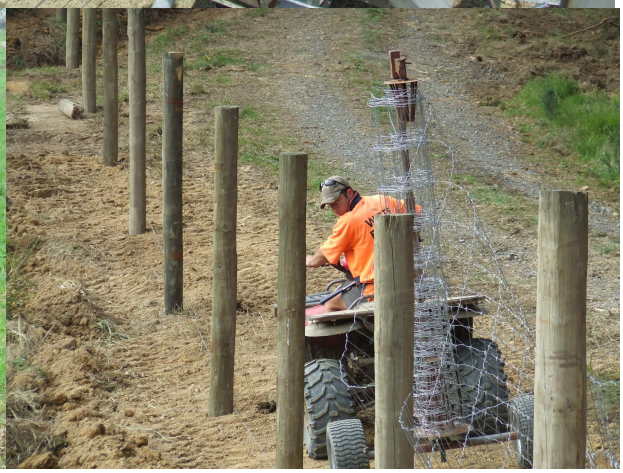
Conventional Farm Fencing



FENCE DESIGN

The particular **types of animals** are not the only deciding factor when it comes to fence design. **Topography**, **availability of material**, **laws, soil** and **budget** also dictate the design of a fence.

It is because of these factors a number of fence designs have developed.

An effective fence design will balance between **effectiveness, economics and tradition**

The most common types of non electric fences fall into three categories:

1. **Multi wire, multi batten**

Often referred to as **Conventional** fences and sometimes **post and wire** fences. (Sometimes these fences have some wires electrified)

2. **Post and wire – no battens**

Often just called Post and wire fences. (Sometimes these fences have some wires electrified)

3. **Netting**

Often called Fabricated Netting fences.

Naturally these are the common fence designs. Fencers often change these designs to suit their needs. Just because they have been changed doesn't make them any less affective if they are done well and suit the situation.

Multi wire, multi batten

Within each category several designs have emerged.

Description

This is a typical multi wire, multi batten fence.

Variations on this design allow for

- 5 -10 or more wires,
- Full round, ½ round or ¼ round posts
- Different sized posts at different lengths
- Post spacing 3.5 -5 metres apart
- battens – 3 - 5 between the posts
- Wire – mild, high tensile or stainless, Barbed, No 8 (4mm) 3.15mm or 2.5mm
- Different wire spacing
- Different strainer assemblies
- Different anchoring/stabilizing systems

Figure 3 - Multi wire, multi batten (Post and Batten fence) with 1.8mtr No1rnd posts spaced at 4 metres. 5 battens between each post and 7 wires of 2.5mm high tensile wire with spacing as shown

Post and Wire

As with the multi wire, multi batten fence several designs have emerged.

Figure 4 – Post and wire fence with 1.8 mtr No1 round posts spaced at 3.6 metres and 8 wires of 2.5mm high tensile wire with spacing as shown

Description

This is a typical Post and wire fence. Variations mainly occur with

- Number of wires
- Wire - mild, high tensile or stainless, Barbed, No 8 (4mm) 3.15mm or 2.5mm
- Post spacing 3.5 -5 mtrs apart
- Post sizes and lengths
- Different wire spacing
- Different Strainer assemblies
- Different anchoring/stabilizing systems

The design of a fence can alter the cost of the fence but the budget is not the only factor that dictates the type of fence you build.

Fabricated Netting Fences

These types of fences are constructed with prefabricated netting with 1 or 2 strands of wire to support the netting. Sometimes they contain battens although the netting has its own 'built in' battens.
The netting option is usually chosen because of the containment abilities - high pressure areas such as holding pens and docking paddocks.
Traditionally netting fences were used in holding paddocks, laneways or other high pressure areas plus for deer fencing. Today deer fencing also consists of conventional post and wire fences. The netting fence however remains the best way of containing young fawns.
Other animals such as alpaca, emu, and ostrich can also be successfully contained using netting fences.

Netting fences are in some areas of New Zealand is replacing the conventional farm fence. The reason being that it is cheaper than other types of fencing and it manages to contain stock well

Fencing with netting on hill country though can be difficult as the netting is cumbersome to handle and it can be hard tensioning the netting over rises and dips.

Description

There are several types of pre fabricated netting, each with its own features and benefits which makes it suitable for a particular job.
Apart from the different types of netting the other variances are similar to the ones for the Post and wire and Multi wire / multi batten fences.

Tips of designing and building netting fences are covered much later in this book in a separate section.

This netting fence features netting, posts, wires and is designed to withstand sustained stock pressure in holding areas.

Designing a fence

Design is influenced by:

- Intended purpose – what are you keeping in or out.
- Topography – steep, flat, undulating.
- Soil type – Rocky, sandy, clay
- Law – laws relating to boundary and roadside fences
- Tradition – many farmers continue to do things because they have always done it that way.
- Location – Coastal areas offer some different problems with wear and tear on material
- Budget

What ever the design outcome it is likely to be influenced by at least 3 of these features.

