Inline laser cut plate steel stringer

design elements

X1

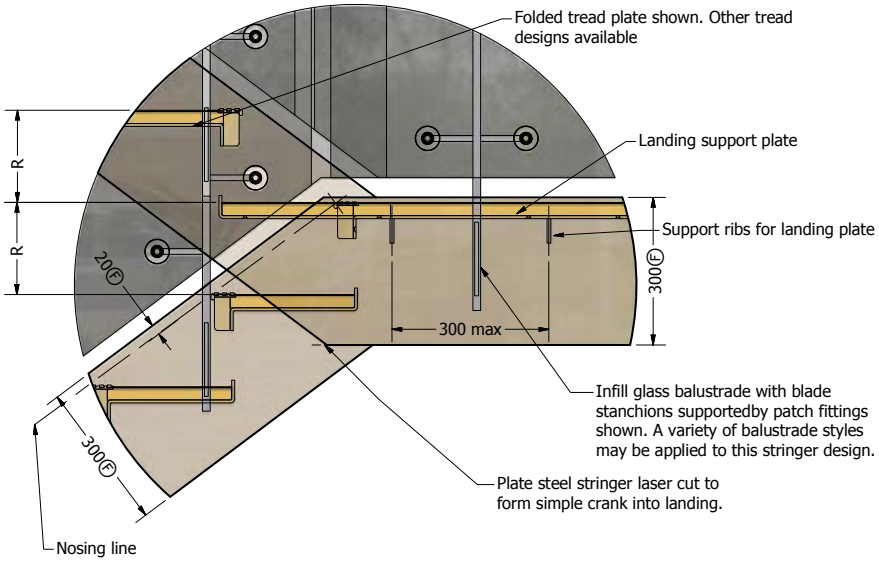
arden
ARCHITECTURAL STAIRCASES

design

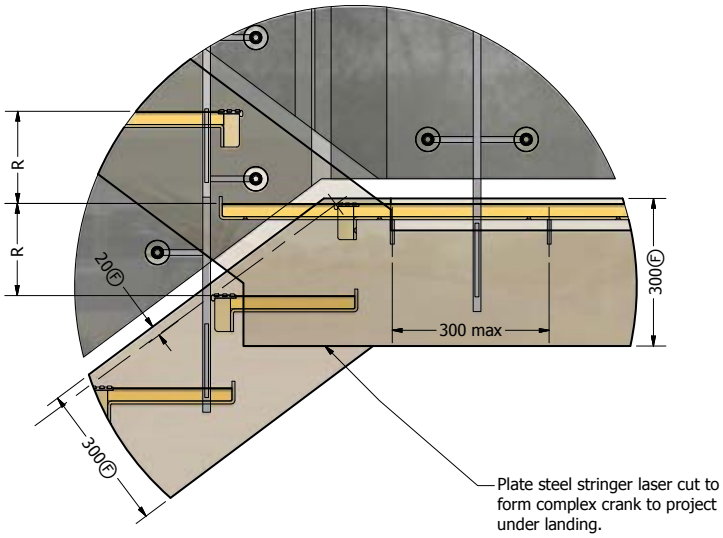
A recurrent theme in modern design is to let the structure speak for itself, and X1 staircase stringer design is an example of how effective this can be in creating visual appeal.

The X1 is designed to create a high degree of openness and an impression of lightness. Plate steel stringers support an open tread and landing design, relying on the strength of complete laser cut section and generating a self-supporting structure. Welded tread plates cross-brace the stringers.

Continuous through the landing, this style of stringer allows for a floating appearance as it can span from the upper flight to an opposing wall or column without the need for intermediate landing supports. These design methods generate a light and open feeling, well-suited to many contemporary office layouts.



