Fencing
FACTSHEET

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# WIRE FENCE CONSTRUCTION

**This factsheet discusses construction of wire fences (barbed wire, high tensile smooth wire, woven wire and electric) from right-of-way preparation to hanging gates. It also illustrates construction methods on curves and through gullies.**

## RIGHT-OF-WAY PREPARATION

During the initial planning stage, the fence purpose, type of animal and site conditions are used in choosing a fence design. These points must be kept in mind when preparing the right-of-way and laying out the fence.

There are two basic types of fence right-of-ways:

- boundary fence right-of-way
  - these fences have predetermined locations
  - right-of-way work may be restricted to the builders side
- general farm fence right-of-way
  - right-of-way location less restricted
  - right-of-way can be chosen to suit the builder

Preparation will vary greatly: forested sites will require logging; bushed sites may be mowed; grasslands may need little preparation. A well prepared right-of-way with good access assures a work area than can only help the fence builder.

Decisions made in preparing the right-of-way have effects through construction, use and maintenance of the fence. Some points to consider:

**Plan.** Know the area well before finalizing the right-of-way.

**Access.** Prepare the right-of-way so a fence line can be laid out with good access to both sides (i.e., for a cattle range fence, ensure a horse & rider will be able to move along both sides of the fence after it is constructed).

**Straightness.** Keep the right-of-way as straight as possible to simplify wire fence construction; all-wood fences have less need for a straight right-of-way.

**Direction Changes.** Right-of-way changes of direction should be done keeping in mind the ideal tensioning distances of wire; 660 feet (barbed and woven) and 1,320 feet (htsw). Because tie-off braces will be located at these approximate distances, change of direction at these locations will not add greatly to fence costs.

**Uneven Terrain.** Remove minor undulations where possible but consider seasonal water flows when filling dips or gullies. Culverts or flood gates may be required.

**Windfalls.** Remove dead, defective or leaning trees that could fall across the fence.

**Slash.** Pile and burn all slash and waste wood (or cut & leave to rot) to ensure the right-of-way is passable.

**Visibility.** Some right-of-ways may have to be prepared using low impact methods if visibility is a concern.

### Right-of-Way Vegetation

Although this is done after fence construction, it is important to remember that all disturbed soil from right-of-way preparation should be seeded to grasses to discourage weed growth.

## FENCE LINE LAYOUT

Once the right-of-way has been prepared, the actual fence line location can be established. There are two typical situations depending on who the builder is:

- owner built – assuming you know what you want, flag the fence line as required
- contractor built – be certain he knows your instructions **and** you flag well to identify everything required

Fence line layout along the right-of-way is commonly done using plastic flagging tape. Choose a bright, easy to see colour that is not already used in the area of the right-of-way, and:

- using single flags (or sight stakes if needed), place often enough so you can stand at one and see the next - at dips or rises, extra flags or sight stakes will be required to ensure a straight fence line as shown in Figure 1, below
- using double flags, mark all changes of direction, gates, or other instructions - use a felt pen to write on the flag what is required (such as corner brace, etc)

Note that tie-off points may be up to the distances recommended by the wire type above. At this point, a detailed materials list can be assembled, materials ordered, delivered to the site and construction can start.