1 Intended purpose

Stock

Sheep, lambs, cows, bulls, deer, horses. All suit some designs better than others

Here are some of the common animal needs

	Type	***Fence Height***	***Wire Spacing***	***Wire size and type***	***Post spacing/ No of battens***	***Other***
Sheep	Multi wire / multi batten	1050 - 1200	8 wire	2.5 HT, 3.15HT,4mm Mild	4m ï 5m 5 battens	
	Post and Wire	1050 - 1200	9-10 wire	2.5 HT, 3.15HT, 4mm Mild	3.5m ï 5m	
Lambs	Multi wire / multi batten	1050 - 1200	9 wire	2.5 HT, 3.15HT, 4mm Mild	4m 5 - 7 battens	Electrify lower wire
Cows	Multi wire / multi batten	1050 - 1200	8-9 wire	2.5 HT, 3.15HT, 4mm Mild	4m ï 5m 5 battens	Electrify top wire/outrigger
	Post and Wire	1050 - 1200	2-4 wire	2.5 HT	5m ï 7m	Electrify 2-all wires
Deer	Post and Wire	1.9m ï 2m		Deer Netting	5.5m ï 6m	

Topography
Topography dictates

- The tools you use. Spade [handtools], post hole borer or post driver
- Where the fence goes. – down or over the ridge; contouring in general
- Stay assembly design – diagonal / horizontal
- The number of rise and dip posts
- The number and distance between angles.
- The preparation – bulldozing fence lines on steeper country

	Type	Preparation	Assemblies	Posts/ distance	Tools
Very Steep	Electric Post & Batten Post & Wire	Bulldoze fence line if possible	Box Assemblies Stay Assemblies	Many intermediate. Posts may be required on uneven country to keep wire close to the ground.	Handtools, Post borer, Post driver on bulldozed lines
Steep	Electric Post & Batten Post & Wire	Bulldoze fence line	Box Assemblies Stay Assemblies		Handtools, Post borer, Post driver on bulldozed lines
Rolling	Electric Post & Batten Post & Wire Netting	Flatten places for gates.	Stay Assemblies	Rise and dip posts required.	Tractor Borer Spade etc
Flat	Electric Post & Batten Post & Wire Netting		Stay Assemblies	Maximum for intended use.	Tractor Borer Spade etc

Class of land
Where possible fences can be used to separate one class of land from another whether it is due to different soil types or aspect (sunny, shady, steep undulating, prone to slipping)

Problem Areas

- Rocky outcrops
- Unstable streams, slopes – fencing straight up and down slopes means that a the fence will suffer less from snow damage, boulder damage, slipping.
- Gullies or areas susceptible to floods

Dips and Bends
Avoid these if possible – every dip will require a tie-down or foot. Likewise a bend will require bigger posts or strainer assemblies (Angles)

Soil Types
Soil types dictate

- The tools you use. E.g. - crow bars in rocky ground.
- How easy it is to dig – Wet, or soft and sandy tends to be easier than, dry, stoney ground or clays.
- The size of the posts you use…and footing Strainers, Angles, Dip posts

This table outlines the suitable post options for different soil types

	Strainer Posts	**Angle Posts**	**Line posts**	**Rise or Dip posts**	**Tools**
Sandy soil	Full round Strainer SED - 2.4m	Full rounds SED 2.1m	Quarter, half or full rounds SED 1.8m	Quarter, half or full rounds 1.8m	Spade Post hole borer Post thumper
Swampy ground	Full round Strainer SED - 2.4m-2.7m	Full rounds SED 2.4m	Quarter, half or full rounds SED 1.8m-2.4m	Quarter, half or full rounds 1.8m-2.4m	Spade Post hole borer Post thumper
Deep Loess	Full round Strainer SED - 2.4m	Full rounds SED 2.4m	Quarter, half or full rounds SED 1.8m	Quarter, half or full rounds 1.8m	Spade Post hole borer Post thumper
Stoney ground	Full round Strainer SED - 2.1m-2.4m	Full rounds SED 2.1m	Quarter, half or full rounds SED 1.8m	Quarter, half or full rounds 1.8m	Spade Crow bar Post hole borer
Clay	Full round Strainer SED - 2.1m-2.4m	Full rounds SED 2.4m	Quarter, half or full rounds SED 1.8m	Quarter, half or full rounds 1.8m	Spade Crow bar Post hole borer Post thumper
Rocky ground	Full round Strainer SED - 2.1m-2.4m	Full rounds SED 2.1m	Quarter, half or full rounds SED 1.8m	Quarter, half or full rounds 1.8m	Spade Crow bar Post Driver

Not only do soil types affect the material you use but they also affect the pasture that is grown. Farmers will subdivide similar soils (or similar pasture growing potential) into one paddock because this will enable you to make best use of the pasture that is grown. E.g. Even with similar soil, the north side of a hill will grow more grass than the south side because of the aspect. By subdividing these two apart you can graze the pasture more efficiently.

Law/ Minimum requirements
The Law comes into play with

- Boundary fences
- Road side fences

The laws governing fences in urban areas are different from those in rural areas

The cost of boundary fences is shared by the two parties?

Road side fences should be stock proof as wandering stock could end up causing an accident. The farmer who owns the stock may find themselves in a legal battle or at the very least paying for restoration of property and increased indemnity insurance.

Roadside fences should be post and batten fences with at least 9 wires. Any electricity should be on the inside preferably on an outrigger. If the electricity is part of the main fence warning signs should be visible.

Boundaries
Check the accurate location of boundaries before erecting the fences. Discuss plans with your neighbour.

Tradition, fashion and personal taste

Some farmers are very traditional in their fence format they require. This can have a huge bearing on what they decide to do.
Just like clothes the ideas and trends in fencing or how a fence should look constantly change.

The two constants should be containment effectiveness and longevity.

A drive in the country will see a range of fence types and trends.