1A

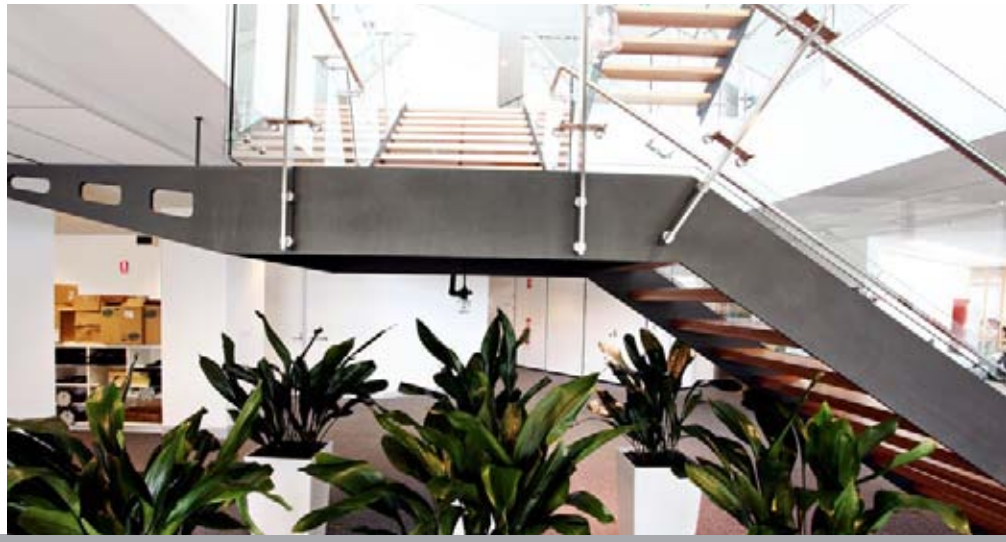


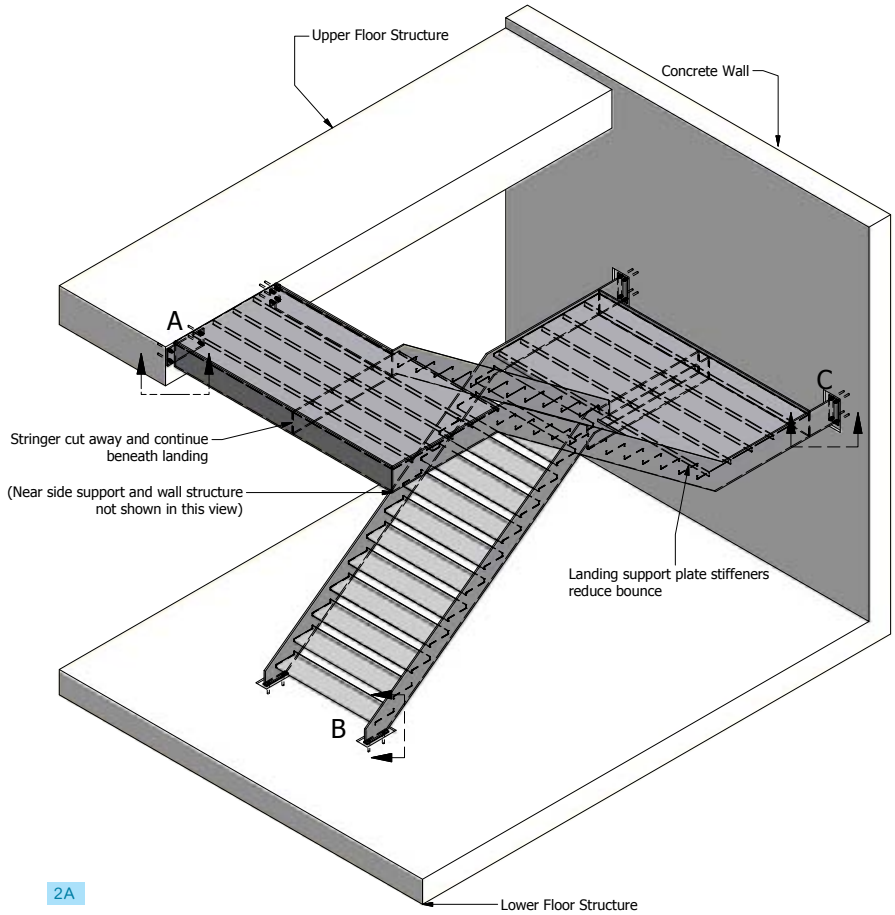
1B

Figure 1. Stringer detail

1A. Simple crank into landing

1B. Complex crank into landing





2A

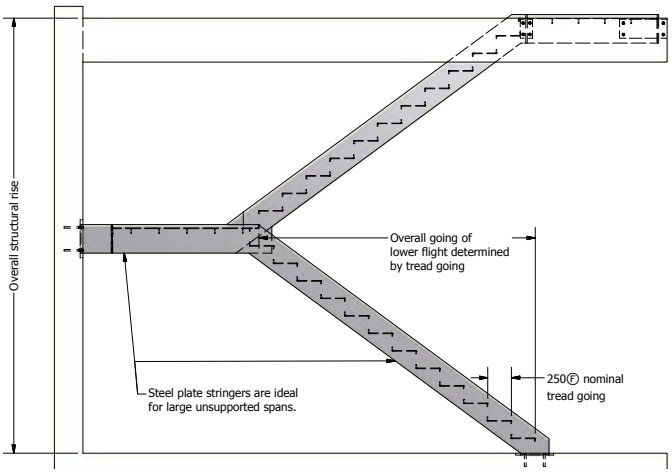
Figure 2. Plate stringer. The 'U' configuration shown is just one example of the many configurations possible with the X1 design.

2A. Engineering overview

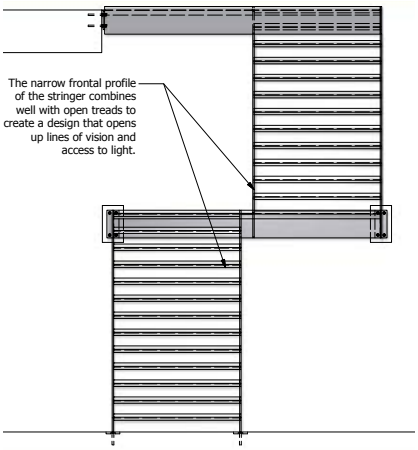
2B. Side elevation

2C. Front elevation

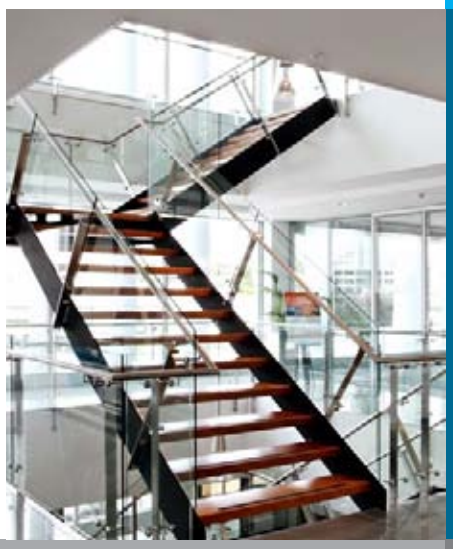
Ⓕ indicated on dimensions denotes a nominal dimension that typically varies according to specific application, engineering requirements or client preferences.



2B



2C



technical

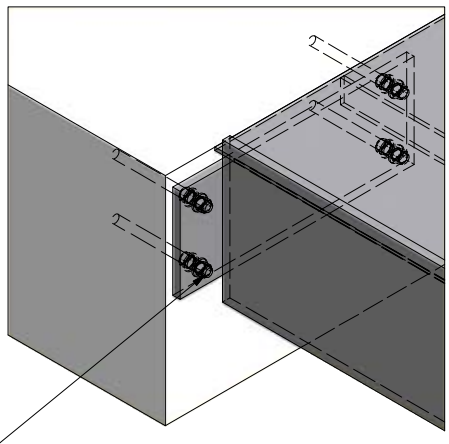
Stringers typically constructed from 200-400 x 12-200mm mild steel depending on span and load rating. Minimal plate steel dimensions that satisfy engineering requirements for design load are generally selected, reducing the bulk of the staircase and increasing the impression of lightness and openness.