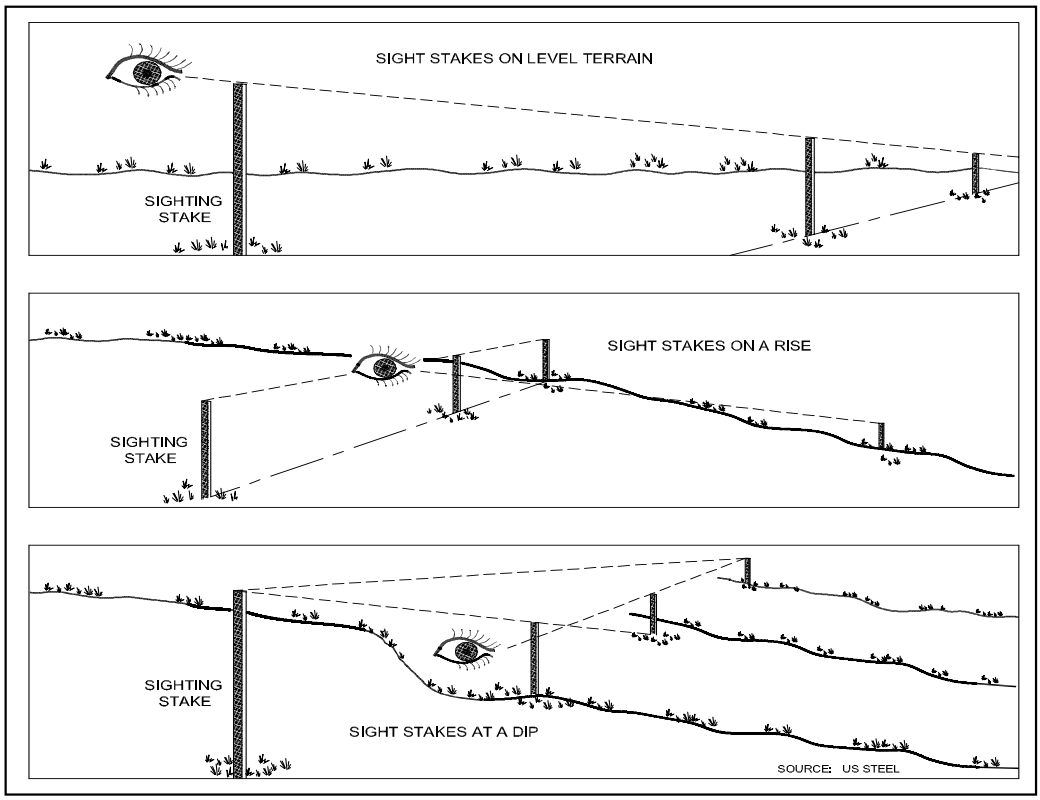


**Figure 1 Fence Line Layout Using Sight Stakes**

# 10-STEP CONSTRUCTION SEQUENCE

The following 10-Step Sequence has been written for construction of a high tensile smooth wire (htsw) fence on a properly prepared right-of-way. Sequences for barbed wire, woven wire and electric htsw follow, listing only the points that are different from this 10-Step Sequence. All materials are assumed to be on site.

## HTSW Construction Sequence

**1. Locate and prepare the right-of-way**.

**2. Flag fence line**.

**3. Install end, rise, dip, change of direction and gate posts**. This may require the use of sight stakes as shown in Figure 1, page 2. Add pull out resistance to dip posts as needed.

**4. String the first fence wire as a guide wire**. Tie off at the far end post and return stapling onto posts at height of bottom wire. Pull hand tight and tie off at the first end post (sight stakes can be removed in the pass).

**5. Install all brace and line posts** - if the soil conditions are favourable, proceed in one pass in alignment with he guide wire. If problems are expected in installing the remaining brace posts due to ground conditions, these should first of all be installed at all locations. This may require an extra pass along the fence line, but at this point brace location can still be moved a few feet if posts cannot be set deep enough. Mark wire heights on each post if not using a "stapling stick".

**6. Build braces**.

**7. String and staple the remaining line wires**:

- pull one strand out at a time, tie off at the far end post, staple on return, hand pull tight and tie off at first end post;

**Or:**

- pull all remaining strands out at once - this can be done easiest by tying each wire off at the first end post and taking all these remaining rolls down the right-of-way
- mount one wire roll per strand on an ATV, tractor or pickup truck (Figure 2, below); use a "stapling stick" to staple each wire in the proper order and height on line posts (Figure 3, next page); hand pull tight and tie off at far end post.

**8. Tension all wires** to 250 lb. starting at the top wire. This can be done in increments or all at once, however tension can change as each strand is tightened. Expect to do each wire twice to achieve final tension. Use a tensioner designed for htsw.

