

A Ledger
B Stringer
C Tread
D Deck Fascia
E Cleat

There is often a need for steps as an access to a deck or for use between decks with different levels. Exterior stairways can be much the same as open internal stairs within a house, except that detailing which avoids trapped moisture or exposed end grain of the members should be used. A basic open stairway consists of the two stair stringers and the treads. The supporting members of a stair are these stringers which are used in pairs spaced at up to about 1 metre apart. The overall height of steps from ground line to deck or landing should not exceed 1 metre.

Steps have several important parts

- Stringers which are the sides of the steps to which treads are fixed.
- Treads are the actual walking platforms which bridge between two stringers. Supported by cleats fixed to stringers.
- Rise which in all designs of steps or stairways is equal to the vertical distance between the upper surfaces of the treads, desirably uniform over the length of the stairway. In this project, and in many published tables, this term may be used interchangeably with "riser" to indicate this height of each evenly spaced step.
- Fixings which attach stringers to the base which may be a concrete slab, path, paving at ground level, or the lower deck; and at upper level to the upper deck supports or perhaps to the house.

First Considerations

Unfortunately, there is no set of steps which will fit every location. To provide comfortable and safe steps which comply with Local Government Regulations, each set of steps should be designed to suit the particular application or situation.

Several established rules should be followed if comfortable, safe and approved steps are to be built.

- All risers should be of equal height, and this includes the first riser from the base (or ground) level and the last riser onto the upper level.
- Steps should provide a **MINIMUM** clear width of 240 mm but a **MAXIMUM** of 355 mm.
- Although linked to tread width, the **RISE** should be between 190 mm and 115 mm but a preferred height could be adjusted for agility of the users. (For example, the less agile elderly may prefer a rise of about 145 mm).
- In correctly designed steps the link between 'rise' and tread (width) is as expressed in the Building Code of Australia: NSW Amendment in the following formula.

$2R + G$ should equal between 700 and 550 where R = rise in mm, G = clear tread width in mm.

Tools you will need

- Saw
- Hammer
- Measuring Tape/Rule (Carpenters metre square) *
- Spanner
- Plane/sander
- Drill and bits
- Chisel

Materials you will need

TIMBER

- For template: Thin plywood/hardboard/particleboard 400 x 200 mm.
- For stringers: 300 x 50 mm DAR/dressed-all-round selected native hardwoods, selected plantation pine, selected to provide relatively straight grained, clear pieces.
- For cleats: 75 x 38 mm DAR, cut to length to suit width of treads (refer to item No. 10).
- For Treads: If wide enough for design, the step tread could be of 250 x 50 mm or 300 x 50 mm DAR or made up of two (spaced) pieces each 50 mm (DAR) thick, provided length does not exceed 900 mm.

N.B. To minimise expansion and shrinkage after installation, seasoned timber should be preferred if available.

Note particularly that steps which will be **exposed to weather and associated moisture absorption**, (rain, dew) should be made from timber (species) selected for durability in such conditions such as some mixed hardwoods, preservative treated plantation pine treated for above ground use (Hazard level 3 H3), selected durable hardwoods such as black butt, ironbarks, turpentine, tallowood, jarrah, kwila (merbau), spotted gum etc. For better performance individual pieces of timber should have the minimum of imperfections which allow moisture (water) to penetrate the timber.

Consult your TABMA timber supplier about suitable available, durable timber for weather-exposed steps.

HARDWARE

- 2/ Angle brackets, galvanised, 150 x 25 x 4 mm or similar to fix foot of steps at ground level.
- Coach screws/screws, galvanised, for fixing bracket to stringers.
- Loxon or similar concrete fastenings to fix brackets to concrete base slab (if required).
- 75 x 3.75 mm galvanised bullet head nails, to fix tread to stringers and at cleats.
- Two 10 mm galvanised bolts, nuts, washers for each timber cleat used, (or 4 bolts per tread) length of bolt to suit thickness of cleats plus stringers you have selected.
- Timber/wood primer (exterior grade if required) to seal end grain of stringers, treads and pre-coat cleats and ledgers.
- Selected paints/stains appropriate for application (interior or exterior).

Limitations and Precautions

- This project sheet is a guide for relatively short stairways ONLY.
- For comfortable ascent with longer stairways, limit the step rise as indicated but also provide a landing at the half way point with a maximum of eight steps between "landings" but ensure all risers are the same throughout.
- Stairways generally, benefit from hand rails. Regulations require that stairways over 1m or with 5 or more risers, (if not bounded by a wall) have a continuous balustrade, not less than 865 mm above the nosing of the stair tread. Note too that the balustrade/guard rail must prevent, as far as practicable, children climbing over or through.

