



BCCA

BURNETT CATCHMENT CARE ASSOCIATION

Some tips, hints and ideas

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Contents

Forward	1
Advantages of Electric Fencing	2
Types of electric fence	2
Bi-polar system	2
Earth-return system	3
Fence-return system	3
Fence-return system design options	4
Three wire fence	4
Two-wire fence	4
Fence component essentials	5
Wire	5
Strainer posts	5
Fence posts	5
Post spacing	5
Insulators	6
End insulators	6
Gates	7
Under gate connections	7
Connecting it all up	8
Joints	8
Earthing the system	8
Isolating fence sections	9
Do you always need a live bottom wire on a three-wire fence?	9
Fence testing	10
Some basic rules	10
Energisers	10
Components	10
Clean up old fences	10
Continuity and connection	10
Buying components	11
Electric fencing and grazing management	11

Forward

The information presented in this booklet is a result of our experiences with permanent electric fencing; recently on our small farm at Mount Maria, and previously on our 500 ha farm in NSW, where we constructed around 15 kms of permanent electric fence, for cattle and sheep.

The information presented or the fence designs suggested may or may not suit some people. The information is presented simply to give people some basic information and essential dos and don'ts, regardless of fence design or application.

This information is for those people looking for alternatives to what is accepted as normal permanent fencing design in this region: that is, split posts at 5 - 6 metre spacing, and four barb wires. This type of fence costs a lot of money, so if you are looking for a more economical and just as (if not more) effective option, consider electric fencing for all of your permanent fences.

The exception to this would be boundary fences, which <u>should not be electrified</u>. The reason for this is twofold: the need for physical strength, and the avoidance of litigation.

Anyone who is thinking of putting in electric fencing is encouraged to download some publications put out by the companies who sell the bits and pieces. In particular the *Daken Ag Electric fencing manual*, the *Gallagher power fencing manual*, and the *Speedrite electric fence manual* are recommended reading.

Some of the information presented here has been obtained from these publications, but the majority is from our personal experience. It is important to note that this publication is aimed at those people planning <u>permanent</u> fencing. For those considering temporary electric fencing, there are a lot of options out there.

Some people claim that electric fencing is unreliable and difficult to maintain. In most cases this is because they haven't built the fence property. A well-constructed electric fence using high quality components, with attention to detail, will result in minimal problems and a highly satisfactory outcome of livestock control.

I don't claim to be an expert. There are many people out there who have as much or more experience as me, and may or may not agree with some of my ideas. I leave it to the individual to decide what is best for their place.

Peter Crawford (October 2023)



Advantages of Electric Fencing

- Low cost: an electric fence can perform the same task as a conventional fence using much less material
- <u>Easy to build</u>: lower wire strains and generally lighter construction allow much quicker and easier construction, especially in difficult terrain
- Universal application: electric fencing will contain all types of animals and can be a positive deterrent to wild pigs and kangaroos. Educated stock develop greater respect for electric fencing than for any other type of fence
- Flexibility: there is no quicker or easier way to effectively subdivide a paddock for controlled grazing than with an electric fence
- Less stock damage: the shock from your electric fence causes no physical damage. If your stock is forced through the fence by bushfires or dogs, they are at less risk of injury than with a conventional barb wire fence
- Low maintenance: once your fence is properly installed and your stock are trained, the maintenance requirements of electric fencing are little different from conventional fences
- Wildlife friendly: barbed wire is responsible for many injuries and deaths of native wildlife, especially bats and gliders. Plain wire is used on electric fences, which is much safer for wildlife

Types of electric fence

Bi-polar system

Normal electric fence energisers have a live and an earth terminal. The bi-polar energiser has a positive and negative terminal, as well as an earth terminal. Therefore the fence must have at least two live wires to work effectively, one positive and one negative.

The animal can receive a shock through one of three pathways: by touching one of the live wires (earth return), by touching one live wire and an earth wire (if present) at the same time, or by touching a positive and a negative live wire at the same time.

