

Australian/New Zealand Standard™

Industrial fall-arrest systems and devices

Part 4: Selection, use and maintenance



AS/NZS 1891.4:2009

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Australian/New Zealand Standard™

Industrial fall-arrest systems and devices

Part 4: Selection, use and maintenance

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-015, Industrial Height Safety Equipment (formerly Industrial Safety Belts and Harnesses), to supersede AS/NZS 1891.4:2000. It is one of five Standards in the series *Industrial fall-arrest systems and devices*. The series comprises the following Standards:

AS/NZS

1891	Industrial fall-arrest systems and devices
1891.1	Part 1: Harness and ancillary equipment
1891.2	Part 2: Horizontal lifeline and rail systems
1891.2 Suppl	Supplement 1: Horizontal lifeline and rail systems—Prescribed configurations for horizontal lifelines
1891.3	Part 3: Fall-arrest devices
1891.4	Part 4: Selection, use and maintenance (this Standard)

This edition has been prepared with the specific intention of aligning it with the recently published edition of AS/NZS 1891.1.

Principal changes from the previous edition are as follows:

- (a) Removal of ‘total restraint’ from the scope of the Standard as equipment provided solely for restraint purposes is not dealt with in the AS/NZS 1891 series of Standards. This Standard recognizes only ‘restraint technique’ which allows for the possibility of a fall and requires the use of fall-arrest rated equipment and anchorages. For clarification purposes a description of ‘total restraint’ is given in Appendix F.
- (b) Minimum allowable anchorage strength to be 12 kN or 15 kN depending on fall distance.
- (c) New terminology for harnesses (full or lower body) and positioning of fall-arrest attachment points.
- (d) Inclusion of twin-tail lanyards.
- (e) In-service values for the extension of personal energy absorbers in fall situations.
- (f) Lower body harness use restricted to limited free fall and restrained fall.
- (g) Updated requirements for operator training and assessment.
- (h) The term ‘suspension trauma’ has been changed to ‘suspension intolerance (trauma)’.
- (i) A belt or waist strap alone in lieu of a harness is no longer permitted for any of the applications in this Standard to protect against a potential fall.

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

Statements expressed in mandatory terms in footnotes to figures are deemed to be requirements of this Standard.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard Industrial fall-arrest systems and devices

Part 4: Selection, use and maintenance

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements and sets out recommendations for the selection, safe use and maintenance of industrial fall-arrest systems and devices based on the use of safety harnesses, horizontal life lines and rails, fall-arrest devices, and associated lanyards, connectors, anchorages and fittings, as follows:

- (a) *Selection* Requirements and recommendations for determining the types of components of the system that would be appropriate to the envisaged usage.
- (b) *Safe use* Requirements and recommendations relating to the safe practices to be followed in the use of components and assemblies.
- (c) *Maintenance* Requirements and recommendations for inspection, storage, servicing and cleaning practices.

NOTE: This Standard provides guidance for the selection of equipment and safe use procedures for some but not necessarily all forms of height protection or all of the circumstances under which such equipment and procedures are used.

The selection and safe use of equipment used in total restraint or rope access is not covered by this Standard (see AS/NZS 4488.2 for selection and safe use of rope access equipment).

1.2 OBJECTIVE AND PRINCIPLES

The objective of this Standard is to provide users of fall-arrest systems and devices with requirements and recommendations relating to their selection, use and maintenance. (See also Clause 1.6, which indicates where fall-arrest systems are placed within the hierarchy of control of fall protection).

The principles on which these requirements and recommendations are based, are summarized as follows:

- (a) Any person at risk of a potentially injury producing fall shall be secured by equipment that is rated for fall arrest.
- (b) A person suffering a fall when secured by a fall-arrest system shall—
 - (i) be subjected to an arresting force not exceeding 6 kN;
 - (ii) be wearing equipment that distributes fall-arrest forces over the body in a way that will minimize the possibility of injury;
 - (iii) be connected to a system which avoids the user reaching ground or striking any other obstacle that will cause injury, and maintains the user in a suitable post fall-arrest attitude for rescue purposes; and
 - (iv) be wearing a harness with at least a front fall-arrest rated attachment point, which may assist in rescue and which is designed to avoid or reduce the likelihood of suspension intolerance (trauma).

NOTE: This does not preclude the use of other permitted fall-arrest rated attachment points.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

NOTE: Excludes some documents listed in the informative bibliography at Appendix B.

AS

1319	Safety signs for the occupational environment
1353	Flat synthetic-webbing slings
1353.2	Part 2: Care and use
1418	Cranes, hoists and winches (series)
1657	Fixed platforms, walkways, stairways and ladders—Design, construction and installation
1666	Wire-rope slings
1666.2	Part 2: Care and use
2550	Cranes, hoists and winches—Safe use (series)
4142	Fibre ropes
4142.1	Part 1: Care and safe usage
4497	Roundslings—Synthetic fibre
4497.2	Part 2: Care and use

AS/NZS

1891	Industrial fall-arrest systems and devices
1891.1	Part 1: Harnesses and ancillary equipment
1891.2	Part 2: Horizontal lifeline and rail systems
1831.2 Suppl	Supplement 1: Prescribed configurations for horizontal lifelines
1891.3	Part 3: Fall-arrest devices
3931	Risk analysis of technological systems—Application guide
4488	Industrial rope access systems
4488.2	Part 2: Selection, use and maintenance

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given AS/NZS 1891, Parts 1, 2 and 3 and those below, apply.

1.4.1 Anchorage sling

A sling designed to be placed around a structural element to form an anchorage.

1.4.2 Competent person

A person who has, through a combination of training, qualification and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

1.4.3 Engineer

A person who is eligible for Corporate Membership of the Institution of Engineers Australia or the Institution of Professional Engineers, New Zealand and who has appropriate experience and competence to assess the integrity of a building or structure and anchorage points.

1.4.4 Fall-arrest device

A self-locking device meeting the requirements of AS/NZS 1891.3 whose function is to arrest a fall.

1.4.5 Fall-arrest system

An assembly of interconnected components comprising a harness connected to an anchorage point or anchorage system either directly or by means of a lanyard or pole strap, and whose purpose is to arrest a fall in accordance with the principles and requirements of this Standard.

1.4.6 Free fall, free fall-arrest

A fall or the arrest of a fall where the fall distance before the fall-arrest system begins to take any loading, is in excess of 600 mm either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or hand line.

1.4.7 Harness

A full-body or lower-body harness as described in this Standard (see Clauses 4.1.2 and 4.1.3)

1.4.8 Height safety equipment inspector

A person who is competent in the skills needed to detect faults in height safety equipment and to determine remedial action.

