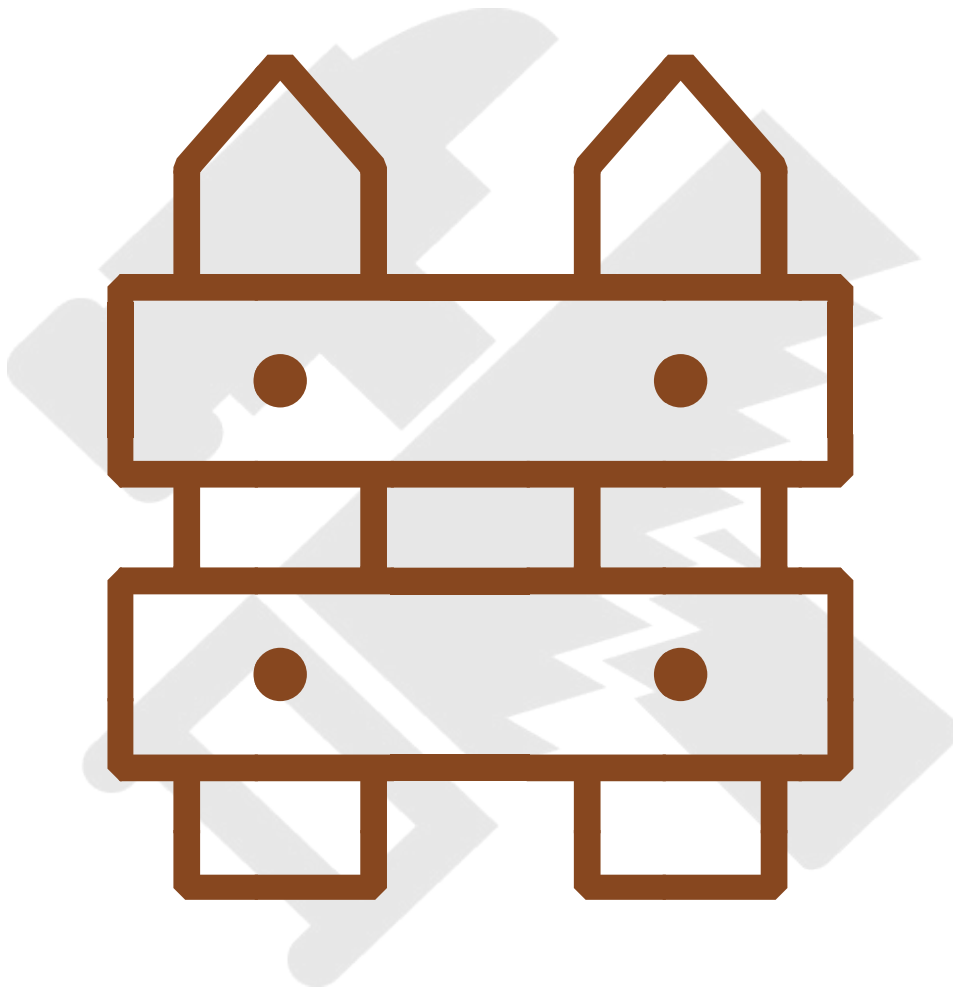




BCATS

BUILDING, CONSTRUCTION
AND ALLIED TRADE SKILLS

Timber fence



Unit Standard 31860 (v1), Level 2

Construct & maintain a basic residential timber fence as a BCATS project. 4 CREDITS

BCITO
buildingpeople

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Introduction

This handbook is an introduction to constructing and maintaining a timber fence.

The example provided is one using timber posts and palings. Your teacher/tutor might ask you to make one with sheet metal instead of timber palings or with timber with different features. The one you make may also be taller than the example provided.

You are unlikely to have the opportunity to perform maintenance on the fence you make. If this is the case, your teacher/tutor will direct you to which older fences they want you to check and fix any damage and wear to.

Remember:

The fence in this resource is an example only. Your teacher/tutor will give you information about the one you will make.

How you will be assessed

You need to construct a timber fence with a minimum length of 4.8 meters using three posts. You need to clad it with timber palings or sheet metal.

Your teacher might give you a work diary to help you record how you made it. If you can, take photos of your project, including a photo of it completed.

You will need to:

- calculate the quantities of materials needed correctly
- prepare an order for materials
- construct a basic timber residential fence to an acceptable standard:
 - set out post positions and excavate post holes
 - set up and fix posts and rails
 - fasten cladding and finish the fence
- maintain a basic residential timber fence:
 - check it for damage and wear
 - replace or repair any damage or wear
- complete everything safely
- keep your work area clean and tidy
- clean and store tools, plant and equipment correctly.

