Electric fencing in the west Kimberley environment

West Kimberley Soil Conservation District Advisory Committee

Western Australian Department of Agriculture
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ELECTRIC FENCING
in the
West Kimberley environment

Produced under the auspices of the
West Kimberley
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May 1987
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INTRODUCTION

The material and erection cost of a well designed electric fence for cattle control is only 40% that of the traditional barbed fence. However, to become an acceptable low cost alternative to the 'Kimberley Cattle Fence' an electric fence must demonstrate a comparable degree of stock control along with acceptable maintenance inputs.

Electric fence evaluation by both the pastoral industry and the W.A.D.A. has highlighted some of the practical do's and don'ts of this technology. A summary of these practicalities is compiled here as a guide to those considering electric fencing in the Kimberley environment.

The fence design adopted here is the result of technical evolution over a number of years (and a lot of trial and error). Other designs and construction techniques have been used with varying degrees of success.

SAFETY

(1) Humans

Electric fences should always be treated with respect. Modern energisers produce a powerful shock which may be harmful to children or pets (under some conditions).

(2) Warning signs

Large signs should be placed on the roadside where it enters a property warning the public. Warning signs should also be placed where "members of the public might reasonably be expected to touch it", spaced no further than 90 metres apart.

(3) Thunderstorms

Lightning strikes during thunderstorms are common. Where the top wire of a fence is a pulsed wire (+) damage or destruction of the energiser will take place unless a lightning protector is incorporated in the fence design. However, where the top wire is an earth wire (-) this problem has not been reported where steel pickets are used. Check with the energiser manufacturer if the lack of a lightning protector negates the energiser warranty.

(4) Power lines

If planning to run a pulsed wire below overhead power transmission lines, seek advice from the S.E.C. In the event of a fallen power line a whole fence system can become lethal.

(5) Barbed wire should never be used in electric fencing

(a) It may prevent a person or animal from moving away after receiving a shock.
(b) It is very likely to become tangled with other fence wire causing a 'short circuit'.
(c) The deterrent effect should come from the shock, not from the sharp barbs.

For further details consult Australian Standard 3129-1985 (copy available at Department of Agriculture, Derby).
HOW ELECTRIC FENCES WORK IN KIMBERLEY

There are basically two methods by which an animal may receive a shock from an electric fence.

(1) The Earth Return System

This system involves an animal touching a pulsed wire. The electrical energy passes through the animal to its feet and returns to the energiser through the ground. This system is only applicable in this environment during the 'wet' when the ground is moist and sufficiently conductive.

(2) The Fence Return System

This system is adopted for use in Kimberley as it does not rely on ground moisture conditions for success. For the animal to receive a shock it must touch both a pulsed wire and an earth wire (see diagram 1).

The animal will not receive a shock if it touches an earth wire only.

DIAGRAM 1

"FENCE RETURN" ELECTRIC FENCE
GENERAL DESIGN AND MATERIAL CONSIDERATIONS

The major material cost of a fence is in the wire. Therefore, the operational lifespan of all components should match as close as possible the lifespan of the wire. The reasons why some components fail in this regard is because they are insufficiently environmentally inert.

e.g. Timber components are susceptible to fire (even when treated with a fire retardant). Timber also cracks and warps in this environment. White ants attack timber (even when treated against termite attack). Fibreglass has not yet demonstrated its ability to withstand U.V. light over time and is susceptible to hot burns.

Plastic products used for electrical insulation breakdown under the effect of U.V. light.

However, timber and fibreglass have application in some circumstances, e.g. in saline conditions. New products are being assessed as they become available.

For the above reasons corrosion resistant steel products have been incorporated in the design together with glazed porcelain as the insulating component.

In-Line Wire

Two point five millimetre diameter high tensile, heavy galvanised plain wire (*Tyeasy or *Permelec) is used.

Properties of H.T.H.G. 2.5 mm Tyeasy Steel Fence Wire

<table>
<thead>
<tr>
<th>NOMINAL DIAMETER</th>
<th>CLOSEST OLD SWG GAUGE</th>
<th>GALVANISING GRADE</th>
<th>MINIMUM BREAKING LOAD kN</th>
<th>RECOMMENDED TENSION kN</th>
<th>APPROX. D.C. RESISTANCE ohms/km</th>
<th>COIL LENGTH km</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.50</td>
<td>12½</td>
<td>A</td>
<td>5.4</td>
<td>1250</td>
<td>2.0</td>
<td>450</td>
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</table>

AVOID INFERIOR PRODUCTS

CONSTRUCTION - PHYSICAL COMPONENTS

A good electric fence utilises suspension fence principles.

1. The Strainer End Assembly

The end assembly must be able to withstand any load transferred from the in-line wire component. End assemblies need only be constructed at the beginning and end of a fence. Diagram 2 shows an end assembly suitable for most conditions. A Geddes knot is demonstrated in Diagram 3.