- Totara strainers, posts and battens,
- Concrete strainers, posts and battens,
- Full rounds and ¼ round as line posts,
- Wooden battens or some other alternative.
- Wooden and metal gates.
- Barbed wire, HT wire and good old No.8 wire.
- Inline strainers crimps,
- Double loop knots and Tex brown knots.
- 4, 5 or 6 battens between posts. No battens at all.
- Wooden stays and concrete stays
- Posts 4,5,6 or 7 metres apart
- Box assemblies and diagonal assemblies

The list is endless. These are just a few of the different material and designs seen. Some variances can not be seen such as

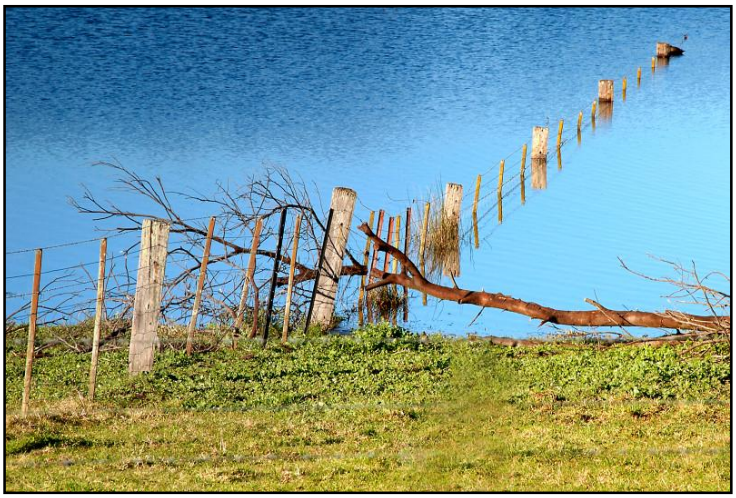
- The types of foots used
- The method the post was put in by – dug – bored- thumped.
- The size and shape of the breast plate
-

Today there are some accepted best practices which are set down by the **FCANZ**. Innovation and new materials have bought about many of the changes. National fencing competitions are good places to see these latest trends.

Farmers sometimes are slow to change preferring things done the way they have been done for a long time. Fulltime contractors need to persuade Farmers that new treads are proven to make these fences stronger for less time taken to install i.e. swinging foots vs. Tee mortice foots.

Location

- Coastal areas, areas that flood and areas that have heavy snowfall may require you to think about specific fence design.
  In costal areas the speed in which wire degrades is faster due to the corrosive action of the sea air and the minerals in the ground
- Conventional fences do not stand up to water and debris running through them as the debris doesn't pass through and tends to end up pushing against the fence. Therefore if an area floods the number of battens are generally reduced or not used at all.
- If snow builds up on an up side of a hill fence it can put a lot of pressure on the wires and posts. Fences have been known to have been pushed over.



FENCE DESIGNS

Posts

Post Material

Concrete

- Concrete is very heavy, making both transport and installation more difficult.
- Concrete posts are **not as strong** as their wooden counterparts, with a particular tendency to crack or break under sudden stress.
- Concrete may regain popularity if timber becomes harder to source, more expensive or technology improves its features.

There are a large number of concrete posts and strainers in use in fences all across New Zealand today. Very few are put into new fences but there are considerably more older fences than new ones in existence.

Concrete posts made during the war/depression are poorer quality as less cement was used. Concrete posts have their own types of staples, stays, foots, gudgeons and wire attachment methods

Metal

Also called standards, waratahs, flat iron standards, "T" sections, "Y" posts, star pickets or "staple lock" posts

Metal standards are widely used as posts in the South Island high country for permanent fences and in both islands for temporary fences.

- Typically, a steel standard could be expected to carry a sideways loading of about half that of a 115mm pine post before it failed (bent).
- Durability is a problem in high-salt or high ground acidity situations (e.g. in coastal situations).
- Ungalvanised steel posts tend to cause premature corrosion of wires.
- They can be put in the ground with a heavy object such as a sledge hammer or a driver such as the one shown here.
- Wire can be attached using a specially designed staple

Timber
In earlier pioneering times while native bush was being cleared, timber for fencing could normally be found within reasonable distance of a proposed fence line. **Totara** was the preferred timber. Totara is renowned for its durability, particularly in-ground, which is attributed to the high levels of protective oils in the timber itself. Many of the large Totora posts found in old fence lines have deteriorated at ground level but are still in good condition both above and below the ground.

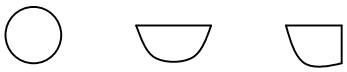
Exotic timbers now provide most of the structural material for fencing. By far the majority of this is the Pines - Radiata and Corsican, with Douglas Fir also used. The demand for this product has created a very quick turnaround from planting to shop room floor with the growing and processing times becoming shorter and shorter. This generally sees a decrease in quality amongst posts and timber.

Timber Post Treatment
Any round wood or timber post which sits on or under the ground, needs to be treated to H4 or higher. H1 – H6 is the rating system for timber treatments which prevents rot and decay.

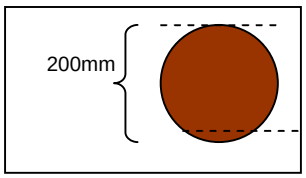
Treatment Level	Application	Typical Usage
H3.	**Outside:** For wood exposed to the weather and in ground contact.	• Decking • Fence battens • Garden furniture • Trellis
H4	**In ground:** For wood exposed to the weather and in ground contact. Non structural use	• Fence posts • Landscaping
H5	**In ground structural:** For wood exposed to the weather, in ground and fresh water contact; and in high risk, load-bearing applications.	• House piles • Retaining walls • Veranda supports • Horticulture • Viticulture • Fences (in set conditions)
H6	**Marine:** For permanent salt water immersion.	• Marine piles • Slipways • Timber in seawater

Size and Shape
Posts are described by their shape.