Glossary of terms

Term	Meaning
Annular grooves	Ring shaped serrations which improve the holding power of nails
Cladding	The exterior, weather resistant surface of a structure
Galvanised	Iron or steel coated with zinc by dipping or electroplating
Paling	Vertical timber fixed to the fence rails
Plant	Fixed equipment
Post	Vertical member of a fence which support the rails
Rail	Horizontal member of a fence

Health and safety

The Health and Safety at Work Act 2015 is designed to:

- prevent harm to employees at work
- promote good practices in health and safety management.

The Act puts responsibilities on everyone to take all practical steps to ensure your own safety and the safety of others.

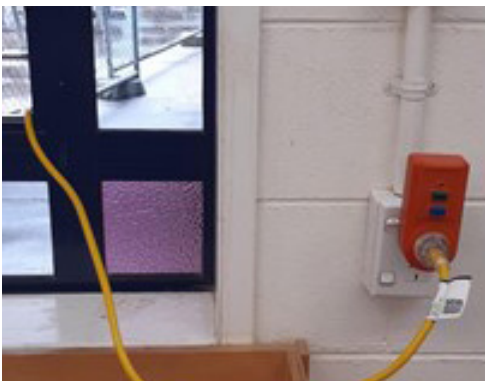
One way you can help ensure your own safety is to use personal protection equipment (PPE). For this project you will likely need to use:

- hearing protection
- safety boots or covered shoes
- gloves
- dust masks
- safety glasses (even if you wear prescription glasses, you must still use safety glasses)
- apron or overalls.

You will likely need to use machinery and other equipment that could cause serious injuries. You **must** use appropriate guards and safety devices. You **must not** use any machine without the safety guards fitted correctly. You **must** receive training in the use of machines and equipment and apply it when you use them.

Before using a machine or portable power tool, check to see if all cords are in good condition. Also check that the compliance tags are current.

Use an RCD device whenever you use powered equipment outdoors (such as an electric drill, skill saw, or a concrete mixer) Ensure that the RCD device is plugged directly into the power socket and power cords are positioned so they will not be run over or get damp. Test the RCD device before using electrical equipment.



RCD being used for outside work

If mixing concrete, which requires water, be extremely careful positioning power cords as water conducts electricity.

Fences overview

This module covers the construction of a post and rail fence. The one your teacher/tutor tells you to construct may be different.

For any construction job you carry out, it's important to:

- select and use appropriate personal protective equipment (PPE)
- follow appropriate safety procedures
- use tools correctly and safely
- clean the work area and dispose of waste
- clean, store and maintain tools correctly.

For any product or tool you use, make sure you read and understand any manufacturer's instructions that come with it before you start using it.

Style

Any fence should be functional and suit the style of the buildings around it.

Swimming pool fences also have legal requirements to reduce the risk of drowning. It is important to ensure local body regulations are strictly followed.

Fences between properties should be agreed on by both property owners and the costs shared.



Materials

Materials required for a fence include timber for posts and rails, cladding (timber or sheet metal), concrete and fastenings. You may also need capping, paint or fence stain.

Any timber used should be specifically treated with wood preserving chemicals for outdoor use.

- Fence posts in contact with the ground should have a treatment level of H4.
- Rails, palings and capping not in contact with the ground should have a treatment level of H3.2.

Timber shrinks as it dries and may also bend and twist. Choosing better grades of timber and painting the timber helps to reduce this.

Never burn treated off-cuts in a domestic fire or barbecue. Burning it releases the harmful chemicals used to treat it.

Posts

Normal post spacing is between 1.8m and 2.4m. Spacings are often 2.0m or 2.4m to match available rail lengths (4.8m and 6.0m).

Fence post size depends on the design of the fence and the material being used. 100mm x 100mm and 100mm x 75mm H4-treated posts are the most common sizes.

- 100 x 100mm posts give a more substantial look. They should be used for fence heights of 1.2 to 1.8m, and for end posts, corner posts and gate posts.
- 100mm x 75mm posts can be used for fence heights up to 1.2m. They should be positioned so the 75mm face is along the line of the fence.

Rails

Three rails are recommended for fences above 1.2m. This provides support that prevents sagging, stops palings from warping, and gives a better finish.

Rail size depends on the post spacing.