2. Where a fence changes direction

Where a fence changes direction a single box strainer assembly should be erected. The longitudinal axis of the assembly should bisect the apex of the joining fencelines.

* Registered Trade Names.
DIAGRAM 2  'EXPLODED' DIAGRAM OF STRAINER ASSEMBLY (NOT TO SCALE)

Direction of pull by force

Concrete cap on posts

Lug 3mm x 15mm rod (or old bolt)

50mm pipe

38mm pipe

Concrete raised against post to prevent water sinking

Concrete 5:1

3turns 2.8mm HG plain wire (not twisted)

Tied with joggle knot

5cm
DIAGRAM 3

THE GEDDES KNOT

Tying Method

(1)  

(2)  

(3)  

(4)
(3) The fence – general specifications

See Diagram 4.

DIAGRAM 4 '3 LINE' ELECTRIC FENCE DESIGN

635mm Waratah steel dropper
pin top & bottom (inverted)

32mm cotton reel
Porc. insulator

25mm Wire T Caps
wire strained to

66 cm clearance

10 cm

133 m

40 m

165 cm
Steel picket

(4) How to affix various components

(a) In-line wire to steel picket (see Diagram 5).

This method is used so that the in-line wire does not touch the picket (which would produce electrolytic corrosion in association with moisture). The in-line wire must be able to move laterally within the tie to allow load transference. The tails of the tie are secured behind the picket. This reduces the chance of contact with the pulsed wire, causing a short circuit.

(b) In-line wire to steel droppers (see Diagram 6).

The pins must hold the dropper firmly onto the in-line wire to maintain wire spacings and assist in load transference.
DIAGRAM 5
TYING IN-LINE WIRE TO A STEEL PICKET

Plan View

Tails secured behind picket
Tails cut short
Steel picket
In-line wire

2.5 mm galv. Soft Manufacturing Wire (40 cm long)

DIAGRAM 6
PINNING IN-LINE WIRE TO WARATAH STEEL DROPPER

Pin - top pin bent down
Waratah Steel Dropper
In-line wire
Pin - bottom pin bent up
(c) *Earth wires to strainer, Pulsed wire leader to strainer* (see Diagram 7)

**DIAGRAM 7**

**TYING IN-LINE WIRE TO STRAINER**

*Plan View*

(1) Strainer post

(2) 1 turn only

(3)

(d) *Anti sink/lift device*

This is used in order that in-line wire tension can be maintained and so that in-line wire to ground distance can be maintained. See Diagram 8.

Old salvaged pickets cut in half are often suitable for this purpose.

**DIAGRAM 8**

**ANTI SINK/LIFT DEVICE**

Cobb & Co (above ground to prevent corrosion)

Half 'old steel picket' driven at 45°
(e) Gates

Two gate designs utilised in electric fencing are shown in Diagrams 9 and 10.

**DIAGRAM 9**

**CONVENTIONAL GATE**

Twitch poly. to strut and diagonal

Galv. line clamp

Bullnose insulator

Gate

Strainer assembly

Poly. pipe containing + undergo gate cable.

NB Poly. ends in goose neck to prevent water entering.

**DIAGRAM 10**

**READ OFFSET LIFT GATE**

Free running in-line wire at single strainer post

Post to hold gate open

3-4 m

40 m

40 m
CONSTRUCTION - ELECTRICAL COMPONENTS

(a) Tying 32 mm diameter Porcelain Cotton Reel Insulator to a Steel Picket

See Diagram 11.

It is important that the insulator is located as close as possible to the steel picket when tied. This greatly reduces the chance of movement which could cause a short circuit between the pulsed wire and the picket.

DIAGRAM 11

TYING 32 mm DIAM. PORCELAIN COTTON REEL INSULATOR TO A STEEL PICKET

Plan View

(b) Tying 32 mm diameter Porcelain Cotton Reel Insulator to a Steel Dropper

See Diagram 12.

Again it is important to ensure as little movement as possible between the insulator and dropper.

(c) Tying a Bull-nosed Insulator into a pulsed in-line wire

See Diagram 13.

This method is used to join the pulse wire to a leader wire at the strainer assembly. It is also used to join pulsed in-line wires where an isolation 'switch' is required.
DIAGRAM 12
TYING OF PORCELAIN COTTON REEL INSULATORS TO WARATAH STEEL DROPPER

(a) Side View
before 'twitch'

(b) Plan View
after 'twitch'

EARTHING
Earthing an electric fence is most important. Earth stakes should be of galvanised steel or copper, not black steel posts or rusty pipe. Good electrical connection between earth stakes is essential. Positioning the earth stakes in a moist situation is advantageous.
DIAGRAM 13

PULSED WIRE JOIN - WITH BYPASS ISOLATION 'SWITCH'

In-line wire

Bullnose Insulator

Galvanized Line Clamp (ensure good electrical contact)

Bypass - allows isolation of length of fence for fault finding or maintenance.
ENERGISERS

Both 'single pulse' and 'dual pulse' energisers have been used in Kimberley. Dual pulse energisers create an unpredictable control pulse which is supported by a number of lesser cue pulses. This system uses less power but has not as yet shown any greater ability to control semi feral stock in the Kimberley situation than the single pulse energisers.

