Fencing
# FACTSHEET

BRITISH COLUMBIA | Ministry of Agriculture

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# WIND AND SNOW FENCES

**Whereas many fence designs are constructed for livestock and wildlife control or crop protection, these designs are to modify either the wind or snow environment. Where wind and snow occur together they must be considered as a joint problem. Also included is a wire fence design modification to withstand high snowfalls.**

Wind may have a far more serious effect on livestock than extreme cold. To reduce this wind chill heat loss (and the associated extra livestock feeding required), producers can provide wind protection with either natural terrain, shelter belt treed areas, or with windbreak fences.

Figure 1 indicates the wind chill effect on beef cattle (note that animal age, hair coat, conditioning, etc., will modify the actual temperature the animal experiences). For instance, at -18° C air temperature with a 22 km/hr wind, the effective heat loss of beef cattle indicates a -34° C temperature.

## Fence Materials

Permanent fences are often constructed using wooden boards. Polymer grid fence material is used for both permanent and temporary fences. This material comes in rolls that are easy to handle and install. It is available in various thicknesses, colours and openings and is light enough to handle for temporary or seasonal fences. Some grades may not be durable enough for permanent use around large livestock.

## Windbreak Fences

A windbreak fence design should reduce wind velocity by at least 75%. The effectiveness of a windbreak fence in doing this depends on its density and height. Density refers to the proportion of solid area versus open area and is expressed as a percentage.

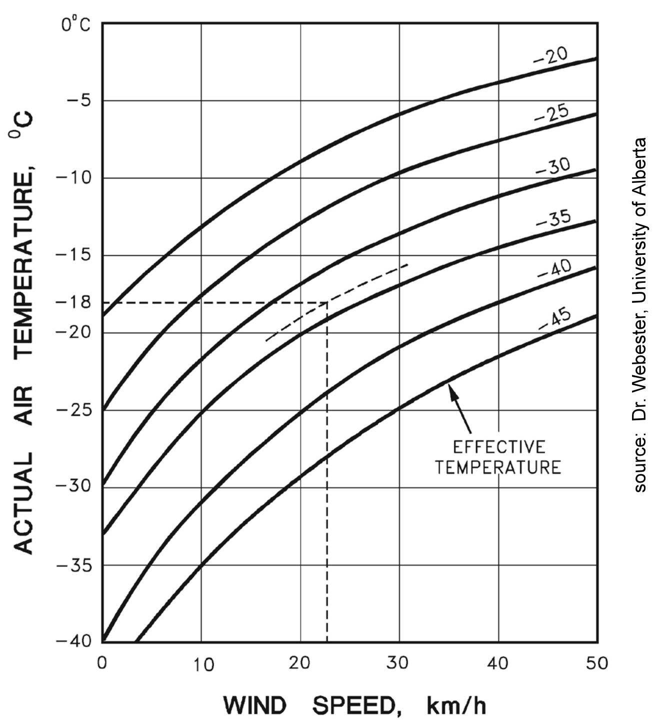


**Figure 1** **Effective wind chill temperatures**

The most effective windbreak density is 75 to 80% solid (natural shelter belts are typically 30-50% - planted belts may be higher). This density may be achieved using a polymer grid material or wooden boards.

Figure 2 shows the wind velocity reduction from various fence densities. For example, a 78% density fence that is 8 feet high will reduce the wind velocity on the leeward (downwind) side to about 15% of the original velocity at 32 feet (4H) and 25% at 80 feet (10H).

For 80% density, the space between boards is one-quarter the board width. Openings greater than 2 inches or boards greater than 10 inch wide are not recommended. See Figure 3. Note, snow may be moved with the wind so windbreak fences will effect snow drifting.

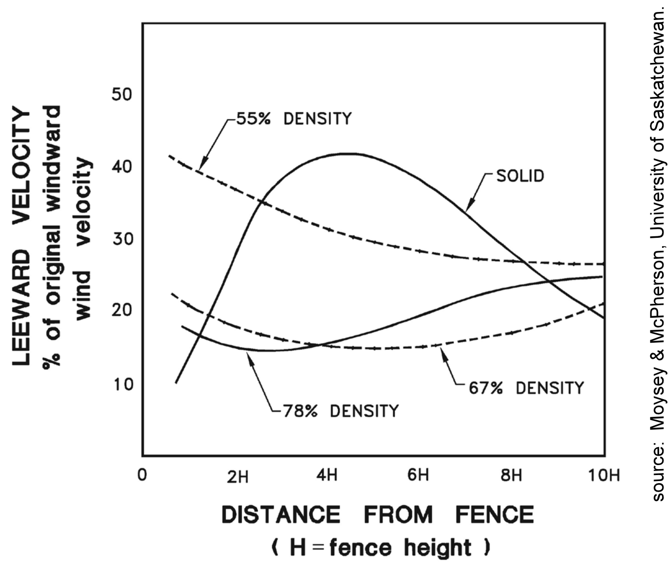


**Figure 2 Wind Velocity Reduction from Windbreak Fences**

## Snow Fences

In windy locations, snow problems are often more from blowing snow (and associated accumulations) than by actual snowfall conditions. Snow will start to drift at about 15 km/h wind velocity. However, as the energy in wind increases proportional to the cube of the wind velocity (i.e., at 19 km/h the energy is twice what it was at 15 km/h), small increases can cause significant snow drifting.