- 75 x 50mm rails can be used if posts are spaced 1.5m or less.
- 100 x 50mm rails should be used if posts are spaced between 1.5 and 2.4m.

Fastenings

We used 60mm galvanised flat head nails to fasten timber palings. Annular grooved nails provide better holding.

What tools and equipment will I need?

What tools you will need to use will depend on the fence you're constructing. This timber post and rail example used the following.

LIST OF TOOLS AND EQUIPMENT USED FOR SHOWN EXAMPLE

Hand tools	Portable power tools	Equipment
→ measuring tape	→ mitre saw	→ sledgehammer
→ square	→ post hole borer	→ concrete mixer
→ pencil	(if available)	→ wheelbarrow.
→ string line		(If concrete mixer
→ spade		is not available, mix
→ shovel		the concrete in a
→ hammer		wheelbarrow.)
→ spirit level		
→ handsaw		

Depending on your school's policy, you might not be able to use the mitre saw. If this is the case, pay careful attention to your teacher using it. Hand saws are a handy alternative when mitre saws aren't available.

Remember that the processes and machinery you use may be different from the ones used in these example projects.

Calculating quantities

Use the fence plan and site specifications to calculate the materials required.

Example

Calculate the materials required for the following fence:

Length – 16.5m

Height – 1.8m

Maximum post spacing – 2.4m

100 x 100mm posts, set 600mm deep

100 x 50mm rails, in 3 rows

150 x 25mm palings, fixed with 10mm spacing

Fastenings for rails to posts – 100mm galvanised flat head or jolt head nails

Fastenings for palings to rails – 60mm galvanised flat head nails

Calculation

Posts required	=	fence length ÷ post spacing + 1 end post $16.500 \div 2.400 + 1$ end post $6.875 + 1$ end post 7 (rounded) + 1 end post 8 posts (100 x 100H4, 2.4mm long)
Rails required	=	length of fence x 3 rows 16.5×3 49.5 (Divide by 4.8m rail length) = 10.3 Purchase 11 @ 4.8m
Palings required	=	fence length ÷ paling coverage (paling width + spacing) $16.500 \div (0.150 + 0.010)$ $16.500 \div 0.160$ 103 palings
Concrete	=	(length x width x post hole depth) x no. of holes or $(\pi r^2 \times \text{depth}) \times \text{no. of holes}$ for round holes $(0.200 \times 0.200 \times 0.600) \times 8$ 0.024×8 0.192 cubic metres
Fastenings (100mm nails)		Each 4.8m rail is fixed to 2 posts, with 2 nails 11 rails x 6 nails per rail 66 nails
60mm flat head (500 gm bags)		no. of spacings ÷ 2 or 6 nails per paling ($6 \times 103 = 618$) $7 \div 2$ 3.5 500gm bags

Preparing an order for materials

When placing an order with a supply merchant for building materials, you need to provide the following information. This will ensure that the right material is supplied to the right place at the right time, and the correct information is supplied for budget and accounting purposes.

The order should be clearly written or typed, and include the following information:

- date of order
- customer's name, account number and billing address
- job identification or number
- order number
- supply merchant's name
- description of goods required and quantity
- address where the order should be delivered
- date and time required
- any other delivery details
- authorised purchaser's signature.

Send the order to the supplier, allowing enough time for them to prepare and deliver it. (You should also keep a copy of the order for your records.) It's a good idea to follow up with a phone call if you don't receive confirmation that the order has been received.

Once your timber is delivered, stack it flat and clear of the ground, and keep it covered to prevent it bowing or deteriorating.

Note:

A template for an order form is located in the resource file. This can be printed off or downloaded and completed electronically.

Constructing a fence



Check before you dig. This is essential in both urban and rural settings, no matter how remote. Services that need checking include: electrical, gas, phone, storm water, and sewerage.



Positioning the fence

1. Check that no services such as gas, phone, or electrical cabling will be interfered with.
2. Set out the position of the fence with a string line attached to a peg at each end.

Many fences have a concrete nib which acts as a mowing strip. A mowing strip makes it easier for lawn mowing and provides extra stability for the fence posts.

If a concrete nib is required, start by excavating the area where the footing is to be positioned. Place a peg at each end and place a string line in position. Place the boxing up against the edge and use pegs to locate the boxing. Once this is completed the holes for each post can be dug.

