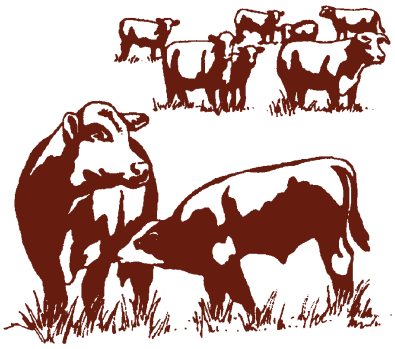

Beef Cattle Handbook

BCH-10200 Product of Extension Beef Cattle Resource Committee

Windbreak Fences

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Winter wind protection and use of summer breezes to advantage are essential to successful feedyard operation. Cold drafts and winds promote stress and re- strict normal cattle production. Research on wind effects on cattle has shown that hair coat, color, and sunshine all have an influence on their heat losses. Consequently, the increase in feed intake and heat loss caused by the wind are variable. In general, how- ever, a 20 mile per hour wind is considered equivalent to an extra 30 degrees of cold. Winds often blow a considerable amount of feed from exposed feedbunks. This leaves the coarser, less palatable portions. Wind also dries out exposed feed and carries off nutrients. Snow drifts in the cattle yard and travel areas are a problem. Summer breezes assist cooling, but also carry odors, dust, and insects. These and related items go to make up what is generally referred to as "wind problems." Different types of windbreak or "board" fences have been used for wind protection of eating, watering, and resting areas about the feedyard. Location and construction of these windbreaks will be discussed here. Use windbreak fences to supplement natural wind barriers of larger scale. When available locate, arrange, and develop cattle areas to utilize trees for winter wind protection, to control snow drifting, and provide shade in summer. Take advantage of hills, buildings, and hay stacks to provide general winter protection and yet take advantage of summer air movement and allow for feedyard drainage. Remember that when the speed of wind is slowed, blowing snow drops out and piles up. Usually this drifted snow has to be moved out of the cattle and working areas to permit winter traffic and reduce spring thaw problems: So, slowing or stopping the wind can change one problem to another.

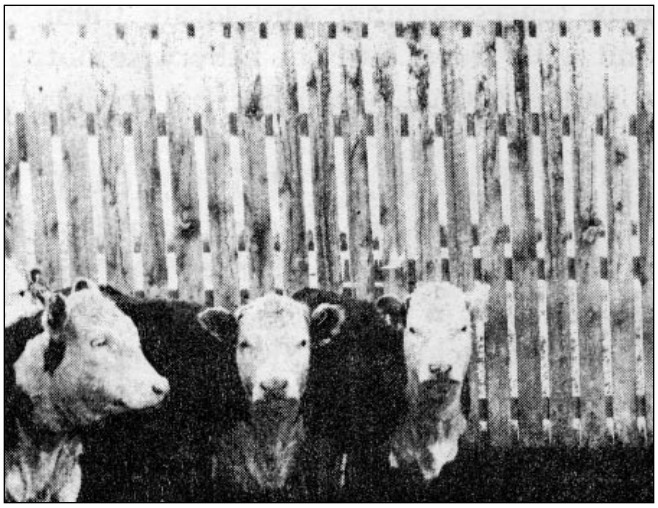

Figure 1. This installation utilized rough 1x6 lumber for a 9 foot high slatted fence. Spaces between boards is about 1 1/2 inches.

Information on prevailing wind directions can be obtained from the National Climatic Center, Federal Building, Asheville, North Carolina 28801. Prevailing winds can vary from one time of the year to another. Indicate which times of the year are the most important when asking for specific wind direction and speed information. Usually cold, winter winds are most harmful to cattle production. Strong summer breezes, however, need to be considered for air movement along feedbunks, odor control, dust, and insect movement. Refer to Cattle Feeders Handbook circular No. 5100,

"Prevailing Winds in Feedlot Site Selection," for more information.

Locations of Windbreak Fences

Since each feedyard has its own peculiar location and operation situation, it is usually different than the feedyard "down the road." Consequently, it is difficult to give any "pat" recommendations on wind- break locations. Some research, however, and considerable observation and experience at feedyard sites have shown certain location items about windbreaks that can be applied to different situations. Wind sweeping around the corners of buildings, silos, or ends of windbreaks or other barriers can cause drafts a considerable distance away. The velocity of wind increases 10 to 20 percent and even higher when it goes around the end of a shelterbelt. Remember that a windbreak fence does not stop the wind. It simply deflects it. Consequently, the windbreak directs the wind off to someplace else. When locating windbreak fences, arrange and locate them so the winter

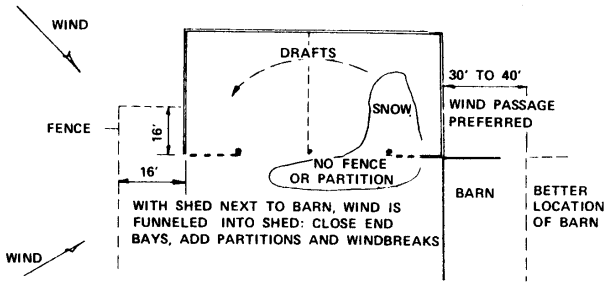

Figure 2. Snow drifting and drafts can be problems with open-front buildings. Offset board fences 16 feet or more from the front of the buildings, provide wind passage between open-front buildings and adjacent high barns, silos, etc.

wind will "flow" away or otherwise not adversely affect cattle eating, watering, or resting areas.

