



# ELECTRIC FENCE ASSOCIATION

## CODE OF PRACTICE for the installation of Electric Fences

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## INTRODUCTION

Electric fencing is not a new concept, indeed, it has been used as an aid to animal containment and management for over 50 years.

Modern electronics have, particularly during the 90's, enabled vastly improved designs of energisers to be built which bear little resemblance to the those of a decade earlier and, by a combination of low impedance, discharge pulse shape, and information feedback, they can be used safely and effectively under situations unheard of a few years ago.

In parallel with improved electronics, the range of insulators and conductors on the market, ranging from traditional polywires, through to a huge range of tapes, netting, rope and high tensile steel, all with different conducting capability, mean that the user has the widest choice ever, quite often without the guidance to make a correct selection for his individual application.

This means that the need for careful planning and product selection is more important than ever as an unbalanced combination of energiser | conductors | insulators may not give the most effective fence.

This guide has been produced by the UK Electric Fencing Association to provide help and assistance to those involved with electric fence design, construction and management.

Its purpose is to ensure that the user buys the most appropriate range of products for his needs, understands the principles of electric fencing for animal control, and correctly installs his system to ensure the best possible results.

All energisers sold by the members of the **EFA** conform to the European standards of design and safety, presently EN61011 plus updates.

We strongly recommend that you only buy those which are manufactured to these exacting standards.

Please read this booklet carefully, it may save you many hours of frustration later.

### SAFETY

As with other forms of fencing, an animal can occasionally become entangled in an electric fence.

While the electric shocks it receives as a result are of themselves harmless, they cause repeated involuntary muscular contractions, so that if the animal is exposed to them for a prolonged period it will suffer from physical exhaustion and may even die as a result.

Animals with horns are more vulnerable to becoming entangled in fencing, whether or not electrified

### DUTY of CARE

It is important to realise and accept that that everyone and particularly the owner, that there is a duty of care to be observed when involved in the installation or maintenance of any electric fence.

Ensure that you do not contact electric fence wires with the head, neck or torso and do not climb over, through or under a multi-wire electric fence – use a gate or especially designed crossing point.

**Do not** use multi-wire electric fences with alternate live and earth wires.

**Do not** pass electric fencing wires across or adjacent to any form of water trough.

**NEVER** electrify barbed wire

**Do not** allow children to play near an electric fence

Where small children are likely to access a fence, the duty of care requires some form of obstacle such as a one metre high chain link or agricultural mesh fence.

**Never** connect more than one energiser to the same fence.

Anyone that is likely to come close to or in contact with an active electric fence, is entitled to be made clearly aware that they are likely to receive an electric shock.

This warning is usually in the form of prominent signs fixed to or adjacent to the fence at no greater intervals of 50m, and which are constantly maintained so as to be effective [it is no defence to state that 'others' damaged or destroyed the signs].

Generally, **it is your duty** to minimise the risk by an innocent party of any accidental electric shock.

## PRINCIPLES OF ELECTRIC FENCING

### ADVANTAGES OF ELECTRIC FENCING

Effective stock control achieved by physical, visible and psychological means.

Animal friendly:

Risk of injury lower than for non electric fences especially barbed wire.

Less expensive to install than conventional fencing.

Versatile

easily and quickly erected

variety of design possibilities

can be permanent or portable

existing fences can be electrified

Can be used to improve pasture and grazing management.

Low maintenance

**Note** : To obtain the full advantages of electric fencing, correct installation using high quality insulators and accessories is essential.

### HOW AN ELECTRIC FENCE WORKS

An electric fence is simply one or more wires carrying a pulsing electric charge.

Any animal coming into contact with the wire receives an unpleasant but harmless electric shock.

Unlike conventional fences, an electric fence is not so much a physical barrier as a psychological or mental one.

The stock "learn" not to approach the fence.

**In simple terms:**

The energiser generates high voltage intermittent pulses.

Each pulse consists of a short burst of intense electrical energy released onto the fence through the lead-out wire in a controlled way over a period of about 0.3 milliseconds.

Any animal touching a live wire receives a memorable but harmless shock by completing the electric circuit back to the energiser via the ground earth system.

**To work effectively an electric fence must have:**

Sufficient voltage on the fence line to penetrate resistance of animal's skin.

Enough energy [power] in the energiser to electrify the actual distance of wire.

Excellent earthing and wire insulation.

### BASIC ELECTRICAL TERMS

**a.c**

Alternating current or mains power supply.

Your local supply will be within 220/240 volts ac.

**d.c.**

Direct current or battery power supply.

**amps**

Electrical rate of flow.

One amp is the current that results when a pressure of one volt is applied across a resistance of one ohm.

Volts/amps = ohms

**ohms**

Electrical resistance.

One ohm is the amount of resistance that will limit the flow rate to one amp when a pressure of one volt is applied **Volts/amps = ohms**

**load** [loss of voltage]

Anything that draws power from the energiser puts a load on the fence line.

This can be in the form of leakage or shorts and is measured in ohms.

The lower the resistance of the load, the greater is its effect.

**short** [short circuit]

In electric fencing this implies a large energy loss from the fence line to earth, such as an earth wire touching a live wire, long lengths of electrified wire lying on the ground etc.

A total short circuit = 0 ohms.[Example, broken post insulator]

**leakage**

In electric fencing this implies small energy losses from the fence line to earth such as seasonal foliage growing over the fence line, faulty insulators etc.

**low impedance**

In effect the internal resistance of an energiser.