- Round, half-round, quarter-round - these are called "Round-wood material", compared to fully sawn, which is not commonly used.



Size relates to diameter and length.
The diameter is measured and called the minimum small end diameters (SED) In other words the smallest end is measured. For half-round and quarter-round posts the size is denoted by **face width**. A quarter round is calculated by doubling the flat surface to get the diameter.



Timber posts are graded on their minimum diameter. This is called the SED (Small end diameter) and the LED (Large end diameter)

This measurement and the length then dictate the class or size.

- No.1 has the widest diameter and No. 3 having the smallest.
- A fencepost is usually 1.8 m in length
- A strainer posts is usually 2.1m and 2.4m,
- Deer fence posts are usually 2.7m and 3.0m.
- There are also 'stay posts' which are usually about the same diameter as a No.2 fence post, however they are the same length as a strainer post, (either 2.1M or 2.4M).

Rounds

No1 SED 115 – 135	**No2 SED 90-115**	**No3 SED 65-90**
1.8M / 6ft	1.8M / 6ft	1.8M / 6ft
2.4M / 8ft	2.4M / 8ft	
2.7M / 9ft	2.7M / 9ft	
3.0M / 10ft	3.0M / 10ft	

Half Rounds

No1 160 - 175	**No2 125-160**	**No3 115 – 125**
1.8M / 6ft	1.8M / 6ft	1.8M / 6ft
2.4M / 8ft	2.4M / 8ft	
2.7M / 9ft	2.7M / 9ft	
3.0M /10ft	3.0M /10ft	

Quarter Rounds

No1 100 - 125	**No2 75-100**	**No3 65 – 75**
1.8M / 6ft	1.8M / 6ft	1.8M / 6ft
2.4M / 8ft	2.4M / 8ft	
2.7M / 9ft	2.7M / 9ft	

Strainers

No1 SED 200 - 225	**No2 SED 175 - 200**	**No3 SED 150 – 175**
1.8M / 6ft	1.8M / 6ft	1.8M / 6ft
2.1M / 7ft	2.1M / 7ft	2.1M / 7ft
2.4M / 8ft	2.4M / 8ft	2.4M / 8ft
2.7M / 9ft	2.7M / 9ft	2.7M / 9ft
3.0M / 10ft	3.0M / 10ft	3.0M / 10ft
3.6M / 12ft	3.6M / 12ft	3.6M / 12ft

Strength of timber

The strength of timber depends upon a number of factors Apart from post diameter; the next most important feature is the **density of the outer wood**, and the presence of **defects**.

Knots and other defects will reduce the strength of a post, but the effect is less severe than in sawn timbers. This is because the natural growth process generates nodal swellings around knots, which increase the local strength. When these are cut or planed off the result is a major loss of strength. However, providing posts are not machine shaved, but are merely trimmed and debarked, the nodal swellings retain much of their strength, and compensate for the presence of a knot.

There are other productions techniques such as drying that affect the durability and strength of the post.

Choosing your material

When you go to buy your posts you should check what your are buying. There are certain things to look out for

- Make sure all the posts are uniform (all a similar size)
- Make sure there are no knots or damage to the round wood.
- Check their density

Check you have the posts with the right treatment for the job you want to

Soil
You should also know the type of soil you will be digging your posts into because that will affect your choices. A soft soil or wet soil will require you to dig your post into the ground further than a firm soil.

A good fencer understands and can identify different types of soil

The Texture of Soil

Feel	Cohesion and plasticity	soil texture	General soil texture
Gritty	Falls apart when you try to mould it into a ball	Sand	Sand
	Soil can almost be moulded into a ball but falls apart when squashed	Loamy sand	
Slightly gritty	Soil can be easily moulded into a ball. If you squash the ball it gets cracks in it.	Sandy loam	
Smooth soapy feel.	Soil can be easily moulded into a ball. If you squash the ball it gets cracks on the edges.	Silt loam	Silt
Very smooth – almost sticky	Soil can be easily moulded into a ball. If you squash the ball it does not get cracks in it.	Clay loam	Clay
	The soil sample will feel a bit like stiff putty		
Very smooth and sticky	Soil can be easily moulded into a ball. If you squash the ball it does not get cracks in it. The soil sample will feel like well worked putty.	Clay	

For very sandy or wet soil the size of the post best suited to the conditions changes.

Types or Posts

Strainer Posts

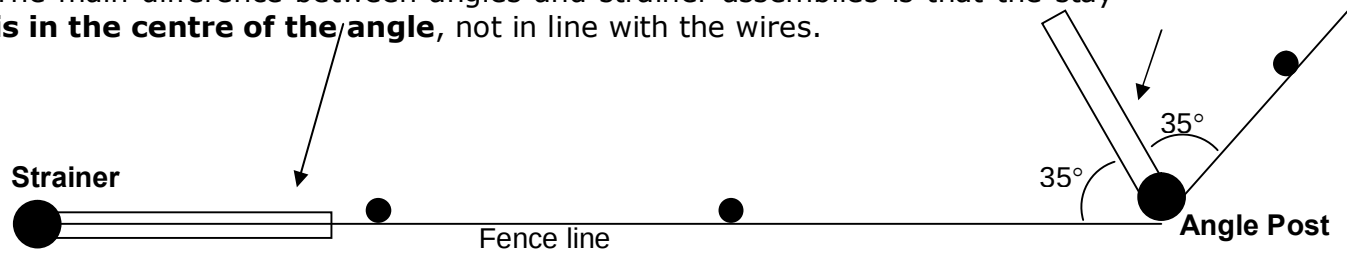
The strainer is the most important fence in the fence line as it takes the load of the line wires and sometimes gates. In both cases, the post needs basic strength so that it does not break and depth in the ground so that it does not overturn. In addition, post bulk or "meat" is needed in which to cut bolt holes and mortrices.

