Appendix 2

Steps, Slopes, Boardwalks and Bridges

Appendix 2: Steps, Slopes, Boardwalks and Bridges

2.1: Overview

Steps don't occur in nature, and so will inevitably appear intrusive. For this reason they should only be used where there is no alternative. Usually this is when the only possible route for a path is so steep it is difficult to walk on and where the walkers' feet push the surface material down the slope. We also need to consider who is using the path: for instance, is it a mountain trail used by people prepared to be challenged, or is it a busy access path used by mainstream tourists wearing ordinary footwear?

Wooden steps can be appropriate in woodland areas. And if natural timber from the woodland can be used to make them, they blend in very well.

In places where the ground is soft and vulnerable to damage from footfall or water, box steps offer full protection and are a very good solution. They are also good in busy tourist destinations, protecting vegetation from the wear and tear of many feet. For the same reason they are ideal when used in combination with boardwalks.

In mountainous locations woodwork looks out of place and stone should be used. Height is gained by the use of stone pitching which, by being apparently random, looks natural. Also, it is more pleasing to the walker than conventional steps, as it gives an impression of using natural footholds.

The techniques for making box steps can be adapted for making small bridges and boardwalks, and a Guide for doing this is included in this section.

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Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

Contents

Guide sheets will be found at the numbered locations below.

(*Continued*)

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Contents (continued)

Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.2a:

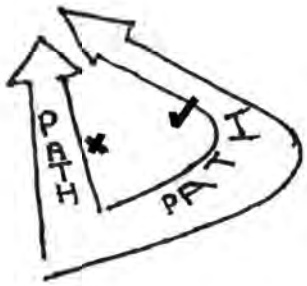
Stone Pitching: General points, first decisions, line of path, where to put it

On a very steep slope the surface material of a conventional path is pushed downhill by the feet of walkers. Also water can wash it down. In these cases pitching can provide a durable alternative.

However pitching uses a lot of stone. A lot of earth has to be dug out to make room for the stones – which then has to be disposed of. And pitching is less comfortable to walk on than a smooth surface.

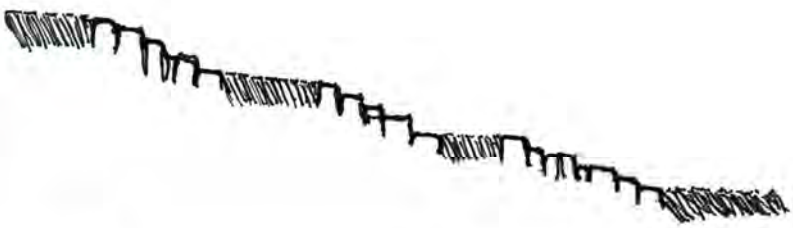
So, when deciding to use it, consider:

Can you re-route the path to make the slope less steep, and reduce the need for pitching?



NEVER do sloping pitching. It is dangerously slippery in frost or when there is moss on it.

Instead, on a long slope mix pitched steps with level stretches of path.



Despite its disadvantages pitching can also be be the best solution for a level path surface in busy tourist locations where there is a very high footfall. Or in places where the ground is loose and unstable.

(continued)

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2.2a *(continued)* Stone Pitching: General points, first decisions, line of path, where to put it

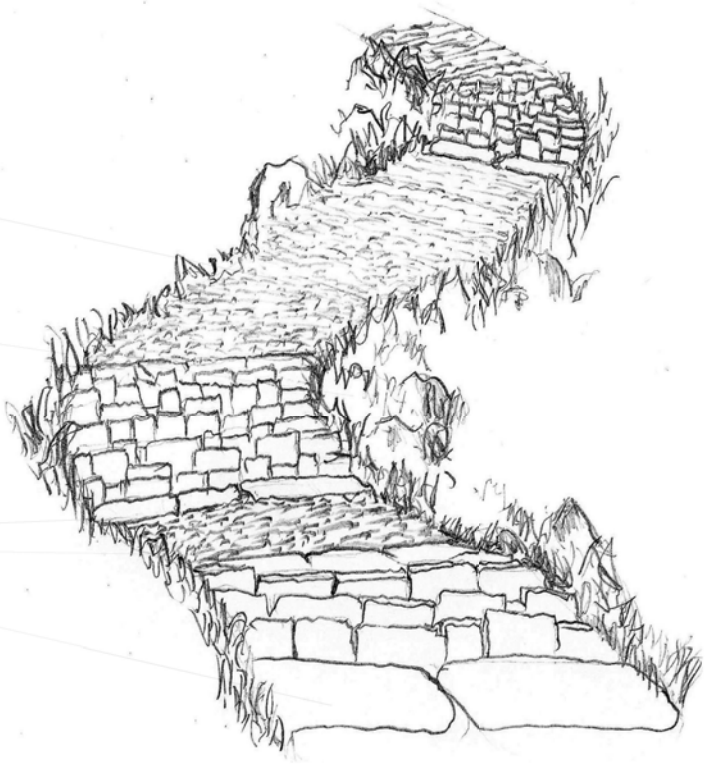
Height is gained with short flights of pitched steps.

Path is curved to reduce the gradient.

Conventional path between pitched steps.

Landscaping at corners discourages short cuts.

Anchor stones.