All modern energisers are low impedance = maximum energy transferred to fence.

**voltage**

Electrical pressure.

One volt is the pressure necessary to cause one amp to flow through a resistance of one ohm.

**Ohms x Amps = Volts**

**watts**

A unit of power

A flow of one amp at a pressure of one volt = one watt.

**Amps x Volts = Watts**

**joules**

Electrical energy.

One joule is the energy required to produce one watt for one second.

**Watts x Seconds = Joules.** Joules per impulse are the measure of the power of an energiser.

**MEASURING ENERGISER PERFORMANCE**

Energiser performance really relates to the ability to deliver a sufficiently high voltage [shock] onto a fence line.

This means that different performance is required of a small portable energiser designed to power 500m [550 yds] of wire, than from a high power energiser which can handle over 200 kms [120 miles].

**HOW CAN PERFORMANCE BE MEASURED?**

**Several factors are important:**

measure energy in output joules at specific loads or the maximum value.

pulse shape

look at voltage under load

distance is very dependent on fence conditions and less relevant than stored energy. This can be quoted in single wire terms of known electrical resistance.

**Pulse Shape**

The shape of the electrical pulse produced by the energiser also influences its performance on the fence line.

**Quoting distance**

The performance of an energiser in distance terms can be quoted on the basis of length of a single strand wire of known electrical resistance with ideal insulation and fence construction.

Generally, a multi-wire fence will carry current further than a single wire.

**SOME QUESTIONS AND ANSWERS ON ENERGISER PERFORMANCE**

**Q. HOW IS A FENCE LINE ENERGISED ?**

**A.** By successive, high voltage, short duration pulses of electrical energy at approximately one second intervals

**Q. WHAT IS STORED ENERGY?**

**A.** The energiser's electronic circuitry takes electrical energy from the power source [mains or battery] and accumulates it in the storage capacitors. This energy is the stored energy and is measured in joules.

**Q. DOES STORED ENERGY INDICATE THE ENERGY AVAILABLE AT THE FENCE TERMINALS TO ELECTRIFY YOUR FENCE?**

**A.** No. It simply indicates the energy stored in the capacitors.

**Q. WHAT IS OUTPUT ENERGY ?**

**A.** Triggered by electronic circuitry, the stored energy is discharged through an output transformer to the energiser's fence terminals.

This is the output energy and is measured in joules.

The effective output energy of this pulse is dependent on these factors:

The stored energy.

The efficiency of the output circuit.

The Fence Load connected to the terminals.

**Q. WHAT SHOULD I LOOK FOR WHEN CHOOSING AN ENERGISER ?**

**A.** The best performance characteristics in the size range to suite your needs.

This means:

The maximum output pulse energy available at the fence terminals of the energiser. This should be stated in joules.

The highest available voltage under heavy fence load conditions i.e. not pure wire resistance.

## **CHOOSING AND INSTALLING YOUR ENERGISER**

### **CHOOSING THE RIGHT ELECTRIC FENCE SYSTEM**

Whether you are installing a new system or upgrading an existing one, there are a number of points you should take into consideration:

- Where the system is to be used and the type of land it is to be used on.
- The size of the area you wish to fence.
- The type and electrical resistance of wire you wish to carry the current.
- Efficient insulation of wires from ground.
- The conductivity of the ground on which the system will stand.
- The most effective earth to ground system.
- Whether the system is to be permanent or moveable.
- The type of insulators you require.
- Types of locations of gateways.
- The type of energiser that will best meet your needs.
- Your ability to install and maintain the system to obtain the maximum performance.
- Conformance with safety requirements and relevant electrical installation regulations.

### **CHOOSING YOUR ENERGISER**

- Your choice of energiser will depend on:
- Power source mains or battery.
  - Whether portable or permanent.
  - How much power [or joules] that you need.

This is determined by:

- Area involved.
- Distance to the extremity of the farm.
- Total length of electrified wire multi or single wire.
- Amount of seasonal weed or grass growth affecting the fence line.
- Minimum voltage requirement for the type of animal to be controlled.

#### **Two important selection tips:**

- It is advisable to allow more energy capacity than may be required initially.
- This will maximise performance in the event of fence defects or future extension of the fence system.
- Where mains power is available, mains type energisers are always recommended for their convenience, low maintenance and higher capacity.

### **INSTALLATION SOME IMPORTANT POINTS**

- All energisers are supplied with detailed operating instructions.
- These should be read in full prior to installation.
- Good earthing is vital to the effective operation of an electric fence energiser.
- The earthing system is connected to the green terminal of the energiser.
- The lead-out to the fence is connected to the red output terminal [or yellow Low Power terminal [where fitted]] and the earth wire to the green terminal
- Care should be taken with installation of self monitoring energisers.

#### **Mains Power Energisers**

Mount the energiser on a wall under cover in a cool, shaded, well ventilated space, out of reach of children and animals.

#### **Dry Cell Battery Energisers**

Portable energisers [strip grazers] may be clipped directly on to the fence wire.

#### **Solar Installation**

Where solar panels are used for battery charging, they should be mounted in close proximity to the battery out of harms way but facing South set at an angle of 45°.

#### **Wet Cell Battery Energisers**

- Mount the energiser on a stand or post close to the battery, clear of animals and wet ground.
- Use only a 12 volt battery to power the energiser of a capacity recommended by the manufacturer.
- Connect positive [+] input terminal on energiser to positive [+] battery terminal.
- Connect negative [-] input terminal on energiser to negative [-] battery terminal.