Advantages of a bi-polar system:

- If one of the live wires is short circuited making it ineffective, the other live wire will generally still have power to it, meaning the fence will not be put out of action
- > No need for an earth wire: alternative positive and negative wires is all that is required

Disadvantages of a bi-polar system:

- Energisers are generally more expensive
- Higher construction cost: double the number of insulators, which can be a significant cost over a long distance of fencing



Basic bi-polar fence design (source: Daken Ag electric fence manual)

Earth-return system

This fence uses a single live wire only, with the ground being the conductor back to the energiser. This type of fence is mainly used for strip grazing, but is gaining more popularity for sub-divisions in a rotational or cell grazing system. As long as there is a multi-wire fence around the paddock being sub-divided, a single wire is a cheap and simple solution.

This type of fence relies on a very good ground system: 2 to 3 gal steel posts driven in to a metre or more, and regular earth stakes along your multi-wire fences.

Disadvantages of an earth return system:

- A single wire is usually only suitable for one class of livestock. For instance, a wire (or tape) at a suitable height to control cows may not be suitable for weaners or calves, and vice versa
- The shock the animal receives depends on the pulse flowing back to the energiser through the ground. If the fence is some distance away from the energiser or nearest earth stake, or if the ground is very dry, the shock effect may not be sufficient to prevent the animal breaking through the fence. However, you may be surprised at just how small a shock will deter a large animal!

Does it matter if an animal jumps this type of fence? Not really, because in a rotational or cell grazing system there is generally no incentive for an animal to cross the fence: the feed is the same on both sides!



Single tape temporary fence

Single wire permanent fence

Fence-return system

This type of fence has at least one live wire and at least one earth wire. Depending on the class of livestock, there may be multiple live and earth wires. The earth wire is continuously connected all the way back to the energiser, which will result in a higher shock even several kilometres from the energiser. Cattle can receive a shock from touching a live wire, but if they continue to push through and touch an earth wire at the same time they will get the full dose.

This type of fence is the most common design in permanent electric fencing.



Basic design of a fencereturn system. Note the three earth stakes close to the energiser.

Fence-return system design options

The following fence designs are for beef cattle. Designs for sheep or goats will need to be developed using the basic principles, and probably with advice from other people with these animals.

Three wire fence

A three wire fence will generally have two live wires and one earth wire. This design will control all classes of cattle. Following initial training of the cattle, the bottom live wire may be left disconnected (details later), with only the top wire being live all of the time. This reduces power loss through the bottom wire being in contact with green or wet grass, mainly during the wet season.



Two-wire fence

For basic sub-division purposes, a 2-wire fence is perfectly adequate. Calves may sometimes go through this fence but mostly they will stick with their mothers.



Fence component essentials

Wire

There are a number of brands of plain wire on the market that are used for electric fencing. The most important principle is to use a medium or high tensile wire only, as soft wire will stretch. The most common gauge is 2.5 mm. In some circumstances, a smaller diameter wire can be used, but generally it is not recommended due to its low visibility and low tensile strength.

Some brands of HT wire are very difficult to work with. Medium tensile wires (such as *Permelec long-life* electric fence wire from Waratah) have been developed specifically for permanent electric fencing. Medium tensile wires are easier to work with compared to some of the springier high tensile wire types.

Plain wire is sold in 1,000 metre and in some cases 1,500 metre rolls. A wire spinner is essential for handling plain wire.

Important: never electrify barb wire; it is dangerous and possibly illegal.

Strainer posts

End strainers and corner posts may be wooden, steel or concrete. Wooden posts are the most popular choice due to a good supply and moderate price. However, there is no need for large posts. A post diameter of 15 - 20 cms is more than adequate for an electric fence, which saves on costs, and backs!

Intermediate strainer posts are only needed where there is a bend in the fenceline. Fence strains can be as long as you like, with strains of 500 metres or more quite achievable.

There is generally no need for stays on intermediate posts, if they are set in the ground deep enough (around 90 cms or more). However a stay may be needed on an intermediate post if there is a sharp angle in the fenceline, and a stay on end strainers in multi-wire fences is always recommended.

Fence posts

Steel posts (star pickets) are the logical post to use on permanent electric fences. They are relatively cheap and easy to put in the ground. Whether black or galvanised will depend on personal choice and budget.

There are also plastic and fibreglass posts on the market which may be more suitable in some situations.