**9. Install droppers** if used.

**10. Hang gates**.

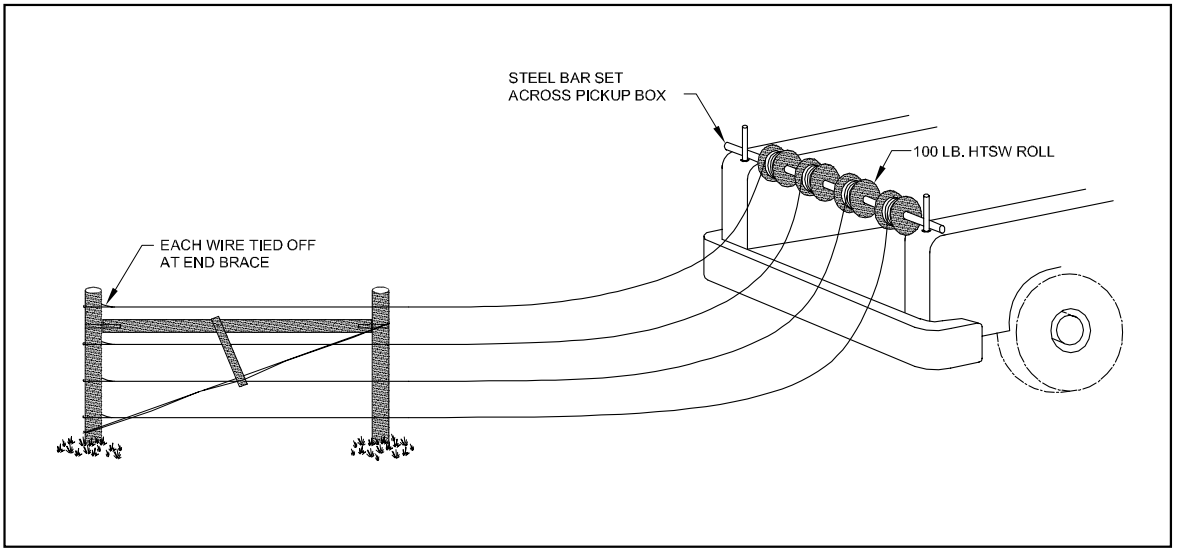


**Figure 2** **Stringing Out Multiple Wires At Once**

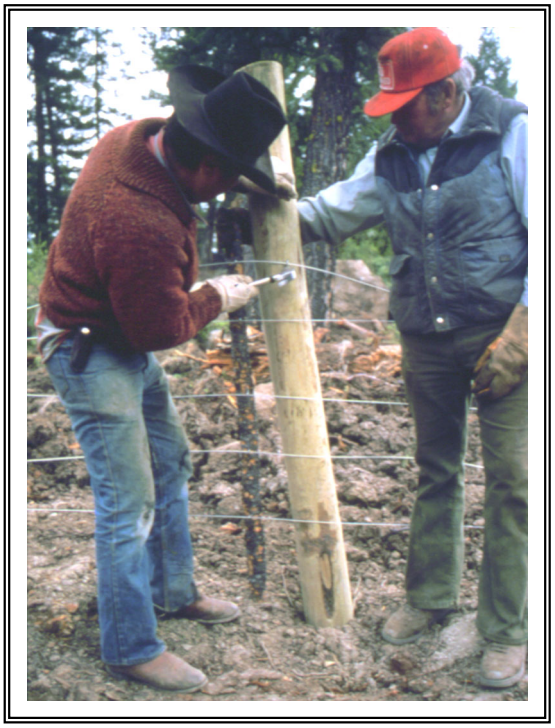

**Figure 3** **Stapling Stick for Multiple Wires**

## Barbed Wire Construction Sequence

**NOTE The following are only the points differing from the 10-Step Sequence, page 3.**

The most important difference in the barbed wire construction sequence is the need to pretension barbed wire prior to stapling.

**4. Guide wire** - barbed wire is not as convenient to use as htsw for the guide/bottom fence wire unless the fence is on level terrain. Because barbed wire must be tensioned before stapling, it is difficult to string properly through gullies, etc. Once stapled, it cannot be retensioned as barbs will catch on the staples. Consider using a smooth wire or cord for a guide wire.

**7. String line wires (don't staple)**:

- Pull one strand out at a time, tie off at the far end post and return to the start for the next strand (stringing multiple strands of barbed wire at once is not recommended).

**8. Prestretch double strand barbed wire** to 600 lb. and relax to the operating tension of 250 lb. On level terrain, the wire can now be tied off at the end post. On undulating terrain, a lower (estimated) tension must be used and then tied off **prior** to the wire being pulled down on dip posts or up on rise posts (which will increase tension). Start tensioning with the top wire as for htsw.

**Staple wire** onto line posts.

## Woven Wire Construction Sequence

**NOTE The following are only the points differing from the 10-Step Sequence, page 3.**

**4. String the guide wire**. Use htsw or cord.

**7. Ready the woven wire**:

- play out the wire either by keeping the roll vertical on a tractor support device or rolling it out on the ground
- join roll sections for the appropriate length
- tie off one end at the first end post

**8. Tension the woven wire**:

Using the "one-end" method (Figure 4, page 6) where the wire is tied off at one end and then tensioned to the second end brace:

- attach the clamp bar to the wire past the second end brace;
- stand the wire vertical (if it's not already);
- pull from clamp bars to a suitable anchor support (such as a tractor) using a come-a-long (note: a tractor may be used to pull the wire up to tension instead of the come-a-long if a very low "crawl" gear is selected - **this however is not recommended due to the possibility of over-tensioning the wire and the danger to the operator should the wire break**)
- tie off the tensioned wire to the end post by carefully cutting one horizontal strand at a time (well past the brace) and tying to the end brace post.

**Or:**

Using the "two end" method (Figure 5, page 6) where two wire sections are tied off at end braces and then tensioned towards each other then spliced:

- attach a clamp bar to the end of each wire section;
- attach the pulling device to the clamp bars;
- stand the wire vertical (if it's not already);
- tension;
- cut and splice each horizontal strand (one at a time);
- release the puller and remover the two clamp bars.
- staple the wire onto line posts.

**9. No droppers** are used in woven wire fences; disregard this step.

## Permanent Electric Fence Sequence

**NOTE The following are only the points differing from the 10-Step Sequence, page 3.**
As neither barbed nor woven wire is normally electrified, it is assumed the following permanent electric fence uses htsw.

**7. String the remaining line wires**:

- grounded wires – as for htsw using standard tie offs and staples
- electrified wires – as for htsw but use insulated tie offs and insulators on line posts

**8. Tension all wires** 100 to 150 lb. starting at the top wire.

**9. Droppers** are not normally used; disregard this step.

**10. Hang gates** and run lead wires over or under the gate as required.

**In addition to the 10-Step Sequence, for permanent electric fences:**

**11. Install ground system** for energizerand for grounded fence wires where required.

**12. Install fence energizer** and attach leads to fence wires.

## Temporary Electric Fence Sequence

**NOTE as temporary electric fences generally require no right-of-way preparation or braces, the following is not comparable to previous sequences, requiring six steps.**

**1. Hand set line posts** (rebar, steel 'T' post, fibreglass or light wood). Set suitable end posts for tie off.

**2. String out line wire**(s) on ground and tie off at far end post.

**3. Attach insulators** and lift wire(s) in place returning to the first end post.

**4. Hand pull slack and tie off** at the first end post. If this is a cross fence running from a permanent fence, use one of these line posts to tie off the temporary wires.