In some of the examples shown, the lower stringers of the upper flight continue beyond the landing to concealed columns in the wall.

Regardless of the wall coverings (i.e. plaster, stone, shiplap), the penetration of blade-like plate stringers into the wall presents a highly effective and modern appearance. This is one of the primary advantages of laser cut plate steel over other stringer types.

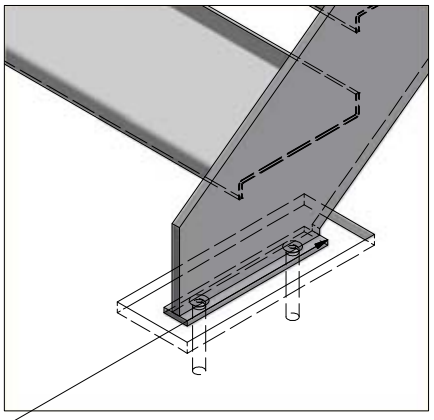
Three alternatives for tread designs applicable to the X1 are shown. If these do not suit, a wide variety of custom tread assembly options are also possible.

The X1 suits virtually any configuration of straight landings and flights: the illustrations use a particular configuration as an example.



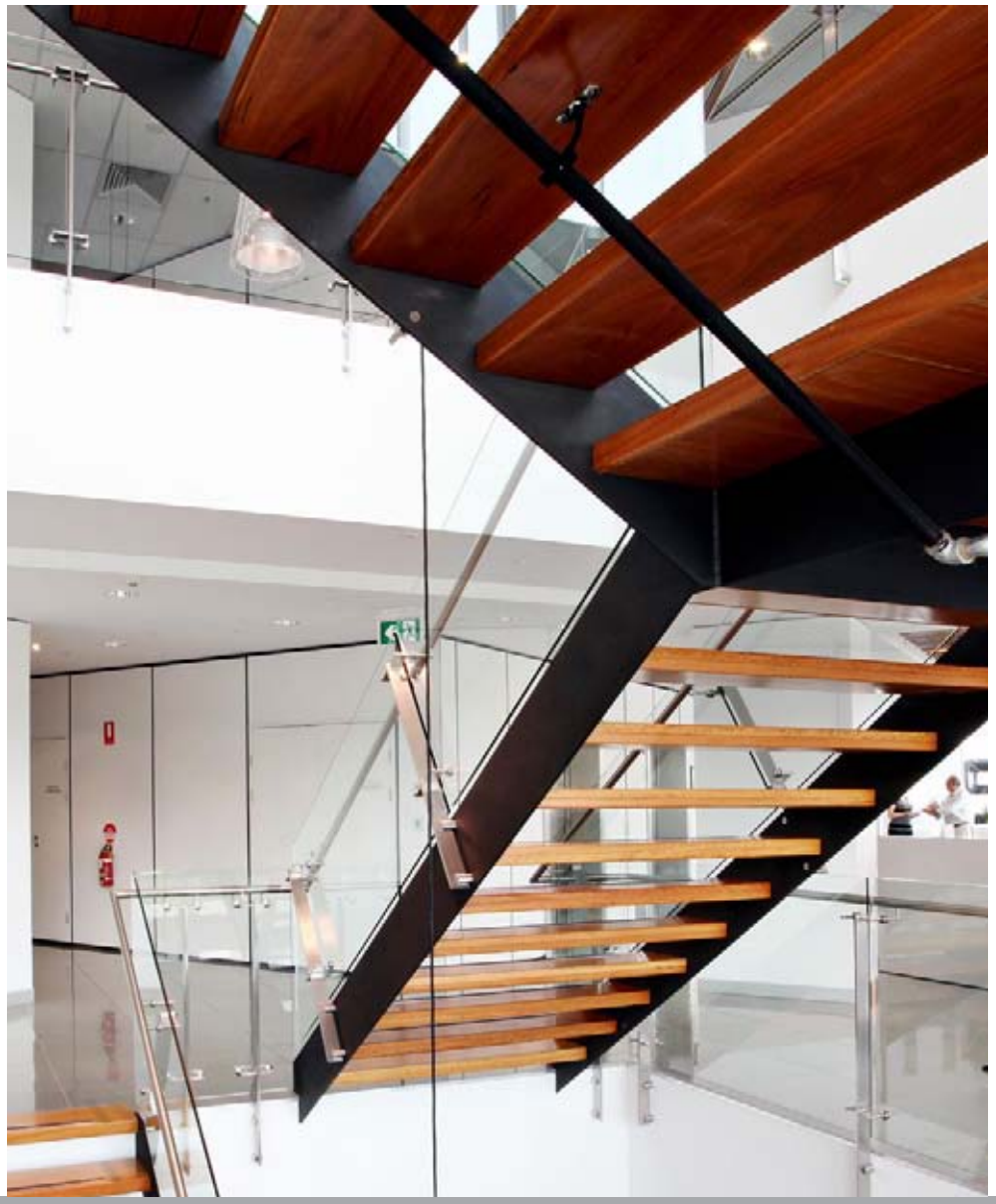
M16 rods chemically bonded into floor structure. Void edge fixing located on rods using 2 nuts. The fixing assembly is covered by void edge treatment stucture.