1.4.9 Height safety manager

A person who is competent in the selection, design, manufacture or installation of height safety systems or equipment, or the development of control measures or work practices.

1.4.10 Height safety operator

A person who is able to perform harness based work at heights under the direct supervision of a height safety supervisor.

1.4.11 Height safety supervisor

A person who is competent in the skills needed to perform harness based work at heights, to supervise other operators including those at entry level and to participate in first response rescue.

1.4.12 Limited free fall, limited free fall-arrest

A fall or the arrest of a fall occurring under the conditions described in Clause 1.4.6 except that under reasonably foreseeable circumstances the fall distance will not exceed 600 mm.

1.4.13 Restrained fall, restrained fall-arrest

A fall or the arrest of a fall where the person suffering the fall is partially restrained by a pole strap.

1.4.14 Restraint technique

Control on a person's movement by use of a fall-arrest system, which entails connection to an anchorage using an adjustable lanyard or other adjustable component that can be adjusted for length as necessary to physically prevent the person from reaching a position at which there is a risk of a free or limited free fall.

1.5 PERFORMANCE REQUIREMENTS

This Standard does not include product performance requirements for height safety equipment. Compliance to this Standard of any such equipment cannot be claimed.

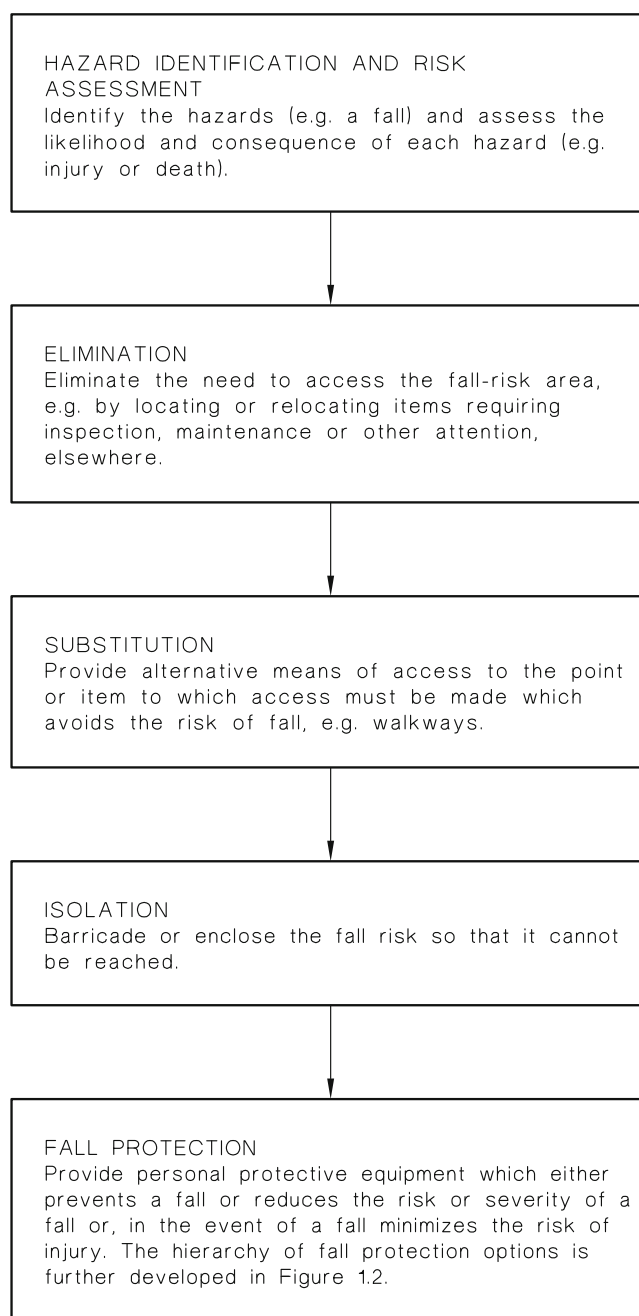
Performance requirements with which items of equipment dealt within this Standard shall comply are specified in AS/NZS 1891, Parts 1, 2 and 3.

1.6 HIERARCHY OF CONTROL

Users of fall-arrest systems need to be aware as to where these systems are placed in the hierarchy of control of fall protection, so that an assessment can be made as to whether the highest practicable level of protection is being applied in a particular case. Figures 1.1 and 1.2 illustrate this hierarchy of control.

Selection of appropriate equipment shall be based on an identification of potential fall hazards associated with the work type and an assessment of the risk of a fall, either free, limited free or restrained (as defined, see Clause 1.4).

Relevant legislation may impose obligations to provide safe systems of work on those responsible for people working at heights. An appropriate means of discharging these obligations is to conduct hazard identification and safety risk assessment with reference to the hierarchy of control of risks. This Standard provides guidance on the selection of equipment and safe use procedures for some but not necessarily all forms of height protection. Guidance on risk analysis can be found in AS/NZS 3931.



NOTES: 1 The most preferred control is at the top and the least preferred at the bottom
2 In New Zealand the legislation refers only to elimination, isolation and minimization