Usually the strainer is double the fence height. Strainers that are 200mm SED by 2.4m long suit most fences.

Angle Posts

Angle posts are placed at a part of the fence where a **change in direction** occurs. This change in direction puts additional pressure on the post, compared to a line post, therefore it is stayed.

The main difference between angles and strainer assemblies is that the stay **is in the centre of the angle**, not in line with the wires.



If the angle is less than 45^{O}	Use minimum 2.1m No.3 strainer as the angle post Stay – No.2 round, minimum length the same as the angle post.
If the angle is 45 – 90^{O}	Use minimum 2.4m No.3 strainer as the angle post. Stay – No.2 round, minimum length the same as the angle post.

Line Posts including dip and rise posts

Line Posts (Intermediate posts) support the wires of the fence and are located between the strainers and the angle posts. If a line post happens to be on the top of a rise it is called a rise post and if it is in a dip or lower spot it is called a dip post. Posts are placed to give the bottom wire clearance from the ground.

These posts at present are usually ¼ or ½ rounds due to insignificant resources available for full round posts.

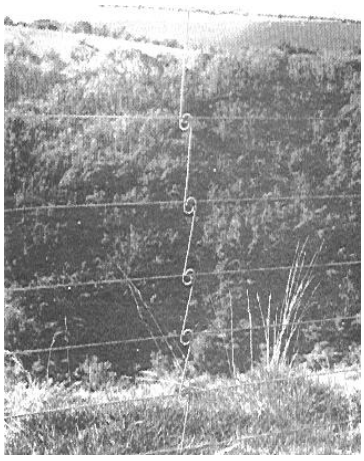
Stay posts
Stays are round tanalised posts. Stay posts are used to help anchor a post against the strain of the wires. There are several methods of constructions depending on terrain, stock or personal preference. Together the stay along with a strainer and its anchoring system is referred to as the **end assembly**. This is because the stay is part of the fencing component that anchors the fence against the forces that the wires exert on the fence. Stays are also constructed on corners on the angle post as these also have forces exerted on them by wires.
The stay post should be free of imperfections such as large knots, bends or cracks as this is a weak point and once strain goes onto the stay a break may occur at this point causing the whole end assembly to fail. This would in turn affect the whole fence.

Battens or Droppers
Battens are usually 1.17 – 1.2m in length 50x50
Battens are used to keep the correct spacing between the wires.

Pine battens require an H3 treatment however it is important to remember that although wooden battens are treated with preservatives they are not treated to be durable with the ground. Care should be taken to keep the bottom ends clear of the ground.
Totara battens are sometimes used or reused, which do not need treating. They too must be kept clear of the ground.
Recent fence designs either eliminate battens completely or reduce their number to one per post interval. Increasing the number of wires or using an electric wire compensates for the absence of battens

The traditional wooden batten or dropper still dominates but there have been a lot of variations in the system over the last 10 - 20 years
Other types of batten include:
- Chain
- Clip-on wires
- Galvanised steel strips
- Polypropylene string

The word dropper can mean different things depending on who you are talking to and what part of the country you are in. Sometimes a batten and a dropper mean the same thing. Other times it can mean a wire or fibreglass alternative to a batten (see right)



Staples

There is a range of staples, all of which have different uses.

Staples are either galvanised or hot-dipped galvanised, which is more durable. Staples must have and retain at least as heavy a coat of galvanising as the wire they hold

They are come as either:

- Plain shanked, or
- Barbed

The New Zealand Agricultural Engineering Institute tested the holding power of staples with plain and barbed shanks. In green posts the plain shank had the firmest hold on the wire but in dry posts barbed staples were best.

Barbed staples driven into green timber cut the fibres and were pulled out more easily.

Plain shanked is best for "green" posts, because the treatment salts corrode the barbs, leaving the staples loose. Barbed are better for dry posts. With soft wood longer staples are better than barbed.

Recommended staples:

- Softwood post: 50 or 45 x 4mm
- Hardwood post: 40 x 4mm
- Softwood battens: 30 x 3.15mm

Post Staples

These are longer and stronger than the smaller batten staples. Staples for pine posts need to have a barb on to make them hold in the post. Staples for hard wood have no barb and are slightly smaller. Barbed staples in these situations buckle. The approximate length of staples is 40 mm.

Batten Staples

These staples are approximately 30 mm in length. For pine battens the staples have a barb and for hardwood battens they have no barb. Batten staples are forced home to hold the batten firm.

Fibreglass Rods

These rods have a special metal clip to attach them to the wires. These clip on to both sides of the wire and hold the rod firmly in place. There are also

clips available for steel standards of varying types as well as hardwood battens and others.

Concrete Post Staples

Concrete posts have staples which are driven through the post in holes that are precast. The staples are made of No. 8 (4 mm) wire and bend over in a groove in the back of the post.

Permanent Strainers

Also called in line strainers. These remain in the fence. Join two wires and can be tensioned as well, using a handle in a ratchet manner, others just tension the wires (see top)

These devices are commonly used on short strains (of up to 30m), as knots and crimps can lose their strain. With these devices they can be strained up at any time.

