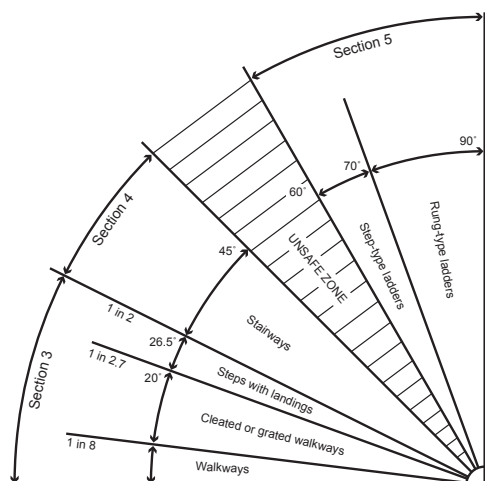




Ladders, steps and stairs. What to use and when.

Ladders are pretty straightforward, right? Think again. The Australian Standard AS1657-1992 is very specific in defining platforms, walkways, stairways and ladders. Unfortunately, far too many buildings have the wrong ladder in the wrong place, exposing their owners to court action in the event of a tragic fall. The following is a handy overview of the requirements surrounding ladders, steps and stairs.

The right choice of ladders, steps and staircases depends on the pitch or gradient to be scaled. The best guide is a chart in AS1657-1992 that covers surfaces ranging from flat to 90 degrees.



Source: AS/NZS1657-1992 (platforms, walkways, stairways and ladders - Design, construction and installation)

0-7 degrees

A walkway is needed for safe access to a roof inclined 0-7 degrees. Normally, the walkway is a 600mm wide, with steel or aluminium grating mounted on support brackets. Follow the spans recommended by manufacturers carefully to avoid flexing that can dislodge fixings and cause roof leaks.

7-20 degrees

AS1657 calls for a “cleated or grated” walkway when the gradient reaches up to 20 degrees. This consists of a square bar fitted across the walkway to gain a foothold. The spacing between the cleats depends on the incline angle of the walkway. It is good practice to install a guardrail/handrail on severe inclines. While guard-rails aren’t specified by the current Standard, their use is consistent with state prevention-of-falls regulations and working-at-heights legislation, and would normally be consistent with the outcome of a risk assessment.

Guard rails are invaluable when, for example, walk up a saw-tooth roof (typically 14- 16 degrees) and sense the need for support – with good reason. Even if you were 5m from the roof’s edge and inadvertently stepped off a 600mm wide walkway on a 14 degree pitch, you would be injured and likely to fall off. A guardrail keeps you on the walkway and provides good hand support.

20-26.5 degrees

In this range, steps with landings are required because the gradient is too steep for a simple cleated walkway but not quite steep enough to accommodate a staircase.

26.5-45 degrees

A staircase should always be built in this range, if practicable, because it is a safer means of access than any ladder but space constraints often present a problem for architects and designers. Table 1 compares the floor space consumed by staircases and ladders to provide access across a vertical 4m rise, for example.

45-60 degrees

AS1657 refers to this as “the danger zone”, so access equipment should not be installed.

60-70 degrees

Step-type ladders consisting of treads and handrails are generally installed in this range. Such ladders closely resemble staircase designs.

70-90 degrees

In this range, rung-type ladders are installed. The preferred angle for such ladders is 75 degrees if practicable, with intermediate landing platforms if the height exceeds specific parameters. Cages are also required under certain conditions, to rest against during access and egress.

Floor space required over a 4m rise	
Access method	Approx. floor space (m ²)
45 degree staircase	4
Step-type ladder	1.75
Vertical rung-type ladder	0.70

Table 1: Floor space required over a 4m rise.



Two factors make step-type ladders safer than rung-type ladders: stability and balance.

The case for step-type ladders

The broad treads of a step-type ladder offer much more stability than 20mm rungs. The step-type ladders also position a person’s bodyweight forward, making a backwards fall unlikely. Instead, the risk is falling to the side, which is effectively excluded by complying with the AS1657-1992 Australian Standard and installing a ladder enclosure.

Ladder hazards

Apart from dealing with space constraints, designers must take the inherent risks posed by different ladder types into account - the injury sustained from falling from a height of 3m is likely at best to be severe and at worst, fatal.

While all ladders are more risky than staircases, it is less risky to use a step-type ladder than a rung-type ladder that introduces a significant risk of falling backwards.



Ladder, steps and stairs. What to use and when.

Ladder lines

'Ladder safety lines' have become a popular way to deal with the risk of falls from rung-type ladders. Generally, steel cables attached to the stile carry a shuttle incorporating a locking mechanism that connects to the user's safety harness.

Unfortunately, they are far from a safety panacea. Ladder lines involve PPE and are one of the last options available according to the OHS Act's hierarchy of control. Users need to be skilled and equipment must be suitable, compatible, carefully maintained and regularly tested. Training and administrative procedures must also be put in place and constantly reviewed. Finally, a fall arrested by a ladder line can also lead to suspension trauma, so rescue plans are essential and users cannot work alone.

Ladder lines are a good option only when severe space constraints preclude the use of a safer means of access (such as a step-type ladder) or midway-landing platforms, or when compliance with AS1657-1992 is not practicable.

Common problems with ladders

The implications of non-compliance with AS1657-1992 are far-reaching. The Standard is referred to in the national Building Code of Australia (BCA), Victoria's OHS Prevention of Falls (Regulations) 2003 and the Code of Practice for Safe Work on Roofs (Part 2) in NSW. A breach of AS1657 is therefore effectively a breach of a host of regulations.

“Apart from dealing with space constraints, designers must take the inherent risks posed by different ladder types into account - the injury sustained from falling from a height of 3m is likely at best to be severe and at worst, fatal .”

In addition to any final inspections carried out by the builder or others, the controller of the workplace must conduct a risk assessment to ensure compliance.

A sample risk assessment follows, based on common non-compliances that Workplace Access & Safety observes in the field.

Floor space required over a 4m rise			
Hazard	Consequence	Minimum/Maximum	Risk Rating*
Insufficient clearance behind rungs of rung-type ladder.	Person can't get proper footing and can fall.	Minimum 200mm	Class 1
Top rung or tread is not level with landing nor one full rung below.	User forced to take uneven step onto landing surface and falls	200-250mm for step-type; 250-300mm for rung-type.	Class 1
Ladder installed at wrong angle.	Ladder ergonomically unsuitable and user can fall.	60-70 degrees for step-type; 70-90 degrees for rung-type.	Class 1
Inadequate hand clearance.	User cannot maintain adequate grip and can fall.	Minimum 60mm	Class 1
Landing platforms not provided at prescribed intervals.	Fatigued user cannot rest and loses grip and falls.	Over 6m - provide midway-landing platform	Class 1

* Class 1 risks have the potential to lead to death or serious disability

Table 2: Risk assessment for a step or rung type ladder

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The bottom line

Dangerous ladders, particularly those at roof level, are a tragedy waiting to happen. The stakes are high and the margins between 'safe' and 'dangerous' are slim: just 10mm of clearance can be the difference between getting enough grip and failing to hold on.

The answer is to develop a practical action plan in accordance with the hierarchy of controls, budget for it and implement it. A great starting point (and one prescribed in the OHS Act) is a height safety risk assessment of your workplace. Thoroughly inspect the access equipment to AS1657-1992 and consult with the people using the equipment.

Your liability will be reduced and, more importantly still, you will be responsible for a safer workplace.



About The Author

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