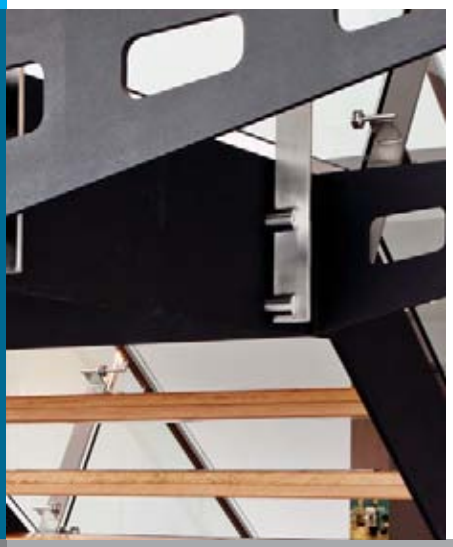
3A

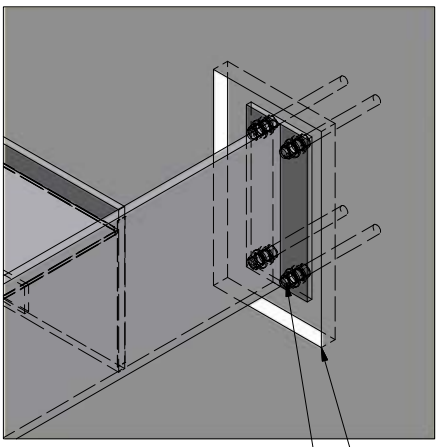


10mm steel fixing plate shown as rebated into floor to allow floor cover to go over. Other options available to suit customer and site requirements.

3B



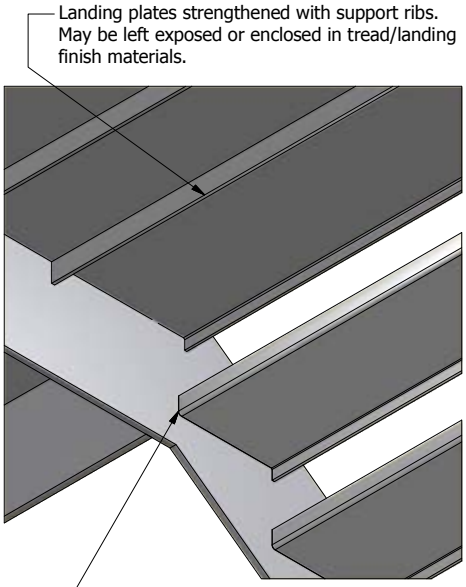




M16 rods chemset into wall

10mm plate steel fixing plate rebated into wall and plastered over for flush finish.

3C



Landing plates strengthened with support ribs. May be left exposed or enclosed in tread/landing finish materials.

Welded steel tread plates add lateral and torsional strength to the stringers as well as supporting the treads.