Put big stones at the sides to hold the others in place. They should be no higher than the ground at the side of the path.

firmly pack the stonework to prevent water getting in and loosening the pitching. BUT – do not insert packing stones until all the pitching is laid. If you do it before it will just push the pitched stones apart.

Landscaping with vegetation and rocks hides the edges of the stones, discourages going off the path and gives it a natural appearance. Earth which has been taken out to make room for the steps can be heaped at the sides, with turf, to make barriers.

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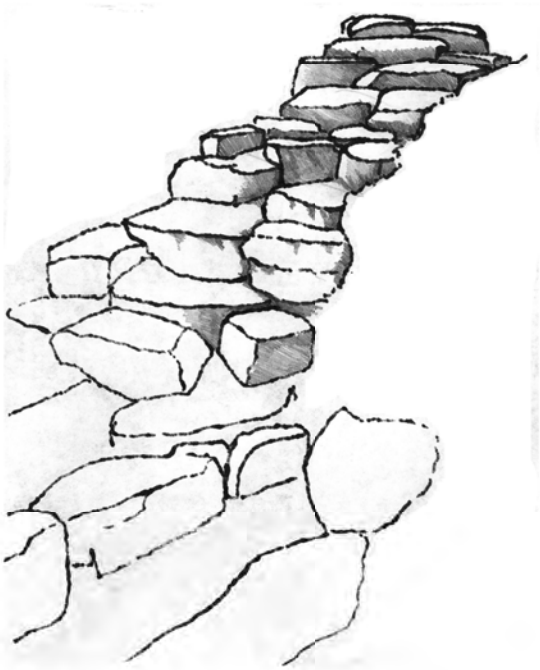
2.2b: Pitching up a slope

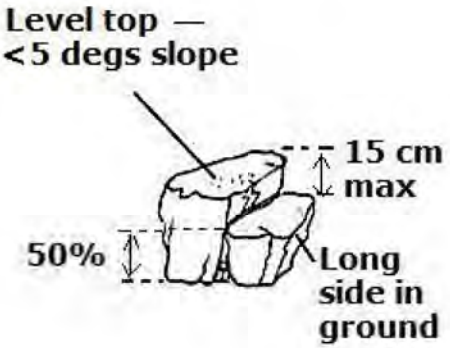
When going up a slope, make a mix of different step heights (to a maximum of 15cm) and positions.

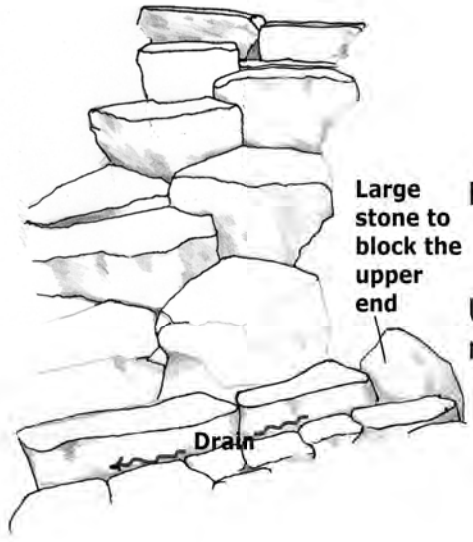
This stops them looking like a flight of stairs and helps them to blend into the natural surroundings.

Also the experience of using the steps is more pleasing as they are like natural rocky footholds.



Stones should be set with at least half below the top of the next lower stone:





Build drainage into the stone work as needed.

Use the instructions for *2.5: Cross Drains* if you need guidance.

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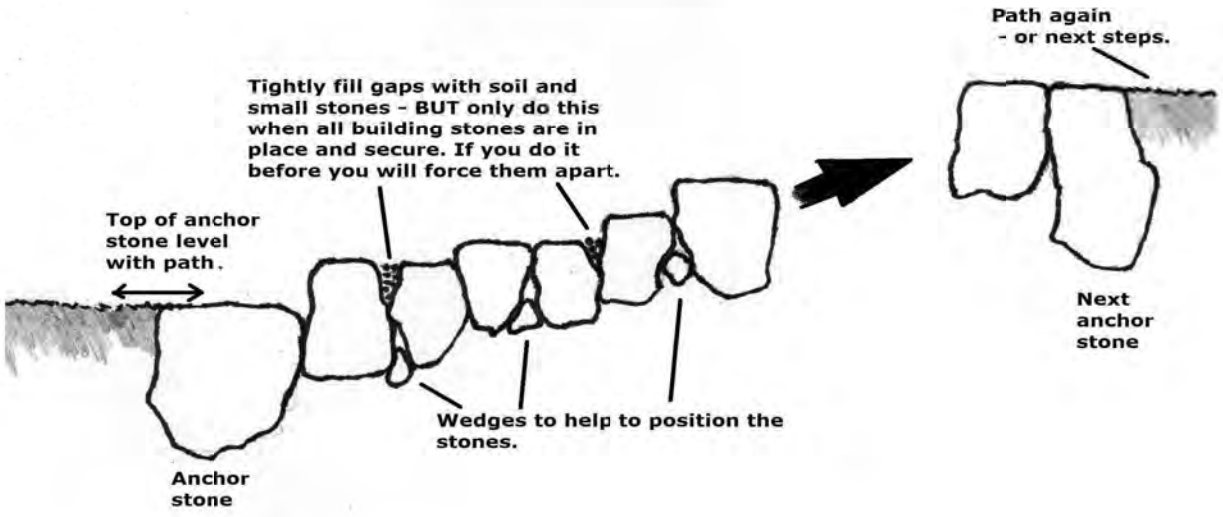
2.2c: Stone Pitching: Arrangement of Stones

Make the steps at the ends high (but not more than 15cm) to emphasise to walkers that they are leaving level ground.