## EARTHING YOUR ENERGISER

### WHY EARTHING IS IMPORTANT

Lack of adequate earthing is one of the most common causes of poor performance of electric fences.

A correctly installed earthing system is essential.

The earth stakes form part of the total electrical circuit which begins at the LIVE 'fence' terminal on the energiser, follows the lead-out, then continues along the fence, through the animal, into the soil and back to the earth stakes AND RETURNS TO THE ENERGISER.

The circuit back to the earth terminal is completed by the stake and the wire connecting it to the energiser. If any part of this circuit is broken, no current will flow and the animal will not receive a shock.

Most difficulties occur from the contact between the soil and the stake.

If this is poor, as it often is, the flow of electricity is restricted.

This is the same as saying that there is a very high resistance between the stake and the soil.

### EARTHING SITE

Select an earthing site that is regularly moist, at least 10 metres [33ft] away from:

an earth stake for another electrical system

any telephone earth stake

any plumbing system including any disused system

any building using structural or reinforcing metal in contact with the ground.

Finding moist ground may require siting of the earth system some distance away from the energiser.

**SPECIAL NOTE : Regulations prohibit the connection of two or more energisers to the same electric fence.**

### TESTING YOUR EARTH SYSTEM

To test the effectiveness of the earth, create a dead short on the fence line at least 100m [330ft] from the earth stakes.

Using an electric fence voltmeter at the earthing site, place one terminal on the earth wire, extend the probe as far away from an earth stake as possible and push into the ground.

If a voltage reading in excess of 400 volts is obtained, the earthing system is inadequate and more earth stakes will need to be installed.

If after the installation of 12 earth stakes the earth voltage still exceeds 400 volts, extend the earth wire to continue as a bottom wire along the fence line until a more wet area or greater conductive type of ground is encountered.

Install more earth stakes in this new area and join them to the extended earth wire

Some energisers indicate inadequate earthing by a flashing warning lamp.

If using another type of energiser, test the earth voltage regularly so that changes may be observed and steps taken to correct any voltage variations.

## LEAD-OUT TO THE FENCE

### SOME IMPORTANT PRINCIPLES

Your lead-out wire is the power output link between the energiser and the fence.

It is important to ensure that the lead-out is correctly installed to minimise loss of voltage.

Lead-out cable - specifically manufactured - should be insulated where there is any risk of contact with the ground or buildings.

**STANDARD HOUSEHOLD CABLE MUST NEVER BE USED.**

The objective is to transfer energy from the energiser to the fence lines.

Lead-out feeds should, therefore, present the least resistance to the current flow that can be practically achieved.

**INSULATING LEAD-OUTS** - Two options are available:

#### INSULATED CABLE

Galvanised Steel or Aluminium Wire with a bonded polyethylene coating makes an ideal lead-out wire as it is:

easily installed

totally waterproof

tough and durable.

#### INSULTUBE

If plain galvanised wire is used it should be insulated with Insultube as necessary against ground or building contact.

Insultube is available in a wide range of sizes.

### EXTENDING A LEAD-OUT TO A REMOTE AREA

The resistance of a lead-out wire increases with its length [see also page ?]

If an area to be fenced is some distance from the mains power supply source, the following suggestions will help minimise problems with a long lead-out.

#### Increase wire diameter:

An increase from:

2.5mm [12½g] to 3.15mm [10g] reduces resistance by one third.

2.5mm [12½g] to 4mm [8g] reduces resistance by almost two thirds.

#### Run lead-out wires in parallel:

Two wires **securely** connected together will halve the resistance and three will reduce it to one third.

Energising two or more wires on another fence leading to the new area has the same effect.

#### Change from steel to a lower resistance conductor:

Aluminium wire has one sixth the resistance of galvanised wire.

As aluminium has less strength than steel a minimum diameter of 2.5mm [12½g] is recommended over long distances.

#### Rearrange the interconnection of fences:

By reconnecting the whole system it may be possible to shorten or eliminate the need for a lead-out. Circumstances will dictate the maximum length of lead-out that can be successfully run.

Factors will include:

Size of your mains energiser.

Type of land to be crossed. [in areas of heavy foliage for example, lead-outs over 5km may suffer too much leakage to be effective.]

Cost

If your mains system cannot be extended, a battery energiser should be installed in the remote area.

## **LIGHTNING PROTECTION**

### **LIGHTNING PROTECTION KIT**

A lightning strike at any point on your 'live' fence wire causes an instantaneous major voltage rise and a flow of current back to the energiser rather than away from it.

This power surge can damage your energiser.

### **FOR MAXIMUM PROTECTION**

Disconnect energiser at power source and switch cut-out switch to OFF position prior to major electrical storms.

Use of a voltage spike protector will minimise risk of damage from a power surge from the mains power supply to the energiser.

Use of a spark gap between the fence and the energiser earth pegs, in a crows foot configuration near the energiser, will protect the energiser from lightning strikes.

### **LIGHTNING PROTECTION WITH CROWS FOOT EARTHING**

Choose a location in either the lead out wire or first section of live fence wire that is as close to the energiser as practicable.

Install a spark gap (lightning diverter) into this location.

Connect the energiser fence supply to one terminal of the lightning diverter.

Connect the fence to the same lightning diverter terminal.

Connect the second terminal of the lightning diverter to the central earth peg of the crows foot earth configuration.