They are suitable for both electric and conventional fences as they can withstand strains of up to 150 kgf (if used with electric fences they must be insulated.)

They can be used with most wires except barbed and aluminium.

Crimps/Joiners

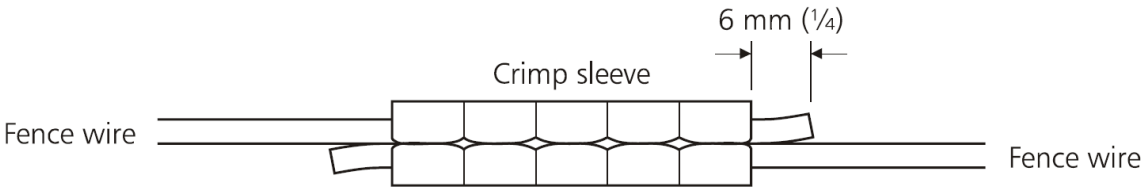
Where as there have been a few types of crimps on the market for many years Crimps are metal 'sleeves' put on the two wire ends and squashed, to hold the wire tight. Specialised crimpers are required to squash the crimps properly

Crimping is stronger than any knot, and is applied when the wire is at the correct tension. No tension is lost after the wire strainers are removed. They are quick and easy to use, but you must have proper crimping tools.

The crimping device has very good conductivity and is commonly used on electric fences. They can be used on all sizes of wire – you just have to make sure you buy the correct sized crimp.

To crimp wires together

1. Slide crimp sleeve onto the end of the fencing wire until 20cm of wire is showing past the sleeve if you want to finish by wrapping the ends otherwise 6mm will do.
2. Push the wire to be joined through the opposite side of the crimp sleeve until 20 cm of wire is showing to finish by wrapping or 6mm if you are not.
3. Open the jaws of the crimping tool and place the jaws over the end of the crimp sleeve
4. Ensure that the jaws overlap the end of the crimp sleeve slightly and that the crimping tool is at right angles to the crimp sleeve. Compress the handles together
5. Slide the jaws of the crimping tool along the crimp sleeve without leaving shoulders between crimps



Once the sleeve is completely crimped wrap the wire end around the wire 3- 4 revolutions and snap off. It is possible to cut the wire close without wrapping it but should the sleeve fail a wrapped assembly will still hold.

Wire

In New Zealand a large number of alternative wire types and sizes are available. Traditionally 4mm diameter mild steel (known as No. 8 or `Farmer's Friendly') has been extensively used, but it has largely been superseded by smaller diameter high tensile steel wire, which is much cheaper for the same strength. Both of these wires have a galvanised zinc coating which protects the steel interior from corrosion. Wire should be manufactured to N.Z. Standard 3471, and the buyer should always check this before purchase.

Wire is sold in coils that are measured by weight.

4mm No 8	25kg coil	253m	0.099 kg/m	98.81 kg/km
2.5 mm HT 12½ gauge	25kg coil	648m	0.039 kg/m	38.58 kg/km
1.6mm 16g electric wire	10kg coil	636m	0.157 kg/m	15.72 kg/km
75 mm barb wire 3 inch	25kg/coil	238m	0.105kg/m	105 kg/km

High Tensile - 4.0mm, 3.15mm, 2.5mm

High tensile wire is produced from steel rod which is forced (cold drawn) through a series of dies to reduce the diameter of the wire progressively until the required size is reached. The galvanised zinc coating is then applied. The cold drawing process results in a metallurgical hardening of the wire which increases its tensile strength. At the same time the material becomes more resilient (i.e. it tends to be harder to deform permanently) but also more brittle.

Smaller diameter wire is frequently used as it is cheaper, but with adequate strength. Otherwise, there is little difference.

Stock containment: Very good as long as fence design is good – needs battens or be electrified. Has higher recommended tensions than mild steel (at the same diameter), which gives better stock containment.

Stock damage: Minimal damage to stock from the wire, unless wire ends are left protruding.

Durability: Galvanised, but not suited to coastal environments. The larger the wire diameter, the greater the long term durability.

Conductivity: Good. Extensively used in electric fencing. Larger diameter wire carries a greater current, but is not normally used due to cost.

Mild Steel - 4.0mm (No.8), 3.15mm, 2.5mm

Mild steel is a low carbon steel, and although produced in a similar manner to high tensile, it does not harden, due to its low carbon content. As a result it is less brittle, and less resilient, and can be bent into odd configurations easily. It has a lower tensile strength (i.e. a lower failure load per unit cross-sectional area), and so must be thicker in diameter to withstand the same tension (and costs more).

Stock containment: Good as long as fence design is good. Needs to have battens or be electrified. Can not be tensioned as much as High Tensile, therefore stock are more likely to push through.

Stock damage: Minimal damage to stock from the wire, unless wire ends are left protruding.

Durability: Galvanised, but not suited to coastal environments. The larger the wire diameter, the greater the long term durability.

Conductivity: Good. Larger diameter wire carries a greater current, but is not normally used due to cost.

Aluminium coated wire - 2.7mm

This consists of a high tensile steel centre to which a pure aluminium coating is metallurgically bonded. Typically, the coating accounts for 25% of the cross-sectional area, making it about 0.2 mm thick on 2.5 mm wire (giving a 2.7mm wire). As pure aluminium is low in strength and soft compared to steel, some care is needed to avoid damaging the coating. The wire must be handled with care (e.g., laying out rather than running out), and special staples and plastic wire protectors are required for stapling to avoid damaging the coating.

