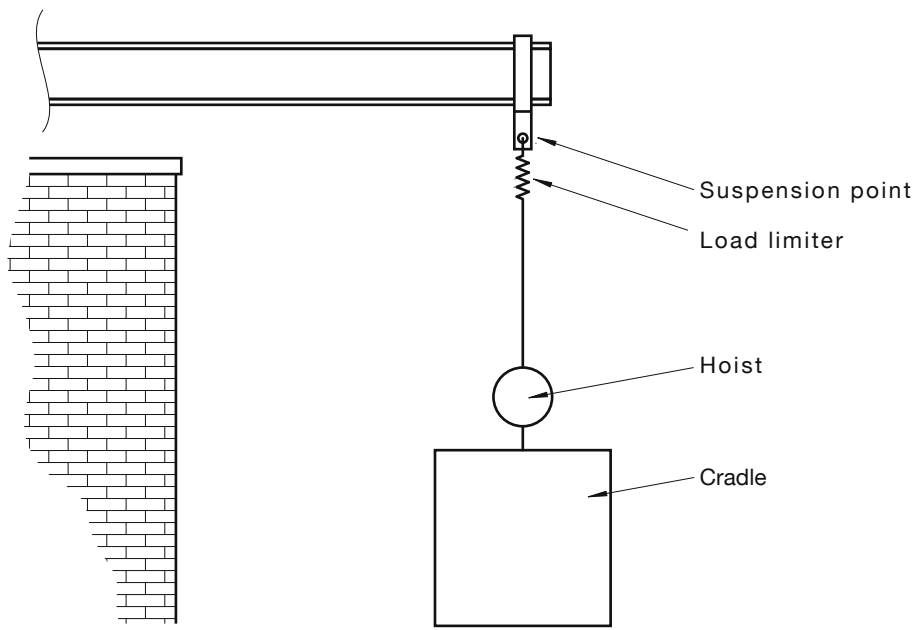
- (a) Self-weight of powered scaffolding hoist, e.g. 65 kg.
- (b) Mass of suspension rope, e.g. 30 m of 8 mm ϕ rope at 0.26 kg/m.
- (c) Rope stabilizing mass attached to the tail, e.g. 25 kg.
- (d) Hoist rated working load, e.g. 500 kg.
- (e) Load-limiting device activation load is set to 1.25 times the hoist rated working load (usually the scaffolding hoist WLL \times 1.25).

Thus, the design rope tension = $65 + (30 \times 0.26) + 25 + (500 \times 1.25) = 722.8$ kg.

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Case A



Case B

(Secondary ropes not shown for clarity)

FIGURE 3.4.2.2 LOCATION OF LOAD-LIMITING DEVICE

For scaffolding hoists, the maximum tension in the secondary rope shall be the sum of—

- (a) the mass of the secondary rope; and
- (b) any stabilizing weights attached to the secondary rope.

3.5 NEEDLE

The outboard end of a needle shall never be lower than the inboard end.

A beam spanning between only two supports shall be horizontal.

A needle or supporting beam shall always be mounted with the greater dimension in cross-section in the vertical position.

The needle shall be designed to support the sum of the following loads at the suspension point on the outboard [see Figure 1.5(A)]:

- (a) Suspension rope tension.
- (b) Secondary rope tension.
- (c) Mass of electrical cables, hydraulic or pneumatic hoses and other accessories supported by the needle.
- (d) Self-weight of needle projection.
- (e) Horizontal loads resulting from wind and traversing forces.

3.6 SUSPENSION RIG

3.6.1 General

The suspension rig shall be designed to support the needle and the supported loads. The ultimate capacity of the needle and the suspension rig shall be adequate to meet the stability requirements of Clause 3.6.2.2. The design shall also include loading from—

- (a) counterweights, where used, attached to the suspension rig;
- (b) weight of electrical cables, hydraulic or pneumatic hoses and other accessories not supported by the needle;
- (c) back-propping or other devices;
- (d) lateral restraint; and
- (e) bracing of the suspension rig components.

3.6.2 Stability of suspension rig

3.6.2.1 General

Overturning of a cantilevered suspension rig shall be prevented by counterweights, props or tie-downs to the supporting structure.

3.6.2.2 Stability of cantilever suspension rig

The ratio of stability of a cantilever suspension rig supporting a suspended scaffold shall be not less than three (3), where the ratio of stability is the sum of the moments acting on the inboard portion of the suspension rig divided by the sum of the moments acting on the outboard portion of the suspension rig.

NOTE: For a worked example using counterweights, see Appendix C.

- (a) The design rope tensions derived from Clause 3.4.2.
- (b) The grouping of suspension ropes relative to their suspension points.
- (c) The outboard portion of the suspension rig and any attached traversing track.
- (d) The inboard portion of the suspension rig, including counterweights if used.
- (e) The ultimate load capacity of the props or tie-downs.

3.6.2.3 *Lateral stability*

If used, the suspension rig, cantilever and traversing track shall have adequate lateral strength or be adequately braced against lateral sway in the longitudinal direction.

For a wire-rope-braced suspension rig, the restraining wire ropes shall be so angled in plan, or supplemented by additional angled wire ropes or other means, that lateral stability in both directions is achieved.

NOTES:

- 1 Lateral sway includes sway from wind, dynamic actions from braking, and from traversing.
- 2 In earthquake-prone areas, earthquake actions should be considered.

3.6.2.4 *Counterweights*

Counterweights shall be fixed to the suspension rig in such a way as to prevent their dislodgment under all expected conditions of operation of the equipment. Counterweights shall be secured to the suspension rig in such a manner that they cannot be removed without the use of a tool (i.e. spanner, lock and key).

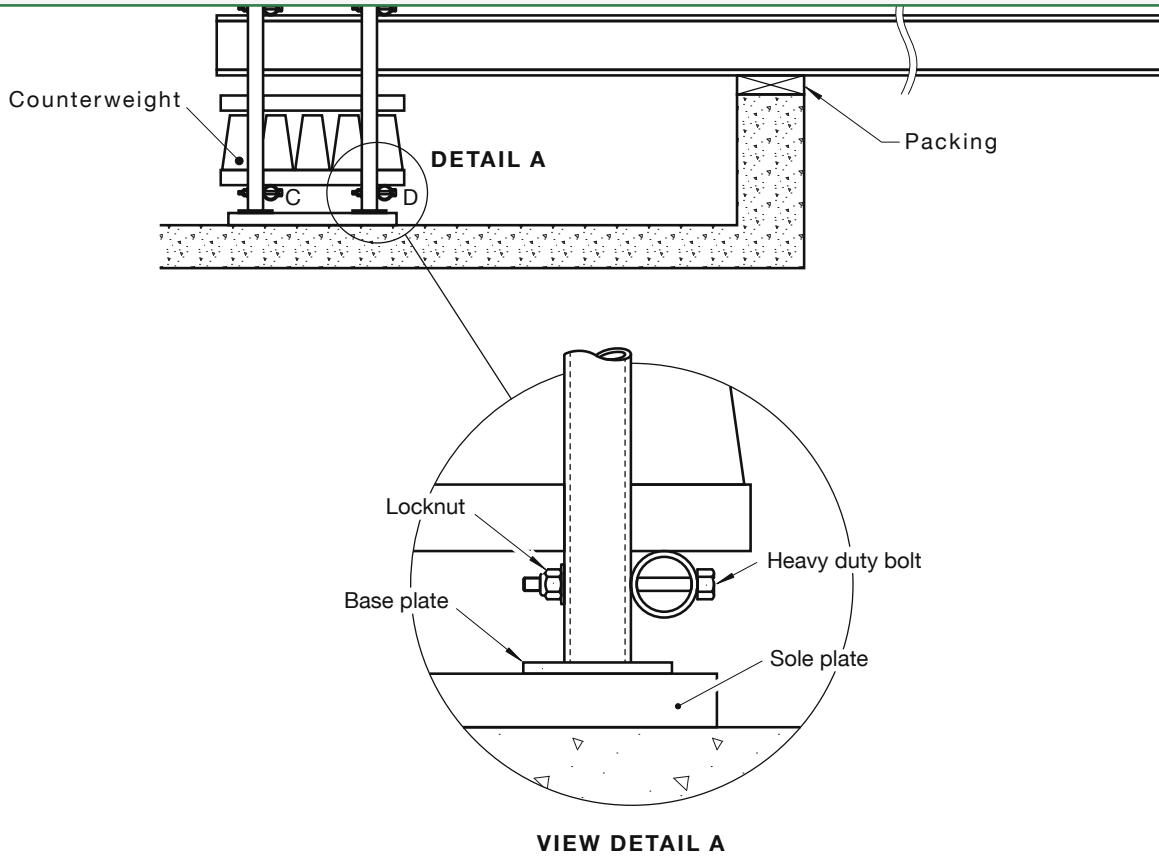
Scaffold couplers or other friction devices shall not be used where their failure could result in the release of the counterweight (e.g. underslung counterweights). A positive connection, which does not rely on friction, shall be used.

NOTE: Examples of positive connections are as follows:

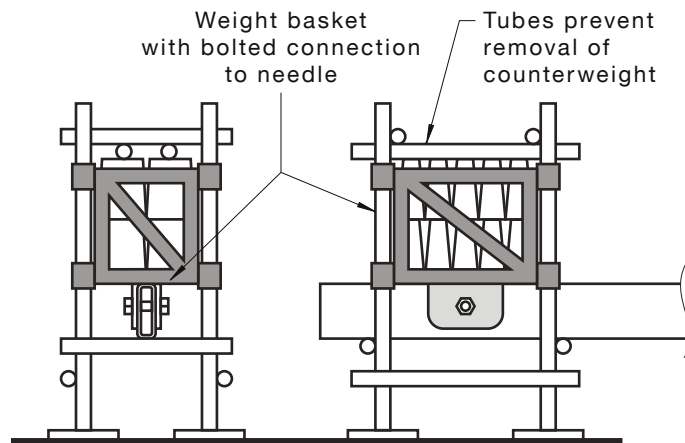
- (a) A bolted or pinned connection where the bolt or pin passes through the structural members and is prevented from unauthorized removal with a nut or other locking system (e.g. split pin) [see Figure 3.6.2.4(a)].
- (b) Using a backup system such as an appropriately rated chain that passes under the counterweight container and over the needle.

C3.6.2.4 *The method of attaching counterweights to needles is critical to ensure the cradle remains suspended and does not fall. The design of the counterweight attachment system needs to be reliable and its integrity easily inspected. One of the best methods is to connect counterweights to needles by securing the counterweights or counterweights container to the top of the needle. Additional structural members and connections then need to be added to ensure the counterweights remain in a fixed location and cannot be readily removed. In some limited situations, where it is impracticable to place the counterweights container on top of the needle, the counterweights are placed under the needle. In this situation it is important to ensure the means of securing the counterweights container does not rely solely on friction device systems such as scaffolding couplers. Scaffolding couplers rely on the installer to tighten the couplers to the correct bolt torque. This can be an unreliable method, particularly when standard scaffold spanners are used. In addition, a visual inspection of the couplers will not show whether the couplers have been adequately tightened. Therefore, underslung counterweights need to be secured with positive systems such as the example given in note to Clause 3.6.2.4.*

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(a) Counterweight secured under the needle



(b) Counterweight secured on top of needle

FIGURE 3.6.2.4 EXAMPLES OF COUNTERWEIGHT CONFIGURATIONS

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Where a suspension rig is anchored to the supporting structure, the material to which the suspension rig is anchored shall be of adequate strength and durability to resist the design loads.