Connect the energiser earth lead to any one of the outer earth pegs of the crows foot earth configuration.

### **HOW THE PROTECTION KIT WORKS**

The choke causes the power surge generated by the lightning strike to literally bounce back.

The surge then takes the shortest path to ground via the Lightning Arrestor.

### **INSTALLATION**

Choose a position in either the lead out wire or first section of live fence wire that is as close to your energiser as practical.

Cut the wire and rejoin with strain insulator inserted.

Attach the choke to the wire using two joint clamps as shown below.

The spacing between the two clamps should be 600mm [2 ft] with the insulator midway between the two.

The lightning arrestor is installed [usually on a fence post] on the fence side of the choke.

**NOTE** : If fitted on energiser side, energiser is not protected.

Clamp one arrestor lead to the live fence using a joint clamp.

The other lead is wired to a series of interconnected earth stakes.

The number of earth stakes in the lightning protection earth should at least equal the number of stakes in the main energiser earth.

Use 2.5mm [12½g] insulated cable for lightning arrestor leads.

## PERMANENT FENCE LAYOUT

There is no one way to lay out an electric fence system.

The approach that you take will depend on a range of factors, including:  
 the geography of your farm  
 the types of animals you wish to control  
 whether you are strip grazing [breakfeeding]  
 your own preferences.

By applying a few basic principles, you can maximise the advantages of installing electric fencing.

### PLANNING

An electric fence system should be planned thoroughly before construction is commenced.

This will enable you to locate faults or shorts quickly and assists with good stock handling and movement.

### ENERGISER LOCATION

Mains power energisers should be located inside a building or shed out of the reach of animals and children.

The position of existing buildings [such as dairy or shearing sheds] on your property will limit the choice of location.

Ideally you should endeavour to place the energiser as close to the fence lines to be electrified as possible.

Battery energisers should be installed as near to the centre of the fence system as can be arranged.

This will ensure that the maximum energy is transferred onto the fence itself.

### USE OF CUT-OUT SWITCHES

Cut-out switches are greatly under-utilised by many farmers.

The installation of well placed switches on fence lines has many advantages, including:

Fault finding.

Sections of fence can be progressively isolated when searching for faults.

Maintenance.

One fence section can be switched off without the need to shut down the energiser.

Paddocks which are not in use can be switched off.

This directs all of the energy from the energiser to sections in use.

Difficult sections of fence to maintain, such as underground cable, can be isolated.

### LAYOUT EXAMPLE

The diagram on the right, illustrates some points about fence layout.

Energiser is located in a farm building.

The lead-out feed can take several forms:

one single wire with high conductive characteristics [i.e. 4mm [8g] wire or aluminium wire]

several strands of 2.5mm [12½g] fence wire connected in parallel.

A cut-out switch where the lead-out splits at this point enables half of the fence system to be switched off.

Layout incorporates a central race for ease of stock movement.

Each fence sub-division is connected to the lead-out feeds wire[s] through a cut-out switch.

This enables each section to be isolated for fault finding purposes.

For gates you should note that:

Insulated cable must be used underground.

Cut-out switches are recommended at all gateways for fault finding.

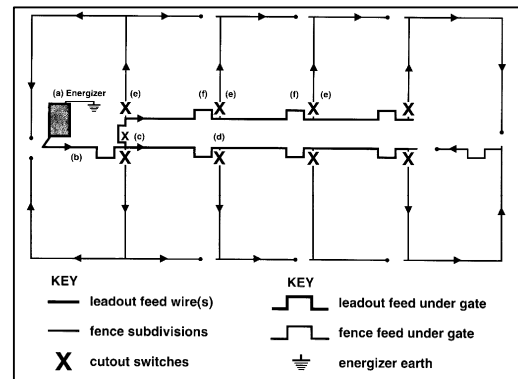
### Others Points to Note:

Only one energiser must be connected to a fence line.

The subdivisions of the fence do not have to complete an electrical circuit.

Each subdivision terminates at a strain insulator.

The circuit is completed when an animal touches the fence.



## PERMANENT FENCE CONSTRUCTION

### WHY FENCE CONSTRUCTION IS IMPORTANT

There are three main reasons for emphasising the need for good quality electric fence construction.

#### To provide an effective barrier.

Electric fences do not need the same strength of construction as conventional fences because animal control is achieved by psychological rather than physical means.

Permanent fences, and especially fencing against large animals, must be soundly constructed to withstand the rigours of use.

#### To minimise power leakage.

Electricity will always seek the shortest route to ground.

If a fence system is poorly insulated the energy from the energiser is wasted.

There is also a risk of insufficient voltage on the fence for animal control.

#### To maximise conductivity

There is little point in connecting a high power energiser to a fence system constructed of wire with poor conductivity.

The energiser will effectively be choked the energy will not transfer as an effective shock to the animal.

TO remedy conditions in paragraphs 2 and 3:

Read section on lead-out wire carefully [section 4].

Always make wire connections using joint clamps.

### FENCE WIRE

Electric fences should be constructed using a minimum 2.5mm [12½g] high tensile galvanised wire.

**NEVER** electrify barbed wire.

### WIRE TENSION

Fence wire on electric fences should be tensioned in the range 2.5 - 9.9kN = 25 - 90kg = 55 - 200lbs

A higher tension is recommended where wild animals may come in contact with the fence.

Tensioning is easily achieved using a line wire strainer.

Simply fit to the wire and tighten with a spanner [or strainer handle].