3D

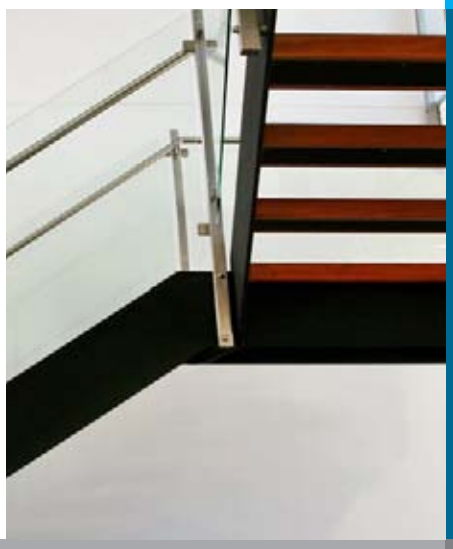
Figure 3. Typical fixing methods

3A. Fixing to upper structural floor

3B. Fixing to lower structural floor

3C. Fixing to structural wall

3D. View from underneath an upper landing illustrating support method for treads and landings



X1

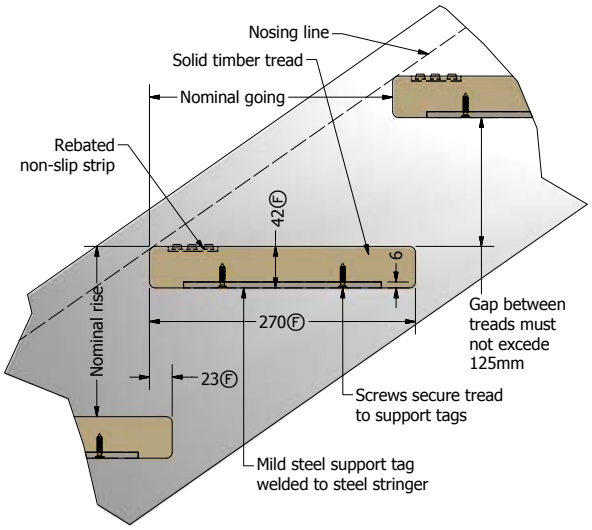
Figure 4. Tread options

4A. Tread option A: Monolithic timber treads supported by welded steel tags

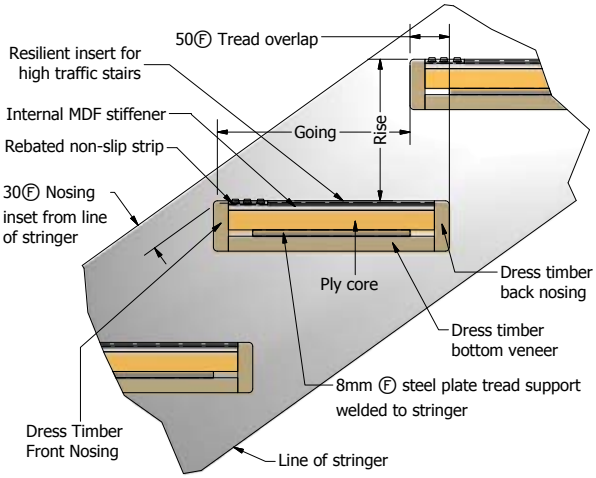
4B. Tread option B: Composite timber treads with non-slip strips supported by internal steel plates welded to stringer

4C. Tread option B: Isometric cross-section illustrating the internal MDF stiffener, non-slip strip and side laminate components

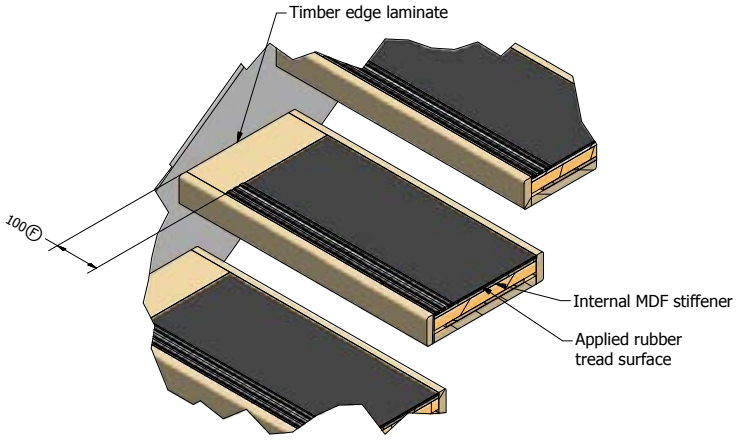
4D. Tread option C: Composite timber treads with non-slip strips supported by exposed folded steel plates welded to stringer