**5. Install ground system** for energizer and for grounded fence wires where required.

**6. Install fence energizer** and attach leads to fence wires.

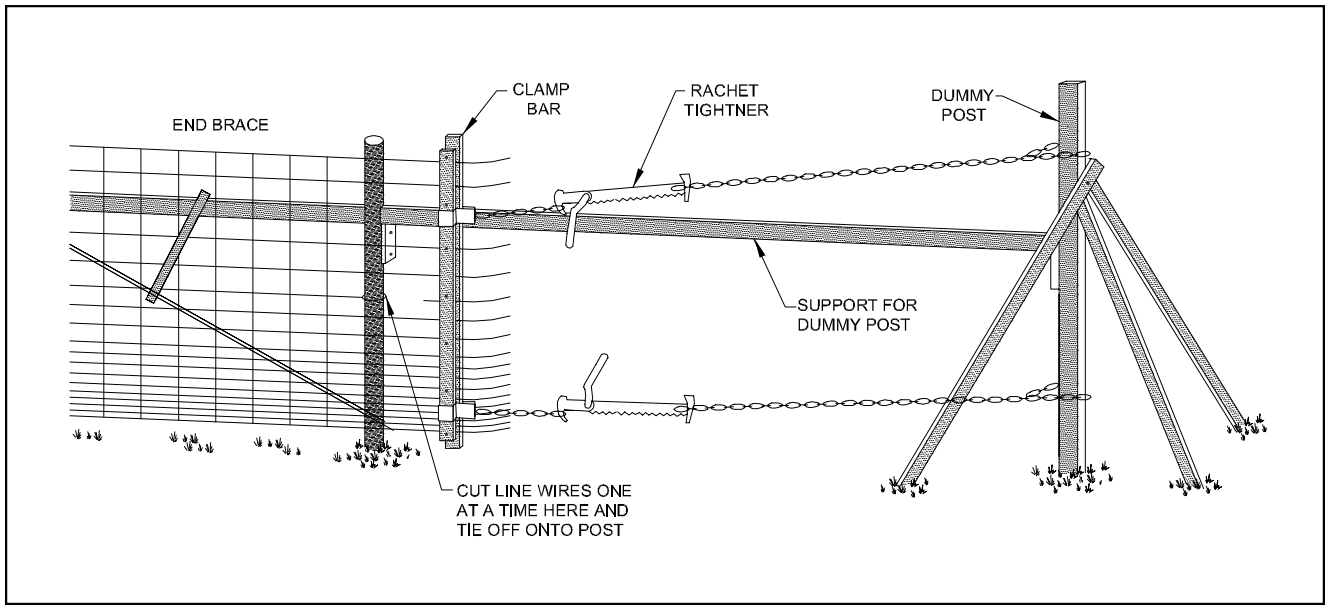


**Figure 4** **Tensioning Woven Wire From One End**

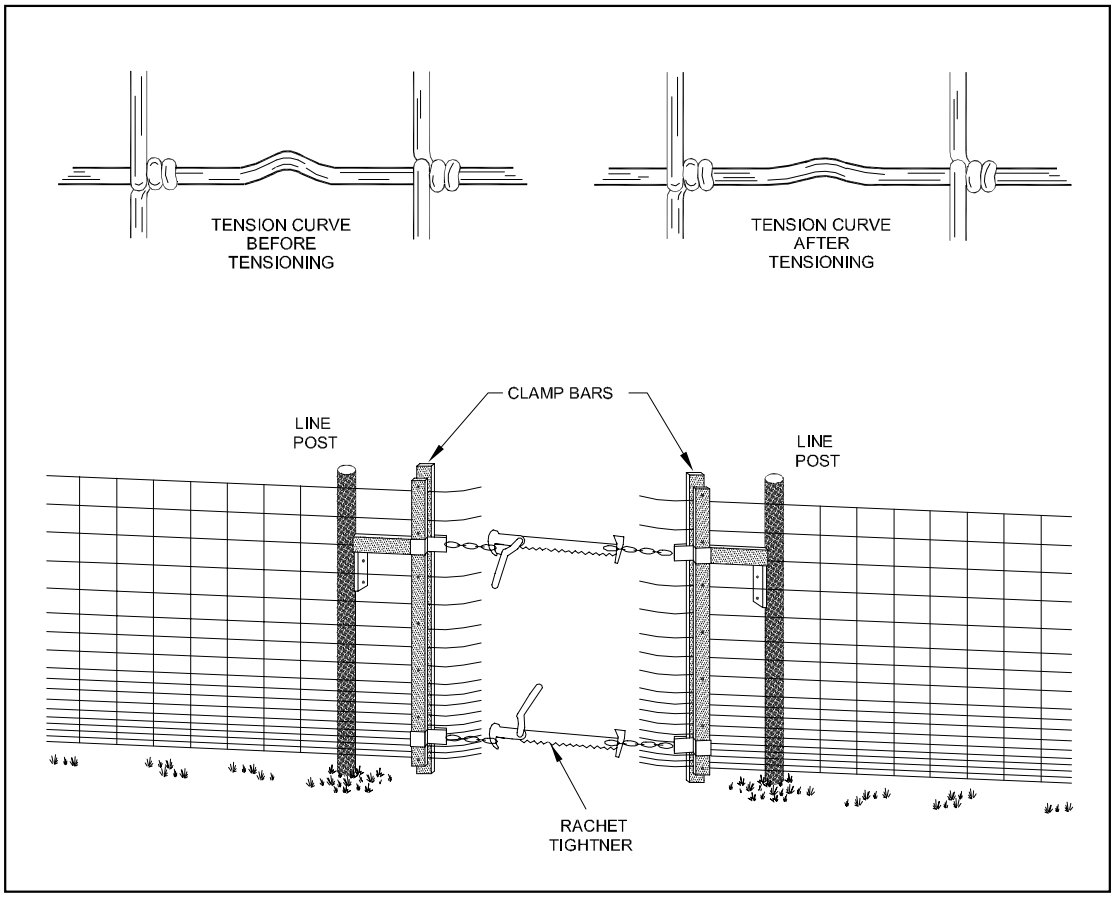


**Figure 5** **Tensioning Woven Wire From Two Ends**

## SPECIAL FENCING PROBLEMS

Many unique problems arise when constructing a tensioned-wire fence. These often relate to the terrain of the right-of-way, such as gullies, watercourses and fencing around curves. These all require special posting solutions.

### Fencing On Slopes

When installing posts on level ground, the post is set perpendicular to the ground (this is also plumb) and the fence wires, when attached, are perpendicular to the posts (parallel to the ground). Everyone would consider this a normal fence.

However when posting on slopes some differences arise. Going up a slope, if the posts are set plumb they will not be perpendicular to the wires. On a steep slope, plumb posts will be easier to overturn as they will be at a shallow angle to the ground (already leaning) and therefore not able to perform properly.