### WIRE RESISTANCE

Minimising wire resistance [or maximising conductivity] is important to ensure efficient operation of an energiser.

Wire resistance is proportional to length, inversely proportional to the cross-sectional area of the wire and varies with metal type.

This means that:

The longer the fence wire the greater the resistance.

Double the length and you double the resistance.

The smaller the diameter the greater the resistance

As shown in the table 2.5mm [12½g] wire has 2½ times the resistance at 4.0., [8g] wire.

Two wires connected in parallel have half the resistance of a single wire.

Aluminium wire has a resistance one sixth that of steel wire.

RESISTANCE OF STEEL WIRE		
Wire size		Resistance
Gauge	Diameter (mm)	(Ohms per km)
8	4	14
10	3.15	22
12½	2.5	35
14	2	54
16	1.6	85

The actual resistance to a pulse will be greater than these values because of the inductance of the wire

### WIRE CONNECTIONS

Wire joints are a major cause of power leakage.

There is only one rule you should apply in all circumstances:

**All live wires should be clamped to eliminate arcing and subsequent loss of voltage.**

Particular care should be observed when joining:

dissimilar metals high risk of electrolytic corrosion

aluminium wire must be clamped tightly because of the high resistance aluminium oxide coating.

### STRAINER POSTS

Because strainer posts support the tension on the fence wire, they must be strong, properly rammed into the ground and well braced.

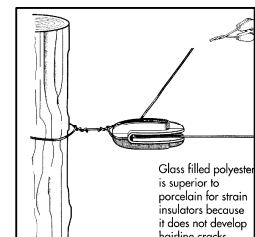
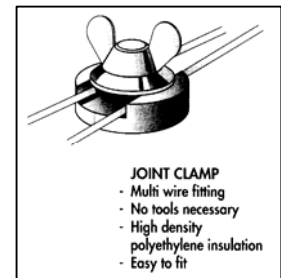
The same applies to gate posts and corner posts.

To run fence wire round a corner post use wraparound insulator as shown below, or use strain insulator as shown below.

### FENCE POST AND INSULATOR OPTIONS

Good quality insulation is very important to prevent power leakage from the fence wire to ground.

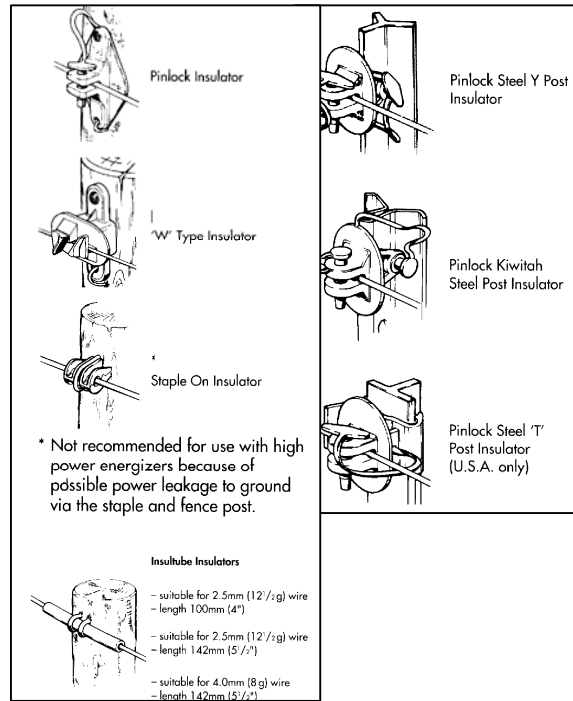
A NORMAL wooden fence post can act as a conductor when wet, especially when high power energisers are involved.



### WOOD POST INSULATORS

Pinlock Insulator 'W' Type Insulator  
 Staple On Insulator

++ Not recommended for use with high VOLTAGE energisers because of possible power leakage to ground via the staple and fence post.



### GATEWAYS

Underground cables are recommended for crossing gateways rather than overhead wires.

Underground wires are much less susceptible to damage.

Feed wires must be insulated

#### Insulated Underground Cable

Insulated cables should be buried 300mm [1ft] underground.

For further protection where there is heavy traffic flow or metalled gateways, underground lead-out wires should be fed through low density pipe.

Use Joint Clamps to attach cable to the fence wire.

Lead outs should be made with insulated cable bent downwards to ensure water does not penetrate the insulation. Feed wires should always have the same or greater conductivity as the fence wire.

Do not use ordinary plastic coated electrical cable under gateways.

When buried in soil and subject to voltages typical of electrical fences, it deteriorates within a few years and the fence becomes very effectively earthed.

The copper conductor will also cause serious corrosion problems with connected to galvanised wire.

### PERMANENT FENCE DESIGN

In selecting one of the illustrated fence designs considered best suited for your stock type and land use, remember that the spacing of wires is more important than fence height.

Spacings should ensure a shock to the face or ears of animals endeavouring to reach between wires.

Post spacing and paddock size will depend upon shape and contour of your farm and your management preferences.