Post spacing

Common post spacings are 10 - 15 metres. Twenty metre spacing, with a treated wooden dropper in between may also be a good option, but treated hardwood droppers have gone up in price in recent years, so there may not be a lot of advantage in using droppers.



A two-wire fence with posts at 10 metres spacing

Insulators

There is a wide range of plastic insulators on the market. They are cheap and easy to attach. However plastic insulators have two main disadvantages: they burn, and they can be easily broken by animals such as pigs or kangaroos going through the fence.

The use of porcelain insulators is advisable at all times, for steel and wood posts. They may be a bit more expensive, and can be a bit fiddly to attach, but once they are in place they are generally there for good.



Steel post porcelain insulator: attached with a 6 mm bolt and nyloc nut.

A battery drill makes attachment easy.



Wooden post insulators with a clip and drive-screw. The post on the right is on a sharper angle so two insulators are used. It is important that the wire does not contact the post as it will short out when wet. The earth wire can be held in place around the post by a large staple, or a notch cut with a chainsaw.

End insulators

Normal porcelain bull-nose insulators are used at the ends of a strain. However, the availability of ratchet connectors has been a huge benefit in the construction of electric (and conventional) fences. Using a ratchet tensioner at one end of the strain is a great idea, making it easy for the fence to be re-tensioned or dismantled if need be.

These tensioners are not cheap, but they are a brilliant idea and they are easy to use. Although they can make the use of wire strainers redundant in most cases, strainers may be needed to pretension the wire on longer strains before inserting the end into the tensioner. The insulator end is tied to the strainer.



Insulated ratchet tensioner. A non-insulated tensioner is used on the earth wire.

Gates

Steel gates are probably the best option around important areas such as house and gardens etc, or other places where stock intrusion would cause a lot of damage, but tape gates are a good option in many situations. Tape gates generally require only one tape, but for a bit more security (such as on a paddock used for training stock brought onto the property, or weaners), two tapes could be used.

This type of gate is very effective, and very cheap. Using a proper gate handle makes it safe and easy to open and close for most people, even children.



Tape gate. Note that the gate is not live when disconnected: the handle connects to a loop of under-gate cable that is connected to the top wire. This means that the tape isn't shorting out on the ground when the gate is open.

A height about the same as the top wire on a two-wire fence seems to work.

Under gate connections

It is critical that this part of the electric fence is done properly. Remember, good power to all following sections will depend on good work here.

Commercial undergate cable is specifically designed for electric fencing. Cable made with copper wire should not be used, as corrosion will occur at the joints with the galvanised fence wire.

There are two gauges of undergate cable sold: 1.6mm and 2.5mm. The recommendation is to use 2.5 mm, as it is more rugged and better insulated.

Both live and earth wires need to be buried across gateways, and each should be placed inside separate poly pipes prior to burial. Normal 12 mm dripper hose is good enough for this purpose, as it is cheap and easy to use. On heavy traffic gateways (for example where a dozer regularly uses the gateway), heavier poly pipe may be required.

Plain fence wire can be used for the underground earth wire, as long as it is placed inside poly pipe.

Note: it essential that the ends of the pipe be turned down so that water cannot enter the pipe.



Undergate cable end detail. Note downturned ends of the poly pipe. This is a 3-wire fence so the earth wire is connected to the middle wire, and the live wire to the top wire.

— Live wire

Earth wire

Connecting it all up

Joints

Some people connect their wires simply by twisting them together. This is not recommended as these joints often corrode over time leading to loss of power. The use of good quality line clamps is recommended at all times.



Joint connection clamp

Earthing the system

It is crucial on a fence-return system to ensure adequate earthing. To do this, two things are necessary:

- Adequate earthing near the energiser: two or more earth stakes driven into the ground as deep as possible and connected to the earth wire
- Intermittent earthing along fence sections

Intermittent earthing is carried out by driving an earth stake into the ground on individual sections of fence. This should be done every 150 - 300 metres, generally at a strainer post at the end of a section. The earth stake can be a galvanised steel post, which can be driven into the ground next to the strainer while the earth here is still soft. It is sometimes difficult to get the post more than a metre into the ground so cut-off posts may be used.

A short piece of wire is bolted to the stake and connected to the earth wire with a line clamp.