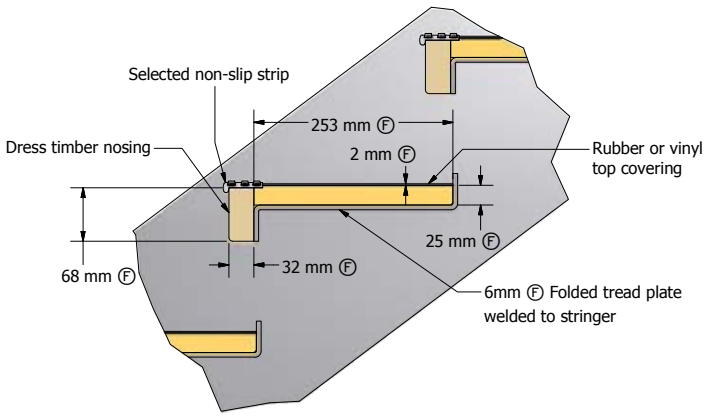
4A



4B



4C



4D

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compliance

Arden is a BSA licensed contractor for carpentry, joinery, glass, glazing and aluminium as well as structural metal fabrication and erection. Arden supplies a Form 16 (Licensed Contractor) on all projects. In design and construct contracts, a Form 15 (Design Engineer) certification is supplied upon request. For products and services incorporating the X1 system, this table shows compliance with relevant codes and standards.

Key

- ● full compliance with the code
- ◑ can comply (see note for details)
- ○ not applicable to this element

Code	Title	Applicability
BCA	The Building Code of Australia	●
AS NZS 1170.1-2002	Structural Design Actions – Permanent, imposed and other actions	●
AS 1288-2006	Glass in Buildings. Selection and installation.	○
AS NZS 1554.1-2004	Structural steel welding - Welding of steel structures	●
AS 1554.6-1994	Welding stainless steels for structural purposes	●
AS NZS 4586-2004	Slip resistance classification of new pedestrian surface materials	●
AS 1428.1-2009	Design for access and mobility	◑ [1]
AS 1657-1992	Fixed platforms, walkways, stairways & ladders. Design, construction and installation	●

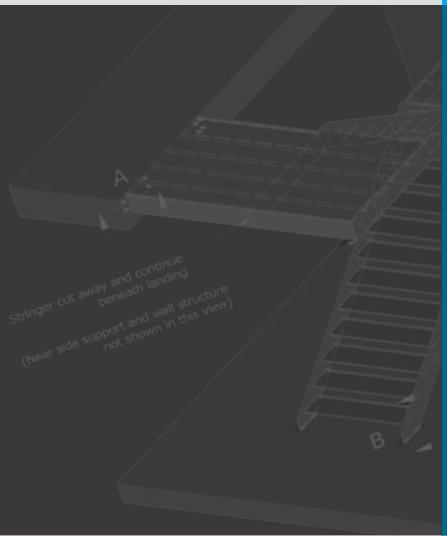
1. The incorporation of risers into the tread design is required for full compliance with AS 1428.1-2001

design note

For all commercial applications, it is important that sufficient space for the stairwell cavity be allowed to satisfy Australian Standards and BCA requirements.

The footprint is primarily driven by the floor to floor rise, as well as the staircase configuration chosen. However, stringer and balustrade style design may increase the amount of space required. Allowing too small a cavity can restrict the design options of the staircase. Also, points at where the staircase interacts with other structures are best addressed early in the design cycle.

Consultation with Arden early on will help ensure that these design issues can be addressed in a cost-effective manner.



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