Diagram 14 illustrates a typical setup. The energiser is placed midway along the fence with the earth stakes in a moisture favoured location if possible. Using a bullnose insulator it is possible to isolate either half of the fence, so aiding fault finding. The energiser must be capable of fully energising the total length of the fence.

DIAGRAM 14
ENERGISER/FENCE SETUP

IMMEDIATE POSTE CONSTRUCTION TASKS

Cold galvanising should be applied to all knots and connections to maintain good electrical contact.

An electric fence should be electrified as soon as possible after construction. Because of the lower visibility of electric fencing flagging tape should be tied onto the fence for early indication of the fence's location. This will reduce the chance of animals running into the fence unawares. Any damage that may occur to an electric fence is most likely to occur in the first few days, so fence checking in the first week is important. Provided cattle are not put under pressure they will become trained to an electric fence within 3-4 days.
MAINTENANCE

(a) **Vegetation control**

Electrical leakage caused by grass stems is only a problem during February and March in most years. However this electrical leakage is partly offset by the fence acting as both a Fence Return and Earth Return system because of the moisture in the ground. The fence at this time of year is also under less stock pressure.

However, woody weeds can be troublesome, e.g. Wattles, Rubber bush, Bauhinia, Gum suckers and Mimosa bush. Where these are a problem a residual herbicide should be applied in a metre wide strip under the fence immediately prior to the first wet following construction. The use of *Ustilan at* > 5 kg/ha active ingredient and *Velpar at* > 9 kg/ha active ingredient has been shown to achieve a high degree of woody weed control in a trial at Myroodah Station. To achieve long term control experience in the Northern Territory indicates that two applications (year 1 and 3) in ten years gives good control.

Where woody weeds are a problem a combination of physical/chemical control system may be applied. This consists of applying *Dybar* granules around posts and strainer assemblies for total vegetation control. This initial application costs $5/km and will give a number of years control. In association with this physical control of under fence woody weeds is maintained by the use of a 'hoe' attached to a grader blade assembly. Myroodah Station has developed an effective but simple attachment to do this job consisting of a piece of railway iron with a cutting edge welded to it!

(b) **Annual fenceline grading**

Annual fenceline grading improves fence visibility, reduces fire risk and vegetation electrical leakage. It also facilitates ease of access for maintenance. Care should be taken when grading erosion sensitive areas.

FENCE MAINTENANCE ACCESSORIES

The two most important items are a voltmeter and vehicle jumper leads. By isolating lengths of fence and using the voltmeter faults are more easily located. Once located the fence may be temporarily worked on with electrical impunity by using a jumper lead (see Diagram 15). If major repairs are required the fence should be isolated from the electrical circuit by disconnecting the pulsed wire at a bullnose bypass. Once the fence has been repaired it should be rechecked with the voltmeter.

**Diagram 15**

**Short circuiting fence for quick repairs**

* Registered Trade Name
DIAGRAM 16

METHOD OF REPLACING A BROKEN IN-LINE INSULATOR AT A STEEL PICKET

Plan View

Porcelain Cotton Reel Insulator

2.5 mm galvanized Soft Manufacturing Wire

Front View

Cut ends of tails short and neat

In-line wire
In-line wires very rarely break in properly designed electric fences. Diagram 16 shows how to replace a broken insulator on a steel picket without having to cut and join the in-line wire.

HINTS TO WOULD BE CONSTRUCTORS

(a) Start on a relatively small scale.

(b) Use only top quality materials.

(c) Attention to detail in construction is vital for initial success and low ongoing maintenance requirements.

(d) It is recommended that fences close (within 200 m) to yards or other points where animals are putting each other and the fence under physical pressure, should comprise of a physical deterrent. A barbed wire fence will be required in these circumstances.

FURTHER TECHNICAL INFORMATION

In addition to W.A.D.A. sources, instructional literature is available from various commercial manufacturers and distributors. Included amongst these are:

Gallagher R.S.M. Pty Ltd  
C/- 29 Mistral Street  
FALCON W.A. 6210

Daken Electra Fencing  
C/- Ethical Traders  
27 Royal Street  
KENWICK W.A. 6107

Sunbeam Rural Division  
359 Scarborough Beach Road  
OSBORNE PARK W.A. 6017

Spider Electric Fencing W.A. Pty Ltd  
P.O. Box 355  
MORLEY W.A. 6062

Australian Wire Industries Pty Ltd  
75 Leath Road  
NAVAL BASE W.A. 6165