Where the needle is fixed to the supporting structure, the needle shall be positively restrained.

Chemical and friction type anchors shall not be used in tension.

NOTE: A U-bolt fitted over the needle and through the concrete floor slab may be used.

Bolts used in an anchorage system shall be fitted with locknuts or other means to prevent inadvertent loosening of the nut.

3.7 SUPPORTING STRUCTURE

The supporting structure shall be capable of supporting the ultimate capacity of the needle and suspension rig to meet the stability requirements of Clause 3.6.2.2. For a mobile system, this requirement shall apply to all positions of its travel.

Where spreaders or pads are used to distribute a load on a roof or parapet, the material shall be such that a proper distribution of the load is achieved, and that the spreader or pad will not adversely deteriorate in the working environment.

3.8 LOAD-LIMITING DEVICE

Powered scaffolding hoists shall have a device to limit the lifting capacity of the hoist to a maximum 1.25 times the rated capacity of the hoist.

The load-limiting device may be set to limit the loads being lifted to below the rated load of the hoist (e.g. the supporting structure may not be capable of carrying the rated load of the hoist).

Once triggered, the load-limiting device shall prevent all movement except lowering until the overload has been removed. Where more than one hoist is controlled by a common control, the triggering of one load-limiting device shall consequently isolate all of the hoists.

NOTE: A continuous visual signal should indicate that the load-limiting device is triggered.

The load-limiting device and its connections shall withstand a static load three times the WLL of the hoist.

3.9 PULLEYS

Where a wire rope passes over pulleys or around drums other than in winches and climbing devices, the pitch circle diameter of the pulleys or drums shall be in accordance with AS 1418.1.

Minimum pitch diameter on pulleys, drums and traction sheaves shall be defined by the following formula:

$$D \geq H \times d$$

where

D = pitch diameter on pulley or drum hoist, in millimetres

H = pitch ratio

= $H \geq 20$ for power-operated hoist

= $H \geq 18$ for manually operated hoist

d = nominal diameter of wire rope, in millimetres

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A protective device shall be provided for each scaffolding hoist to act, without delay, in the event of overspeed or loss of suspension, in accordance with the following requirements:

- (a) The protective device for breakage of the suspension rope shall act on an independent secondary rope.
- (b) The protective device for overspeed shall act on either an independent secondary rope or the suspension rope.

NOTE: In the event of failure of the suspension rope, overspeed or failure of the hoist mechanism, the suspension load will transfer to the secondary rope with an additional impact. The design of the suspension rig and supporting structure will need to take account of this transfer of loading.

The protective device shall comply with the following requirements:

- (i) The forces resulting from the protective action shall not cause deformation of the engaged wire rope upon whose dimensional stability the protective capacity of the device is dependent.
- (ii) The device shall be designed to withstand the most extreme instance of the following:
 - (A) The combined loading of the WLL and mass of the equipment in motion.
 - (B) The inertial-effect loading of the combined loading of maximum WLL and mass of the equipment in motion resulting from the operation of the protective device under freefall stopping conditions for the rate of deceleration determined by rational analysis, without stressing any component in excess of 75% of its yield stress.
 - (C) The inertial-effect loading of the combined loading of the WLL and mass of the equipment in motion due to the operation of the protective device under overspeed stopping conditions for the rate of deceleration determined by rational analysis without stressing any component in excess of 75% of its yield stress.
- (iii) The device shall be mounted in such a way that the stability of the cradle is not adversely affected when the device is activated.
- (iv) When activated, the device shall stop the descent of the cradle within a vertical distance of 100 mm without resulting in undue shock to the suspension system.

3.11 RATED LOAD OF CRADLE

The rated load of a suspended scaffold cradle shall not be limited to the specified duty categories of AS/NZS 1576.1 (i.e. light, medium, heavy or special duty).

The rated load shall be not less than light duty loading in accordance with AS/NZS 1576.1.

The rated load of the cradle plus its self-weight shall not exceed the lifting capacity of the hoists that support it.

For installation design purposes, the rated load (RL) shall not exceed the system design, as given by the following equations:

- (a) Cradle for one user:

$$RL = M_p + M_e + M_m \quad \dots 3.11(1)$$

$$RL = (n \times M_p) + (2 \times M_e) + M_m \quad \dots 3.11(2)$$

where

M_p = mass of a user (which shall be taken as the weight of a person being not less than 100 kg as specified in AS/NZS 1576.1)

M_e = 40 kg, mass of personal equipment (for first two users only)

M_m = mass of material on the platform, excluding personal equipment

n = number of users in the cradle

For design purposes, the rated load shall be applied in the most adverse location, distributed to achieve a 2.5 kPa loading, unless systems are in place to control load distribution.

3.12 DECK LOAD CAPACITY

The minimum load capacity of the deck components shall be 2.5 kPa. The deck shall withstand a load of 1.2 kN (120 kg), distributed over an area 100 mm × 100 mm at any point.

NOTE: Deck loading deals with the decking components not the cradle capacity.

3.13 BOATSWAIN'S CHAIR AND WORK CAGE

The minimum load capacity of a boatswain's chair shall be 120 kg. The minimum load capacity of a work cage shall be 120 kg per user able to be accommodated in the work cage.

3.14 FORCES EXERTED BY USERS

The minimum forces exerted by users on the edge protection of a cradle shall be taken as follows:

- (a) On the guardrail or top edge of a rigid side, 200 N for each of the first two users in the cradle and 100 N for each additional user, acting in a horizontal direction at 500 mm intervals.
- (b) The guardrail or top edge of a rigid side shall be capable of resisting, without permanent deflection, a vertical load of 1 kN located in the most unfavourable position.
- (c) A cradle surrounded by open mesh or sheeted sides shall not fracture when a force of 600 N is applied to a steel plate of 200 mm diameter at any location on the mesh or sheeting.
- (d) On a midrail, the greater of a concentrated load of 300 N acting outwards or downwards at any point on the rail, edge or post, or linear load of 175 N per lineal metre acting outwards or downwards on the rail. An upward load of 300 N shall be applied to the component at the connection to the supporting member.

NOTE: The 300 N upward load is to check the adequacy of the connection.

- (e) On a toeboard and kick plate, a concentrated load of 150 N acting outwards at any point on the toeboard or kick plate.

SECTION 4 INSTALLATION DESIGN AND STABILITY

4.1 GENERAL

The design of structural members and components shall comply with the relevant requirements of AS/NZS 1576.1.

The design shall take account of—

- (a) wind sail conditions created by a weather cover, safety screening, or other sheeting material attached to a scaffold; and
- (b) the need for overhead and side protection for the occupants.

4.2 GROUPING OF LIVE LOADS

The design of all parts of the installation shall take account of the possible grouping of the live loads at one end of the cradle.

4.3 INSTALLATION DESIGN REQUIREMENTS

4.3.1 General

The design of a suspended scaffold for a particular installation shall include an assessment of all anticipated loads and the intended usage of the scaffold. The following factors shall be considered:

- (a) The load capacity of the cradle configuration for the intended use.
- (b) Load capacity of the suspension ropes, secondary ropes and their attachments to support the imposed loads.
- (c) Load capacity of the scaffolding hoists.
- (d) Suspension rig strength and stability (factor of safety).
- (e) Adequacy of the supporting structure to support the suspension rig.
- (f) Environmental loads, including wind actions.
- (g) Access to and egress from the cradle (operational).
- (h) Parking position of the cradle (operational).
- (i) Counterweights, mechanical fixing of roof rig or structural supports (as in back-propping).
- (j) Intended working load and distribution of the load.
- (k) Potential grouping of users adjacent to one position (i.e. at one hoist or cantilever section of the cradle).
- (l) Encapsulation of cradle.
- (m) Weight of electric cable and suspension ropes.
- (n) Adequacy of electrical supply (operational).
- (o) Single, multi-level cradles, boatswain's chair or work cage.
- (p) Weight of cradle and accessories.
- (q) Parapet brackets and parapet strength.
- (r) Scaffold relocation (operational).

(t) Length of wire ropes and electric cables to suit the installation (operational).

4.3.2 Buffers

Where face wall rollers or buffers are used, they shall be attached to the cradle in a location to prevent a crush hazard, and shall be visible to the operator.

4.3.3 Access within cradle

Hoists that are located at points other than the ends of the cradle shall provide for access past the hoist.

4.4 ROPE

Suspension ropes shall meet the rope specifications provided by the hoist manufacturer, subject to minimum requirements of Clause 3.4.1.

Secondary ropes, or ropes used with other devices, shall comply with the rope specification provided by the device manufacturer.

NOTES:

- 1 The use of galvanized steel wire rope is recommended.
- 2 Fibre ropes may be used for traversing.

4.5 SUSPENSION AND SECONDARY ROPES

Each suspension and secondary rope shall be terminated at the suspension point with a thimble eye splice, ferrule-secured eye termination or other rope coupling device that does not damage the rope and results in a strength of not less than 80% of the breaking load of the rope.

Where a swaged ferrule is used to produce a termination, it shall be subjected to a proof force that is not less than twice the WLL of the rope. This test shall be conducted prior to first use. The test procedure shall not damage the rope.

The rope shall hang freely from the suspension rig by an eye that complies with AS 2317 and shall not be reeved through the eye.

The bullet end termination of a rope shall be suitable for its purposes and shall be finished to prevent overlaying.

Where appropriate, the tail end of the rope shall be fitted with a suitable rope clamping device to prevent the rope passing through the hoist.

Where a weight is attached to the rope to provide a tail load, it shall be attached in a manner that does not damage the rope (e.g. a thimble and double base clamps). Bulldog grips shall not be used.

The rope shall be long enough so that the system does not run out of rope.

The strength of a secondary rope shall be not less than the relevant suspension rope.

4.6 SUSPENSION RIG

4.6.1 General

The design shall ensure that the suspension and secondary ropes are retained on the needle.

Welds on the suspension rig shall be in accordance with AS/NZS 1665 for aluminium, and AS/NZS 1554.1 or NZS 4704 for steel.

NOTE: The design of suspension rigs should take into account any likely lateral forces, including wind and dynamic actions.

The fulcrum point for a mobile suspension rig is the centre-line of the front wheel. Eccentricity for the castor shall be considered when determining the fulcrum point. Castors or wheels used on a mobile suspension rig shall not be loaded in excess of the rated load.

NOTES:

- 1 The fulcrum point for static suspension rig is shown in Figure 1.5(A).
- 2 For castor requirements, see AS/NZS 1576.2.

4.7 SUSPENSION RIG COMPONENTS

4.7.1 Trolley track

The trolley track shall be connected to the suspension rig using positive fixings or specialist fittings.

Suspension from a scaffold coupler that is designed for joining tubes is not permitted (e.g. right angle, swivel and putlog couplers).

Stops shall be attached to the trolley track using a positive method (e.g. nut and bolt). Friction stops shall not be used.

Trolley track sections shall be adequately held at splices to prevent horizontal and vertical movement that may affect the operation of the trolley.

To prevent cradles from colliding on a traversing track or imposing an excessive load on the rig and supporting structure, a buffer zone with intermediate stops shall be fitted to the traversing track.

4.7.2 Traversing equipment

Where traversing tracks for suspended scaffolds are suspended beneath needles or beams that span between two supports (to help horizontal movement of a suspended scaffold), the ends of the traversing track shall be fitted with through-bolted stops, to prevent any trolley from running off the track.

Trolleys supporting a suspended scaffold shall have a rated working load of at least 1.25 times the maximum rope tension. Trolleys supporting a swing stage shall be connected with a spacer tie at the same centre-to-centre distance as the suspended scaffolding hoists, to prevent spreading.