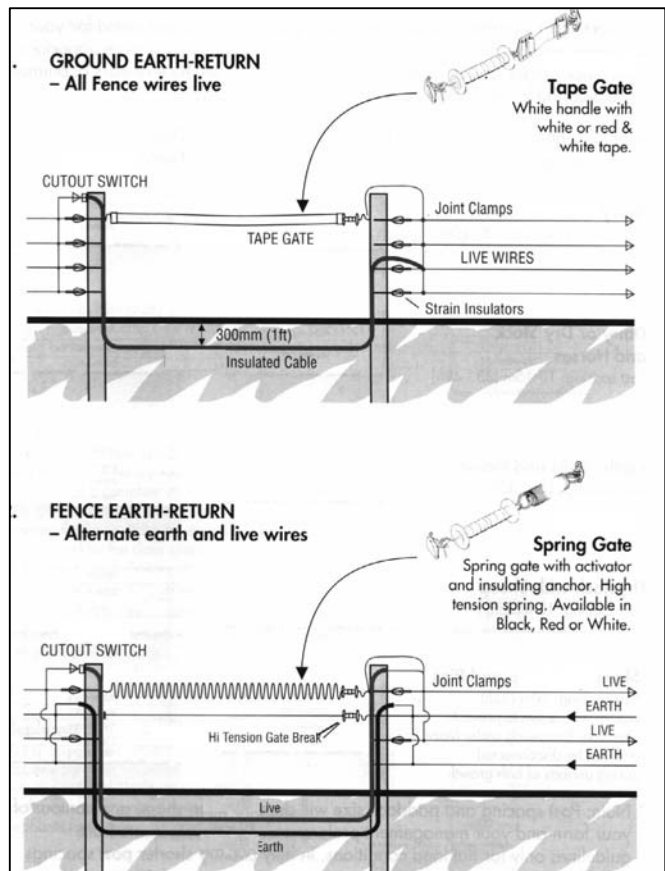
The figures quoted are guidelines only for flat land conditions. In hilly country, closer post spacings should be used.

### ELECTRIFYING EXISTING FENCES STAND-OFF SYSTEMS

This is the prime method of electrifying existing conventional fences.

Uses and advantages include:

- Electrifying existing plain wire or netting fences.
- Economic fence renovation
- Protection for horse fence
- Deer and bull control
- Predator control



**An electrified wire in the right place will extend the life of any non-electric fence considerably by reduction of fence abuse by stock.**

### TYPES OF STAND-OFF

Post cross-section

#### Wire fixing stand-offs

The range of stand-off insulators clip easily on to existing fence wires.

The short tail versions are designed for use with netting [the attaching wire arms are shorter].

All are made from heavy gauge high tensile wire.

#### Wood post stand-offs

Pigtail standoff insulators are recommended for use where direct fixing to wood posts is required.

They are available in two lengths for top fixing and three lengths for side fixing.

Simply drive into the post and staple.

No wire threading required made in heavy gauge spring steel wire.

#### STAND-OFF WIRE PLACEMENT

For large animals one stand-off wire at the top of the fence line may be sufficient.

For smaller animals, stand-off should be placed at a height coinciding with the animal's nose.

For sheep and cattle a single offset at sheep nose height will control both.

Two wires will ensure maximum animal control however.

#### TEMPORARY FENCING

The materials used for temporary electric fencing differ from those for permanent electric fencing.

#### ELECTRIC CONDUCTORS

These are plastic twines known as polywires, woven plastic tapes, plastic ropes or stranded metal conductors. Unlike solid wires, they are very flexible and so easily handled on small reels.

Polywires, tapes and ropes include a number of fine metal conducting wires which may be of stainless steel, tinned copper or aluminium; sometimes a mixture of these.

Stainless steel wires have a much higher electrical resistance than those of copper or aluminium, but have the advantage of resisting corrosion in all environments.

The number and diameter of the wires in each strand varies widely in conductors for different uses, so the electrical resistance also varies widely.

It is therefore necessary to ensure that the conductor is adequate for the length of fence to be erected; the makers' guidance should be followed.

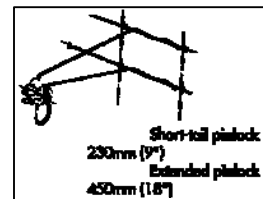
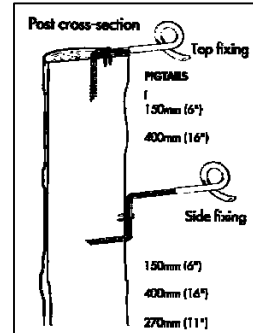
Tapes and ropes have the advantage that they are much more visible to the stock being controlled.

Very high power energisers can cause breakage of these fine metal wires by arcing due to short circuits to vegetation etc.

Generally speaking there is no advantage in using an energiser of more than five joule stored energy.

Stranded steel wire can be used for longer lengths of temporary and semi-permanent electric fencing without experiencing significant voltage loss.

Provided that the wire is galvanised to BS 443 standard, then a life of at least 10 years can be expected.



**FENCE POSTS**

These are usually plastic posts having a steel ground insertion spike.

They have a number of features for supporting the conductors at various heights.

Special posts are also available which can support one or more reels at the end of the run of fencing, so that the conductor can be tensioned.

For single strand fences, light steel posts are available with an insulated feature at the top for supporting the conductor.

Steel posts are also available to which plastic insulators can be quickly fitted at chosen heights.

**ELECTRIC NETTING**

Electric netting is constructed of polywires and plastic twines.

It is usually supplied in fixed lengths of 50 or 25 metres with support posts already installed.

It is particularly quick to erect and dismantle, provided the makers' instructions are followed.

If the length of netting is greater than is needed for a particular run, the netting should not be cut; instead the surplus net should be erected back along the line of net already erected.

Electric netting can provide better control of certain animals such as sheep, poultry and rabbits.