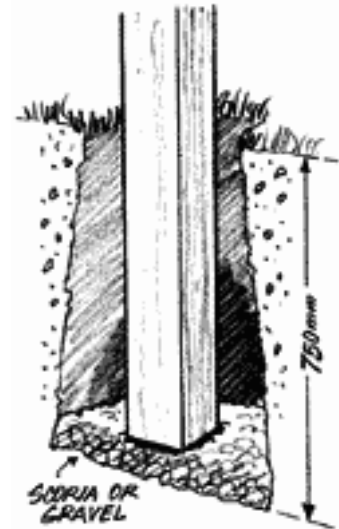
If not incorporating a concrete nib, position the string line to show where the front of the posts will be located



Constructing a fence

Excavating the end post holes

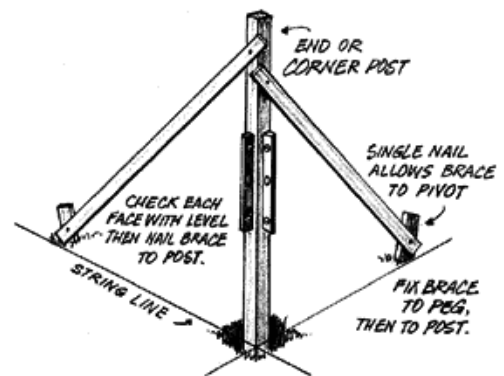
3. At both ends of the fence line, dig a hole with a spade or 200mm post-hole borer to the required depth:
 - For a 1800mm high fence, posts should be at least 600mm deep.
 - For a 1500mm high fence, posts should be at least 500mm deep.
 - For a 1200mm high fence, posts should be at least 400mm deep.
4. Remove all loose material from the hole.



Positioning and setting the end posts



In this example the post is screwed to a cross member that was added to the boxing. This method helps with keeping the post in the correct position. It also makes it possible to position concrete under the suspended post.



Bracing is also fitted higher up the post to ensure the post remains in the correct position as shown in the diagram above.

5. Position the posts in the hole just touching the string line.
6. Put the uncut end of the post in the ground as this end is treated.

If you have had to cut a timber post length you will have one untreated end. Use a timber preservative to restore protection to the cut ends.

Constructing a fence

7. Adjust the post height by digging deeper or adding gravel, scoria, or builder's mix to the hole.
8. Securely brace the end posts in position.
 - Nail the brace to the peg.
 - Check that the post is vertical by checking two adjacent faces with a spirit level.
 - Nail the brace to the post, leaving the nail heads out approx 10mm so they can be easily removed later.

Check the post height is correct and the post is vertical.

9. Carefully place the concrete into the hole and ensure that the post remains in the correct position. Compact the concrete around the post by prodding with a small piece of timber to remove any air pockets that may weaken the concrete
10. Recheck the post height and the vertical alignment.

Corner posts

11. Corner posts are positioned in the same way as end or gate posts.

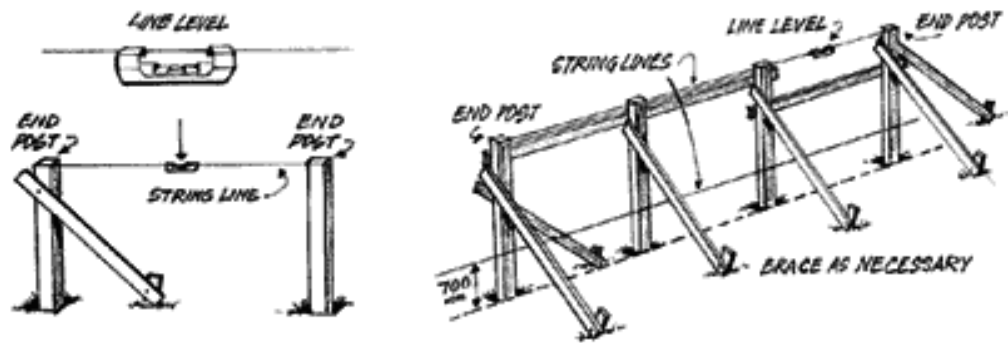


In this example the boxing for a concrete nib was positioned to be level with an existing driveway kerb.

Constructing a fence

Intermediate posts

12. For even spacing, measure the total distance between the end posts and divide into equal parts. Posts should be no more than 2.4m apart.
13. Mark the position of each hole and dig out to the required depth.
14. When the concrete around the end posts is properly set (at least two days), drive two nails into each post – about 100mm from the top and 400mm above ground level.
15. Stretch a line between the nails to align the intermediate posts and as a guide to post height.