Going across a slope, posts perpendicular to the ground will appear to be inadequate for livestock on the upper slope side as the posts will be leaning down slope.

While it may seen unsightly to the eye, **posts should always be installed perpendicular to the ground on fence lines up and down slopes and plumb going across slopes** as in Figure 6, below. This will produce the strongest fence at the proper height. On very slight slopes this is not as important as it is on steep slopes. Some post drivers will not be able to work perpendicularly to steep slopes.

Fence wires can be on either side of the posts. Choose the side with the greatest livestock pressure; for fences along slopes this is usually the upslope side of the post.

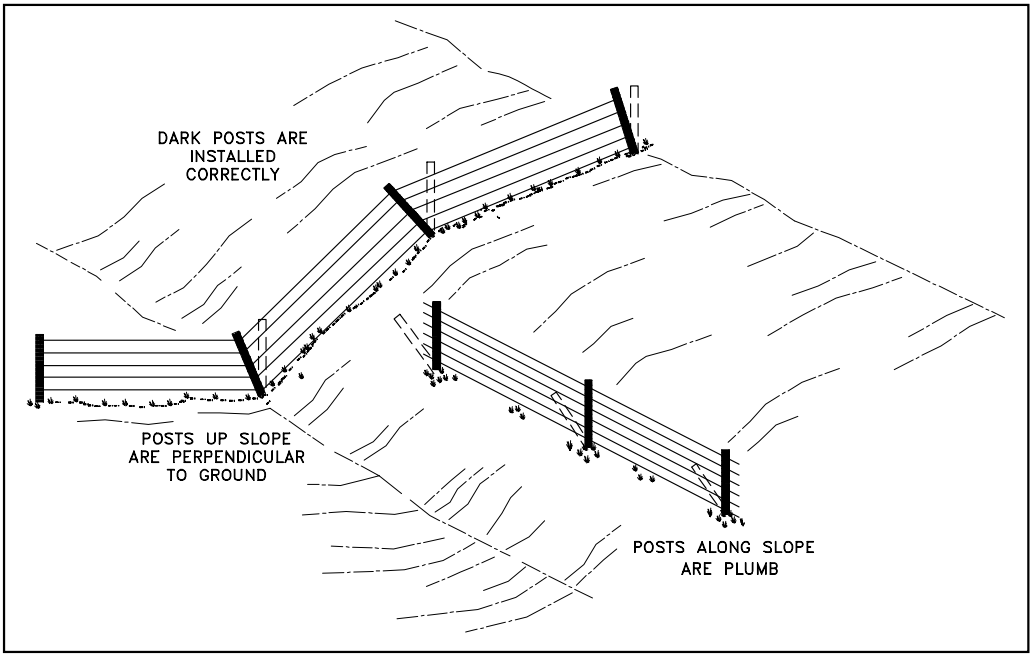


**Figure 6** **Installing Fence Posts on Slopes**

### Fencing Through Gullies

When fencing across a dip or gully, posts set in the bottom will have an uplift force applied when the fence wires are tensioned. The greatest uplift will be on the bottom gully post(s) and will be in relation to the fence angle change through the gully (i.e. to the relationship of the width and depth of the gully). Narrow, deep gullies cause the greatest uplift conditions.