Anchor stones hold the pitching in place. Put them at the ends of the pitching, and in between if it is a long flight. Make them flush with the path surface at the bottom because this will soon be compressed by walkers' boots and a step will form anyway.



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2.3a: Simple wooden steps, part (i)

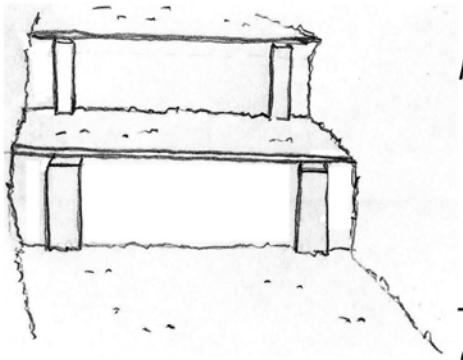
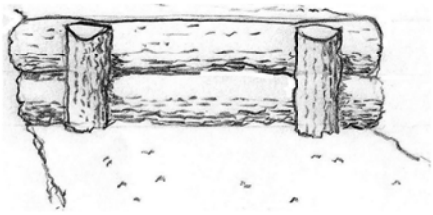


Fig.1

fig.2

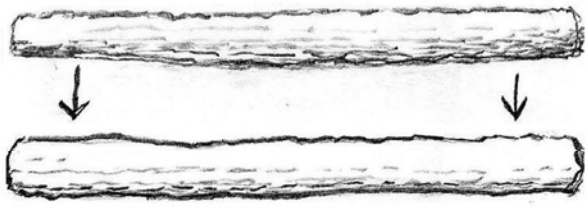


These may be made from construction wood (fig.1) or from logs (fig.2).

Scrape out a level shallow channel.

Place the first piece of timber in it, making sure it is level.

Then place the second timber on top of it.



When fitting timbers together choose ones that will not have gaps between them. Roll them around to get the best fit.

(Continued, *Guide to Construction 2.3b: Simple Wooden Steps Part (ii)*)

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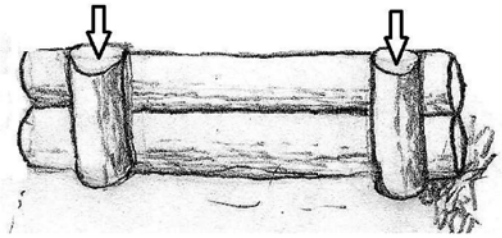
Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

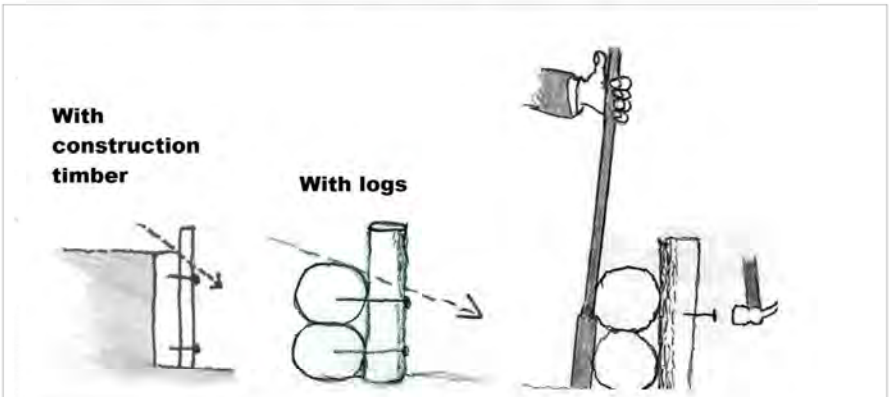
2.3b: Simple wooden steps, part (ii)

A large gap between the timbers would allow soil to leak through.

Hammer in two stobs. These should be close to the ends of the timbers. They should be no less than 6cm diameter and need to be hammered in as far as possible – 45cm is good.

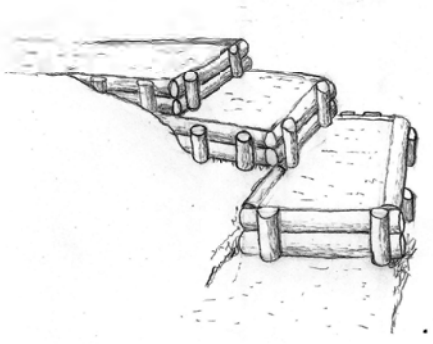


Use a saw or an axe to **make a point** on the stob, to make it easier to hammer in. When it is in, **cut the top at an angle** to allow water to run off. (below).



Put a nail through the stob to each timber to secure it. Keep the top one low so it does not get in the way of the saw when you trim the stob. Get a helper to push a rock bar against the timbers to resist the impact of the hammer.

If necessary you can put a side or sides on the step. Fit the side timbers behind the front ones.



Fill the step with earth and put on a top layer of bark chippings, or pine needles if woodchip is not available.