FIGURE 1.1 HIERARCHY OF CONTROL OF RISKS FOR PEOPLE WORKING AT HEIGHTS

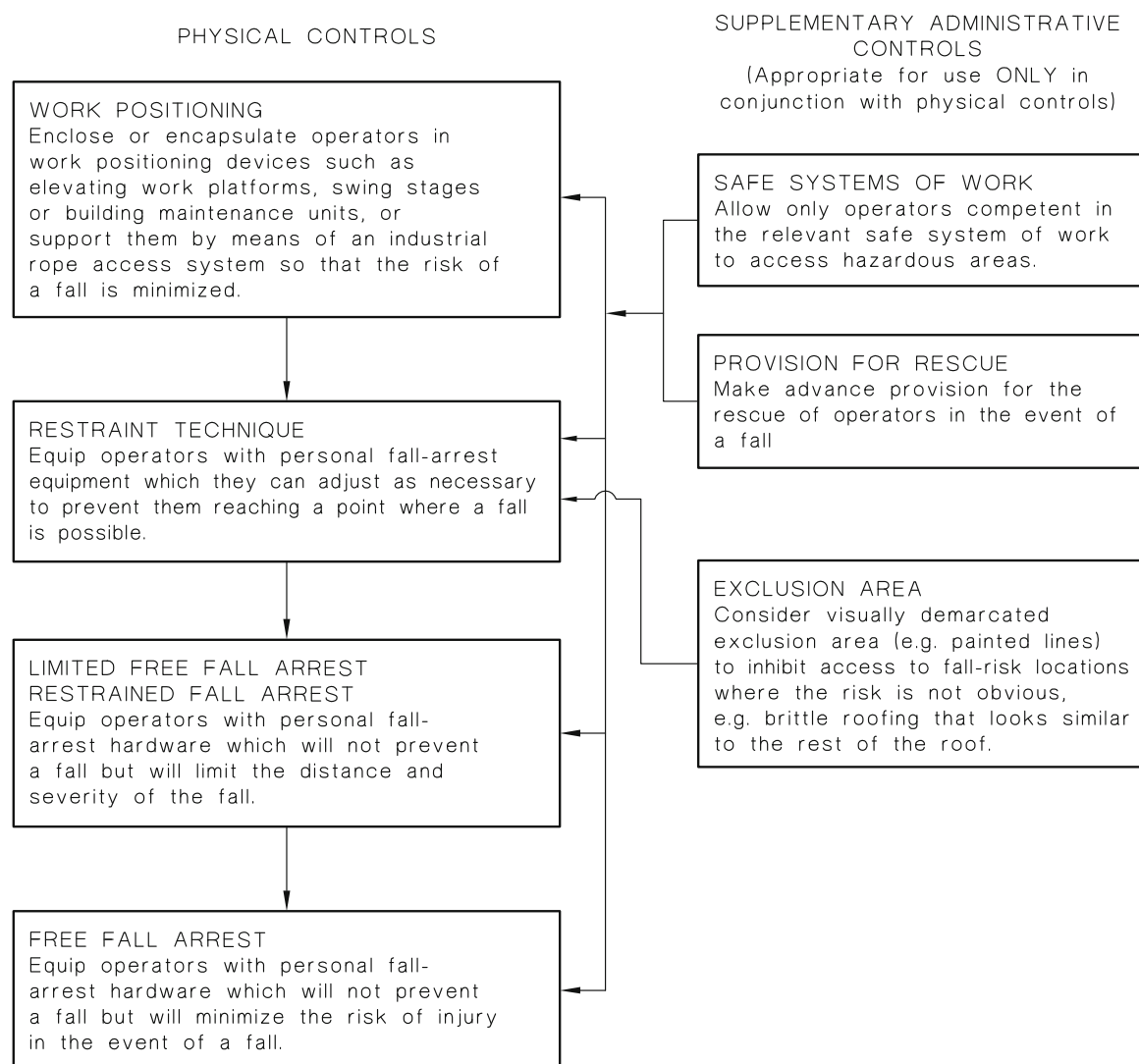


FIGURE 1.2 HIERARCHY OF FALL-ARREST OPTIONS

SECTION 2 GENERAL REQUIREMENTS FOR SELECTION AND SAFE USE

2.1 SYSTEM AND EQUIPMENT SELECTION

2.1.1 General

This Section gives general requirements and recommendations applicable to all forms of fall-arrest systems including restraint technique. It should be read in conjunction with the relevant Sections 3, 4, 5 or 6 relating to the specific items of equipment covered in those Sections.

It is important that investigations be conducted before purchase of any fall-arrest equipment in order to identify the aspects of use that need to be catered for to enable the best system or equipment for the task to be selected. The investigation should include a risk assessment of any special hazards such as those covered in Clauses 2.1.4 and 2.1.5, likely to be encountered during the use of the equipment. Factors needing initial consideration include but are not necessarily restricted to, the following:

- (a) Work type, e.g.—
 - (i) pole work;
 - (ii) work from a high fixed platform;
 - (iii) ladder work;
 - (iv) confined space work;
 - (v) working on a slope, e.g. roof work;
 - (vi) work requiring horizontal restraint only; and
 - (vii) work from elevating work platforms, building maintenance units and suspended scaffolding.
- (b) Potential for a fall and fall severity, e.g.—
 - (i) free fall, including restraint technique that could result in a free fall;
 - (ii) limited free fall, including restraint technique that could result in a limited free fall;
 - (iii) restrained fall.

The characteristics of various situations, equipment and anchorage requirements are specified in Table 2.1. Typical situations are illustrated in Figure 2.1.

- (c) Task mobility requirements, e.g. degree of lateral and vertical movement needed to perform the task whilst connected to the system.
- (d) Constraints on fall distances and clearances, both vertical and lateral (see also Section 7 and Clause 2.2.2).

The selection of a single piece of equipment or assembly, which will cover all of the work types and other operational variables encountered by each user or at least any one set of work situations on a particular job, should be considered.

2.1.2 Effects on wearer

Regardless of the type of system to which the wearer is connected, if there is a likelihood of a free fall greater than 600 mm, a full-body harness shall be worn.

Fall-arrest systems shall be selected and assembled so that in the event of a fall the maximum force transmitted to the wearer's harness is 6 kN.

In the selection of equipment for any particular task, care should be taken to ensure that the equipment gives the wearer, as far as is compatible with safety, the maximum degree of comfort, freedom of movement and, in the event of a fall, the greatest possible security against injury—

- (a) from impact with the ground or other objects below the wearer, or with the surrounding structures;
- (b) from the harness as a result of the arrested fall; or
- (c) from falling out of a harness.

Equipment should be tried on by potential users and checked for comfort and freedom of movement when working. Trials should include users being suspended in the harness, taking care that during such trial the possible onset of suspension intolerance (trauma), see Clause 2.1.6, is allowed for.

Equipment that may be worn by persons at risk of falls of various levels of severity is described in Clauses 4.1 and 4.2, and tabulated in Table 4.1.