Successful fences require some means to ensure these gully posts will remain securely in the ground. Six solutions are used depending on the degree of uplift:

**1. Add weight to the gully post**

- rocks wired to hang from the post for very slight gullies
- or rock jacks constructed around posts then rock added for greater weight
- limited due to amount of rock practical to place on post

**2. Oversize the gully post**

- similar to brace posts, use larger diameter, set post deeper or use two posts close together to increase uplift resistance
- suitable for slight to medium gullies

**3. "Brace" the gully post**

- wire from the top of the gully post to the bottom on each neighbouring line post as shown in Figure 7, below
- suitable for slight to medium gullies

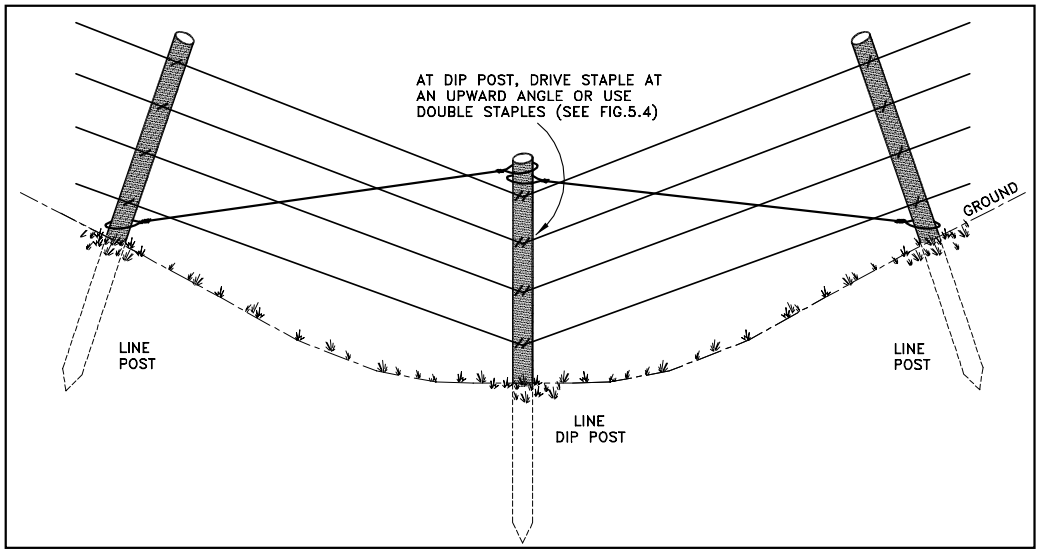


**Figure 7** **Wire Bracing a Dip Post**

**4. "Foot" the gully post**

- increase the pull out resistance by adding a foot to the dip post
- use a 3 to 4 foot length of steel fence post driven in at 45 degrees at the base of the post then wired to the post as shown in Figure 8, next page
- or a wood foot can be constructed. Note this requires digging a hole around the post if the post was driven into the ground

**5. "Over-fence" the gully**

- the main tensioned wires are strung to run continuously over the gully
- a "dummy" fence under low wire tension runs through the gully which puts very little up-lift on the gully posts
- suitable for a narrow gully or waterway as shown in Figure 9, next page

**6. "Separate-fence" the gully**

- the main fence is completed with end braces on either side of the gully
- the gully section is fenced separately with reduced wire tensioning
- most suitable for wide gullies as shown in Figure 10, next page