(See also 2.*5a: Working with Wood - tips; 2.5b: Working with wood – logs and landscaping*)

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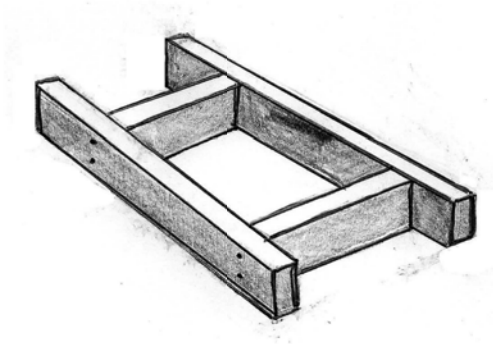
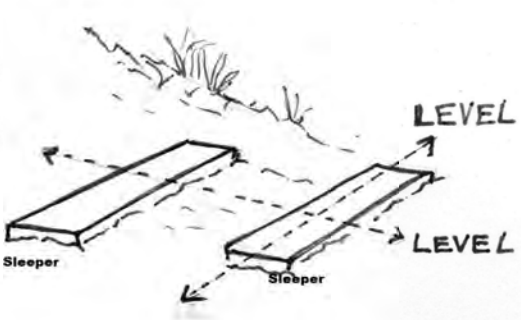
2.3c: Wooden box steps – making the frame; starting the first step

Make a strong frame.

(For details see 2.*3g: Wooden Box Steps - Measurements and Sizes*)

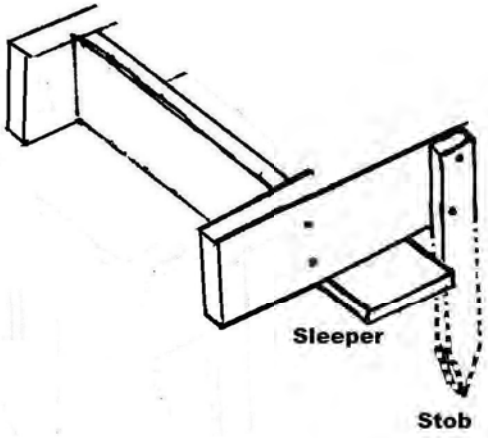


Level the ground for the first step.
Lay 2 flat sleepers.



Lay the frame on the sleepers.

To prevent movement, secure it with stobs.



(Continued: – *Guide to Construction Box Steps 2.3d*)

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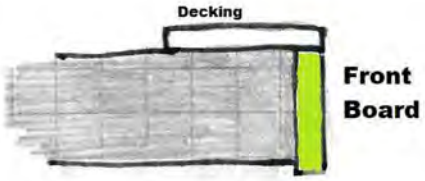
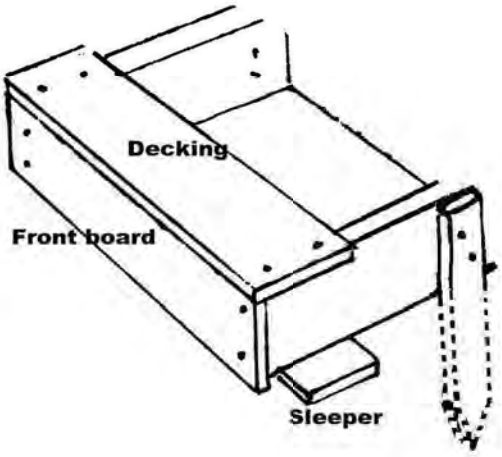
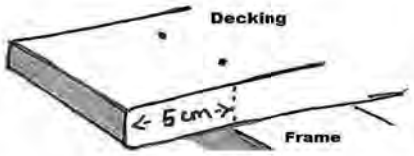
2.3d: Wooden box steps – second and subsequent steps

Fit one piece of *decking* and a *front board*. The front board is the same width as the decking. The decking lays over the top of the front board.





They project beyond the sides of the frame by about 5cm.

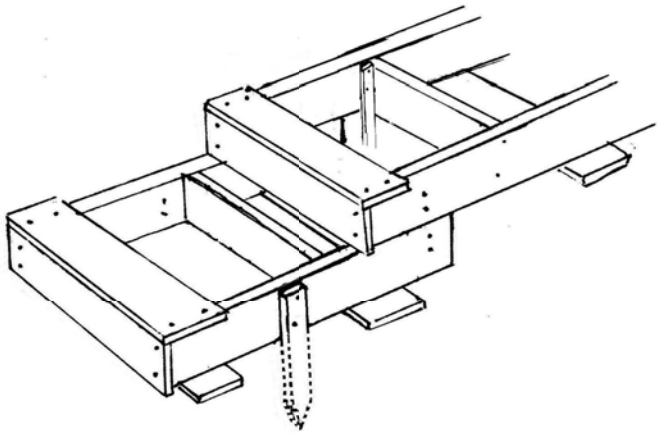


This is done to hold the frame rigid during handling. With care, it can be left until later if wished.

Second and subsequent steps:

Lay 1 sleeper for the back of the step. (The front will rest on the lower step.)

Put the second step in place. If possible, adjust its position so that a whole number of decking boards will fit on the lower frame. (See *2:3e* below.)



Secure it with stobs.