Earth stake driven in next to a strainer post. A short piece of wire is fastened to the stake with a bolt and fastened to the earth wire with a line clamp.

Note: some people claim that the earth wire running through the steel posts is sufficient to maintain good earthing. This is incorrect, for two reasons: a) there is not a good connection on the post, and b) the post is generally driven into the ground at a shallow depth which has low moisture levels for much of the year, leading to poor connectivity.

- Wire connecting to fence earth wire

- Wire bolted to earth stake

Isolating fence sections

It is a good idea to install a switch at the start of each fence section. This has three purposes:

- 1. You can isolate paddocks that don't have stock in them, so other paddocks have full power.
- 2. In the event of a fault, switches are invaluable for assisting to locate where the fault is.
- 3. If a tree or branch has fallen over the fence, you can switch this section off to remove it without having to go all the way back to the energiser to cut the power.



Isolating switch. The live wire is connected to the switch with undergate cable.

Do you always need a live bottom wire on a three-wire fence?

The answer is generally no. In fact, after cattle have been trained, they usually won't go near this wire anyway. As well as that, this wire tends to have a lot of fresh or wet grass on it over the wet season, and this can reduce the power in the fence. However, calves and weaners may require you to keep the bottom wire connected.

A simple connector can be a short piece of wire with a hook at the bottom, enclosed in a piece of dripper tube (you could also use undergate cable). The wire is connected to the top wire at the start of each section, to enable simple connection and disconnection of power to the bottom wire.



Bottom wire hook-up system

Fence testing

In addition to testing your fence following construction, it is important to regularly test your fence for faults. Energisers generally put out 5 - 8 kilovolts, so if the voltage is much lower than normal a fault is indicated.

Check the voltage close to the energiser, and if it is low it could indicate a short circuit somewhere. It is then a process of elimination to determine where the fault is by isolating sections.

To do this you need a proper fence tester. A normal multimeter won't do the job.



Fence tester hooked up between a live wire and earth wire. The tester can also be used to see how much voltage you are getting through the ground, by clipping the lead on to a short piece of fencing wire pushed into the ground.

This will give an indication of how much of a shock a cow will get by touching a live wire, and how good your earthing system is.

Some basic rules

Energisers

Energisers can be mains powered or solar powered. Solar energisers have come down in price significantly over the past few years. However if mains power is available, it may best to use it. It is more reliable, and a mains powered energiser will only draw an insignificant amount of power (a few watts).

Energisers are sold in various sizes depending on the length of fence they are suitable for. Always buy an energiser much larger than you think you need. Remember, if you have two or more live wires, they all add up to the length of fence. So a two-wire fence 5 kms long is really 10 kms. As well, you will possibly be adding on to the system down the track, so it is a good idea to have some capacity up your sleeve.

Components

Spend the money and buy good quality components. This includes wire, insulators, undergate cable, switches, line clamps, etc. It will be worth it.

Clean up old fences

The most common cause of faults is wire from old fences finding its way onto your live wire, shorting it out. Get rid of all old fence materials, by recycling or burying.

Continuity and connection

Do not scrimp on connections, especially under gates. Most importantly, don't rely on a tape or something similar to get power from one side of a gateway to the other. Always put it underground.

Buying components

Most reputable farm supply stores stock a range of electric fencing materials. It is good to support your local supplier, and most will offer a discount for bulk purchases.

Unfortunately porcelain steel post insulators are not stocked by some suppliers. This is where purchasing on-line might be an advantage, and there are several on-line suppliers of electric fencing components offering good prices and posting direct to your mailbox.

You will hear some people say electric fences don't work and are a waste of time. There are two reasons why people are turned off electric fences: 1) they haven't built it properly; and 2) they are not using sound grazing principles. A hungry cow will always try and break through any fence to get to feed on the other side.

Electric fencing and grazing management

It is a common misconception that cattle need strong fences to keep them in. Generally stock will only try to break through a fence for one reason: they are hungry. If this is the case, it is better to fix the cause, not the effect.

In other words, stock according to your carrying capacity, and regularly rotate through paddocks. The more paddocks the better.

Electric fencing makes subdivision into smaller paddocks much easier and cheaper to achieve!



Basic principle: maintaining good grass on both sides of the fence is the secret to success