▼ STEP BY STEP ▼

- 1 WHERE TO START**, measure overall rise or height of steps which will be the vertical distance from the top platform (e.g. decking surface) to the existing patio or pathway or to the proposed new level base.

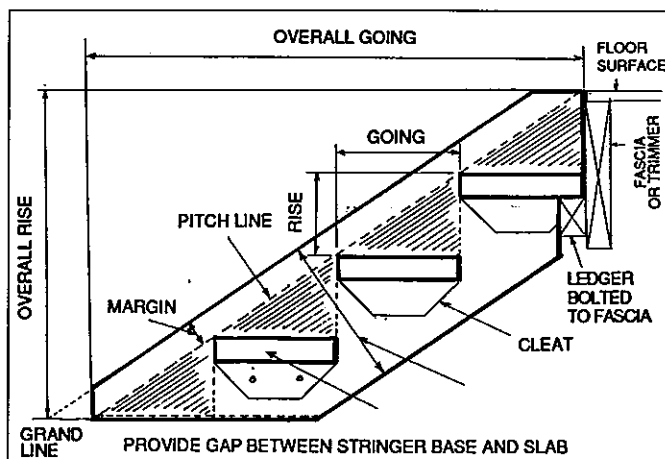
Example:

- Assume the height H is 640 mm from base to surface of deck.

- 2 CALCULATE RISER HEIGHT**, which is the height of each equal sized step to be taken to move from ground or base level up to the height (to deck floor) measured.

Example:

- Divide steps height, H , by 3 which gives a step height of 213 mm which is too large for comfort . . .
- Divide Steps height, H , by 5 which gives a step height of 128 mm which is too small.
- Conclusion is that 4 rises, each 160 mm, would give acceptance design.



- 3 CALCULATE CLEAR TREAD WIDTH**. With the acceptable riser height calculated as in step 2 above, now calculate the preferred clear step width. (Note that the MINIMUM acceptable clear tread width will be 240 mm.)

Example:

With a riser height of 160 mm and using the previously mentioned formula ($2R + G = 550$) it can be calculated that for this example only, the MINIMUM step width should be 230 mm which would NOT comply with the regulator's requirement, or a MAXIMUM of 380 mm. For the practical reasons that wide planks are often difficult to obtain it may be preferable to select tread widths according to readily available dressed timber sizes namely finished widths (after dressing) of 240 mm or 290 mm.

4 FIRST CONSTRUCTION STEP: make a template from the plywood, hardboard or particleboard (or thick cardboard) to suit your particular stair requirements.

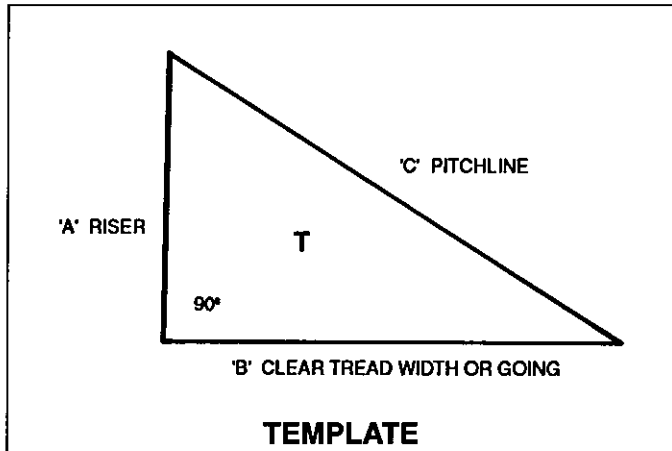
Example:

using the figures calculated in steps 1,2,3 cut a template as shown where

A - riser = 160 mm

B - tread = 240 mm (or 290 mm)

C - pitchlines to be measured, which will be about 289 mm (or 331 mm)



5 CALCULATE STRINGER LENGTH. Measure C the pitch length on your template. Multiply pitch length by the number of risers to give overall length of pitch line.

Example:

When B = 240 mm and A = 160 mm, then C = 289mm. From Step 2 the number of risers is 4. Then total pitch line/stringer length is $4 \times 289 = 1156$ mm (for B = 290 mm pitchline length is 1324 mm).

6 PURCHASE TIMBER: on the basis of using 50 mm thick DAR (dressed-all-round) timber for both stringers and treads.

NB Order multiples of 300 mm LENGTHS for stringers but assume acceptable tread lengths of 900 mm.

Example:

◆ **Stringers**

2 required (minimum tread width of 240 mm) 300 x 50 mm DAR, 2/1.2*

◆ **Treads**

3 required (for minimum tread width 240 mm) 250 x 50 mm DAR, 6/900 mm*

◆ **Cleats**

6 required (for minimum tread width 240 mm) 75 x 38 mm DAR, 6/240 mm*

◆ **Ledger**

1 required
75 x 50 mm DAR, 1/1.2 m*

* Merchant will supply sufficient material from which these sizes can be cut.