Special joiners should also be used instead of knots and alloy type permanent wire strainers rather than conventional chain strainers should be used for tensioning. The wire is relatively expensive; it is about two or three times dearer than ordinary high tensile steel wire of the same diameter. It is intended for situations where corrosion problems are acute such as lead out wires in electric fencing, and conventional fences in very corrosive environments.

Stock containment: Aluminium wire has a low recommended tension and is a soft wire. For adequate stock control it must be electrified.

Stock damage: Minimal damage to stock. Is more likely to break if stock gets tangles, preventing serious injury.

Durability: The aluminium coating, instead of zinc is designed for highly corrosive situations, such as coastal areas. It is much more resistant to rust, and has a longer lifespan.

Conductivity: Much more conductive than other wire. Very well suited to electric fencing.

Barbed wire

Barbed wire usually consists of two galvanised wire strands wrapped together with sharp pieces of wire protruding every 100 mm or so. It is three times as expensive as 2.5 mm high tensile wire. Depending on the quality of the galvanising, the wire tends to rust early at the plaits and so has a limited life. It is still used by some farmers to prevent stock pushing their heads through a fence. However, the fence should be built strong enough to withstand loads produced under these circumstances.

Others use barbed wire to prevent stock from pushing wooden battens sideways along the fence. This can also be avoided by stapling the battens correctly. A third use is to prevent damage to netting, caused by stock leaning over the fence. Again adequate design could help to eliminate this problem. Possibly the only suitable use of barbed wire is to deter humans and even this use is doubtful. Barbed wire is not recommended, not only for safety reasons, but because it will also damage hides and pelts, and electric fencing will usually do a better job wherever barbed wire is considered.

It must be stressed that barbed wire should **NEVER** be electrified. Stock or humans can be killed if they are unable to release themselves from an otherwise safe electric fence, and the possibility of becoming entangled in electrified barbed wire is too high to be safe. It is now illegal in New Zealand to electrify barbed wire.

Stock containment: Designed to stop stock pushing through wire, and leaning over fences. Barbed wire is often not tensioned as high as other wires; therefore stock can still push through the fence. Not as effective as electrification.

Stock damage: Barbed wire can damage skins, pelts, fleeces and can cause serious injuries to stock.

Durability: Although galvanised, it tends to rust early, especially at the barbs. It is normally handled with pliers, which damage the galvanising and make it prone to corrosion. It has a limited life.

Conductivity: It is illegal to electrify barbed wire, so it is of no use in electric fencing.

Barbed wire is available in both mild and High Tensile

Breaking strain of wire

If the tension is increased, eventually a point is reached where the strain stops being proportional to the stress. It is around this point that the ***Yield Point*** of the wire is reached. This is when the tension (stress) begins to permanently damage the wire. At this point the wire will not return to its original length – it has been permanently stretched.

If the wire is continued to be tensioned, it will eventually reach a maximum stress level, called the ***Tensile Strength***. After this point the wire weakens, and breaks

Breaking strains of the various types of wires can be found:

a) **In manufacturers publications**, e.g. in product guides put out by wire companies.

b) **On the label** of a new coil of wire. This is also called the Wire Mark, and is normally located at the lead-out end of the coil of wire.

Wire Damage

Most types of wires are protected by a coating of either zinc (galvanising) or aluminium. This protects the steel core. If the coating is damaged the wire is weakened and the life span of the wire is reduced.

Wire Corrosion

Corrosion of a material is the removal of the material by chemical activity. If this coating is removed by mechanical or other means then corrosion will occur.

Factors influencing corrosion of wire:

- **Poor storage:** Wire in coils, when wet will corrode more rapidly than on the fence. Storage near fertilisers, chemicals and corrosive materials will also corrode the galvanising.
- **Frequent wetting and drying:** Such as occurs at ground level. Galvanised wire is not recommended where wire goes into the ground. Instead, use stainless steel wire.
- **Contact with copper-chrome-arsenate (CCA) treated wood**: The copper of the wood preservative reacts with the zinc causing rapid corrosion. This is particularly serious for wires in close contact with recently treated "green" posts. Allowing posts to dry out will reduce this problem but not overcome it completely.
- **Salt air close to the sea, wind blown dust, corrosive gases in the air (e.g. sulphur):** All reduce the life of zinc coating.
- **Chemical contamination:** from drift or direct contact with fertiliser when transporting or storing the fertiliser.
- **High rainfall area:** every time the wire gets wet part of the zinc coating is lost due to the chemical reaction between the zinc and moisture. Therefore, in high rainfall areas the life of a fence is shorter than in a hot, dry climate.
- **Nicking:** Nicking is the damage to the wires galvanizing from the use of tools, or by dropping tools on the wire.

  Incorrect use of tools while fencing can cause 'nicks' in the galvanising. The use of tools should be kept to a minimum. Pliers should not be used directly on the surface of the wire to hold it.
- **Kinking and movement fractures of galvanizing:** Care should be taken when hammering in staples, that the wire is not accidentally hit.

  Excessive bending and movement of wire weakens the wire and cracks the galvanising. Reusing old wire may not be a good idea if it has been bent and straightened

In farming the environment is generally not too bad for fencing wire. If the air is clear and unpolluted and the relative humidity is low, then the loss of zinc will be very slow. In these areas commercial wire products will last upwards of 20 years.

Other Wire types

Stainless Steel

- Similar strength to mild steel wire
- Does not corrode as quickly
- Much more expensive
- For use where wire is in ground contact.