Trolleys supporting a double-rope-suspended scaffold shall be rigidly connected, both longitudinally and transversely, and braced to prevent twisting.

4.7.3 Parapet clamps

Parapet clamps shall be used only where the parapet has adequate strength (see Clause 5.3).

NOTE: Parapet clamps may be back-tied for additional anchorage.

4.7.4 Rope connections

The suspension and secondary ropes shall be connected to the suspension rig in a manner that enables either rope to be disconnected whilst the other supports the cradle.

4.7.5 Multi-rope suspension systems

The failure of any suspension rope in a multi-rope suspension system shall not lead to instability of the cradle or the suspension rig. The remaining ropes, suspension and secondary, shall be capable of supporting the load of the cradle and the users in the cradle.

Access shall be provided to users of suspended scaffolding at all points where they may be required to enter or exit the cradle.

NOTE: It is permitted to climb over the guardrail to access the cradle.

Where access and egress is not from the ground or from a protected landing—

- (a) fall protection shall be used by all those entering and leaving the cradle; and
- (b) during access and egress the cradle shall be secured against lateral movement.

4.8 CRADLE WORKING ON AN INCLINE

The following additional requirements apply when a cradle is required to travel along an incline:

- (a) Where the design requires a cradle to move along an incline, the design shall provide the capability for the cradle to remain horizontal in the transverse plane, within a tolerance of 8°.
- (b) The suspension rig shall remain stable for all forces imposed by the cradle and its use, and all environmental forces to which it is exposed.
- (c) Where the cradle is directly supported by the inclined surface, it shall be fitted with wall rollers that ensure it is stable throughout the travel distance. The design, quantity and location of rollers shall be appropriate to cater for the maximum forces that the cradle is expected to withstand for the specific design.
- (d) Where fitted, the wire rope winder(s) shall be designed to avoid any slack in the suspension or secondary ropes. If a slack rope situation occurs, lowering shall be stopped automatically.
- (e) End stops in combination with limit switches to stop the cradle shall be provided at the start and end of the inclined surface on which the cradle has been designed to travel.
- (f) Where the cradle is suspended from an inclined track, the traversing mechanism shall incorporate end stops in combination with limit switches to stop the cradle at the start and end of its intended travel. A brake shall be installed to retain the cradle at the working position on the inclined track.

4.9 STABILITY OF CRADLE WITH CANTILEVER END

In a two-point suspension system if the cradle extends past an attachment point and the load is located on the cantilever section, the stability coefficient against overturning of 2.0 shall be applied to the cradle design to provide stability as calculated in accordance with the following equation:

$$P_2 \geq \frac{L_1}{L_2} \times P_1 \times 2.0 \quad \dots 4.9$$

where

$$P_1 = n (M_p + M_e)$$

M_p = mass of a user (which shall be taken as the weight of a person being not less than 100 kg as specified in AS/NZS 1576.1)

M_e = mass of personal equipment (for first two users only)

P_2 = mass of cradle and hoist assembly

L_1 = cantilever distance from cradle end to hoist rope minus 300 mm

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L_2 = distance from hoist rope to centre of gravity (CG) of cradle and hoist assembly

n = number of users in the cradle

For a symmetrical cradle and hoist arrangement the CG will be at mid length, but that will not be the case for a cradle with a single end extension or different length end extensions.

NOTE: No materials are to be stored at the cantilevered end.

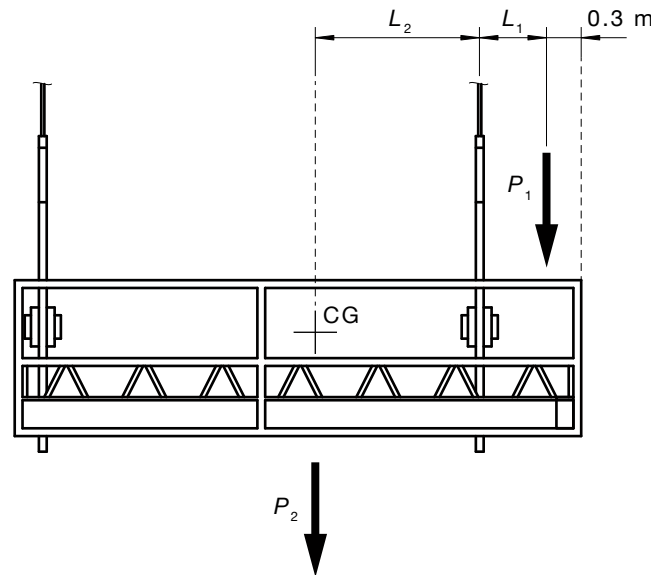


FIGURE 4.9 STABILITY OF CANTILEVER CRADLE

4.10 WIND LOADS

Any suspended scaffold intended to be used outside of an enclosed building shall be assumed to be affected by wind, the effect of which shall be determined in accordance with AS/NZS 1170.2.

Wind loads transmitted to a suspension rig and guide ties from suspension ropes, secondary ropes, the cradle and its enclosures (such as shade cloth, banners and similar enclosures) shall be considered. All enclosures shall be considered as solid.

The suspension rig shall not be laterally movable by wind forces, whether in service or in the parked position.

Components of a cradle shall not be able to be dislodged by wind forces.

For an unclad cradle, the design area of each user shall be taken as 0.7 m^2 with the centre of area 1.0 m above the cradle floor.

SECTION 5 OPERATIONAL PROCEDURES

5.1 GENERAL

Other than a boatswain's chair or a work cage sized for one user, every cradle shall have at least two (2) users in the cradle whilst in motion.

There shall be within the cradle a clearly visible notice detailing the procedures to be adopted by the users in the event of a power failure or if a load-limiting device, tilt-limiting device or protective device is activated.

Where a suspension rig is set up to be mobile on castors, once parked at the location, adjustable bases shall be used to ensure the suspension rig loads are not carried by the castors.

Apart from any purpose-designed buffer rollers, no part of the cradle or hoist shall come into contact with the structure (including projecting scaffold tubes, timber, open swivel or pivot windows) while it is climbing, descending or traversing.

Where automatic levelling devices are not fitted during climbing or descending operations, the cradle shall be maintained as close as practicable to the horizontal by synchronized operation of the hoists.

An emergency descent shall not be operated while power is connected to the scaffolding hoist.

5.2 EMERGENCY PROCEDURES

Procedures shall be provided for the safe emergency recovery of users working from suspended scaffolding in the event of power failure, equipment failure, or operator disability of any nature. Emergency procedures shall be included in the operating and maintenance instructions for the installation.

5.3 BUILDING DESIGN REQUIREMENTS

The design of suspended scaffolding to be used for working on, cleaning or repairing the external surfaces of buildings shall take into consideration the absence of openable windows when designing the operational requirements of the suspended scaffolding, particularly in relation to the recovery of users in a cradle in the event of failure of the equipment.

All loads resulting from the design of the suspended scaffolding system, particularly roof rig and counterweight loads, and attachments to the building shall be assessed in relation to the structural capacity of the building to support those loads and attachments.

NOTE: The structural capacity of the building to support the loads can be confirmed by the owner of the building by referring to the original engineering design specifications for the building.

5.4 TRAVERSING

5.4.1 General

Traversing of a cradle shall be controlled to enable accurate positioning in a location for work or to a place of storage.

Powered traversing trolleys shall be limited to a maximum speed of 0.25 m/s.

Manual traversing shall not require a pulling or pushing force in excess of 445 N per person to produce movement.

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End stops shall be provided to prevent the trolley being moved beyond its designed travel limits. Such stops shall be capable of withstanding the contact force of the combined mass of the trolley and the supported cradle.

5.4.3 Operating controls for a powered traversing trolley

The following requirements apply:

- (a) Traversing controls for a powered traversing trolley shall be of a weatherproof deadman type.
- (b) Traversing shall be limited to only one control location at a time.
- (c) Traversing control(s) shall be so connected that traversing of the cradle is not possible until the cradle is located at its designated level for traversing and is clear of contact with the face of the building.
- (d) During traversing, the operator shall have a clear view of the immediate travel path of the trolley in the direction of movement.

APPENDIX A

EXAMPLES OF CONFIGURATIONS OF SUSPENDED SCAFFOLDING

(Informative)

This Appendix illustrates examples of different configurations of suspended scaffolding that are commonly used, as shown in Figures A1 to A14.

NOTE: The figures are shown diagrammatically and are for information only.

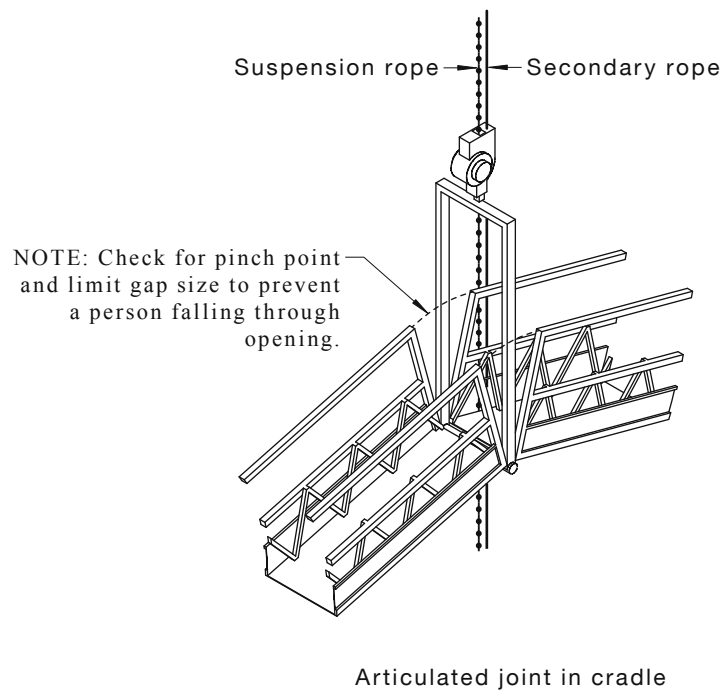


FIGURE A1 ARTICULATED CRADLE JOINT

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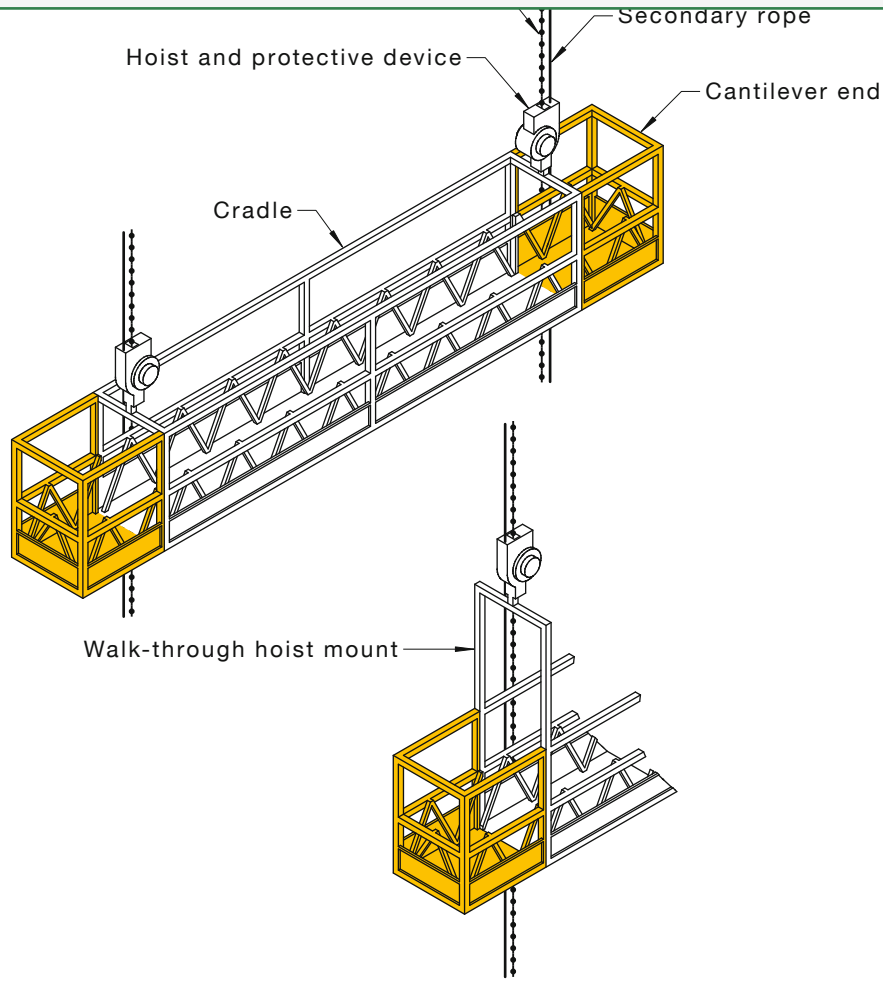