TABLE 2.1
CHARACTERISTICS OF VARIOUS RESTRAINT/FALL SITUATIONS

Restraint/fall situation	System description	Equipment and anchorage requirements (minimum) (see Notes 1 and 4)	Typical application
Restraint technique	A combination of anchorage placement and lanyard length adjustment which will not physically permit the operator to reach a fall-risk position (see Note 2) unless the lanyard is incorrectly adjusted.	Fall-arrest rated equipment as follows: Where any possible fall will only be a limited free fall (<600 mm), a lower-body harness and anchorage with ultimate strength 12 kN. All other cases, a full-body harness and anchorage with ultimate strength 15 kN.	Any situation where access to the work can be achieved entirely on a working surface with secure footing and without exposure to a fall provided that the equipment is correctly adjusted.
Restrained fall only	A pole-strap of length which will permit only a restrained fall when working on a pole	Full-body or lower-body harness and pole strap.	Working on a pole where no free fall is possible.
Limited free fall	A combination of anchorage placement and lanyard length which will permit only a limited free fall (< 600 mm).	Full-body or lower-body harness. Lanyard or fall-arrest device that will limit free-fall to 600 mm max. (See Note 2). 12 kN ultimate strength anchorage or equivalent horizontal lifeline or rail.	Any situation where the use of either a short lanyard or a fall-arrest device (or both where applicable) will limit any free fall to 600 mm. May also be applicable to rope access systems, see AS/NZS 4488.2.
Free fall	Any suitable fall-arrest system.	Full-body harness. Lanyard or fall-arrest device which will limit free fall to 2 m max. (see Note 2). 15 kN ultimate strength anchorage or equivalent horizontal lifeline or rail.	Any situation in which a free fall greater than 600 mm is possible.
Total restraint	A system where no fall is possible	Not specified in the AS/NZS 1891 Series of Standards (see Note 3).	See Appendix F.

NOTES:

- 1 Fall protection work practices not in accordance with this Standard, in particular, the use of non-complying personal equipment (e.g. lanyards without specified energy absorbing properties), may create fall-arrest forces which will exceed the anchorage strengths specified in the Table.
- 2 See also Section 8.
- 3 Whilst no equipment is specified, fall-arrest rated equipment can be used.
- 4 'Ultimate strength' means that the anchorage may yield at the stated load but must not fail.

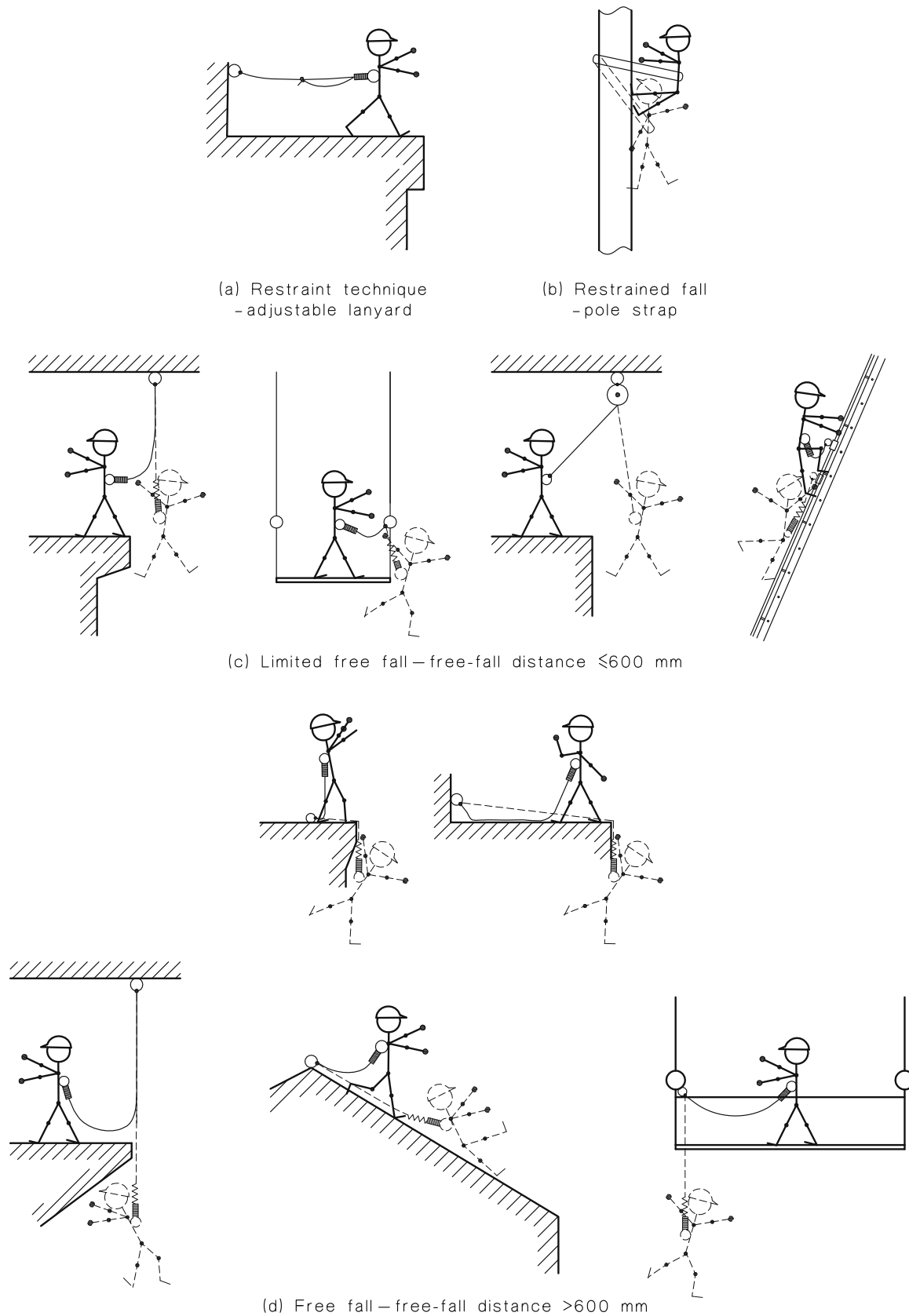


FIGURE 2.1 TYPICAL RESTRAINT/FALL SITUATIONS

2.1.3 Compatibility of components and systems

A fall-arrest system shall comprise items that are compatible with one another. For example, when using connectors, there shall be negligible risk that any of the following will occur such that the connection will be released:

- (a) Loading of a gate on a connector unless the gate is designed to be loaded.
- (b) Loading of a connector in such a way that the locking device can be inadvertently knocked or pushed, and released, leading to the possibility of disconnection.
- (c) Lack of free movement between mating components so that possible jamming will cause unintentional loading that will lead to a connector being released.
- (d) Exposing the connector to excessive wear from a mating surface such as the inside surface of an anchorage point.

Typical cases of compatibility problems that might arise with connections to anchorage points are illustrated in Figure 2.2.