The lowest electrified strand is much closer to the ground than is the case with stranded fencing, so that extra care is needed to prevent leakage from vegetation growth; also the ground needs to be sufficiently flat.

Animals with horns run a greater risk of becoming entangled in netting

**APPLICATIONS**

Temporary electric fencing has a wide range of uses, including:

**Strip Grazing**

Maximum use of pasture can be achieved by confining animals to small sections of a paddock or pasture.

This reduces the animal's choice of where it will feed thereby ensuring that all areas are evenly grazed (e.g. sunny and shaded areas, steep and gently sloped ground).

The result is an overall improvement in pasture quality.

**Cattle and Horses**

Usually a single strand dividing fence is moved daily.

For horses, the strand must be tape or rope to provide the required visibility.

The distance the fence is moved will depend upon animal type and age plus the quality of the pasture being grazed.

In some cases a back fence is erected temporarily to restrict animals from returning to grazed areas prior to full recovery of grass.

**Sheep, Goats and Pigs**

A portable fence with at least three strands, or electric netting, is erected.

The duration and size of grazing area will vary as with cattle relative to animal and pasture conditions.

As the grazing in one paddock or pasture is completed the stock will be moved onto other pastures which will in turn be temporarily subdivided or strip grazed in this manner.

It is particularly necessary to ensure proper electrification at all times, as these animals will soon get to know if electrification has failed or become inadequate.

**Temporary Grazing**

Stock can be grazed in areas not normally fenced, such as road fronts or crop paddocks.

**Poultry**

A multistrand system or electric poultry netting is used.

Since the lowest electrified strand can be as low as 7cm. from the ground, greater care is needed to inhibit vegetation growth which would cause leakage.

**Vermin**

Electric fencing can be used to exclude rabbits.

A multistrand system or electric rabbit netting is used.

As with poultry fences, the lowest electrified strand can be as low as 7cm above the ground, so care is needed to inhibit vegetation growth.

Electrification must be properly maintained at all times.

**Predators**

A multistrand electric fence or netting is a powerful deterrent against predators such as foxes and dogs.

It needs to be at least 80cm high, and must be kept properly electrified at all times.

**Temporary Yarding**

Animals from sheep to horses can be held in a quickly constructed pen at any site.

**Home and Garden Protection**

Fences can easily be erected around trees, gardens or the backyard for protection from pet damage.

**SOLAR POWER and WIND GENERATOR OPTIONS****INTRODUCTION**

In remote areas with no mains power, or even one corner of a farm some distance from the mains supply, battery energisers are commonly used to power electric fences.

Solar panels can be used to maintain the charge on wet cell batteries providing a permanently operating fence power system.

**HOW A SOLAR PANEL WORKS**

Solar Panels draw energy from the sun that is converted to electricity to recharge the battery.

The panel is at its maximum effectiveness during hours of peak sunlight and at the other extreme, makes no contribution at night.

In the space of a few sun hours, a panel can provide enough energy to keep the battery charged.

### **BATTERIES**

The battery must match the size of your energiser to have sufficient storage capacity to compensate for cloudy days and reduced winter daylight.

Minimum battery sizes for energisers are suggested below.

If you are purchasing a new battery for solar use, we recommend deep cycle batteries.

These are especially designed to cope with the conditions of solar use [trickle charging from a panel and very heavy power draw on occasions].

Automotive 12 volt batteries can be used with your solar system, but the life of the battery will be shortened significantly.

### **SOLAR PANEL**

The size of the panel required for your solar system depends on four main factors:

What is the **MAXIMUM** amperage **DRAW** of the energiser?

What power/pulse setting have you selected?

What are your local sun conditions?

Will the energiser be used all year around, or only for certain periods?

Sun intensity varies considerably depending on your geographic location.

### **INSTALLATION**

#### **Location:**

The following points should be observed:

Panel should be installed facing south in a position that allows for maximum sun to fall on it during the whole day.

Positioning should ensure that no shadows fall on the panel at any time during the year.

Panel should always face the equator [i.e. North in the Southern Hemisphere and South in the Northern Hemisphere].

The best tilt angle for the UK is 45°. This angle also helps the panel to be self cleaning.

**Never set a panel on the horizontal.**

#### **Assembly and Wiring:**

Solar panels require a simple mounting bracket to hold panel firmly at correct angle.

Panel and battery should be as close together as possible.

Panel is wired to the battery.

Do not connect the panel to the energiser.

Ensure that connection polarity is correct.

### **MAINTENANCE**

Panel:

This should be cleaned **REGULARLY**.

At same time check wire connections.

Battery: Check electrolyte once a fortnight.

## FAULT FINDING

### LOW VOLTAGE ON FENCE

The most common electric fence fault is low or insufficient voltage on part of a fence system.

A fault finding chart is shown below.

A few points stand out:

Always check voltage at energiser first *with the lead out wires disconnected*.

Check the obvious, e.g. is the energiser switched on

If voltage at energiser is normal, check earth before fence.

Once you have been through the initial steps you may need to check your fence.

If you have a large fence system, the value of cut-out switches is now obvious.

By process of elimination, beginning at the first cut-out switch [at the end of the lead-out wire] you can narrow down the area at fault.

When the area at fault is disconnected, voltage in the rest of the fence should rise.

