



MONKEYTOE EBOOK

FIRE STAIR & GENERAL STAIR DESIGN GUIDE

Monkeytoe

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INTRODUCTION

You'll likely need engagement from your fire engineer and Architect but along with them Monkeytoe can provide a stair design service which complies with their requirements, structural requirements and the building code. The design then flows through manufacture and even installation if required.

This piece will help guide you on your choice of design specification. The guide outlines information in the acceptable solution D1/AS1, for clarification on details please consult this document and relevant AS/NZS standards and literature. All stairs are required to be designed to enable the safe exit of occupants in the event of a fire. To confirm the width, design category, landings, required length/distance and number of people it services requires the building to be assessed by a relevant professional. solutions that others haven't. Our XBeam – with the power of carbon fibre – has helped builders and architects see huge gains in their projects, delivering faster, safer outcomes with better returns.

In the design, engineering and architectural spaces, we're always being pushed to make the most of what's available and to create – and find – innovative solutions. Let's see how Monkeytoe and XBeam can help.



**BY USING
MONKEYTOE IT WAS
AN OFFSITE PRE-FAB
ALLOWING US TO
CONTINUE THE
BUILD WITHOUT
INTERRUPTION
ONSITE.**

Nick Wright - Hawkins Consturction, Cordis Hotel
Project.

STAIR CATEGORIES

The Design Category of stairs can be defined broadly into 4 categories:

1'Accessible', 2'Common' 3'Service'/ 'Private '(Minor Private') and 4 Restricted access stairs that are generally used for building maintenance operations such as roof access, these are covered by the AS1657-2018 standard. These classifications govern the pitch or angle, depth of steps and other design characteristics.

A 'Common' stair can be steeper and have open steps whereas an 'Accessible' stair must have a closed design and a wider tread. If the stairs are the only access in a publicly accessible building at least one set must be a 'accessible' stair and the second may be a common, service, or private stair depending on the site specifics. Accessible stairs are not required for private dwellings and small industrial buildings.

ACCESSIBLE STAIRS

These are the easiest access stairs with the gentlest pitch with handrails both sides and are designed to be able to be used by those with impaired mobility if needed. These are typically for public facilities main access, and larger commercial building access stairs. Some buildings can have one accessible route and often a second stair can be classified as a common, service or private stair depending on the fire evacuation design.

COMMON STAIRS

These are most common stairs and for multistorey applications as well as external stairs such as secondary fire escape stairs. These can be accessible to the public but not required to provide for disabled access. Applications include entrance stairs to houses and apartments and externally mounted fire escape stairs. Depending on the fire evacuation design some applications may have multiple Common stairs instead one accessible stair. For the purpose of simplification this includes 'Main Private' stairs as defined by D1/AS1.

PRIVATE STAIRS

These provide private access to a single household unit bedrooms or bathroom areas but not access to kitchens, living rooms garages, does not include external stairs access to verandas and those that are accessible by the public. These are defined by D1/AS1 as 'Minor Private' stairs. Secondary Private stairs are not included in this document.



**ESPECIALLY USEFUL
WHEN DESIGNERS
AND BUILDERS ARE
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LATE TO A PROJECT
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SOLUTIONS IN
NO TIME**



SERVICE STAIRS

These are secondary stairs to provide access for service personnel or goods delivery, does not include external stairs access to verandas and those that are accessible by the public. These are defined in D1/AS1 as 'Service' stairs

RESTRICTED ACCESS STAIRS

Areas that are closed by gates or doors or bars and have access restricted to normal occupants are covered by the standard AS1657-201. These are often incorporated with service and maintenance walkways such as roof top and plant area access systems. These can be steeper and narrower than normal stairs used for everyday use. When specifying these stairs, it is often required to clarify the status of AS1657 as an acceptable solution for this application with the consenting authority.

STAIR DESIGN CHEAT SHEET

Table 1 is a quick reference showing the limits that stairs need to be designed to according to D1/AS1 and AS1657-2018, for more information read the descriptions below and the standards themselves.

Stair Design Limits D1/AS1 and AS1657				
Design Feature	Accessible Stairs	Common Stairs	Service/Private ¹ Stairs	Restricted Access (AS1657)
Max Height Per Flight	2.5m	2.5m	4m	4m
Max Height before change of Direction ⁴	8m	8m	8m	8m
Pitch Angle	23 ⁰ - 32 ⁰	23 ⁰ - 37 ⁰	23 ⁰ - 47 ⁰	20 ⁰ - 45 ⁰
Max Step Height	180	190	220	225
Min Tread Depth	310	280	220	185
Riser Style	Closed	Closed, Open if accessible alternative stair available ⁴	Open ¹	Open
No of risers per flight	≤13	≤13	≤18	≥2 ≤18
Width between handrails	900 mm	900 mm	600 ² , 850 mm ³	600 mm ²
Landings	900 mm	900 mm	900 mm	600 mm
Handrails	Both sides	One side ≤2 m	One side ≤2 m	One side ≤ 1 m
Tread Projection	0-25 mm	0-25 mm – 15 min for Open	25 mm – 15 min for Open	≥-30 mm
¹ For more information on Secondary Private stairs see D1/AS1, not covered here. ² For maintenance access systems covered by AS1657-2018, not covered in D1/AS1 for service or private ³ Required for multi-unit dwellings and recommended for private, 600 mm is OK for service stairs ⁴ Can also be achieved by landings see change of direction info and D1/AS1				