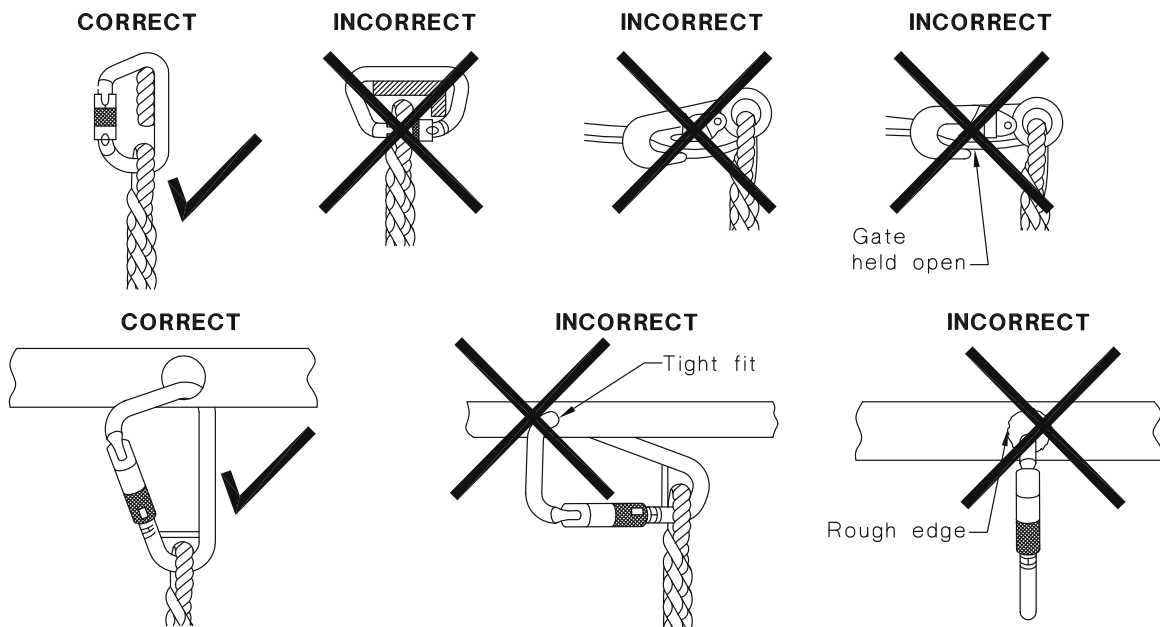


FIGURE 2.2 COMPATIBILITY BETWEEN CONNECTORS AND ANCHORAGE POINTS

In selecting personal equipment special attention should be given to the ease with which an operator can transfer between common user systems without exposure to the risk of a fall.

Further advice on the problem of inadvertent release of attachment hardware is given in Clause 4.3.6.

2.1.4 Work in adverse environments

Specialist equipment may be required for work in adverse environments. Such environments include the following:

- (a) Natural hazards, including wet weather, wet or icy surfaces, sand, dust and high winds.
- (b) Chemical hazards.
- (c) Heat hazards, including hot surfaces, sparks and naked flame.
- (d) Mechanical hazards, including power cutting tools and sharp edges.

- (e) Free flowing solids such as grain in silos.

Where a risk assessment indicates that one or more of these hazards are likely to be encountered, the equipment supplier or other competent person should be asked for help both in selecting suitable equipment and in advising of any special precautions to be taken in its use.

2.1.5 Work task hazards

Work tasks that may be especially hazardous include the following:

- (a) Welding.
- (b) Using power tools, especially cutting tools.
- (c) Use of abrasives.
- (d) Use of chemicals likely to have an adverse effect on equipment.
- (e) Electrical work.
- (f) Work in explosive or flammable atmospheres.
- (g) Work in confined spaces.

Where one or more of these tasks is likely to be encountered, consideration should be given to the following:

- (i) The adoption of altered work practices such as the use of two separate lanyards.
- (ii) The provision of protective sleeves or covers.
- (iii) The purchase of special equipment designed to cope with these hazards.

2.1.6 Rescue and first aid

Analysis of each work environment should include consideration of the provisions for first aid and rescue of a person working at height who becomes incapacitated, e.g. as a result of a fall, and the preparation of a recovery plan for such an event.

The following should be considered in the preparation of such a plan:

- (a) Provision of a means of calling for help by a person whose fall may not have been seen or noticed by others on site.
- (b) Provision for possible self recovery or recovery by such means as fall-arrest devices equipped with winching mechanisms for raising or lowering.
- (c) The need to rescue an incapacitated person from a location difficult to reach and requiring the use of height safety equipment by the rescuer, and not necessarily following a fall.
- (d) The possible need to pre-deploy rescue systems.
- (e) The possible need to render urgent first aid to a person prior to rescue coupled with need to get that person to ground as quickly as possible for professional medical assessment and treatment, and assessment of condition of personal protection equipment.
- (f) The need to manage the threat of suspension intolerance (trauma) by speedy deployment of a rescue system, generally within a few minutes, and whether there needs to be a person at ground level to minimize further injury as well as managing suspension intolerance (trauma).
- (g) The following principles:
 - (i) Rescue should not be reliant on emergency services.
 - (ii) Rescue should not endanger rescuers or other persons.
 - (iii) Rescue should not depend on any action by the person being rescued.

Provision for rescue should take into account that even an apparently uninjured person may only be able to be suspended in a harness for a short period after sustaining a fall without beginning to suffer suspension intolerance (trauma), may have serious consequences (see Appendix A).

2.2 SAFE USE OF EQUIPMENT AND SYSTEMS

2.2.1 General safety requirements and recommendations

Circumstances vary for each industry and specific problems requiring some modification to the requirements and recommendations in this Standard may arise depending on the industry and the task to be undertaken. The underlying safety principles should, however, be taken into account.

The following requirements and recommendations are applicable to the management or supervision of any work with fall-arrest equipment:

- (a) Users of fall-arrest systems shall be connected to at least one fall-arrest system whenever they are at risk of a fall.
- (b) Systems and equipment shall be used in such a way as to minimize as far as practicable the fall distance of a potential fall, e.g. by removing as much slack from the system as possible.
- (c) Fall-arrest equipment shall be fitted and used in accordance with the manufacturer's instructions.
- (d) Fall-arrest equipment shall be carefully handled to ensure parts are not damaged.
- (e) Users should satisfy themselves immediately before and after use that the equipment is in good order and condition and has been inspected, serviced where required and maintained in accordance with Section 9.
- (f) Equipment which is defective shall not be used and shall be either destroyed or marked 'defective' and repaired in accordance with manufacturer's instructions.
- (g) Users shall check for correct assembly of equipment before placing any load on it. Of particular concern is the possibility of clothing becoming entrapped in snaphooks or other connectors, and preventing complete closure of the latch and locking mechanism.
- (h) A particular fall-arrest system shall only be used if there is adequate fall clearance (see Section 7) for that system to operate correctly.
- (i) Hand tools, if carried by the user, should be secured in such a way e.g. by means of a tether, that they will not impede the user's progress or the operation of fall-arrest equipment.
- (j) After use, the equipment shall be stored as indicated in Clause 9.8.
- (k) If the equipment has been used to arrest a fall, the equipment shall be withdrawn from service and referred for inspection in accordance with Clause 9.5.
- (l) If there is a risk of falling objects injuring people below the work area appropriate control measures shall be put in place, e.g. an exclusion zone or a protective structure.