FIGURE A2 CANTILEVERED ENDS (ALSO KNOWN AS BALCONIES)

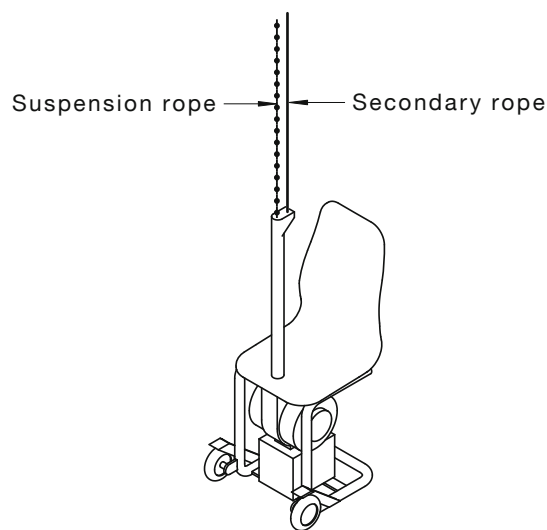


FIGURE A3 MOTORIZED BOATSWAIN'S CHAIR

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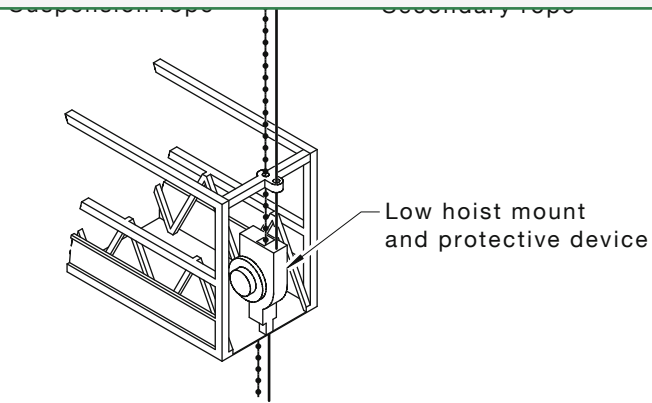


FIGURE A4 LOW MOUNTED HOIST

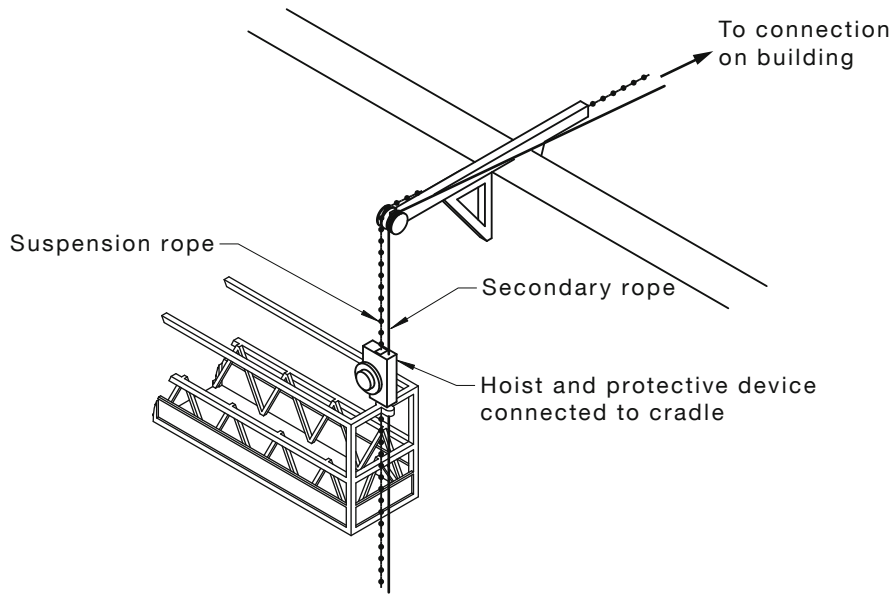


FIGURE A5 HOIST ON CRADLE

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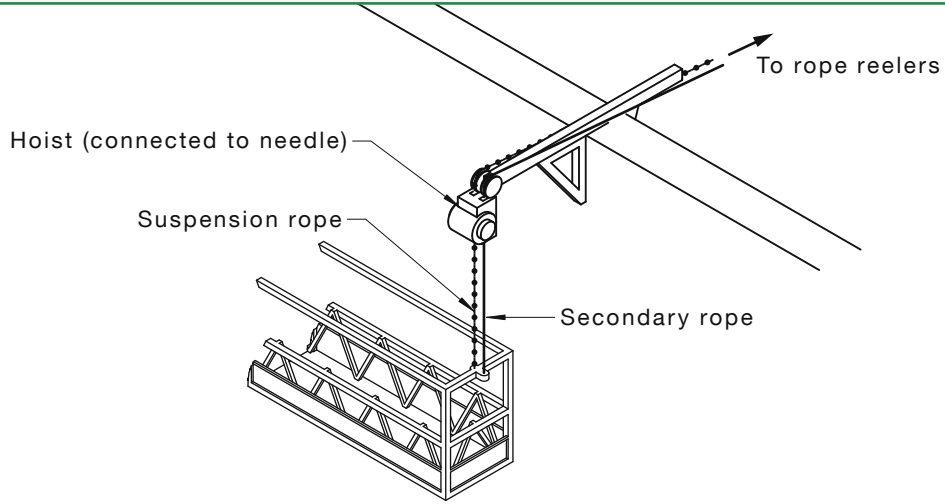


FIGURE A6 REMOTE HOIST ON NEEDLE

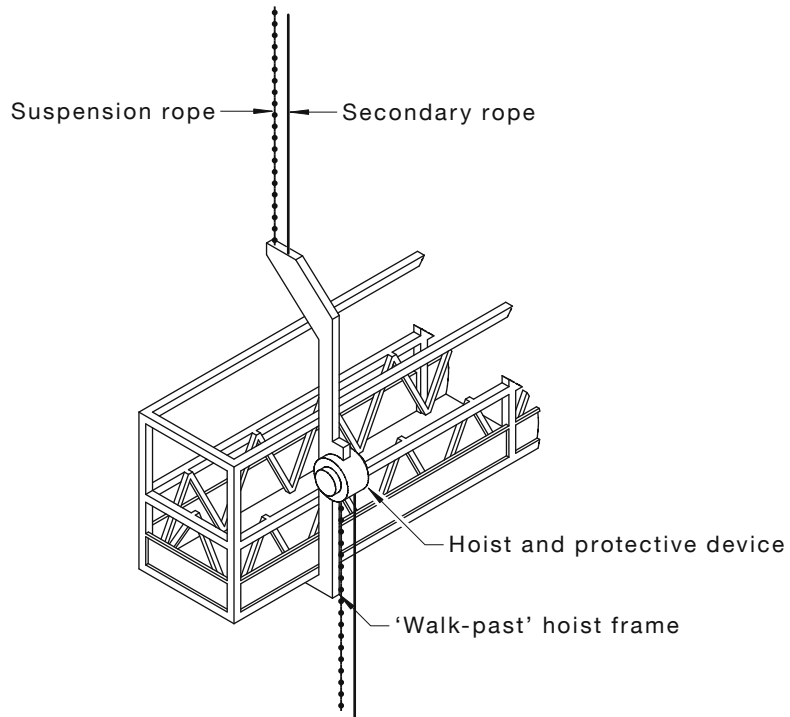


FIGURE A7 WALK-PAST HOIST FRAME

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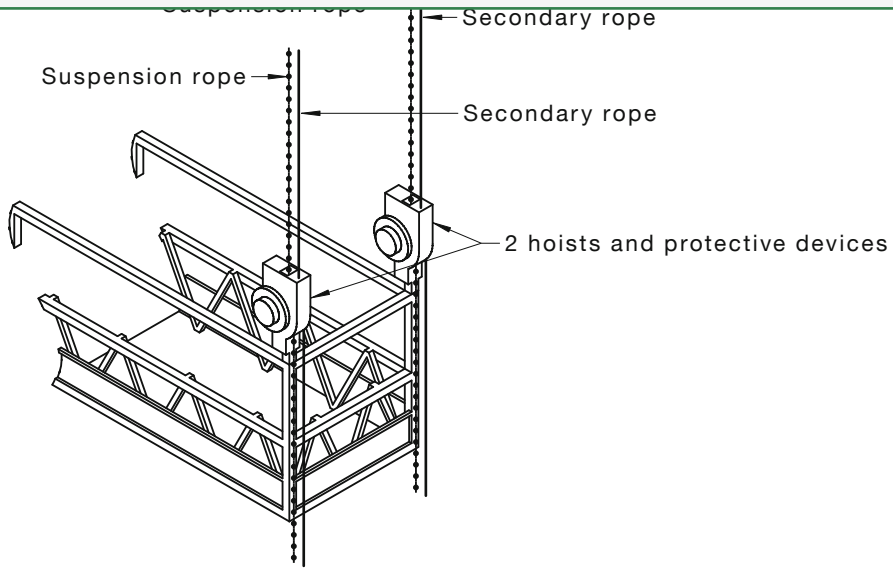