(Continued: - *Guide to Construction - 2:3e Wooden box steps – decking*)

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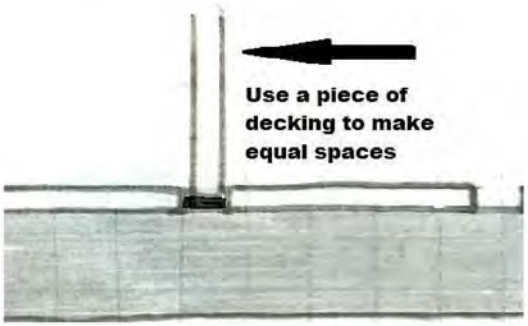
2.3e: Wooden box steps – decking

This is made much easier if you position the higher step so that it leaves space for a whole number of decking boards. Otherwise you will have to cut a piece along its length to make it fit.



Nail the rest of the decking pieces onto the lower step. Lay out the decking boards to get them equally spaced before nailing. A spare piece of decking board can help with this.

Place the third step and continue as before.

See also *2.3g: Wooden Box Steps - Measurements and Sizes; 2.3h: How Many Box Steps Do I Need? and 2.5a: Working with Wood - tips*

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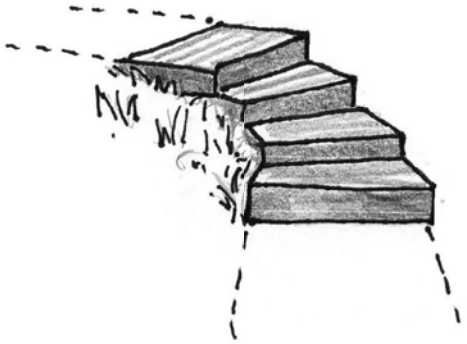
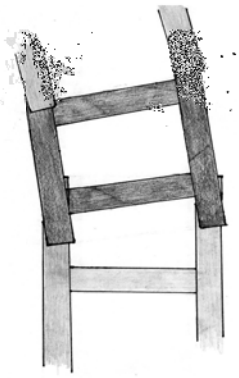
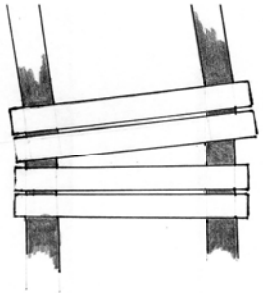
Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.3f: Wooden box steps – constructing a curve



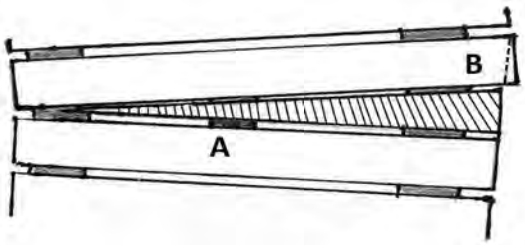
A flight of box steps can be made to go round a curve by turning each frame by a small amount.



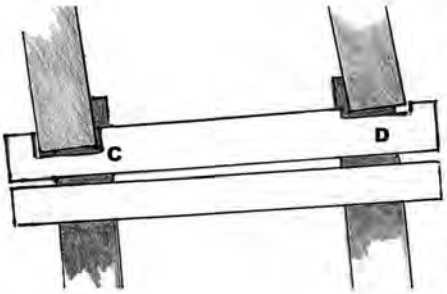


Decking needs to be adapted to fit in the space between frames.

A piece of decking can be cut to fit into the space. If one end is very narrow, or if if it does not reach all the way across, extra support can be placed underneath (A). For this, use a piece of frame timber standing on a a short length of sleeper wood.

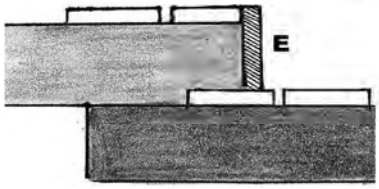


To finish, **trim the ends** of the decking so they line up neatly (B).



An **easier**, but less attractive, way of adapting the decking is to cut slots (C,D) to fit round the upper frame.

If you do this the front board will be lifted and will have to fit in **front** of the decking on the next step, not under it (E)



See also *2.3g: Wooden Box Steps - Measurements and Sizes;2.3h: How Many Box Steps Do I Need? and 2.5: Working with Wood – tips*

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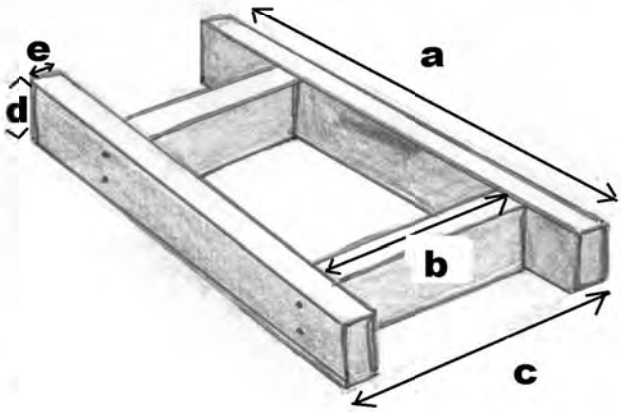
2.3g: Wooden box steps – measurements and sizes

Box Steps - Measurements and Sizes



Frame: Often we use recycled wood so we can't always choose the exact size we would prefer.