NOTE: Reference should also be made to the particular guidelines for the use of specific devices as detailed in Sections 3 to 6.

2.2.2 Pendulum effect and snagging

Situations that may result in lateral movement or 'swing' during a fall and so produce the pendulum effect, have the potential to result in either the operator striking objects to one side of the fall path or in snagging of the lanyard or anchorage line of a fall-arrest device, which may reduce its effectiveness in arresting the fall. Appropriate preventative steps include attention to the positioning of single anchorages, or the use of diversion anchorages (see Clause 3.2.3) or horizontal lifelines.

2.2.3 Falls over sharp edges

A fall over a sharp edge where the anchor point is behind the sharp edge can result in stress on a lanyard or anchorage line where it strikes the edge during the fall. This can lead to failure to arrest the fall safely or in an extreme case, breakage of the lanyard. Relocation of the anchorage point, selection of a different anchorage type or a protective covering over the sharp edge can reduce this possibility.

Further treatment of such problems specific to fall-arrest devices is given in Clause 5.2.4.

2.2.4 Fragile work surfaces

On a fragile work surface such as a roof, the possibility of a fall through the surface as well as off the edge, needs to be considered. The following factors need to be taken into account:

- (a) *The potential fall distance* If a fixed length lanyard is used, a greater fall distance could result from a fall through the surface at a point closer to the anchorage point than at the edge of the surface.
- (b) *Available fall clearance in accordance with* The area below the surface as well as below its edges needs to be checked for obstructions which could infringe on fall clearance.
- (c) *Sharp edges* The area below the surface needs also to be checked for sharp edges which could lead to snagging or cutting of lanyards or the anchorage lines of fall-arrest devices, or to personal injury.
- (d) *Swing clearance* The presence of lateral obstacles that could cause personal injury if the pendulum effect is encountered, should be checked.

The use of walkways, preferably with handrails, is the preferred means of movement across fragile surfaces. Their use becomes essential if matters raised in Items (a) to (d) cannot be dealt with adequately.

2.2.5 Restraint technique

All restraint technique and limited free-fall equipment and their anchorages shall be fall-arrest rated to ensure adequate safety levels.

Restraint technique entails the use of a harness and adjustable lanyard or other component that can be adjusted for length by the user to maintain a restraint condition in different situations as the distance from anchorage to a potential fall zone varies.

Restraint technique may however, fail to prevent a fall in some or all of the following typical situations, viz.—

- (a) the user can inadvertently reach a position where a fall over an edge is possible; or
- (b) the user makes an error in adjusting the length of an adjustable lanyard such that a free fall position can be reached; or
- (c) there is a danger of the user falling through the surface (e.g. roofing material); or
- (d) there is support failure on a movable platform leading to a fall; or

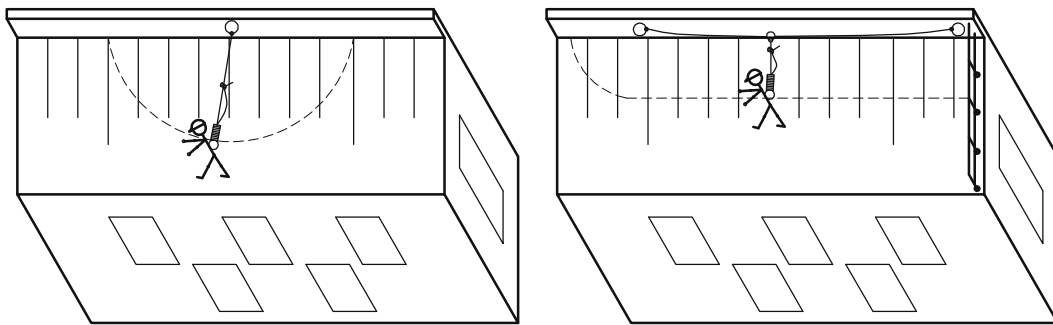
- (e) there are any other reasonably likely misuses or failures of the system that could lead to a free fall.

The requirement for fall-arrest rated equipment and anchorages is designed to cover these eventualities.

Restraint technique is suitable for use where the user can maintain secure footing as set out in Clause 2.2.6 without having to tension the lanyard.

Typical restraint technique situations are illustrated in Figure 2.3.

Despite the requirement to equip the user for fall arrest, restraint technique should be employed whenever practicable as providing an extra level of safety by reducing the potential for exposure to falls.



NOTE: User cannot reach edge if lanyard correctly adjusted

FIGURE 2.3 EXAMPLES RESTRAINT TECHNIQUE

2.2.6 Working on slopes and work positioning

Where a user at risk of a fall can maintain secure footing on a sloping surface without tensioning the lanyard or safety line, or requiring additional support such as hand hold, fall-arrest equipment attached to anchorages of commensurate strength shall be used. Factors that need to be considered as to whether secure footing can be maintained are as follows:

- (a) The degree of slope. Slopes in excess of 15° from the horizontal should always be checked for risk of a fall.
- (b) Surface slipperiness or skid resistance, change from dry to wet conditions and whether the surface is likely to be oily or otherwise slippery.
- (c) Surface roughness likely to become a tripping hazard.
- (d) Security when carrying heavy loads or operating hand held equipment.
- (e) Unusual weather conditions, high winds, snow, ice or frost.
- (f) The grip provided by footwear, e.g. sole material and tread pattern.

Where a user cannot maintain secure footing without the aid of lateral support alternative means of access or support shall be provided, e.g. a harness and pole strap, a walkway in accordance with AS 1657 or a work positioning system such as a rope access system in accordance with AS/NZS 4488.2.

2.2.7 Total restraint

Total restraint is expressly omitted from the scope of this Standard. For further discussion see Appendix F.

2.2.8 Degradation of equipment

The strength and performance of equipment can become degraded due to causes such as wear, exposure to adverse environments, poor maintenance or the general effects of ageing. Inspection requirements are summarized in Section 9.

2.2.9 Labels and signs

Relevant AS/NZS Standards for personal fall-arrest equipment require that they be permanently marked or labelled to indicate their purpose, correct use, limitations and other relevant information aimed at reducing the incidence of misuse or mis-fitting of the equipment.