FIGURE A8 TWO HOIST END CONFIGURATION

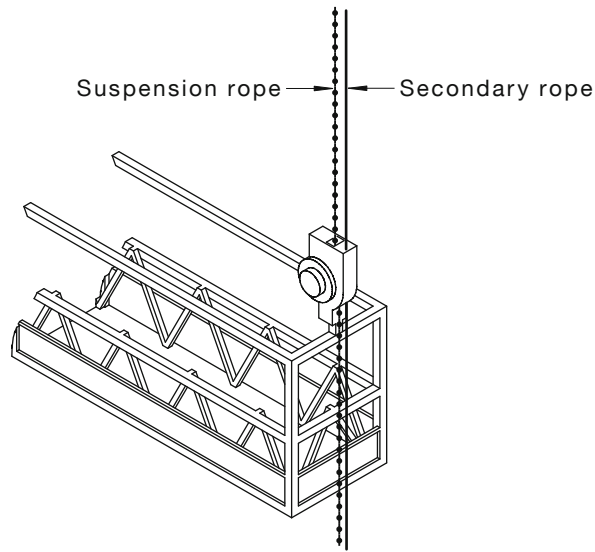


FIGURE A9 SINGLE HOIST END CONFIGURATION

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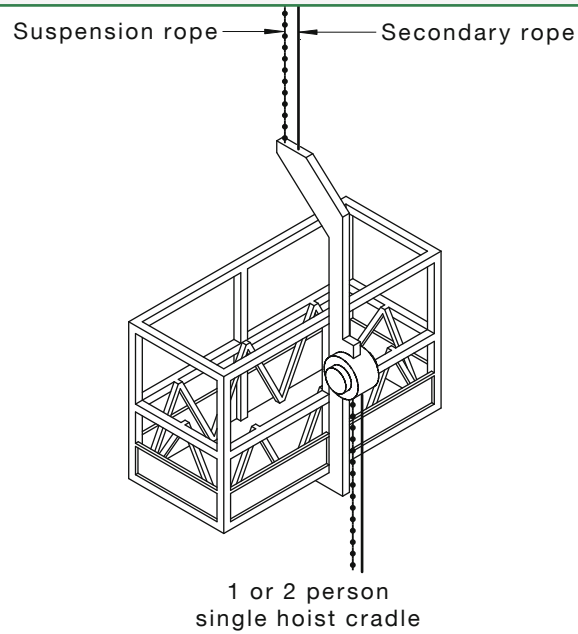


FIGURE A10 SINGLE HOIST CRADLE
(ALSO KNOWN AS A WORK CAGE)

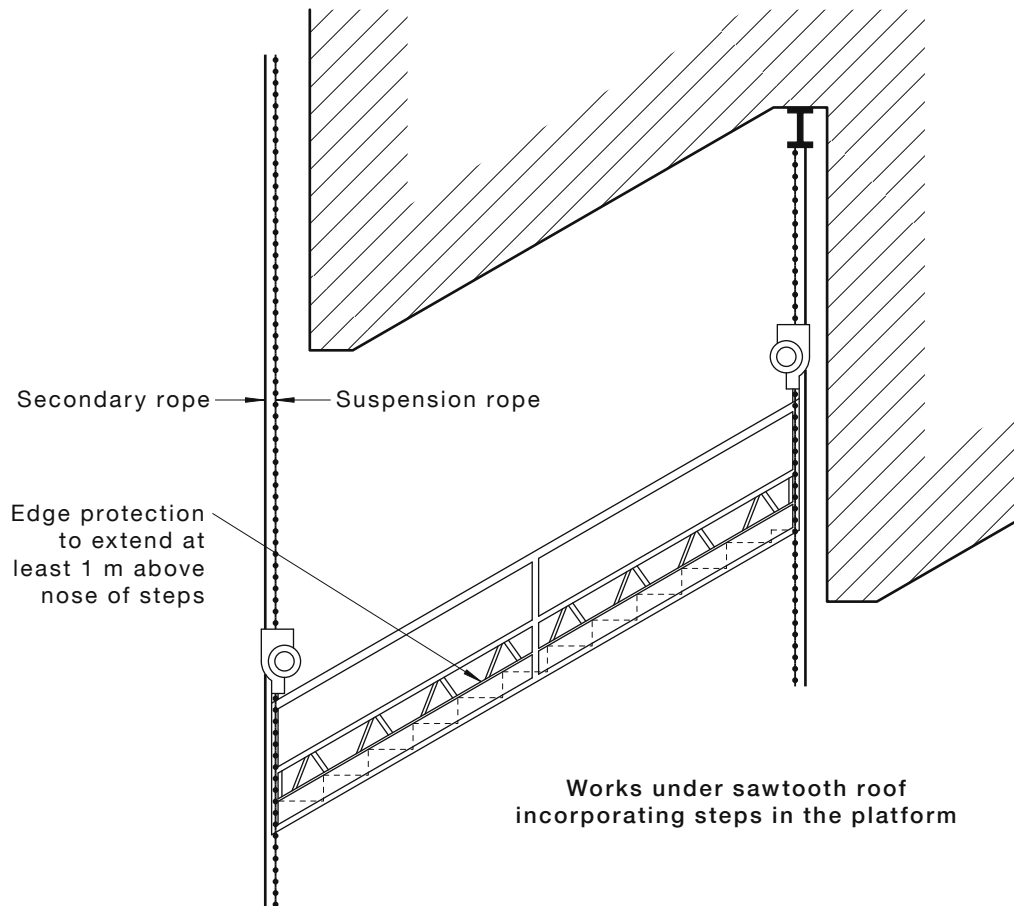
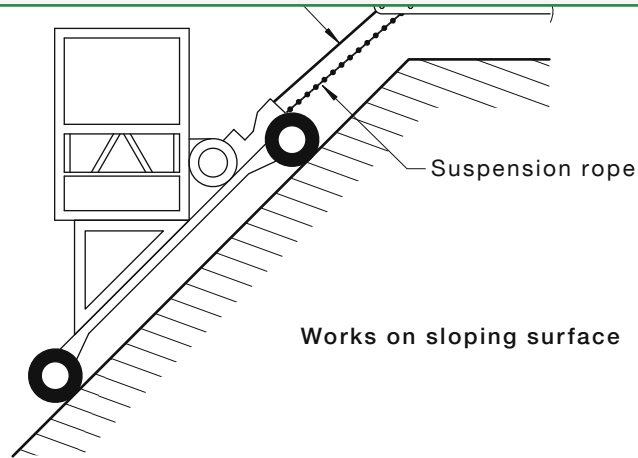


FIGURE A11 SLOPING CRADLE

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NOTE: Ropes to be collected on rope reelers or baskets.

FIGURE A12 SLOPING FACE CRADLE

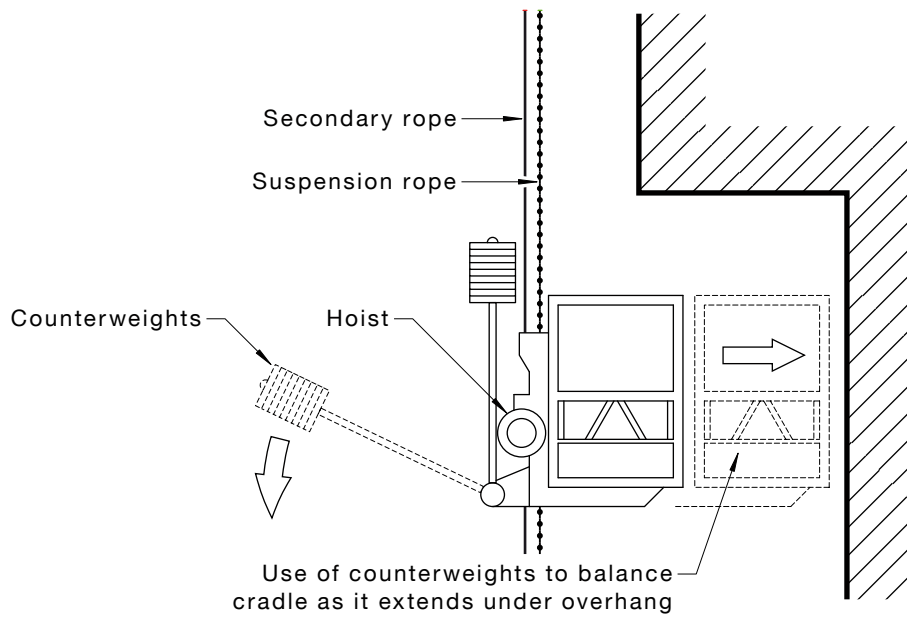


FIGURE A13 CRADLE FOR OVERHANG

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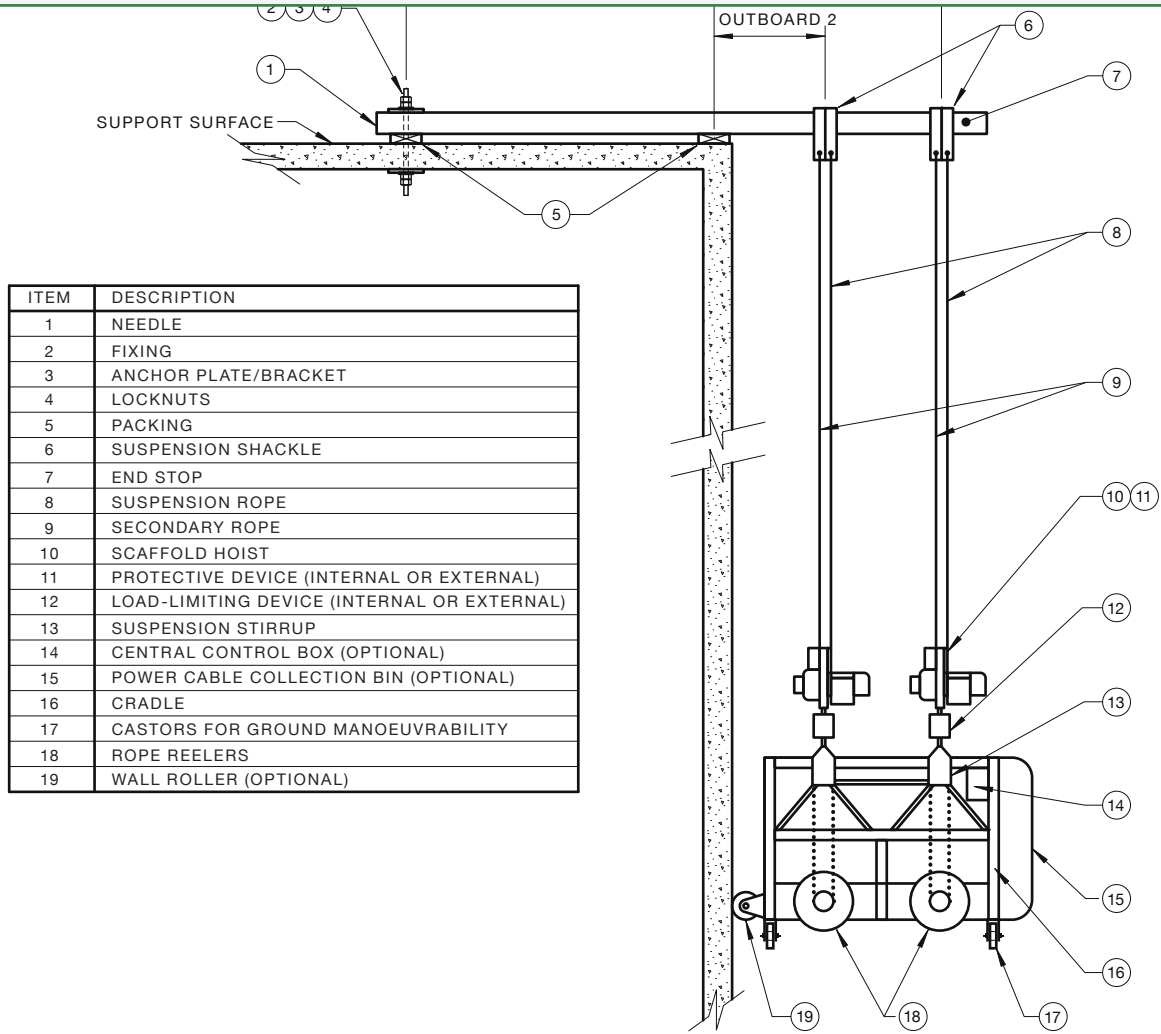


FIGURE A14 TYPICAL DOUBLE HOIST SUSPENDED SCAFFOLD

APPENDIX B

SAFETY PROCEDURES FOR UNATTENDED CRADLES

(Informative)

Unattended cradles on suspended scaffolds should be left such that they cannot be accessed by unauthorized persons and so that wind cannot affect the equipment such that it will cause damage to adjacent structures or equipment.