16. Cut four small packer blocks all the same thickness and force a block under each of the string lines on the end posts to hold the string the same distance out from the post.
17. Brace each intermediate post in the same way as the end posts:
 - Nail the brace to the peg.
 - Check that the post is vertical by checking two adjacent faces with a spirit level.
 - Nail the brace to the post, leaving the nails so they can be easily removed later.
18. Check each post height is right and the post is vertical.



Constructing a fence

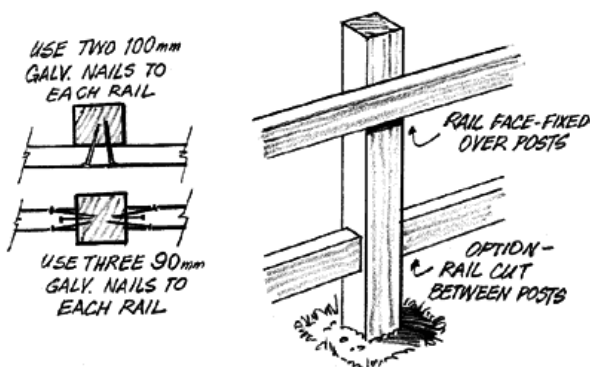
19. Remove the string line and carefully shovel concrete into the hole. Again, use a small piece of timber to prod the concrete to work out any air pockets.
20. Use a screed (flat piece of timber) to level the concrete and finish using a trowel.



21. Recheck the post height and the vertical alignment immediately afterwards.

Installing the rails

22. Leave the concrete to set for at least two days before you install the rails to the posts. It is best to also keep the bracing on until the rails are installed because this helps to prevent the posts from twisting.
23. Rails are normally placed with the narrowest edge uppermost for maximum support to prevent sagging.
24. Use a string line to align the rails and a set square to check for squareness as you go.
25. Rails are usually either installed on the face of the posts or butted between the posts.



Constructing a fence

For rails installed on the face of the posts:

- measure the span from centre to centre of the posts
- select lengths of timber to span three posts
- square the ends and cut the rail to length
- stagger the joints on alternate posts for extra strength
- fasten the rails to posts using two 100mm galvanised nails.

For rails installed between posts:

- measure the distance between the posts at ground level
- square and cut the rails to length
- fasten rails with at least three 100mm galvanised nails.



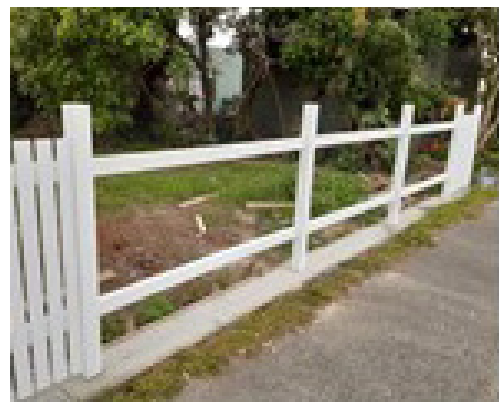
In this example the palings are fitted between the posts.

The rails are fitted flush with the back edge of the posts. This ensures the fence panels will not protrude forward of the front of the post.

Having the bracing still in position at this stage will make it easier to nail the rails as the post will not vibrate as much as an unsupported post.

Installing the cladding

26. Allow for a minimum gap of 40mm between the palings and the ground. If a concrete nib has been included this measurement may be reduced substantially.
27. If the specifications require the fence to be stained or painted, paint the posts, rails and palings before you install the palings. This keeps all edges well protected and extends the 'life' of the fence.

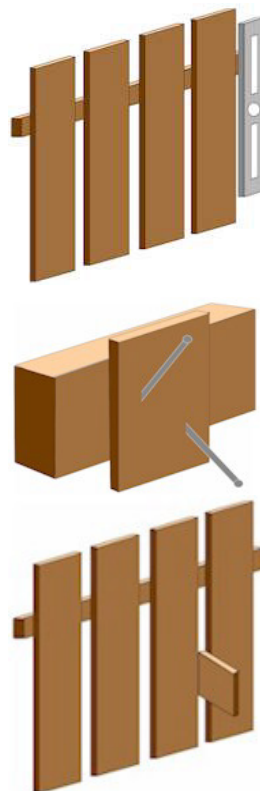


Pre-painted posts, rails and palings

28. Fix a string line to the end posts 20mm below the line of the palings.

Constructing a fence

29. Fasten the first paling flush with the end of the rails at the start of the fence line. Use a 20mm packer off the string line to get the right height. Put one nail through the paling into the bottom rail.
30. Use a level to check the paling is vertical.
31. Hammer a nail through the paling into the top rail.
32. Check the position of the paling again.
33. Use two nails through the paling on each rail. Drive the nails at different angles. This helps to reduce the likelihood of the paling coming away from the rail.
34. Use a block to space the palings evenly, about 10mm apart.