Aluminium wire

- Very good corrosive resistance
- Considerably weaker than HT steel of the same diameter
- More expensive
- Good alternative to aluminium coated wire for long lead out wires

Galvanised wire strand

- Seven HT wires twisted together
- Developed to carry large loads in some horticultural situations

Plastic wire

- Ribbons and strands of plastic woven together with fine stainless steel wire
- Used for temporary and semi permanent electric fencing.

Recommendations

High tensile recommended end use applications

- 1.60mm, 2.00mm, **2.50mm** (recommended) for electric fencing
- 1.60mm, 2.00mm for support wires in orchard irrigation systems
- 2.50mm and 3.15mm for lead out wires for electric fencing
- 2.50mm, 3.15mm Zinc Aluminium Alloy coated for conventional smooth wire in coastal, corrosive situations
- 2.50mm, 3.15mm, 4.00mm for brace wires in end assemblies
- 2.50mm and 3.15mm for orchard applications in training wires and overhead support wires
- 3.55mm, 4.00mm for tieback, artificial shelter applications and canopy support wires

Mild Steel recommended end use applications

- 1.60mm, 2.00mm for lacing and tying wire
- 2.50mm for electric fencing wire
- 3.15mm for coastal fencing

- 4.00mm Zinc-Aluminium coated for coastal and corrosive environments. No8
- 4.00mm for horse containment and footing wire
- 4.50mm for footing wire.

The information relating to the wire is found on the coil when you buy it.

The zinc or zinc alum coating that protects the wire from corrosion needs to be cared for when the wire is used, transported or stored.

To help care for wire follow these simple guidelines

- Always twist over the end of the wire when you cut the coil so as you can identify the right end to work from. If you don't have time or two hands free at the time poke the end into the ground and come back to it.
- Always run the coil out in the right direction and smoothly to eliminate tangling.
- Handle wire carefully when using it to prevent kinks, Knicks or cuts on the wire
- Keep wire away from corrosive chemicals
- Tie coil tightly when transporting or storing

Anchoring Material

Foots and **breast plates** are made from material that will not deteriorate in the ground such as tanalised timber and concrete. Native timber such as Totara is also good to work within some regions.

Fencers or farmers are able to utilise broken posts or old totara posts or battens for this job.

Stakes/Pegs are usually metal standards as they do not deteriorate quickly under ground

Timber

Timber is used to construct fence rails, flood gates and wooden gates

Rails

Rails are usually situated around gate ends tricky corners or around trees.

They are used for yards

They are more decorative so can be used on road frontages or buildings.

Some equestrian properties use post and rail as their main form of fencing

When choosing the wood (or in some cases synthetic material) there are several things to consider.

- Purpose
- Terrain
- Availability of timber
- Animals that are to be contained
- Budget

Rails are rough sawn and usually Pine or Douglas Fur. Timber sizes commonly used are:

125 x 32 (5x1¼)

150 x 32 (6x1¼)

150 x 50 (6x3)

There is special shaped railing timber also available which is often used in more decorative or domestic use. Half rounds can be used in stead of timber rails but this is an expensive option

To complete the timber rail fence, nails are necessary. 4ò-6ògalvanised flathead nails should hold most rails well and are harder to pull through than flathead nails. In high use areas such as cattle yards washers can be used with flatheads to decrease the likelihood of pull through and to give added strength to the structure.

If you are worried about rails coming off they can also be wired on. This is especially useful with cheaper wood as it tends to twist when it dries and may pull off the post. Use mild wire such as No 8 (4mm)

Flood gates

Flood gates are used to keep stock from moving under a fence when it travels over a creek, ditch, small gully, culvert or hole in the ground.

It should be able to cope with the rising or falling water levels and it should not collect debris.

Returning to its original place when the water goes down is important.

They are never attached to the actual fence. This would put too much strain on the fence.

Floodgates are often quite temporary.

Farmers tend to build them out of whatever is about. They are generally however made from wood or wood and iron. Sometimes old gates are used. Posts, nails and wire are required to complete the floodgate.

Gates

There are two choices of material when it comes to gates

- Wooden
- Metal

Wooden gates are more expensive and heavier to work with
Metal gates are cheaper and lighter

The wood in the wooden gates can weaken and break but they are easy for the farmer to repair.
Metal gates donôt break easily but they can bend. The farmer can usually unbend them.
Repairing netting damage in a gate can be fiddly but with the right wire and netting it is possible

Wooden gates can be made to fit odd sized gateways
Metal gates come in standard sizes but you can get them made to order.

Wooden gates can be of many different designs to suit different stock or personal taste
Metal gates come in a range of designs.

A basic gate comes as heavy duty, standard and economy in a range of sizes.

Sizes are in metrics but the length measurement usually equates to feet. In addition to the gate measurements below there are specialty gates for deer fencing and yards.

Length	Height
2.44 (metres) / 8' (feet)	1.00 (metres) / 3' 3" (feet)
2.74 (metres) / 9' (feet)	1.00 (metres) / 3' 3" (feet)
3.05 (metres) / 10' (feet)	1.00 (metres) / 3' 3" (feet)
3.35 (metres) / 11' (feet)	1.00 (metres) / 3' 3" (feet)
3.66 (metres) / 12' (feet)	1.00 (metres) / 3' 3" (feet)
3.96 (metres) / 13" (feet)	1.00 (metres) / 3' 3" (feet)
4.27 (metres) / 14' (feet)	1.00 (metres) / 3' 3" (feet)
4.57 (metres) / 15' (feet)	1.00 (metres) / 3' 3" (feet)
4.88 (metres) / 16' (feet)	1.00 (metres) / 3' 3" (feet)