While a cradle is unattended, appropriate safety procedures, including the following, should be adopted:

- (a) During short periods, such as meal breaks—
 - (i) the cradle should be secured to the serviced structure, to prevent damage to property or equipment from the effects of wind; and
 - (ii) the power supply should be disconnected from the scaffolding hoists, either at the units or at the supply point.
- (b) Overnight or longer periods—
 - (i) the cradle should be isolated from access by unauthorized persons, (e.g., lowered on to a secure gantry);
 - (ii) the cradle should be secured to the serviced structure, to prevent damage to property or equipment from the effects of wind;
 - (iii) trailing ropes and cables should be stored on the cradle;
 - (iv) mobile suspension rigs should be effectively chocked or otherwise prevented from moving under the effect of wind;
 - (v) protective devices should be trip-locked onto their respective wire ropes;
 - (vi) power supply leads should be disconnected from the power supply outlets on the supporting structure; and
 - (vii) air supply hoses should be disconnected from any permanent air supply line, or the supplying air compressor should be shut down and the air reservoir pressure released.

APPENDIX C
OPERATIONAL GUIDANCE
(Informative)

C1 GENERAL

Suspended scaffolding supplied to a job should be accompanied with clear instructions about safe configurations for installation and the intended uses and load combinations. Examples of different shapes of suspended scaffolding are shown in Appendix A.

C2 ERECTION, ALTERATION AND DISMANTLING

The erection, alteration or dismantling of a suspended scaffold should take place only under the control of a person holding the appropriate licence or certificate of competency. This person should examine all components for defects prior to commencing the installation.

Suspension rigs and suspended scaffolds should only be erected or altered in accordance with their design specifications. At the completion of the installation or alteration, the competent person in control of the work should issue a written statement of completion in the form of a Handover Certificate to the person in charge of the workplace. The Handover Certificate should be retained until the suspended scaffold is further altered or dismantled.

Thoughtless or unauthorized alteration to the cradle structure or supporting equipment can endanger the lives of those working from the cradle. Care should be taken to ensure that persons who are working in the vicinity of a suspension rig or other supporting structure do not inadvertently alter or damage the supporting equipment.

Purpose-made weatherproof covers should be fitted to all scaffolding hoists, to minimize contamination of the hoist mechanism by construction materials.

Users of suspended scaffolding should be protected from coming into contact with unprotected electric wires or dangerous plant or substances.

Where there is any likelihood of debris falling from above the cradle, overhead protection will need to be installed. Close meshed or solid overhead protection fixed to the cradle may retain debris that could cause instability to the suspended scaffold.

C3 ACCESS

Safe access and egress points should be provided for users required to work from the cradle. Approaches to the suspended scaffold should be illuminated by either natural or artificial light. Where access is not from the ground or a safe protected landing, safety harnesses and lanyards should be used by all those entering or leaving the cradle and the cradle secured against movement. Guidance on the use of harness systems can be found in AS/NZS 1891.4.

C4 PERSONAL FALL PROTECTION

Where a personal fall protection system is required, guidance can be found in AS/NZS 1891.4. Where an adequate anchor system cannot be provided within the cradle, an independent lifeline may be used.

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An assessment of the structure to support a suspended scaffold and the intended loads should be made by a competent person prior to the erection of a suspended scaffold.

A copy of the statement of assessment or design should be made available to the person in control of erecting, altering or dismantling a suspended scaffold.

C6 SUSPENSION RIGS

Typical suspension rigs are illustrated in Figures 1.5(A), 1.5(B) and 1.5(C). The design of suspension rigs should take into account any likely lateral forces, including wind forces and surging.

C7 STABILITY OF SUSPENSION RIGS

The stability of suspension rigs is specified in Clause 3.6.2.2 which states:

‘The ratio of stability of a cantilever suspension rig supporting a suspended scaffold shall be not less than three (3), where the ratio of stability is the sum of the moments acting on the inboard portion of the suspension rig divided by the sum of the moments acting on the outboard portion of the suspension rig.’

Below is a simple calculation of the number of counterweights needed on each needle of a cantilevered suspension rig.

$$\text{Number of counterweights} = 3 \times (\text{rope tension in kg}) \times (\text{outboard in mm}) \\ \div (\text{inboard in mm}) \div (\text{mass of each counterweight in kg})$$

Where the maximum rope tension is calculated in accordance with Clause 3.4, using the example in note to Clause 3.4.2.3.2, the maximum rope tension = 722.8 kg.

Calculation of number of counterweights (assuming each counterweight weighs 25 kg):

$$\begin{aligned} \text{Maximum rope tension} &= 723 \text{ kg} \\ \text{Outboard} &= 900 \text{ mm} \\ \text{Inboard} &= 3600 \text{ mm} \end{aligned}$$

Therefore: $3 \times 723 \times 900 \div 3600 \div 25 = 21.69 \cong 22$ counterweights per needle.

Include the following factors in calculations of the inboard moments:

- (a) The self-weight of the inboard portion of the suspension rig, including any counterweights.
- (b) The design load of anchorages and props.
- (c) The strength of the supporting structure.
- (d) The distance between the fulcrum and the inboard end of the suspension rig.

Consider the following in calculations of the outboard moments.

- (i) The self-weight of the outboard portion of the suspension rig, including trolley tracks and trolleys.
- (ii) The mass of secondary ropes, traversing ropes, electrical cables, welding cables and compressed air hoses.
- (iii) The distance between the fulcrum and the suspension rope attachment points.
- (iv) The maximum rope tension.
- (v) Where suspended scaffolds incorporate trolley tracks, the most adverse horizontal position of the cradle should be considered when calculating the ratio of stability.

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The design of needles and supporting beams should consist either of scaffold tubes and couplers that comply with AS/NZS 1576.1 and AS/NZS 1576.2, or be structural steel or aluminium beams designed for the intended loads.

A beam that spans between only two supports is often used to support a suspended scaffold in a shaft, boiler or chimney, or through grid-mat flooring and like situations. The supporting beam should be fixed or located to prevent the possibility of dislodgement or slippage.

C9 ANCHORAGE

Anchorage design should take into account the nature of the material to which the anchorage is fastened.

Anchorage bolts should be provided with locknuts or other suitable means that will prevent inadvertent loosening.

Clause 3.6.2.5 specifies that drilled-in anchors, whether expanding or chemical type, be not used in tension.

C10 REVEAL PROPPED NEEDLES

Needles should be positively fixed under or to the reveal props. For needles that are structural beams, close-fitting U-head may be used.

C11 COUNTERWEIGHTED NEEDLES

Counterweighted needle suspension rigs should not be used to stabilize a needle to which two or more suspension ropes are attached.

The use of counterweights is specified in Clause 3.6.2.4 and expanded on in the Commentary to the Clause (C3.6.2.4).

C12 BUILT-UP FRAMEWORK

The built-up framework of a suspension rig should be purpose-built to engineering principles or constructed from scaffold tubes and couplers that are tied together with braced ledgers and transoms to form a structure that is rigid and stable under working conditions.

Each suspension rig should incorporate at least two rows of uprights, fixed with ledgers and transoms and provided with longitudinal, transverse and plan bracing systems. Couplers are required to comply with AS/NZS 1576.2 and tubes and prefabricated modular components are required to comply with AS/NZS 1576.1 and AS/NZS 1576.3.

C13 SUSPENSION ROPES

Do not use wire-rope grips on suspension ropes or secondary ropes, because of potential damage to the rope. Suspension and secondary ropes should be—

- (a) of a diameter, grade and construction that conform to the data plate of the scaffolding hoist and protective system with which they are being used;
- (b) marked with an identification number in a manner which does not damage the rope or ferrule;
- (c) with climber type scaffolding hoists, bullet-headed to help reeving; and
- (d) have an eye that is swaged and thimble, and no part of the rope construction is to be removed to facilitate the swaging operation.

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rope on the drum when the suspended scaffold is at the lowest point. The flange of the drum fully loaded with wire rope should extend not less than two rope diameters clear of the built-up rope, to prevent the rope jumping over the drum flange.

Ropes for climber-type scaffolding hoists should comply with the following:

- (i) There should be at least 1 m spare of suspension rope while the suspended scaffold is at its lowest point.
- (ii) Excess rope should be coiled carefully and tied to hang freely below the cradle, or inserted into a rope winder, to avoid kinking.
- (iii) Where the lowest point of the suspended scaffold travel is neither on the ground nor on an impassable base, and excess rope is not coiled below the cradle, the tail end of the rope should be fitted with a suitable rope clamping device to prevent the rope passing through the hoist.
- (iv) Rope ends should not be fixed to the suspended scaffold unless fixed into a cable reeler, as this can cause kinking or birdcaging and rope failure.

C14 OVERHEAD FIXINGS

Where shackles are used to secure suspension ropes and secondary ropes to suspended scaffolds, scaffold tubes, beam clamps and various other devices, the shackle pin should be moused to the body of the shackle with wire, cable tie or fitted with a split pin to prevent accidental unwinding.

Chains or slings supported over a beam with sharp edges should be provided with beam chaffers.

A positively fixed stop should be fixed at the end of each needle, to prevent ropes from sliding off.

A check coupler should be fitted on either side of the suspension point of suspended scaffold needles, to prevent movement.

In the case of a steel or aluminium beam, a bolt with a diameter of not less than 12 mm should be fitted through the needle with pipe washers.

The maximum rope tension applied to a shackle, strap, bolt, sling, chain, trolley, beam clamp or other device should not exceed 80% of the rated working load.

The maximum rope tension applied to a choked sling should not exceed 40% of the rated working load.

Where a strap is used around a needle or supporting beam, it should be made to an engineered design.

C15 TRAVERSING EQUIPMENT

Where traversing tracks for suspended scaffolds are suspended beneath needles or beams that span between two supports (to help horizontal movement of a suspended scaffold), the ends of the traversing track should be fitted with through-bolted stops, to prevent any trolley from running off the track.

Trolleys supporting a cradle should be connected with a link at the same centre-to-centre distance as the suspended scaffolding hoists, to prevent spreading (see Clause 4.7.2).

Trolleys supporting a double-rope-suspended scaffold should be rigidly connected, both longitudinally and transversely, and braced to prevent twisting.

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500 kg. Clause 4.7.2 specifies that the WLL of a trolley not be less than 1.25 times the maximum rope tension.

Ropes used for traversing suspended scaffold should be of fibre and at least 12 mm diameter.

C16 ELECTRICAL EQUIPMENT AND CONTROLS

Electrical equipment and controls of suspended scaffolding should be safe to install, use and maintain, they are required to comply with the relevant requirements of AS 1418.2. Any central control box should be fully enclosed, lockable, shatterproof and weatherproof and should include—

- (a) socket outlets for scaffolding hoists;
- (b) an emergency stop button;
- (c) a power-on light; and
- (d) a Type I or Type II residual current device complying with AS 3190.

In New Zealand Type II devices are required to be of a design that is unaffected by the presence of direct currents. Residual current devices complying with VDE 0664-20 or JIS C 8221, JIS C 8222 and JIS C 8201-2-2 may also be used in New Zealand.

Operating buttons and levers should be of the spring-loaded deadman type. The electrical control system should fail to a safe condition, in the event of an electrical failure or malfunction. Protection should also be provided against phase reversal in three-phase systems.

Electric cables should be purpose-designed and should be suspended only from built-in thimbles.