STAIR DESIGN FEATURES

STAIR WIDTHS - HOW WIDE SHOULD MY STAIR BE?

Stairway width is always measured between handrails, the minimum width for Accessible and Common stairs is 900 mm. For Multi-unit residential stairs, the minimum is 850 mm, this is recommended but not mandatory for private stairs. For service stairs and for normally restricted area access systems for e.g., roof maintenance and building services access the minimum width is 600 mm this is covered by AS1657-2018 rather than D1/AS1. It must be noted that for larger buildings the width of stairs is also governed by the fire escape methodology developed by the fire engineer.

HANDRAIL REQUIREMENTS

DO I NEED HANDRAILS? WHICH HANDRAILS DO I NEED?

Handrails should always be on both sides for all Accessible stairs, and Common and Private stairs greater than 2m wide. A central handrail is required for widths greater than 4m. For other stair types a single handrail is permitted for widths less than 2m. Handrails are not required for short steps of 2 or 3 risers for common or private residential applications. Handrails should be continuous except for door openings. Areas subject to overcrowding such as cinemas and shopping malls have a requirement for higher design loadings and must be specified as C5 barriers, other stair handrails are C3 (AS/NZ1170.1). When access is used by children under 6years all handrails gaps must be no greater than 100mm.

HANDRAIL LOCATION

They must be mounted 900mm – 1000 mm above the landing and stair nosing, it transitions to a height of 1100 mm when on top of a barrier on an intermediate landing. This is because barriers to landings must have total minimum height of 1100 mm high as required by F4/AS1.

Handrails must extend 300mm past the end of the steps for accessible stairs

The handrails must be 45-60mm from the side of the wall or stair, 90mm from the top of the handrail to the mounting bracket and a min of 100mm beneath overhangs.

The handrails are not allowed to intrude into the working area of the stair and landing area except for central handrails including those on the inside of a change of direction landgin.

LANDINGS

Landings are the space required at the top and bottom of each flight for resting, access and changing direction. Landings are required on all stairs where the rise is greater than 600 mm. Where a door opens onto the landing a space of 400 mm (600 mm for AS1657) is required to be free of the door edge while opening.

CHANGE OF DIRECTION

A change of direction or a landing length of more than 1800 mm (2m for AS1657) is required when consecutive in line stairs rise greater than 8m. The change of direction must be at least 30° (90° for AS1657)

OPEN & CLOSED RISERS

DO I NEED OPEN OR CLOSED RISERS?

Open risers are allowable on service and private stairs, when able to be accessed by children 6 years and under the maximum opening must be 100 mm. When there is an accessible alternative available common stair may have open risers. Accessible stairs must always have closed risers.

TREAD PROJECTION, EDGE NOSING

STAIR NOSING COMPLIANCE REQUIREMENTS

Treads on Accessible and Common stairs which are required to have closed risers have a maximum tread projection of 25 mm. For Common and Service/Private which can have open risers' stairs must have a minimum projection of 15 mm and a maximum of 25 mm, if closed risers are used a minimum of 0 mm is acceptable. All stairs require the leading edge to be visible, this is normally achieved with a visibly contrasting nosing cover which also provides extra grip. (Lighting can be used in some situations for non-Accessible stair applications).