Finishing the fence

35. Use a string line or chalk line to mark the top of the fence. Use a saw to trim posts and palings to length if necessary.
36. Fix any capping or trim such as decorative post heads.



Common wooden fence capping (left) and decorative post capping (right).

Maintaining a fence

It is important to check fences and gates regularly for damage and wear to the posts, rails, cladding, or fixings, and to repair any damaged or worn components before they deteriorate and have to be completely replaced.

Maintaining a fence regularly (yearly) starts with thoroughly cleaning by water blasting or applying a sugar soap mixture, scrubbing, and rinsing off. Reapplying a stain or paint will also lengthen the life span of the fence significantly.



The image on the left shows the level of deterioration of the unpainted side of a fence compared to the painted fence built at the same time.

Many of the skills used in building a fence will be used when it is time to replace damaged posts, rails, or palings. The procedure for replacing damaged palings or posts is described below.

Maintaining a fence

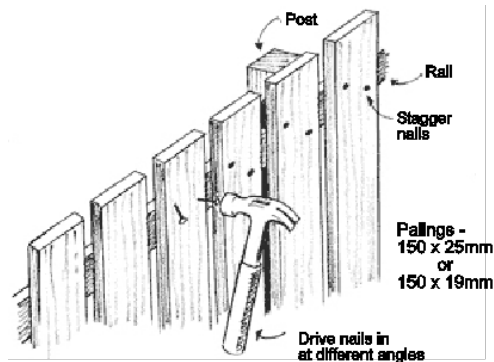
Replacing damaged palings

1. Remove the damaged paling(s).

Use a crowbar or claw hammer to remove the nails, punch the nails through, and/or cut out the damaged section with a handsaw.

If you need to remove any other palings or capping that will get in the way of the repair and you want to reuse them, prevent damage to the timber by drilling

out the heads of any nails with an electric drill. Use a drill bit which is slightly larger than the diameter (thickness) of the nail.



2. Measure and cut the new palings to the correct length. Allow for a minimum gap of 40mm between the palings and the ground.
3. Paint or stain the replacement palings before you fix (attach) them if required.
4. Fit the paling into position and nail the paling to the bottom rail. Use a level to check the paling is vertical.
5. Nail the paling to the top rail.
6. Check the position of the paling again.
7. Fasten the paling with two nails to each rail. Drive the nails at different angles to stop the paling from lifting. Place a small timber block between each paling to help space them evenly.
8. Once the repair is completed, replace the palings and/or capping with new nails driven into new nail holes.

Maintaining a fence

Replacing a fence post

1. Support the top fence rail to the left and right of the post to keep the fence from sagging when the post is removed.
2. Remove any palings or capping that will get in the way of the repair. Prevent damage to the timber by drilling out the heads of any nails with an electric drill. (Use a drill bit which is slightly larger than the diameter of the nail.)
3. Use a pinch bar or claw hammer to remove the nails connecting the post to the rails. (Put a piece of wood between the crowbar or claw hammer and the rail or paling to protect the timber.)
4. If the damaged post is set in earth, lever the post out of the ground. If the post is set in concrete, dig around the collar to the bottom and use a pick or wrecking bar to break up and remove the concrete, then pull or pry the post out of the hole.
5. If the post has been set in a footing, the footing will need to be cut with a concrete cutter either side of the post.
6. Remove any loose material from the bottom of the hole and add 100mm of concrete to the bottom of the hole so that the uncut end of the new post is not in contact with the ground.
7. Slip the post between the horizontal fence rails.
8. Adjust the post height by digging deeper or adding gravel, scoria or builder's mix to the hole.
9. Securely brace the post in position. To do this:
 - drive a wooden peg into the ground about a metre from the post
 - nail a brace to the peg
 - check that the post is vertical with a spirit level on two adjacent faces
 - nail the brace to the post, leaving the nail head out approx 10mm so it can be easily removed later.

Maintaining a fence

10. Carefully place concrete into the hole. Compact the concrete with a piece of 50 x 50mm timber to work out any air pockets that will weaken the concrete.
11. Recheck the post height with a tape measure, and use a level to recheck that the post is vertical.
12. After the concrete sets, reattach the rails and palings to the new post.