Where an electric cable passes over a ledge to a scaffolding hoist operating below, care should be taken to ensure that the electric cable is not caused to bend over a radius smaller than its minimum bend radius. Suitably shaped rigid spacers should be used to protect the cable from damage to its core wires.

Where a central control box is fitted, the main supply cable should be plugged into the box. From this box, separate yokes should lead to the scaffolding hoists. The control box should be removable for safety and security. When in use, it should be attached securely to guardrails of the cradle on the side away from the working face.

Do not use electric cable with a damaged outer covering that has exposed any insulation of the wires.

Do not use electric cable coated with material from a previous usage that is likely to conceal damage.

C17 PNEUMATIC EQUIPMENT

Pneumatic equipment, including air-supply hoses, on suspended scaffolds should be of a type and capacity that are recommended by the manufacturer of the scaffolding hoist. Air supply hoses should be suspended from built-in thimbles with an effective bending diameter of not less than eight times the nominal internal diameter of the air supply hose.

Incoming air should pass through a suitable filter and lubricator set, which is fitted as close as possible to the air motor powering the scaffolding hoist, but does not supply air to a second motor.

Oil in the lubricator should be maintained within the specified levels. Oil should be of the type recommended by the lubricator manufacturer.

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A sign clearly displaying the WLL should be securely fixed to the inside of the cradle. For multi-decked cradles, each level should have a sign displaying the WLL for that level.

For articulated cradles, a sign displaying the WLL should be securely fixed to the inside of each bay.

The width of a platform of a cradle should be not less than 450 mm. The cradle should not be cantilevered past the scaffolding hoist by more than the design distance of the cradle.

The platform dimensions of cages should be not less than 700 mm and not more than 1.5 m.

Stabilizing sheaves, where required, for suspension ropes and secondary ropes should be mounted at least 2.0 m above the platform.

Where netting is specified for cradle on suspended scaffold, it should be either galvanized steel wire mesh netting having wires with a diameter of not less than 1.5 mm and spaced not more than 25 mm apart, or of other fire-resistant materials of an equivalent strength. The netting should be securely fixed between the guardrail and the toeboard on all sides and ends of the cradle.

C19 TRAINING

Suspended scaffolding can be the most hazardous type of scaffolding.

Persons who are to operate suspended scaffolding equipment should be provided with sufficient information, instruction, training and supervision to enable them to use the equipment correctly and undertake emergency procedures. Users should have written authorization to operate that type of suspended scaffold.

Because users in the cradle of a suspended scaffold are isolated from the rest of the workplace, they should have adequate training to avoid the risk of injury, and to enable them to work from the suspended scaffold in a manner for which it was designed. Before working from a suspended scaffold, users should be able to demonstrate the safe work practices learnt in training. Retraining of users should occur each time there are changes in work practices that are likely to affect health and safety, particularly with suspended scaffolding.

C20 SAFETY EQUIPMENT

Adequate personal protective equipment should be present in the cradle and used correctly.

Fire extinguishers that are fitted to the cradle should be full and bear a stamped dated tag.

A first aid box with adequate equipment, including eyewash and means to stem heavy bleeding, should be provided and checked daily. The contents will depend on the work being carried out and the type of materials and substances being used.

There should be a reliable and efficient communication system between the cradle users and other persons outside. Communication systems include persons being in sight of the cradle or chair at all times at a distance from which hand signals, whistles or bells can be used effectively. Radio communication and mobile telephones may be used.

In the event of an emergency, there should be a means for rescuing those in the cradle, such as fire brigade on standby, crane-lifted work boxes and industrial rope access.

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Use suspended scaffolds only in the way in which they were designed and intended to be used. Each scaffolding hoist should be operated by an authorized user. It should not be operated from a remote point via an improvised means such as lengths of rope or wire or by means of wedging or tying a deadman's handle in the 'on' position.

Care should be taken to ensure that, apart from any purpose-designed buffer rollers, no part of the cradle comes into contact with the structure (including protruding scaffold tubes, timber, open swivel or pivot windows) whilst it is climbing, descending or traversing.

Where automatic levelling devices are not fitted, the cradle should be maintained as close as practicable to the horizontal during climbing and descending operations by synchronized operation of the hoists.

An emergency descent should not be operated whilst power is connected to the scaffolding hoist.

Precautions should be taken to ensure that the suspended scaffold and its supporting structure are not damaged by traffic, cranes or other plant.

Lateral restraint may be required to prevent instability of the cradle during use. Instability may result from work procedures or wind. Lateral restraints include—

- (a) lanyards;
- (b) tensioned wire rope systems;
- (c) removable ties;
- (d) fan units; and
- (e) suction units.

Suspension ropes and secondary ropes should not be contaminated with construction materials resulting from work activities.

The cradle should be maintained in a tidy condition with unobstructed access along its entire length.

The total load in the cradle, including users, materials and equipment, shall not be in excess of the WLL of the suspended scaffold.

All reasonable precautions should be taken to prevent materials or debris falling from the cradle or from the area where work is being performed from the suspended scaffold. To protect those passing below, where possible the area shall be fenced off to prevent access to the area below the cradle. Where it is not possible or practicable to close off the area, it is necessary to install a catch platform in compliance with local government regulations. In the absence of such regulations, the catch platform should be designed to support a uniformly distributed load of not less than 5 kPa and be long and wide enough so that it will trap any falling debris.

APPENDIX D
INSPECTION AND MAINTENANCE
(Informative)

D1 SCAFFOLDING HOIST INSPECTION

Each scaffolding hoist should be inspected and subjected to an operational test by a competent person before being sent to a job. Such test should include lifting a test load of 1.25 times the rated load of the hoist (even if the hoist has a load-limiting device) up a distance of not less than 3 m, lowering the load, and arresting and sustaining the load in any position without the hoist showing over-straining of any part.

The protective device should be inspected and subjected to an operational test by a competent person before being sent to a job.

The load-limiting device should be inspected and subjected to an operational test before being sent to a job.

The operational test for a load-limiting device should ensure that the device stops operation of the scaffolding hoist at a load not more than 25% above the load setting marked on the device. Where the load is limited by an electric current limiting device, the test should be carried out with the supply voltage reduced to typical site conditions.

D2 DAILY ON-SITE INSPECTIONS

Before use, a daily on-site inspection of the suspension rigs, cradle, scaffolding hoist, protective device and load-limiting device should be carried out by an operator to check the following:

- (a) The suspension rig and cradle has not been tampered with or shows signs of damage.
- (b) The directional switches function correctly.
- (c) All emergency stop button switches operate correctly.
- (d) The top limit switches operate.
- (e) The emergency crank handle is fitted, if there is provision for such an item.

Where the emergency crank handle has an electrical interlock, loosening the handle will cut off power and re-tightening the handle will return power to the controls. The emergency handle must be left tightened.

- (f) The overspeed governor operates correctly.
- (g) After a manual tripping, the overspeed device functions correctly followed by resetting.
- (h) Any slack rope device functions correctly.
- (i) The load-limiting device does not show visible signs of damage to the equipment and connections to the scaffolding hoist or stirrup.

D3 WEEKLY ON-SITE INSPECTIONS

Weekly on-site inspections of the suspension rigs, cradle, scaffolding hoist, protective device and load-limiting device should be made and the results recorded on an inspection register maintained at the job site. The register should include the following:

- (a) Date of inspection.

- (c) Serial number of the scaffolding hoist inspected.
- (d) Evidence of having passed an operational test, where the cradle is run up and down a sufficient distance to ensure that all operational controls on each attached scaffolding hoist function correctly and the mechanism does not produce unexpected noise or vibration.
- (e) The protective system electrical interlock functions correctly after the overspeed device trips.
- (f) For a protective device not integrated with the scaffolding hoist, the connecting links do not show any signs of distortion and have been correctly sized and fitted with connecting bolts and nuts.
- (g) Name and signature of the inspecting persons.

D4 LONG-TERM SITE USE

Each scaffolding hoist, protective device and load-limiting device used on a job for an extended period of time should be returned to the maintenance shop for a thorough inspection and maintenance program to be carried out by a competent person at periods nominated by the manufacturer but not exceeding six months.

The six-monthly inspections should be recorded in a maintenance register retained in the maintenance workshop or base office. The register should include the following:

- (a) Dates of inspection.
- (b) Dates of services.
- (c) Test notations.
- (d) List of parts replaced.
- (e) Test loads and rated working load of the hoist, in kilograms.
- (f) Statement that the hoist performed the tests satisfactorily.
- (g) The load setting of the load-limiting device, in kilograms.
- (h) Name and signature of the servicing and testing persons.

D5 WIRE ROPES FOR SCAFFOLDING HOISTS

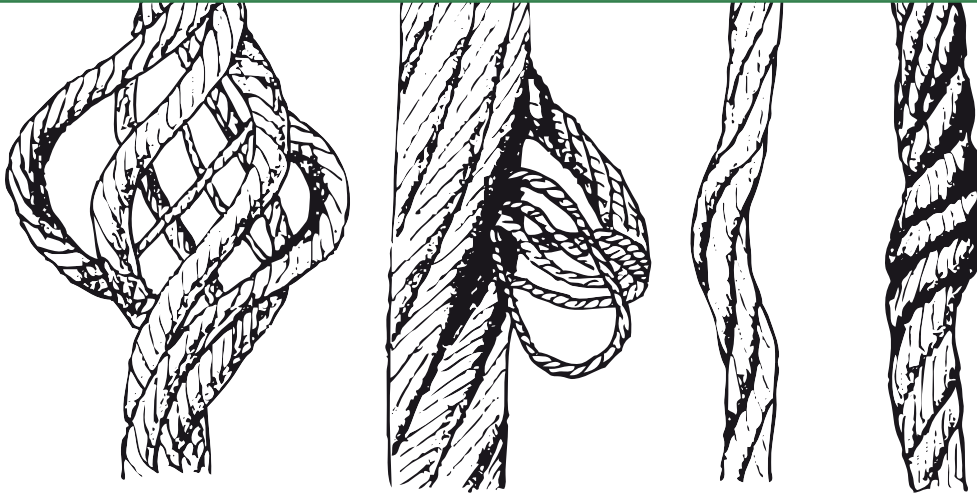
Wire ropes for scaffolding hoists should be inspected by a competent person before being sent to a job. Ropes with defects, including defects shown in Figure D1, should not be sent to a job.

Daily on-site inspections should cover the expected working range of the rope.

The daily on-site inspections should be recorded in a maintenance register retained at the site, in the maintenance workshop or base office. The register should include the following:

- (a) Date of inspection.
- (b) Location of inspection (e.g. on-site, workshop).
- (c) Comment on rope condition or need to remove damage by shortening.
- (d) Shortened length of rope.
- (e) Name and signature on the inspecting persons.

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Birdcaged

Popped core

Kinks

FIGURE D1 COMMON DEFECTS IN SCAFFOLDING HOIST WIRE ROPES

APPENDIX E CHECKLISTS

(Informative)

The checklists detailed in this Appendix may be used for operation and inspection and maintenance (see Appendices C and D) as a means of ensuring all relevant matters are checked at the appropriate time, prior to installation and use of the suspended scaffold.

It is recommended that the completed checklists be kept on site at all times during erection, use and dismantling of any suspended scaffolding complying with this Standard.

Where tick boxes are shown, copies of the relevant backup documentation should be retained and the tick indicates the person filling out the check list has sighted the relevant documents.