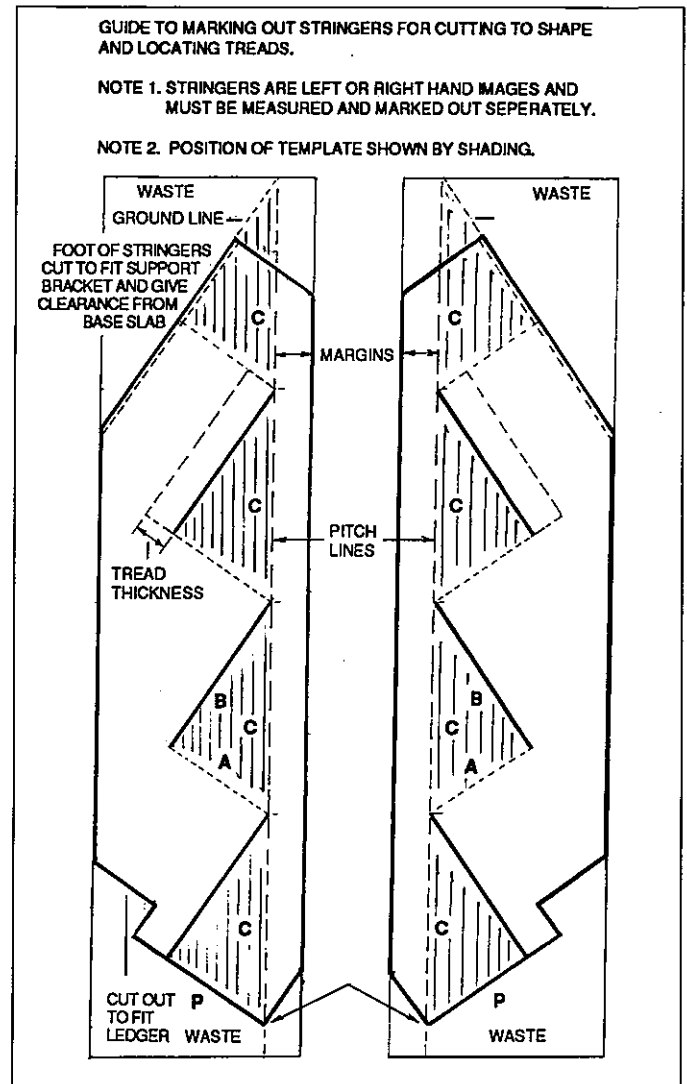
7 CUT TWO STRINGERS of calculated length from 300 x 50 mm DAR purchased.

Example: 1156 mm each piece, at least.

8 MARK OUT STRINGERS. The essential tool in this task is the template made in Step 4. First task is to mark a margin line which for example could be 50 mm (see diagram) away from the upper edge of both stringers.

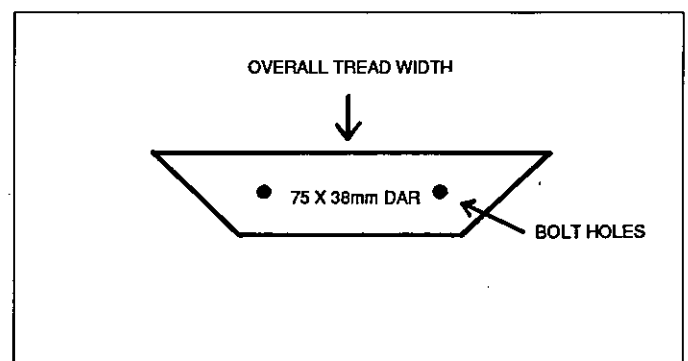
Then, as indicated on the diagram mark the stringers out using the template.

Mark also the upper line 'P' which indicates top vertical line of the stringer (when installed) allowing for full tread width, including any overlap for the topmost tread. With the outline of stringer marked also locate and mark position of the cut-out for ledger (if used) as well as the necessary cut away for the fixings used to mount the stringers to the base slab/pathway which should still provide the designed "rise" from base to first tread.



9 CUT OUT STRINGERS as marked. Spot prime or otherwise seal all exposed end grain.

10 CUT CLEATS to pattern shown and prime or seal all over if steps are to be exposed to weather. Fasten in position using two galvanised bolts, nuts and washers. Pre-bore bolt holes not less than 50 mm from ends of cleats.



