

Universal Design Checklist

Stairway Design

Stairs are high risk areas, with a significant potential for injury from trips, slips and falls. The following checklist provides best practice guidance for designing safe and accessible stairways.

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Location

- Co-locate stairways with a step free route to provide users with a convenient step free alternative.

Stairway Length, Width & Pitch

- Stairs should have a maximum rise of 1.8 metres or 12 steps between level landing areas (CEUD).¹
- Where stairs are divided into multiple sections (i.e. through the use of landings) each section of stairs should have an equal number of steps.²
- Stair landing areas should be at least 1200mm deep and clear of swinging doors (including landings at the top and bottom of stairways) (NZS 4121).
- Stairways should be wide enough to comfortably and safely accommodate the volume of expected users.
 - External stairs should have a minimum width of 1200mm (CEUD).
 - Internal stairs should have a minimum width of 1000mm (CEUD).

Step Design

- Steps should be between 310-450mm deep and 150-180mm high (NZS 4121/CEUD).³
- Step dimensions and profiles should be consistent across all steps.⁴
- All steps and landings need to be level.
- Make all step edges easy to see across various lighting conditions by using visual highlights or tonal contrasts (CEUD).⁵
 - Nosings should be rounded and of a contrasting colour to the rest of the step tread (NZS 4121).
- Avoid open risers, spiral stairs, or winders as these don't meet accessibility standards.⁶

Handrail Design

- Provide handrails on both sides of all stairs (NZS 4121).⁷
 - Provide an additional central handrail when stairs are more than 2000mm wide (CEUD).
- Handrails should be structurally fixed to support up to 150kg.
- Position handrails to the optimal user height.
 - Dual height handrails provide for a wider range of users.
 - As a guide handrails should be 850-950mm for adults, and 450-600mm for children or people of shorter stature, above the pitch line of stairs (CEUD).
- Ensure handrails are easy to grasp for support.
 - All handrails should be round or have rounded edges, as these are easier for the hand to grip, particularly for people with conditions such as arthritis.
 - Round handrails should have a diameter of 32-50mm for adults and 25-32mm for children (CEUD).
 - Wall mounted handrails should have a clearance of 50-75mm from walls (CEUD).
- Handrails should continue 300mm past the top of the stairs and 300mm plus one tread depth (310-450mm) past the bottom of the stairs (NZS 4121).⁸
 - Stairways should be designed to avoid handrails protruding into pedestrian flows.
- Handrails should provide continuous support around corners and across landings.⁹
- The ends of handrails should be down-turned by at least 100mm, or return to the wall or back upon themselves (NZS 4121).¹⁰
- Handrail fixings and uprights should be free of sharp edges or corners.
- It is recommended that handrails are contrasted in colour against their immediate background.

Additional Safety Considerations

- Stairs need to have slip resistant surfaces.
- Steps and landing surfaces should be evenly lit to 150 lux to ensure good visibility for users (CEUD).¹¹
- Avoid the use of reflective polished surfaces (NZS 4121).¹²
- Install tactile hazard warning surfaces at the top and bottom of flights of stairs. These should extend the full width of the stairs. Tactile hazard surfaces are essential for external stairs and recommended for internal stairs (CEUD).
- Ensure collisions with the underside of stairs are prevented by shielding any areas below stairs that have a headroom of less than 2200mm (CEUD).
- Avoid disappearing stairs.¹³
- Avoid doors and windows that open directly over stairs, these can pose a serious hazard. Also avoid locating fixtures, such as fire extinguishers, directly in the path of travel (MBIE).
- Avoid single steps (MBIE).

Endnotes

- 1 It is important to limit the number of stairs between landing areas so that people, particularly those with limited stamina or are pregnant, have the ability to stop and catch their breath.
- 2 When people walk up or down stairs, their brain enters into a stepping rhythm and expects the same number of steps on each flight. When a lesser amount of steps is unexpectedly encountered, people can step with excessive force, which can result in pain and injury. Step consistency is particularly important for people who are blind or have low vision.
- 3 Having a deep stair with a short rise can be unnatural to a person's gait and can create a trip hazard.
- 4 Similar to the need for consistency in the number of steps on each flight, people expect each step to have a consistent height and depth. If a sudden change is encountered people can step with excessive force, which can result in pain and injury. Again, step consistency is particularly important for people who are blind or have low vision.
- 5 Colour and tonal contrast of step edges is particularly important for people who have low vision. It is also very important for external stairs where light levels are changeable (CEUD).
- 6 Open risers pose significant tripping hazards for people ascending stairs, particularly for those with leg/foot weakness, for example people with Parkinson's or who have had a stroke.
- 7 Handrails on both sides of stairs (bilateral hand rails) allow users to support themselves with either their left or right arm. This is particularly important when someone has one sided weakness, such as following a stroke (NZS 4121).
- 8 Handrails must continue past the top and bottom of the stairs so that people, particularly those who are blind or have low vision, are able to transfer to a firm flat surface before letting go of their support (NZS 4121).
- 9 Continuous support from handrails around corners is important so that people, particularly those who are blind, have low vision or have impaired balance, are able to safely navigate around corners/landings and know that the stairs are continuing.
- 10 It is important that handrails are down-turned, return to the wall or upon themselves so that they do not protrude into path of travel or catch clothing, as well as signalling to people who are blind or have low vision that the stairs have ended (NZS 4121).
- 11 Adequate lighting is a very important measure for increasing safety on stairs.
- 12 Reflective surfaces make step edges difficult to see and give the impression of being slippery, particularly for people with low vision.
- 13 Disappearing stairs are not supported, these pose significant trip/falls hazard to people who are not paying attention, for example using a cell phone, or for people who are blind or have low vision.

Reference List

- 1 Ministry of Business Innovation & Employment (2019). Buildings for everyone: Designing for access and usability. Wellington, NZ: MBIE. <https://www.building.govt.nz/building-code-compliance/d-access/accessible-buildings>
 - 2 Standards New Zealand (2001). NZS: 4121 Design for access and mobility – Buildings and associated facilities. Wellington, NZ: SNZ <https://www.standards.govt.nz/assets/Publication-files/NZS4121-2001.pdf>
 - 3 The Centre for Excellence in Universal Design (n.d.) Building for everyone. Dublin, Ireland: CEUD <http://universaldesign.ie/Built-Environment/Building-for-Everyone/>
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