**Figure 8 Footing a Dip Post**

**Figure 9 Over-Fencing a Gully**

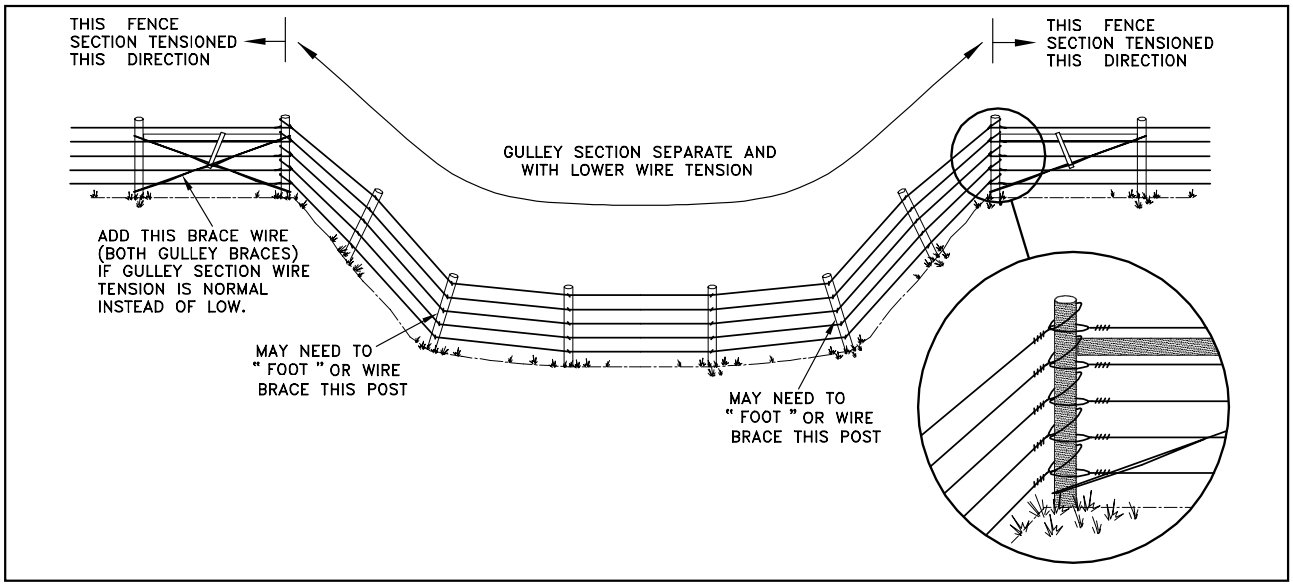


**Figure 10 Separate-Fencing a Gully**

## Fencing Over Small Water Bodies

Another fencing problem arises where a fence line encounters a gully with a stream or small water body. For instance, a gully that is subject to seasonal water flows. In these cases a fencing method should be selected to protect the main fence away from the gully from possible water damage. This damage could range from soft soil reducing the retention of the gully posts, to flood damage affecting the entire gully fence section. To limit such possible damage to only the gully fence section, either of the following two procedures are recommended:

**1.** Floodgate the gully (suitable for narrow gullies with high seasonal water flows)

- over-fence the gully as previously shown but instead of a dummy gully fence, hang a floodgate - refer to **Factsheet 307.400-1**

**2.** "Breakaway" fence the gully (suitable for wide gullies with high seasonal water flows)

- using either gully fence methods previously shown in Figures 9 or 10 but post the gully sections separate from the main fence as shown in Figure 11, below using a brace-sized post driven 3½ feet (min)

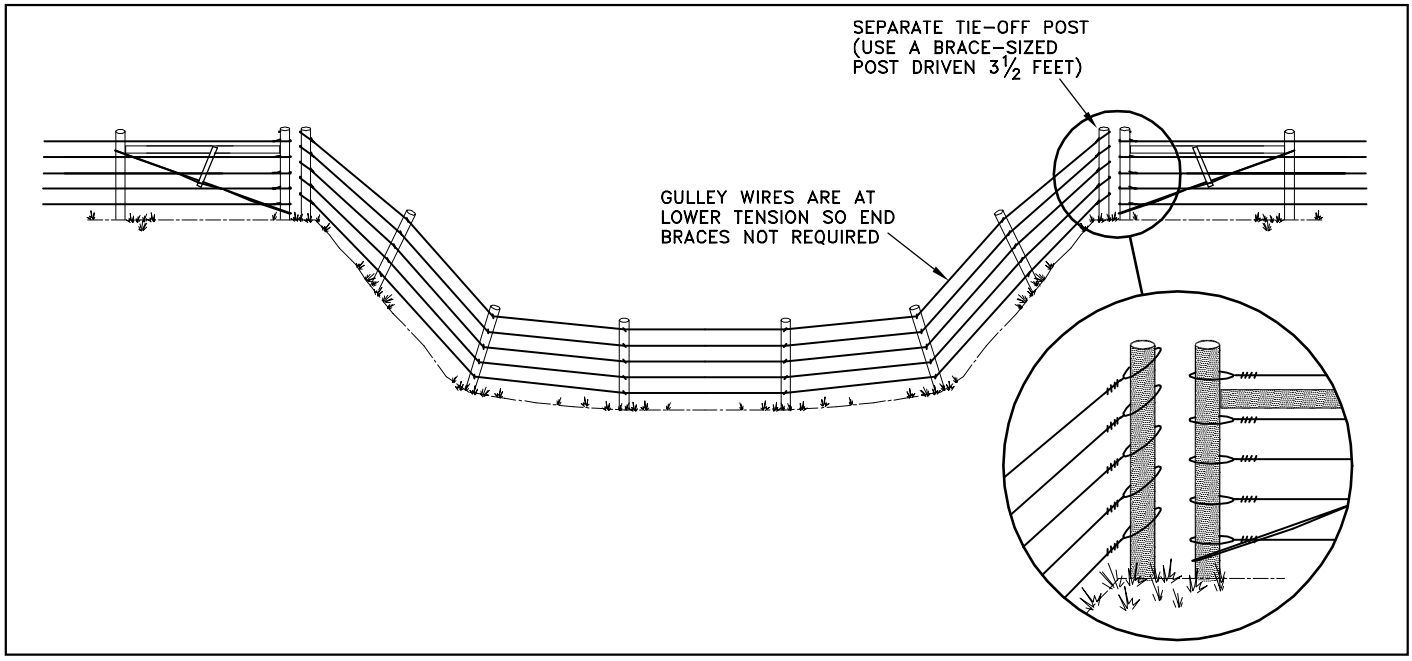


**Figure 11 Breakaway Fencing a Gully**

## Fencing Around Curves

Fencing at corners is discussed in **Factsheet 307.220-1** with the use of braces. However when fencing around gradual curves, the fence wires can be supported without constructing braces by using various single posting methods.