Descriptive and instructional signs are also required for fixed installations such as anchorages and horizontal lifelines or rails to control possible overloading and advise on correct use. Specific detail on the information to be provided on signs is given in Clause 3.2.5 for anchorage points and Clause 6.3(j) for horizontal lifelines and rails.

Descriptive and instructional signs shall be firmly fixed to a suitable base near the item and shall be sufficiently durable to remain in place and legible for the duration of the installation.

Hazard warning signs shall conform to AS 1319 (Australia only).

Equipment data and maintenance documentation requirements are given in Clause 9.10.

2.2.10 Equipment combinations

Combinations of equipment from a single manufacture shall be used only in accordance with the manufacturer's instructions. Where it is proposed to combine equipment from more than one manufacturer, each separate item should be used in accordance with its manufacturer's instructions and the components checked for compatibility with one another, again, obtaining advice from one or both manufacturers.

2.2.11 Training and competency

Users of fall arrest equipment and all people undertaking tasks associated with harness-based work at heights shall be trained and assessed in accordance with the requirements set out below:

NOTE: Guidance for the provision of training and competency assessment is given in Appendix E.

(a) *Training and competency assessment*

Training and competency assessment shall be conducted at five levels as follows:

(i) *Height safety theory*

All people falling under the competency classifications in Items (ii), (iii), (iv) and (v) shall undergo training in height safety theory to a standard equal to that of a nationally accredited general height safety course for operators.

(ii) *Height safety operator*

Operators at entry level who are required to perform harness based work at heights shall be trained and assessed in a nationally accredited general height safety course or a course of equal standard, to a level of competence where they can work under a supervisor. Such training and assessment shall take into account the type of work to be conducted, the structure(s) on which they work, the fall protection equipment they are to use and first response rescue methods.

(iii) *Height safety supervisor*

Supervisors shall be assessed as competent if they can demonstrate competence in the work requirements of Item (ii) and in addition, can demonstrate their ability to work unsupervised, to supervise on the job, entry level and other operators when performing harness based work at heights and to participate in first response rescue.

(iv) *Height safety equipment inspector*

People to be designated as equipment inspectors shall be trained and assessed in height safety theory, see Item (i), and in the identification and assessment of all defects that may occur on any equipment they may be required to inspect. This includes application of manufacturers' recommendations where they exist for particular items of equipment.

(v) *Height safety manager*

The category of height safety manager shall apply to people who may have tasks associated with harness based work at heights, which include but are not necessarily limited to people who—

- (A) are responsible for the management and administration of people performing harness-based work at heights;
- (B) design infrastructure upon which people may be exposed to a fall-from-height risk or equipment that may be used while working at heights;
- (C) make decisions about the suitability of equipment when purchasing or specifying for purchase, equipment (such as tools and personal protective equipment) that may be required for use in areas where fall-from-height risks exist; or
- (D) participate in safe work practice development for harness based work at heights.

The training and assessment of height safety managers shall include where appropriate, additional height safety theory, the technical skills specific to their work and risk and systems management.

NOTE: Retailers, resellers and the providers of hire equipment should be aware of any duty of care they may be required to observe when supplying equipment covered by the AS/NZS 1891 series of Standards directly or indirectly to operators, by encouraging those operators to acquaint themselves with height safety theory.

(b) *Competency reassessment*

All competencies shall be reassessed at appropriate intervals.

(c) *Records of training and competency*

Records shall be kept for each person who has been trained and assessed as competent. The level of competence achieved shall be recorded.

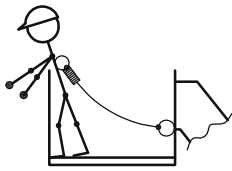
2.3 FALL PROTECTION ON MOVEABLE PLATFORMS

Users of moveable platforms that require occupants to use fall-arrest rated equipment such as building maintenance units, swing stages and boom type elevating work platforms may find difficulty in providing adequately for the anchoring of fall-arrest equipment to the platforms. The following requirements and recommendations for the fall protection of people working on these platforms therefore need to be observed:

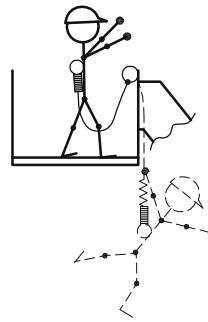
- (a) If an anchorage point with minimum ultimate strength of at least 12 kN cannot be found, the operator shall be limited to the use of a work method that is designed to prevent a fall, i.e. use of restraint technique (see Clause 2.2.5) which will prevent the operator reaching or climbing to a position from which a fall is possible. Fall-arrest rated equipment shall be worn.
- (b) If an anchorage with an ultimate strength of 12 kN or more but less than 15 kN is available, a system allowing either restrained or limited free fall may be used.
- (c) An operator should not be allowed to reach a position from which a free fall is possible unless attached to an anchorage of ultimate strength at least 15 kN.
- (d) In a potential free-fall situation the possibility of encountering the pendulum effect (see Clause 2.2.2) should be considered. This can occur when the anchorage point is neither directly above nor directly behind the operator at the point at which the fall occurs. A typical case is a fall from one end of a swing stage where the operator is anchored to the centre of the stage. A horizontal lifeline or rail within the stage is a possible solution provided adequate strength end anchorages can be found.
- (e) The personal fall-arrest equipment to be used is specified in Table 2.1.

Typical cases are illustrated in Figure 2.4.

NOTE: Further advice on the anchorage points for these equipments may be obtained by reference to relevant parts of AS 1418 and AS 2550.

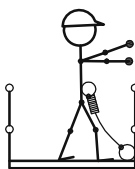
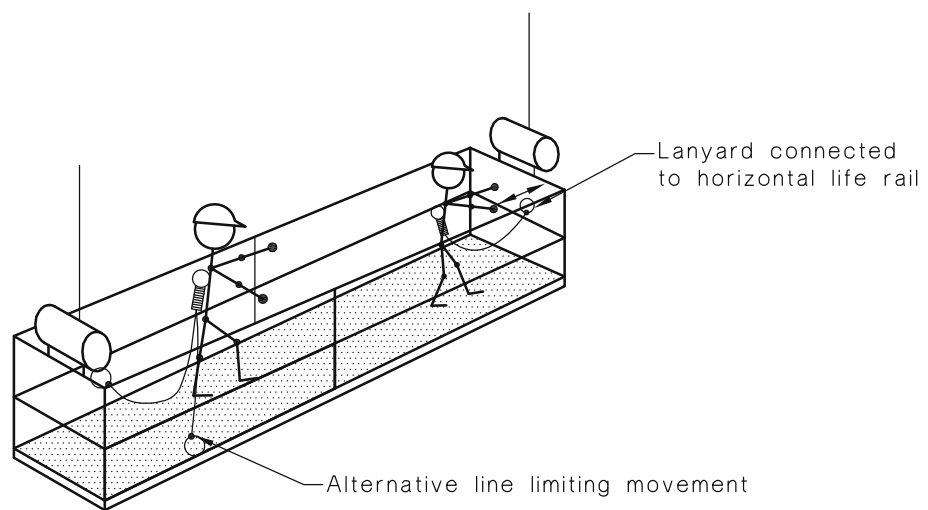