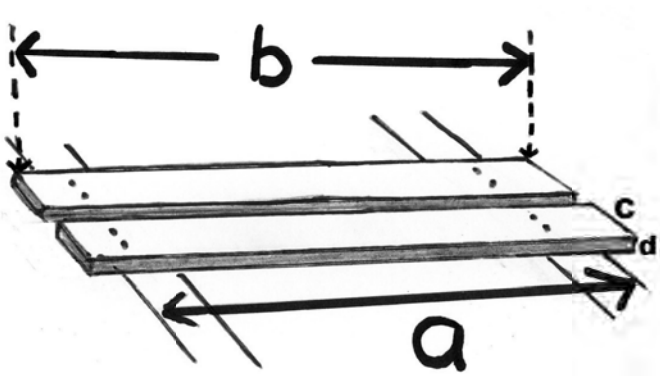
And the size of the steps needed may be different in different places.

So these measurements are for guidance only and it's OK to change them if you need to. (But see *Notes* at bottom of page.)

The sizes here are: **18cm**(d) x **7cm** (e), **1m** (a), **75cm** (c), **61cm** (b) – this is (75 -7-7)cm, i.e. total width less the thickness of the two side pieces.

Use 5 inch (125mm) nails to fix the cross pieces (b). (4 inch nails would only penetrate the ends of the cross pieces by an inch which would be too weak.)

Decking:



Decking should go beyond the frame by a few cm. Here the frame is 75cm wide (a), so the decking boards are 75cm + 5cm at each end = 85cm (b).

Decking boards should all be the same thickness: variations might cause a trip hazard. Here they are 2cm (d).

Ideally all decking boards should be the same width. Here they are 12cm (c). But this is not always possible. It's OK to use mixed widths, but if you do, do not group equal sized pieces together. Instead, mix them – it looks better. 3 inch (75mm) nails would be OK for fixing these 2cm boards.

See also *2.3h: How Many Box Steps Do I Need?* and *2.5: Working with Wood*

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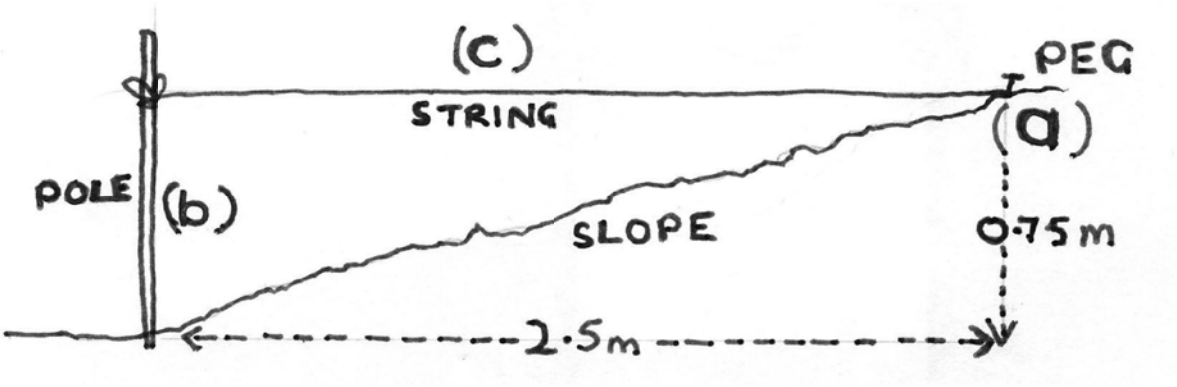
Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.3h: How many box steps do I need?

- Step *height* should not be more than about 20cm (8 inches), and not less than about 15 cm (6 inches).
- All steps in a flight of conventional steps should be the same size – changes in height and varying lengths are inconvenient and potentially dangerous.



How many?

You need string, something to use as a pole, and a spirit level (if you have one, or a good eye for judging horizontals if you don't), and a peg.

Peg one end of the string where the steps will end (a). Stand the pole up straight where the steps will begin (b).Stretch the string between them, keeping it level (c).

You now know 2 things:

By measuring up the pole you know how high the steps need to go (b)
By measuring the string (c), you know how far ahead they need to go.

- Divide the height (b) by the height of a single step to know how many steps you need.
- Now you can divide the distance (c) by that number to find out how long each step should be in order to go that distance.

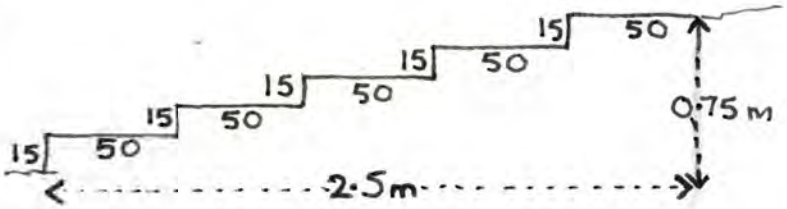
(Continued *2.3i: How many box steps do I need? (Continued)*)

Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.3i: How many box steps do I need? (Continued)

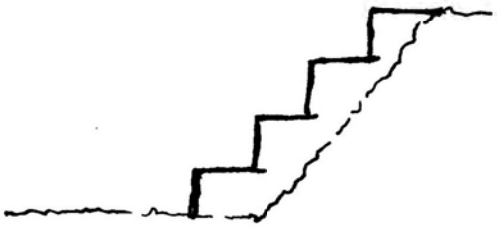
Here, the height is 75cm.

A single step is 15cm high, so 5 steps are needed (5x15=75).



The distance is 2.5m. You have to fit those 5 steps into this, so each step should be 50cm.