The aim of a snow fence is to reduce the wind velocity and cause the snow to accumulate. This accumulation will be in an area sheltered so the wind cannot move it again. At some point the area will be “filled” and the fence no longer effective.

It is the storage capacity of the fence that should first be considered when choosing a fence design. Figure 4 shows the snow pattern and relative volume collected for both solid and various porous fences. A solid wall will have a large snow accumulation on the windward side and very little snow on the leeward side (but an area of air turbulence). A porous fence will allow snow to drift through to accumulate on the leeward side. Notice that as the snow volume and drift length is related to fence height, a higher fence will collect more snow.

The volume of snow collected, as shown in Figure 4, increases as the fence density is reduced from 85% to 50% but the length of the drift increases. The expected snow conditions will direct the design selection and the distance the fence must be placed back from the area to be protected.

Typical windbreak fences (80% density) will create short, deep drifts on the leeward side; about 4 times fence height long (with the wind) and about the fence height (as shown by the solid graph line in figure 4). Typical polymer grid snow fence material is about 50% density and will create longer drifts, about the same height, with more total snow collected (dashed line in Figure 4). These lines show the point that the fences are “filled” and will no longer trap snow.

Generally, the bottom of the fence should be above the ground by about 10% of the fence height. For a 4 foot high fence this would mean a 4 to 5 inch gap.

The placement of snow fences near buildings and the swirling action of wind around buildings results in peculiar snow drifting habits. For instance, do not attach windbreak fences directly to the front corner of an open front shed; allow for a 'swirl chamber' (an offset of the fence from the building where blowing snow will accumulate away from the front of the shed). For details of this, refer to Agriculture Canada’s ***“Snow and Wind Control for Farmstead and Feedlot”.***

| | |
|---|---|
| **USE:** | livestock protection |
| **POSTS:** | spaced 8–10 ft |
| **HORIZ NAILERS:** | 2 in x 6 in |
| **VERTICAL BOARDS:** | 1 in x 6 in, or 1 in x 8 in |
| **HEIGHT:** | 8–10 ft |
| **NOTES:** | Effective wind protection. The 80% boarding can run either vertical (as shown) or horizontal. Keep boards 6 in. above ground surface to avoid rotting |

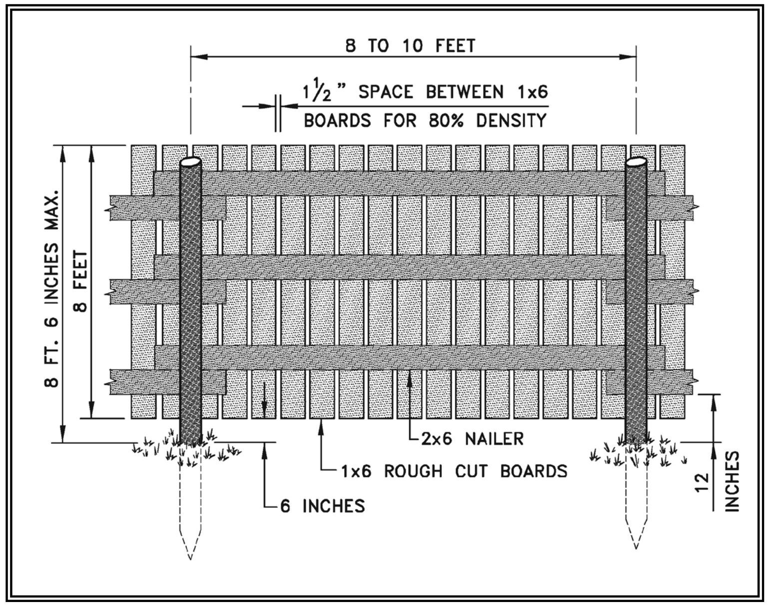


**Figure 3** **Board windbreak fence**

| **Materials Required** ( per 8 ft pane ) | | **Description** |
|---|---|---|
| Boards: | 13 or | - 1 inch x 6 inch rough cut x 8 feet long, or |
| | 10 | - 1 inch x 8 inch rough cut x 8 feet long |
| | | - attach to livestock side of posts. |
| | | - Note: if livestock are on both sides, add a guard rail to the side opposite the boards. Use a 2x8 at 30 inch height. |
| Posts: | 1 | - 4 to 5 inch diameter x 10 feet long |
| | | - pressure treated, pointed, domed |
| | | - driven 3 feet (minimum) |
| Nailers: | 3 | - 2 x 6 inch rough cut (or dressed) x 10 to 12 feet long |
| | | - allowance for overlaps at joint |
| | | - butt joint OK if adequate connection can be made |
| Nails: | 1x6 use 78 | - 5 inch spiral-shank (galvanized optional) |
| | 1x8 use 60 | - 2 per board per nailer |