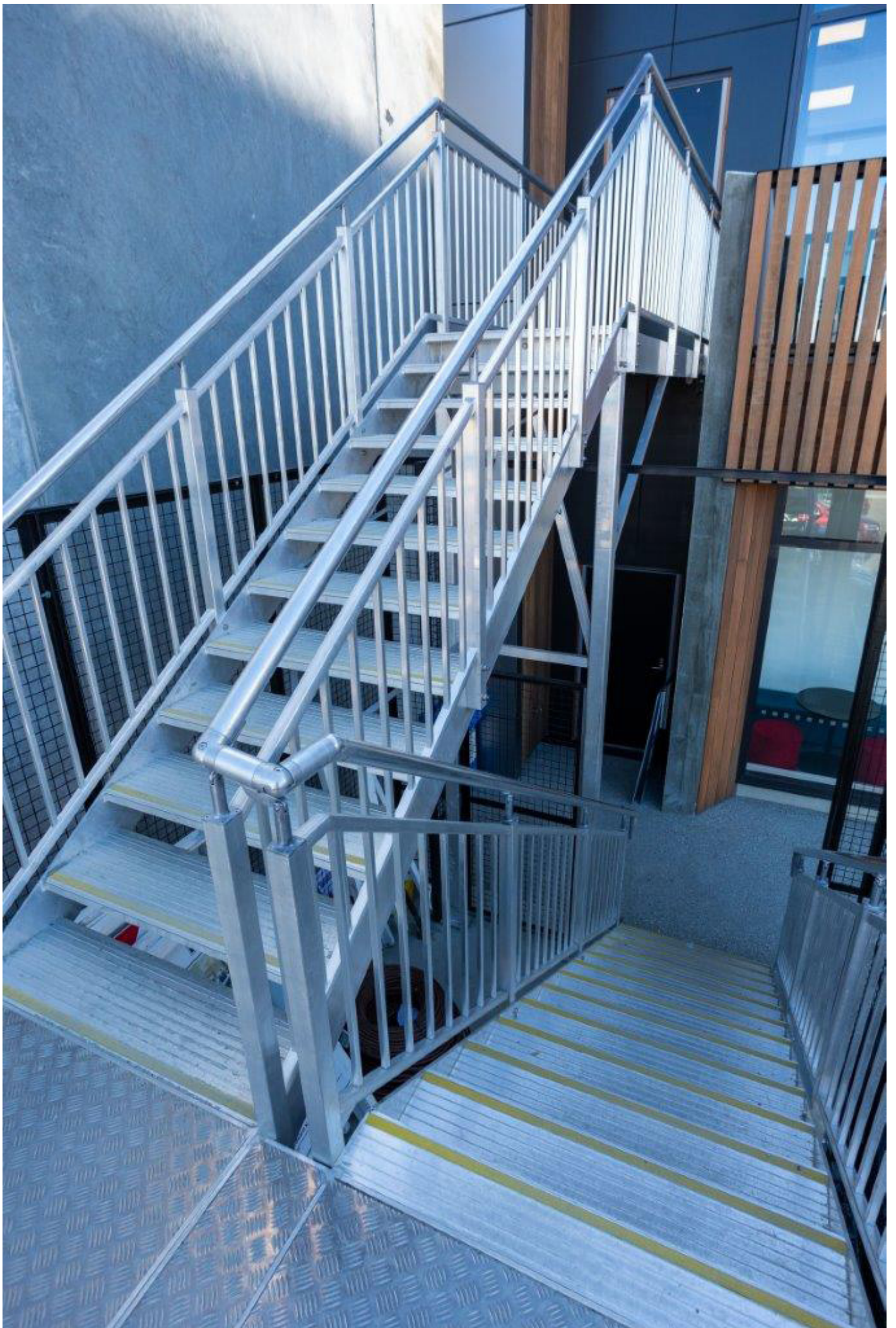


FIRE ESCAPE STAIRS

Fire Escape Stairs are designed to provide a means of escape during a fire. They will be categorised as accessible, common or service depending on each application. Depending on the location and function of these they need to be structurally sound and keep the users safe during evacuation. Aluminium is a Lightweight Long-lasting material ideal for fire exit stairs. The design and placement of the stair needs to ensure any fire protection systems are independent of the stair to provide proper protection. This can be achieved by protective shielding, locating stairs in their own fire cell or locating them away from the side of buildings and window openings

OTHER REQUIREMENTS

Other requirements that need to be considered but not covered in this document are slip resistance, visibility, obstructions, fire engineering requirements and engineering loads. For more information on these please refer to the relevant standards and MBIE literature.



STAIR TERMINOLOGY

ACCESSIBLE STAIR/STAIRWAY - A stairway having features for use by people with disabilities. Usually required in places that the public use, regardless of whether a lift is provided. Not required for private dwellings and small industrial buildings.

COMMON STAIR/STAIRWAY - A stairway which is used able to be accessed by the public but not required to have features for the disabled. Typically for private dwellings entrance, external stairs, and small industrial buildings. NOTE: a Main Private Stair has the same requirements as a Common Stair

SERVICE STAIR/STAIRWAY- A stairway that is used infrequently by service personnel to gain access to spaces for the service and maintenance of goods.

PRIVATE STAIR/STAIRWAY: A stair used by a household unit.

FLIGHT: The set of steps in between two landings

RISER: The vertical height of the step determined by measuring from the top of each surface

PITCH: The Angle of the stair obtained by measuring the angle from the front edge of each step

OPEN RISER: Stairs having no material on the vertical face between the treads

TREAD DEPTH: The measurement of the tread taken from the front to the back edge for open risers and from the front edge to the back corner for closed risers

TREAD PROJECTION: The amount each step overhangs the one below that

Commercial Stair Code Requirements & Design (Including Common, Private, Service, Accessible & AS1657 Stairs).



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