A step should be long enough to comfortably take a large booted foot. If a slope is very steep, the steps may be too short. (*fig.1)*



(*fig.1)*

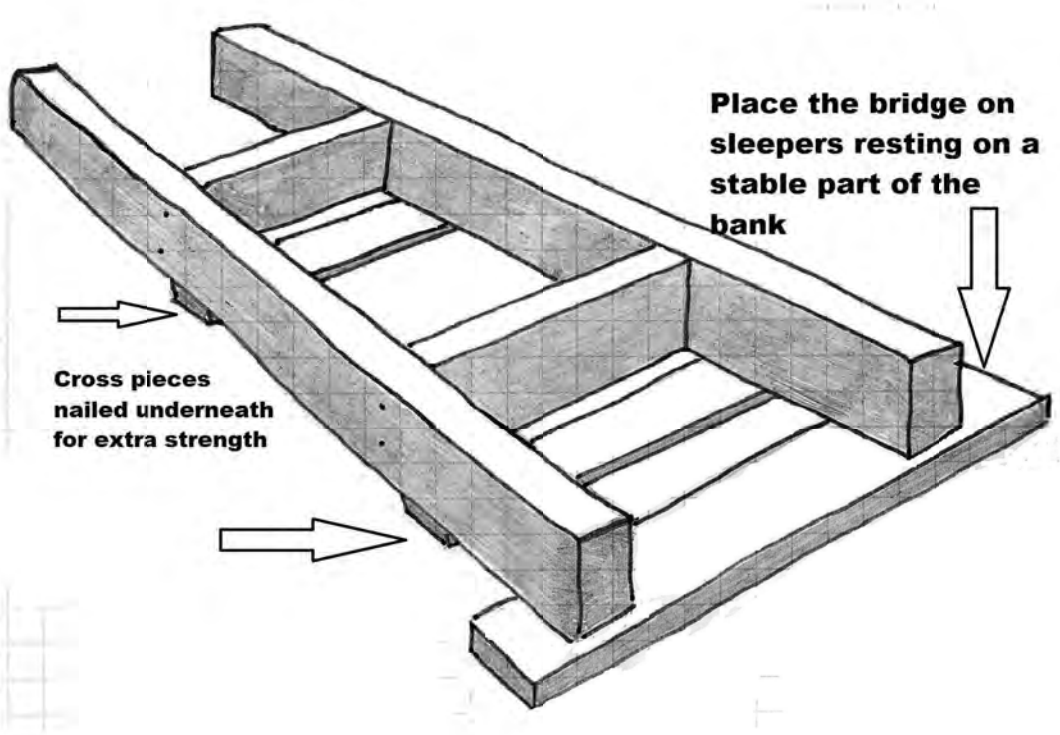
In this case the steps should begin far enough away from the slope to enable a better size of step. (*fig.2)*

(*fig.2)*

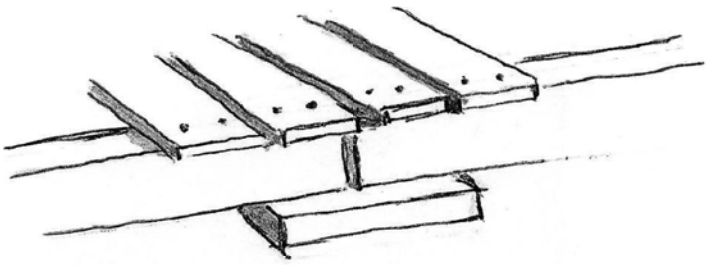
Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.4a: A Footbridge and Boardwalk using the box step method

A small **footbridge** can be made in the same way as a box step, with cross pieces underneath and sleepers under the ends.



Boardwalks can be made in the same way, laid end to end, each end resting on a shared sleeper.



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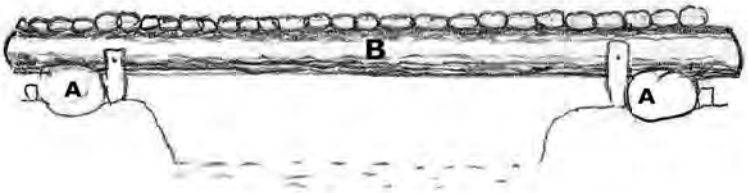
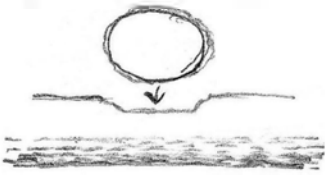
Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

2.4b: A Small Bridge With Logs

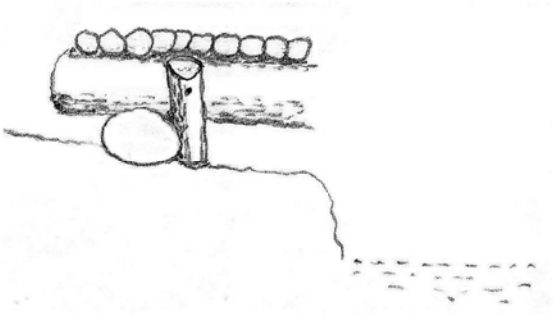


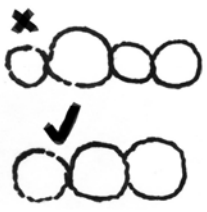
Lay 2 level logs for sleepers (A). Lay 2 long timbers ('stringers') on them to support the decking (B).