Notes:
1. For 80% density the space between boards is ¼ the board width.
2. In some areas, consider a solid fence (100% density) to control snow drifts. See Figure 4.
3. Do not under estimate the force of the wind on a board fence. Consider deep post placement with concrete or good compacted backfill.
4. If sawmill slabs are used for boards, place the bark side away from the nailer boards.
5. See Figure 2 for the wind protection area from a board fence.

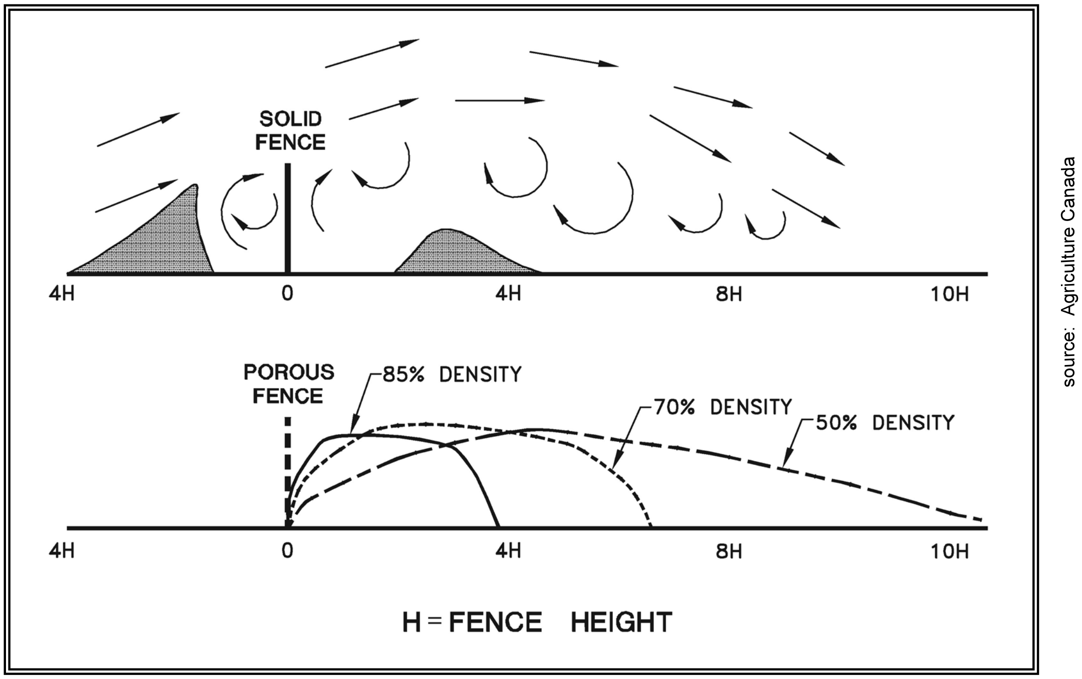


**Figure 4** **Snow drifting due to solid and porous snow fences**

## Snow Entrapment Fences

In areas with significant winter winds, snow fences can be used to create snowdrifts where the snow melt can be captured for crop or livestock uses. It could be said that "water is blowing in the wind". There may not be as much potential for this in British Columbia as in prairie areas with consistent winds.

Some "rules-of-thumb" from research in Wyoming for maximum snow collection:

- In digging a snow collection pond, place the excavated soil on the downwind side of the pond forming an embankment.
- The most efficient system is to combine a snow fence with the embankment, adding the snow fence just ahead of the up wind edge of the pond.
- Place snow fence boards horizontally (research indicates 25% greater snow capture).
- The height and length of the snow fence depend upon the application, but generally the "rule of sixes" applies:
  - 6 inch boards spaced 6 inches apart (50% density)
  - 6 foot height (although 4 foot is often used)
  - 6 inch gap between boards and the ground.

One important factor; the wind is often not from a prevailing direction. In these cases, fence the two or three sides of the pond most likely to be windy. The costs will be higher but the snow entrapment should also be greater.