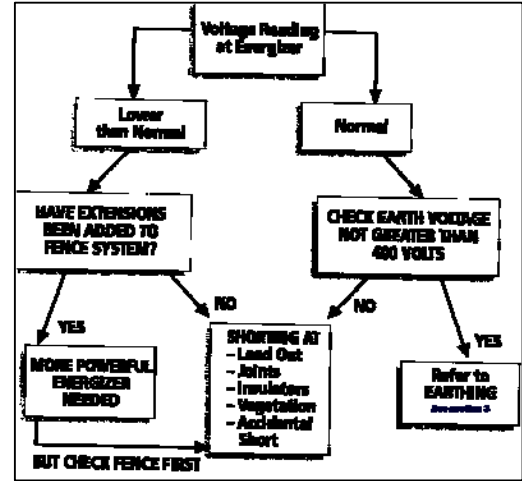
Well placed cut-out switches in your fence system will help isolate sections of your fence line to help trace fence fault locations.

A digital voltmeter is a very important part of your fence maintenance equipment.

#### Notes:

A voltage variation may occur because of an energiser change, an increase in fence line length, changing climatic conditions, seasonal growth over wires, insulation breakdown, etc.

Improving the earth system may assist the fence line voltage, but does not negate the necessity to remove critical faults from the fence line in order to preserve a high degree of efficiency.



### SOME UNUSUAL FAULTS

#### Electric shocks from Sheds or Waterpipes

This can be caused by one of the following:

Failure to observe instructions for "earthing"

A spot on the wire where the insulation has been removed and has shorted to the metal work in the shed .

If in doubt, disconnect the lead out at both ends and try another fresh wire run out in a temporary manner for the energiser to the fence line.

#### No Voltage at all on the Fence Line

Cause could include:

a break in the wire between the earth stake and the earth terminal on the energiser

broken lead-out wire

a short from the lead-out to the shed as described above

a live wire entangled with such material as a dead wire or wire netting in an obscure place.

ENERGISER NOT OPERATING.

#### Fence line wires other than the electrified portion also becoming live

check first for faulty insulators on the electrified lines

look for any stray wires that may have hooked into both wires to form a link between them

if no fault can be found then ground both ends of the wires carrying unwanted electrical charge

Power transference caused by a combination of induction and capacitance will have little overall effect on the operation of the electric fence system.

### RADIO INTERFERENCE

Loud "clicks", coinciding with the energiser pulsing can occur in poor radio reception areas or conditions.

#### Problem solving checklist

Check radio and power supply ensure all electrical connections are correct.

Energiser earth must be at least 10m [33ft] from other electrical earthing or large metal objects above the ground [Refer Earthing].

Lead-out wire should not run parallel with overhead power supply or telephone wires

Fence faults poor joints, partial shorts or cut-out switch fault can cause problems.

Walking or driving with a portable radio tuned to medium or long wave and 'off station' is a convenient way to locate electrical leakage.

A suitable volt meter will also assist with locating faults.

## SAFETY REGULATIONS

Safety regulations for electric fence energisers may vary slightly from country to country.

The following regulations are common in most markets.

Refer to your energiser operating instructions for further information.

If in doubt you should check local requirements.

In exceptional circumstances, such as drought conditions or the presence of highly inflammable material, there may be risk of fire caused by sparking from the fence.

**ELECTRIC FENCE ENERGISERS MUST NEVER BE CONNECTED TO ANY FENCE CONDUCTOR OF BARBED WIRE.**

Energisers should, if possible, be installed inside a building in a position free from the risk of mechanical damage [or unauthorised interference].

If mounted outdoors, they should be mounted on a substantial structure in a position free from the risk of mechanical damage.

**Each energiser should be fitted with a separate earth electrode and this should not be connected to any other earthing device.**

Crossings with overhead power lines should be avoided wherever possible.

If such a crossing cannot be avoided, it should be made underneath the power line and as nearly as possible at right angles to it. If an electric fence has to be installed in the vicinity of an overhead power line, the vertical distance between any fence wire connecting lead and the surface of the earth should not exceed 2m [6ft].

Fence wiring should be so installed that it is well away from any telephone or telegraph line, radio aerial or any earth continuity conductor.

An electric fence when installed in such a position that members of the public might reasonably be expected to touch it [such as along a public road or highway, or as a boundary fence] should be identified by suitable signs clamped to the conductor or fastened to the posts at intervals not exceeding 90m [295ft].

The sign should have the size of at least 200mm x 100mm [8" x 4"].

The inscription on the sign should take the form of either the symbol show below, or the words 'electric fence'. The inscription should be indelible and any letter should have a height of at least 25mm [1"].

It is recommended that the basic colour of the sign be yellow with black inscription.



Where the energiser is used to supply a system of conductors used for deterring birds from roosting on buildings, no conductor should be connected to earth.

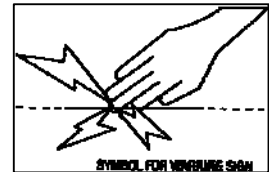
A readily accessible switch should be installed to provide means of isolating the energiser from all poles of the supply e.g. not the wrong side of a locked door.

A clear warning notices should be fitted at every point where persons may have ready access to the conductors.

The notice should bear the words 'LIVE WIRES' in block letters not less than 13mm[½"] high, the letters should be red on a white background and the size of each notice should be not less than 62mm x 50mm [2½" x 2"] overall.

An energiser should not be mounted on any post of any overhead line unless permission is granted by the owner of the line.

Only one energiser may be connected to any electric fence system.



**WARNING: Do not connect simultaneously to a fence and to any other device such as a cattle trainer or a poultry trainer, otherwise lightning striking your fence will be conducted to all other devices.**