For gradual curves, rather than have many short sections of fence, the fence wires can continue around a change of direction post(s) provided they can be adequately set. Shown in Figure 12, below, it is suitable for fences with up to 6 wires on gradual curves and direction changes less than 60° (for greater changes use braces). For every 20° of fence direction change (about 3 feet 8 inch angle change over 10 feet of fence line):

- space a post 4 feet
- use posts one diameter size larger than line posts
- set them a minimum 3 feet deep
- set with 4 in top lean into the wires (away from the curve center)

Firm soil conditions are required. Special stapling techniques are used to reduce wire-to-post friction around posts (refer to **Factsheet 307.100-2**).

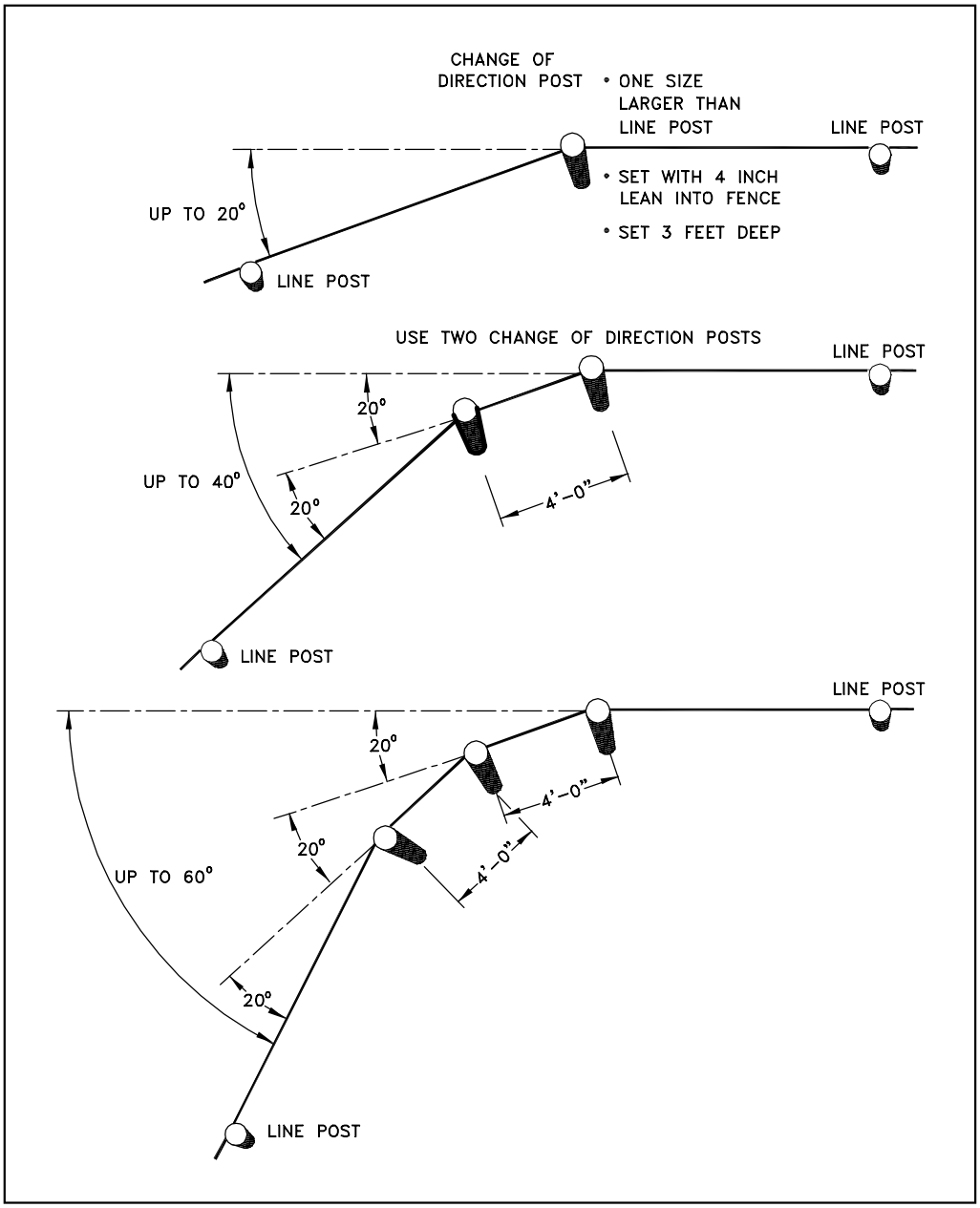


**Figure 12** **Posting Around Gradual Curves**

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