## Wire Fences in High Snowfall Areas

Snow can put a tremendous load on a fence. Deep snow can actually pull staples from posts and make most wire fence designs impractical due to the maintenance required. To overcome this, special "lay down" designs can be used if the annual labour costs of raising and lowering the fence are warranted. See Figure 5.

A concern when using a lay down fence is the possible entanglement by wildlife when the wires are not deeply covered with snow. In some locations, there may be no wire fence design suitable for high snow conditions and a log style fence should be considered.

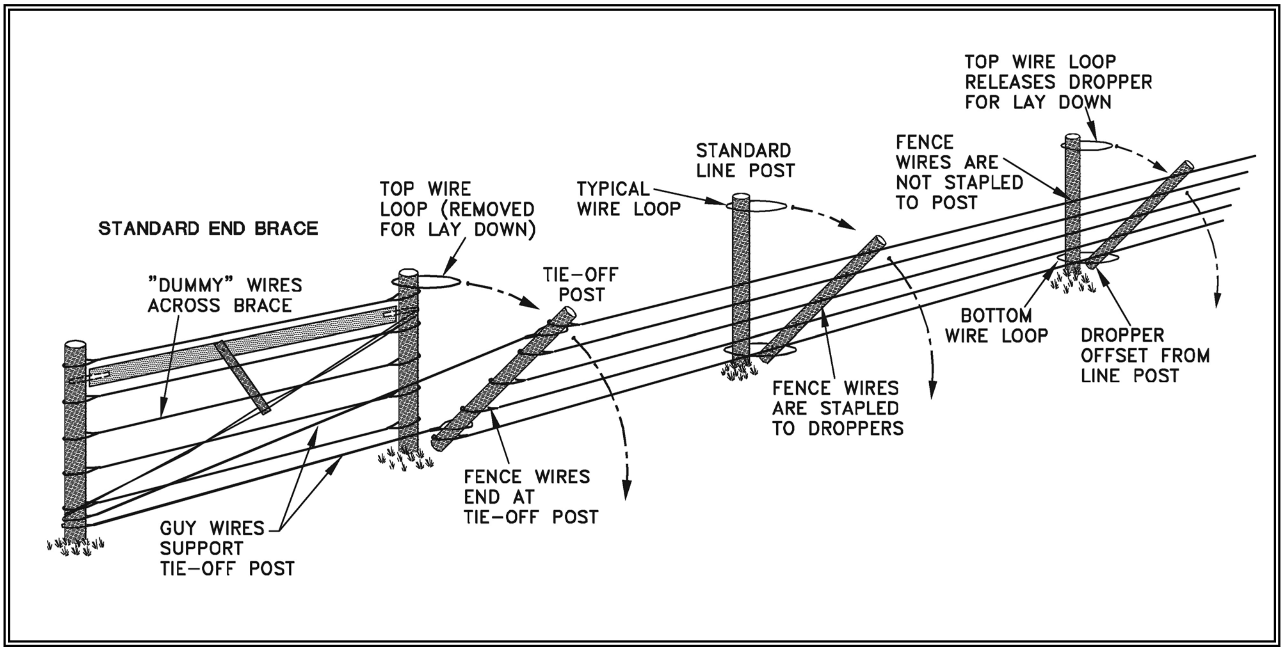


**Figure 5** **Lay-down snow fence**

## Lay-Down Fence — Wire-Looped Dropper Design

A design used in Colorado allows for the wire tension to be maintained while laying down the fence (wires and droppers) as a unit. Shown in figure 5, this design uses a "tie-off" post which is wire anchored to the end brace. Each line post has a upper and a lower wire loop to secure an adjacent dropper (to which the fence wires have been stapled).

To lay the fence down prior to winter, a stretcher is used at the end brace to gain some slack. The tie-off post is then freed by lifting the top loop. Each upper wire loop at the line posts can then be lifted to free the fence, allowing it to lay down. The bottom loops remain on the droppers and the tie-off post. The stretcher is removed and the tie-off post is laid down. The fence wires remain tensioned. To raise the fence in spring, the process is reversed. A long bolt may be used in place of the bottom loop joint for the tie-off post to brace post connection.

## Lay-Down Fence — Pin Release Design

This is an alternative to the wire loop attachment of the fence wires to line posts. Pins or wire rods can be used that are withdrawn from the post staples to allow removal of the line wires from the line posts. Sheet metal brackets (one per wire strand) are available that are either nailed (wooden posts) or crimped (steel posts) onto line posts with a removable pin to release the line wires.

## Lay-Down Fence — Alternative Tension Release

Instead of the "tie-off-post" method, each fence wire can be tensioned (and released) with an inline tensioner. On release of tension, the wires (with attached droppers) could then be unhooked or otherwise detached from the brace and laid to the ground. The attached droppers would keep the fence wires from tangling.

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