- 11** **FIX ANGLE BRACKET AT FOOT.** With stringers held in final position as a guide, the location of the galvanised angle bracket can be fixed and the necessary Loxon, Ramset or similar fastenings inserted in the existing patio floor or path. If new concrete slab is required this should be level and sufficiently wide, at least, to form another standard size ground level tread and located to conform to the step/tread pattern.

Example:

Tread length 900 mm

Minimum concrete slab 1200 x 300 x 100 mm

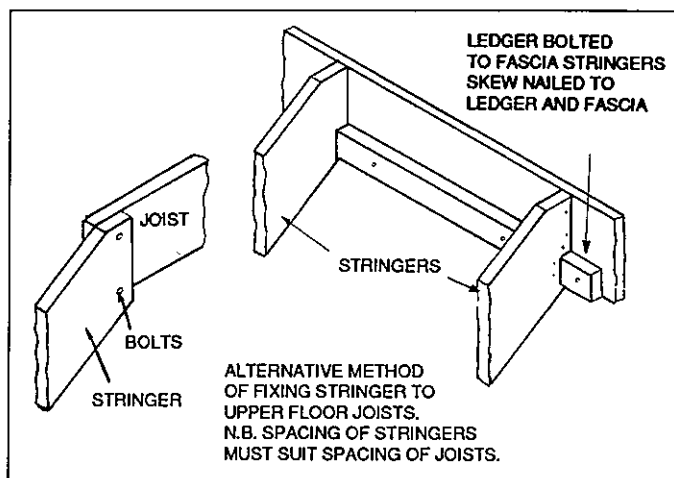
Distance between centres of brackets and stringers 945 mm.

- 12** **CUT LEDGER** of a length sufficient to project about 150 mm each side of stringers.

Example:

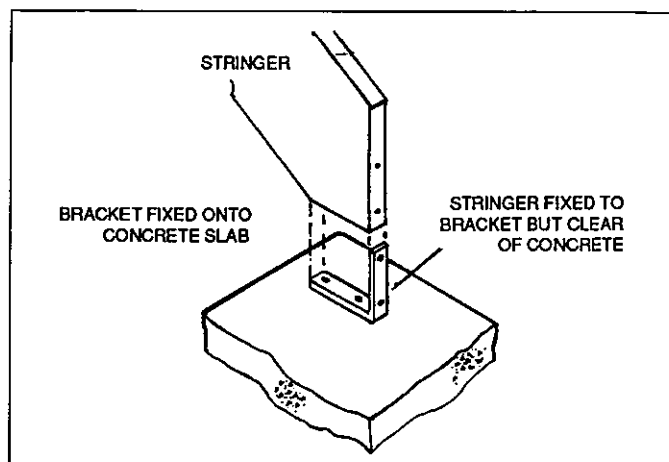
For 900 mm tread width this would require ledger 1300 mm long, which would be cut from the piece 75 x 50 mm x 1.5 m.

- 13** **FIX** ledger in place on fascia or timber board or on edge of deck using three galvanised bolts, nuts and washers or coach screws as appropriate. Pre-bore bolt holes not less than 50 mm from end of ledger.



- 14** **FIX** stringers to angle brackets at foot and screw nail to ledger ensuring that they are located parallel, vertical, and at spacing as required for treads.

Note: Stringers do not contact concrete slab. Dampcourse can be fixed if desired between the concrete and the stringers.



- 15** **CUT TREADS TO LENGTH**, slightly round or bevel each long edge.

- 16** **SPOT PRIME** or otherwise seal end grain of each tread, particularly where steps will be exposed to weather.

- 17** **FIX TREADS IN PLACE**, nailing through stringer into end of tread and through pre-drilled holes into the cleats. Use three 75 x 3.75 mm galvanised bullet head nails into each end of tread and through tread into cleats.

- 18** **SAND/PLANE OFF ALL SHARP CORNERS** punch and putty nail holes if desired. Clean up surfaces as required and apply appropriate exterior (or interior) stains or paints as instructed by the paint manufacturer.

(N.B. The long term durability of those timber structures which are exposed to weather is improved by application of exterior quality water repellents, stains or paints, which should be regularly inspected and maintenance coatings applied as necessary).

Disclaimer: While the Timber and Building Materials Association (NSW) Limited (**TABMA**) and its members believe this publication is an invaluable guide to this project, the Association cannot guarantee that every statement is without flaw. Therefore, the Association and its members hereby disclaim all liability for errors or omissions of any kind, whether they be negligent or otherwise, or for any loss, damage or other consequence which may arise from any person relying on information stated in this publication.

This brochure was prepared with the assistance and co-operation of the Timber Development Association NSW Ltd.

For further advice telephone the TDA Timber Advisory Service on (02) 9360 3088

Copyright Owner: Timber and Building Materials Association (NSW) Limited

Supplied by