Restraint technique
(see Note 1)

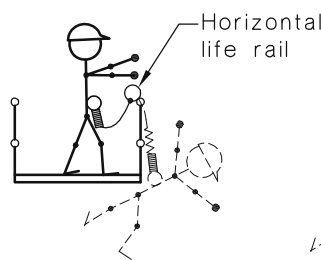


Free fall or limited free fall
(see Note 2)

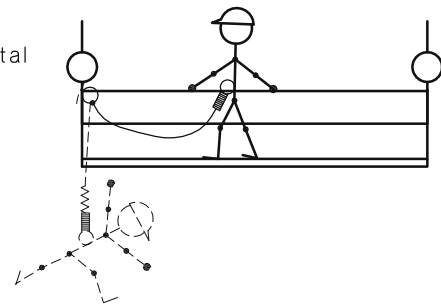
(a) Boom type elevating work platform



Restraint technique
(see Note 1)



Limited free fall ≤ 600 mm
(see Note 2)



Free fall > 600 mm

(b) Swing stage

NOTES:

- 1 It is unlikely that total movement limitation can be achieved in either a swing stage or a boom type elevating work platform due to the minimum requirements for lanyard length in the normal working situation and to the possibility of stage or platform support failure.
- 2 By selection of an appropriate anchor position and use of a short lanyard potential fall distance can be limited to 600 mm or less.

FIGURE 2.4 FALL PROTECTION ON MOVEABLE PLATFORMS

SECTION 3 ANCHORAGES

NOTE: This Section should be read in conjunction with the relevant general requirements and recommendations relating to all systems and equipment given in Section 2.

3.1 ANCHORAGE SELECTION

3.1.1 General

Selection of the type and location of anchorages will depend on the nature and location of the task and the type of construction of the building or supporting structure. A summary of types of anchorage, their strength requirements and their application is given in Table 3.1.

NOTE: Certain structures may not be capable of providing anchorages of adequate strength for fall-arrest purposes as required by this Standard. In such cases alternative methods of protecting workers working at heights, based on appropriate risk assessment, will need to be developed.

TABLE 3.1
STRENGTH REQUIREMENT FOR ANCHORAGES

kilonewtons	
Purpose of anchorage	Ultimate strength in direction of loading (minimum) (see Notes 1 and 4)
(a) <i>Single point anchorages</i>	
Free fall-arrest—one person	15
Free fall-arrest—two persons attached to same anchor	21
Limited free fall-arrest (including rope access anchorages)	12
Restraint technique	12 or 15 (see Note 3)
(b) <i>Horizontal lifelines</i>	
End anchorages	See Clause 6.2.4
Intermediate anchorages	
—diversion less than 15°	12
—diversion 15° or more	12+ (see Note 2)

NOTES:

- 1 As far as practicable all single point one-person anchorages should meet the 15 kN requirement regardless of primary purpose.
- 2 Horizontal component of forces induced during a fall-arrest (multiplied by a safety factor of 2.0) is to be added as indicated in Clause 6.2.5.
- 3 Anchorage strengths applicable when using a restraint technique, see Clause 2.2.5, are either 15 kN or 12 kN depending on whether the ultimate fall risk is free fall or limited free fall.
- 4 'Ultimate strength' means that the anchorage may yield at the stated load but must not fail.

3.1.2 Single point anchorages suitable for direct connection of personal fall-arrest equipment

In addition to any specific requirements of the manufacturer of the anchorage system or other related equipment, the following requirements and recommendations for the selection and location of anchorages apply:

- (a) The anchorage and the structure to which it is attached shall be capable of sustaining an ultimate load equal to that shown in Table 3.1 for the corresponding anchorage purpose for single person use when loaded in the direction of the lanyard, anchorage line, or restraint line during a fall arrest. This load requirement shall be increased by 6 kN (i.e. to 21 kN) if two people are to use the one point. The maximum number of people connected to any one point shall be two.

As far as practicable, all single-point anchorages for single-person attachment should have an ultimate strength of 15 kN even though Table 3.1 specifies a lesser strength for some categories.

The building or structure and anchorage points shall be assessed by an engineer, unless it is clear to a height safety supervisor that the anchorage system is structurally adequate. An example of where an engineer may not be required is where an anchorage sling of adequate strength is secured around a solid permanent structure such as a plant room. However, if any doubt exists as to the structural adequacy of the anchorage, an engineer shall make the assessment. If called upon to make the assessment the engineer shall certify in writing that all combinations of loads in a worst case situation can be safely contained by the proposed structure and anchorage points.

- (b) The following conditions shall apply to the use of anchorages in each of the purpose categories listed in Table 3.1:
 - (i) *Free fall-arrest* Required in any situation where a free fall in excess of 600 mm is a possibility.
 - (ii) *Limited free fall-arrest* Limited to any situation where there is no risk of a free fall in excess of 600 mm.
- (c) Signage in accordance with Clause 3.2.5 shall be provided.
- (d) Fall-arrest anchorages shall, except as given below, be located in positions where there is adequate fall distance before the user can strike a lower obstruction, having regard to the fall-arrest equipment likely to be used (see Section 7). Examples include striking any machinery or open window, door or panel during a fall. If it is not possible to provide clearance from all obstructions a person might strike, the requirements of Section 7 shall be observed.
- (e) Lanyards or anchorage lines shall be able to be attached to the anchorages before the operator moves into a position where there would be risk of a fall, unless the operator is already protected by another fall-arrest system.
- (f) Possible deterioration of anchorages or substrate damage, e.g. that caused by chemical attack, corrosion or atmospheric conditions, should be considered in selecting the anchor material and design.
- (g) Where used, drilled-in anchorages such as friction and glued-in anchorages shall be placed so that the shear load is at least twice the tension load. For collared eye-bolts this translates to a pull at an angle not exceeding 20° to the surface in which the bolt is installed.