Use stobs to hold the timbers steady. A notch cut into the sleeper can also help with this.

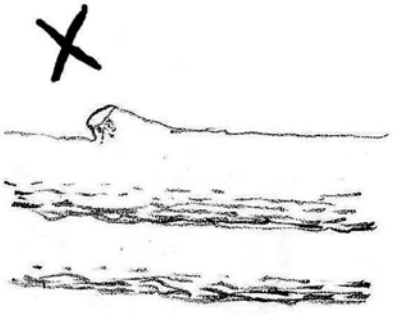


If necessary build steps at the ends to help people get on and off the bridge.





Arrange the decking logs so there are no trip hazards (a), (b). If necessary, graduate them from thinner ones to thicker ones rather than placing a thicker one among the smaller ones (a).



(a)

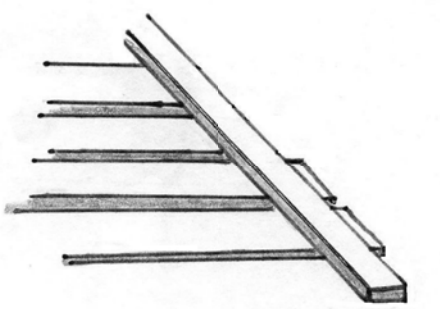
(b)

See also *2.5b: Working with wood – logs and landscaping*

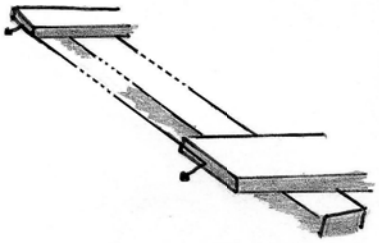
Roger Whysall

Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

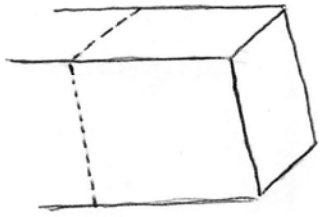
2.5a: Working with wood – tips



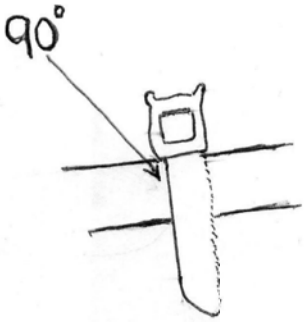
There will always be **small differences in lengths of decking boards.** This can make your finished project look untidy. So, when the boards are all nailed on, trim the edges straight using a piece of wood as a straight-edge.



On one side, keep the ends of the boards in a straight line as you fit them (a length of string nailed to 2 measured pieces at the ends can help). Then you will only need to trim the other side at the end of the job.

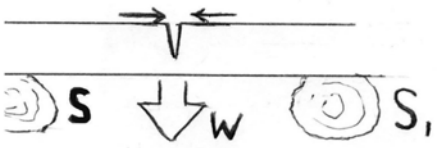


When you cut wood for the frame, it's very important to cut it straight. If you don't the shape of the frame will be distorted. So carefully draw a line all the way round to guide your saw.

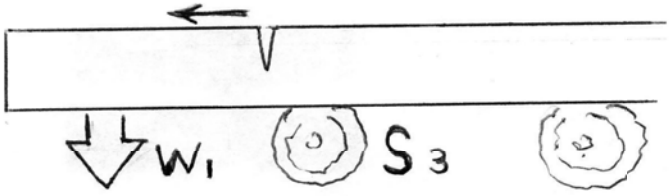


(Most saws are made so that they can help to draw a line perpendicular to the edge of the wood.)

When sawing the wood, **DO NOT support it at the ends** with the cut between the supports (S, S^1) The weight will push down (W) and close the cut, trapping your saw.



Instead, support the wood with **one end hanging free** (S^3). Then the weight of the wood will pull the cut open, making it easier to saw (W^1). When you have cut almost all the way through, get someone to support the end to prevent it dropping and tearing the wood.



See also 2.5b: Working with wood – logs and landscaping

Roger Whysall

Appendix 2: Steps, Slopes, Boardwalks and Bridges – Guide Sheets

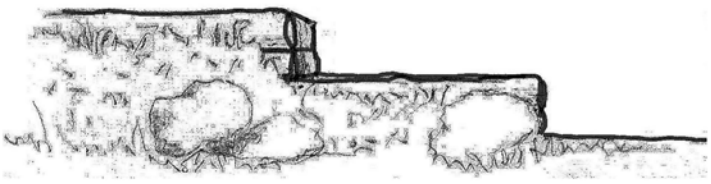
2.5b: Working with wood – logs and landscaping

Logs become available when we work in or near woodland. Use trees which are fairly straight and which are inside the wood and away from the path; take single trees from various different places, so that you do not make an obvious clearing. If possible, choose trees whose removal might benefit the wood, such as weak ones or ones which are being shaded out by bigger trees.

If you have thick logs to work with, it's OK to have the front and sides made from single pieces instead of two pieces.

Stobs which are made from logs should not be thin. Choose wood which is at least 6cm in diameter.

If the steps are in an open area they may look intrusive. Turf and rocks can be used to blend them into their surroundings.



Important: *cutting down trees requires skill and knowledge of safety practices. Only cut down trees if you have been trained to do so.*

Roger Whysall