PRE-PLANNING

- Design of suspension rig specific to site, including needles, counterweights, etc.
- Design of suspension rig if custom built
- Suitability of building structure for loads to be applied by suspension rig
- Design and condition of cradle
- Hoists and safety devices—registered under plant regulations, if required
- Hoists and safety devices—service and testing
- Wire ropes as per manufacturer's requirements and inspected for condition
- Installation documentation
- Load testing—any specified
- Commissioning—specific requirements to be met recorded and complied with
- Ongoing inspections—process and documentation set up, ready to implement
- User training

Checklist completed by: Date:

(Print Name)

PRE-INSTALLATION

- Load-limiting devices for all hoists are present
- Hoist and cradle secondary rope device are 'in service' (including testing of load-limiting and cradle secondary rope device)
- All electric devices have been tested and tagged
- All electric devices are safe and mounted correctly
- Certification of the cradle design for the nominated WLL and configuration as it is to be used on site. (Includes any cantilever ends, hinges, multi-level cradles, etc.)
- All overhead rigging design documentation is present for the equipment, including site-specific designs for all locations intended to be used.

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Engineering certification for structure to take imposed loads of the scaffold structure including counterweights (that is, roof in case of a roof-mounted structure, tower members where the cradle is suspended off parts of a tower structure, etc.).

Checklist completed by: Date:

(Print Name)

EQUIPMENT SITE CHECKS

Installation checks before use:

Harness attachment points are present and defined

Harnesses are present and fitted with correct length and configuration lanyards

Load sign is attached to the cradle

Suspension rig system, including counterweights (whether scaffold or purpose built), assembled properly and checked

Counterweights are attached securely and not removable without tools

Building structure, including roof and parapet are acceptable and checked (any protection works, such as propping is in position and secure)

Ropes are connected properly and moused

Power supply hung correctly, secure, no visible damage and plugged to correct supply point with earth leakage protection

Final inspection of equipment and sign-off

Access to cradle is safe

Tampering is prevented

Users trained in harness use

Users trained in working from a suspended cradle

Users trained in daily inspection

Users trained in emergency procedures

Checklist completed by: Date:

(Print Name)

GROUND LEVEL CHECKS

Public protection in place, if applicable

Wire ropes secure

Power cable secure and set up so as not to be landed on

Safe access to cradle

Tampering of any of the equipment is prevented

Checklist completed by: Date:

(Print Name)

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ONGOING CHECKS

Daily check (semi-formal)

Checklist completed by: Date:
(Print Name)

Weekly check (semi-formal)

Checklist completed by: Date:
(Print Name)

Monthly check (formal)

Checklist completed by: Date:
(Print Name)

Any time equipment is moved, re-configured or after bad weather, incident, etc.
(formal)

Checklist completed by: Date:
(Print Name)

APPENDIX F

FLOW CHART FOR THE DIFFERENT PHASES OF A SUSPENDED SCAFFOLD

(Informative)

The flow chart shown in Figure F1 gives examples of the different phases in the design and supply, installation and use of a suspended scaffold. The chart is for information only.

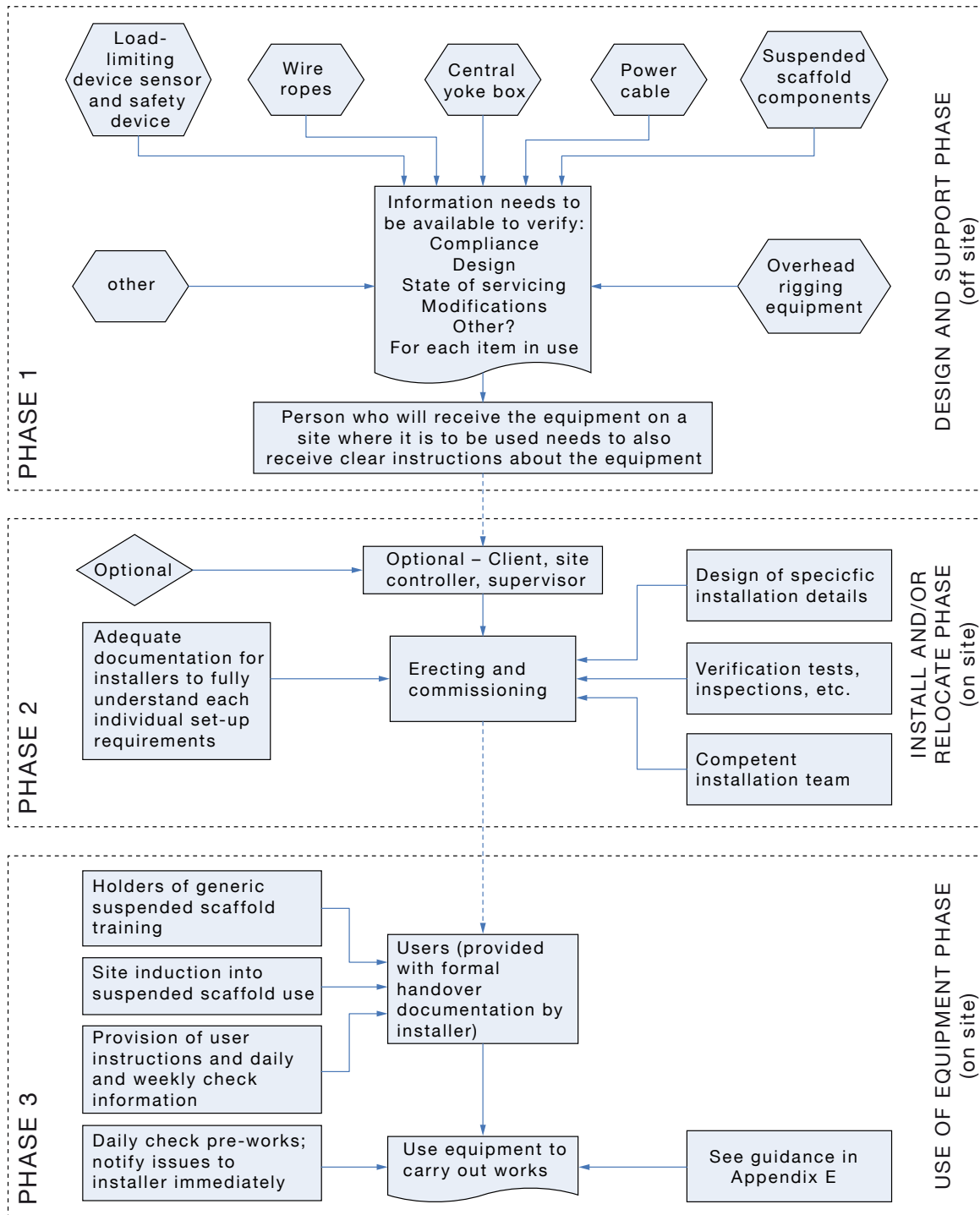


FIGURE F1 FLOW CHART FOR DIFFERENT PHASES OF A SUSPENDED SCAFFOLD

APPENDIX G
CRADLE STRENGTH TEST
(Normative)

G1 SCOPE

This Appendix sets out a method to test the strength of a cradle assembly as an alternative to design by analysis. The method is for determining the strength of suspended scaffolding work cage or cradle of any plan profile and also the capacity of the deck to support a concreted load.

This Appendix does not apply to a boatswain's chair.

G2 PRINCIPLE

The cradle deck only is tested as a unit or, if the design requires the fitting of edge protection components for structural strength, the components are fitted to the cradle deck for the test. The cradle deck is supported in such a manner as to simulate the conditions of support as a suspended scaffold. The cradle is loaded in static bending in a test rig and inspected for failure. Where the cradle is intended to support a cantilever section, this is tested as part of the assembly.

G3 APPARATUS

The following apparatus is required:

- (a) A test rig comprising a rigid base with supports that span the full width of the cradle deck at the equivalent support points of the suspension system and a method of applying the specified load to the span or spans if there are more than two support points. This applies where the cradle deck is of an irregular or non-rectangular shape.
- (b) Weights or device for applying the specified test loads.
- (c) A timer.
- (d) Measuring equipment capable of reading the applied load to an accuracy of 5%.
- (e) Deflection-measuring device with an accuracy of ± 1 mm.

G4 PROCEDURE

The procedure shall be as follows:

- (a) Simply support the cradle deck at the design maximum spans for which it is intended to be used. Where applicable, each end and each intermediate support point shall be supported across its full load-bearing width.
- (b) Apply a preload of 100 N for 1 min over an area of 100 mm \times 100 mm at the centre of each span of the test assembly.
- (c) Remove the preload and take reference measurements from the underside of the centre of each span that is being tested to a firm datum.
- (d) Apply a gradually increasing test load to 1.2 kN over an area of 100 mm \times 100 mm at the centre of each span of the test assembly and hold for 15 min.
- (e) Measure and record the midspan deflections under load.
- (f) Remove the test load and check the deck for any signs of cracking or local permanent deformations.

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- (h) Take reference measurements from the underside of the centre of each span that is being tested to a firm datum.
- (i) Apply twice the design working load as a distributed load over the middle third of the cradle deck for each span being tested. The test load shall be not less than 4.4 kN between suspension points and for cantilever sections. The load shall be applied gradually at an even rate retained for 5 min.
- (j) Inspect the deck under loading for signs of distress.
NOTE: For timber decking material, the signs may be visual or audible. For metal decking material, the signs may include buckling.
- (k) Reduce the test loading to the preload of 100 N, and measure and record the deflection at the underside of the centre of each span that is being tested.
- (l) Remove the preload and check the deck and the attached edge protection structural components, if any, for any signs of cracking or local permanent deformation.
- (m) Repeat Steps (b) to (l) with all loads applied (and measurements taken) within 300 mm of the end of a cantilever end, where part of the cradle.

G5 REPORT

The report shall include the following information:

- (a) Materials and manufactured shape of the cradle deck.
- (b) Type of cradle deck.
- (c) Nominal dimensions of cradle deck.
- (d) Whether edge protection components were attached for the test.
- (e) The test load(s) applied to the cradle deck, and the span(s) tested.
- (f) Deflection measurements as recorded.
- (g) Signs of distress under load or permanent deformation.
- (h) If any failure, the load at failure and the mode of failure.
- (i) Whether the cradle deck passed or failed the test. [Failure is determined where the concentrated load specified in Paragraph G4(f) resulted in cracking or permanent deformation of the deck material.]
- (j) Whether the cradle structure passed or failed the test. [Failure is determined where the loading specified in Paragraph G4(i) resulted in cracking or permanent deformation of any structural member of the cradle.]
- (k) Identity of the manufacturer or supplier.
- (l) Detailed or numbered drawings or photographs of the test apparatus.
- (m) Location of testing facility.
- (n) Date of test.
- (o) Name, position and qualification of the person responsible for the test.
- (p) Signature (including date) of the person responsible for the test.
- (q) A reference to the test method, i.e. Appendix G, AS/NZS 1576.4.

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BIBLIOGRAPHY

AS/NZS

- 1891 Industrial fall-arrest systems and devices
- 1891.4 Part 4: Selection, use and maintenance
- 3190 Approval and test specification—Residual current devices (current-operated earth-leakage devices)
- 4576 Guidelines for scaffolding

JIS C

- 8201 Low-voltage Switchgear And Controlgear
- 8201-2-2 Part 2-2: Circuit-breakers Incorporating Residual Current Protection
- 8221 Residual Current Operated Circuit-breakers Without Integral Overcurrent Protection For Household And Similar Uses (rccb's)
- 8222 Residual Current Operated Circuit-breakers With Integral Overcurrent Protection For Household And Similar Uses (rcbos)

VDE

- 0664 Residual Current Operated Circuit-breakers With Integral Overcurrent Protection For Household And Similar Uses (rcbo's)
- 0664-20 Part 20: General Rules

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