When wind passes over a vertical barrier, it will tend to "drop" or swirl downward on the leeward or downwind side. This is caused by a difference in air pressure from the one side of the fence to the other. How much swirl and how close this dropping occurs to the fence depends on how solid, dense, porous, or open is the fence or barrier. In an actual situation the side-effects from buildings, etc. can also affect this.

Research and experiences have shown that the most effective windbreak for wind protection is 75% to 80% solid (20% to 25% open or porous). Consequently, the "slatted" type of windbreak fence is preferred and recommended. This slatted type allows some air to flow or "leak" through. This air flow can be felt a few feet away on the leeward side of the fence. This same air flow, however, prevents much of the downdrafting and swirling that occurs by a solid board fence. The effective distance protected downwind by the fence is increased by relieving the downdraft and swirling. This action is comparable to that used with "windproof" cigarette lighters. Natural tree shelterbelts are usually 30% to 50% solid during winter when there are no leaves on the trees. This is considerably more open than desirable. Shelterbelts that have a row of evergreens are better wind barriers. In general, wind velocities are reduced 5 to 10 barrier heights away on the windward side and 10 to 30 heights away on the leeward side of a windbreak. The wind velocity reduction beyond 20 heights on the leeward is minor, however. A 12-foot high, slatted board fence, for example, can be expected to give fair wind protection downwind to about 200 feet away. The wind velocity reduction on the upwind or windward side accounts for the snow drift on the windward side of snow fences, shelterbelts, buildings, and other barriers.

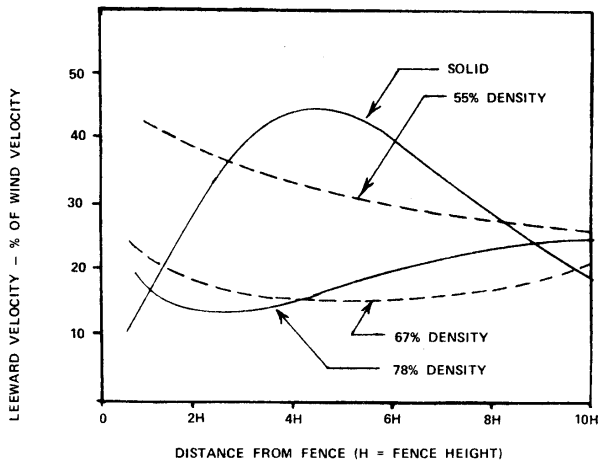

Figure 3. This chart shows measurements of the velocity reductions for windbreak fences of different densities and at various distances downwind from the fence. Note that the wind velocity resumes rather fast after the wind passes over a solid fence. Also that the 78% dense fence is generally the most effective.

Again, when the wind velocity is reduced snow drifts will build up. It is recommended to locate buildings, cattle yard areas, feed storage, etc. about 185 feet beyond and downwind from the outside or windward row of trees in a shelterbelt (not the inside or leeward row of trees). Major snow drifting will generally occur within this 185-foot zone. It is difficult to eliminate snow drifting within the feedlot area itself as wind control there is more important than snow control. Utilizing the porous or slatted type board fences, however, allows the snow to be spread over a larger area rather than pile up next to a fence. Snow drifting near the windbreak fence is more common with a solid windbreak fence. The solid fence allows very little wind to come through it and relieve the downdraft and swirling on the leeward side as does the slatted fence. Wind coming over the top of a building is another troublesome item. In an actual situation the wind comes over the ridge, drops down, swirls around and often leaves a big snowdrift in front of or inside an open front shed! The idea of a slatted wind barrier installed along the ridge has been tried. It has given limited success, however. Again, so much depends on wind barrier upwind and adjacent to the building. Offset a windbreak fence to the side and to the

rear of an open-front resting shed. This provides a "swirl" chamber to the side and reduces wind in front of the shed. A 16-foot offset to the side and rear of the front corners is minimum. A larger distance can be used. However, keep in mind wind sweep over the top of the windbreak. The offset fence seems to be particularly useful in controlling winds that approach the building at an angle.

Allowing some wind to pass through the building will also relieve the snow drift problem in front of the shed. Often the space between the rafters and top plate is left open so air can enter the shed there and move out through an open ridge or the opposite open wall. Providing a means of closing off or adjusting the amount of opening is helpful to permit various amounts of air to pass through the shed. Considerable snow can sift inside the shed through this type opening during a blizzard unless it can be properly closed off.

Many cattle sheds are a pole-frame building and have manure planking up about 4 feet high on the inside of the pole-frame walls. The space between this inner manure planking and the outer siding can also be used to let air enter the building to relieve air suction and swirling in through the opposite open side. This air inlet can be in place of or in addition to letting air blow in between rafter spaces. A plank can be fitted in between each pair of poles in the wall. The plank is fastened to hinges and the amount and direction of air coming in through the opening is easily adjusted to wind or temperature conditions

Provide a space of 40 feet or more to permit wind to pass between buildings (this also reduces the fire hazard). Two-story barns, upright silos, or other high structures can be particularly troublesome in this respect. Wind swirling around an upright silo will restrict the use of an uncovered feedbunk near the silo base, for example. Wind "funnels" through a narrow pathway between two buildings at a much higher velocity than that out in the open. This is comparable to pouring water through a funnel. By restricting the area down through which the water can pass, the velocity or speed of the water has to increase. Wind blowing through the driveway of a grain elevator is another example.

Drafts and funnelling between sheds, around silos, and other critical areas can be reduced by installing a slatted wind barrier. A slatted or porous barrier is especially recommended over a solid type for these locations. This avoids development of added downdrafts or swirling. Partition windbreak fences may be required inside wide, long buildings, particularly those with open fronts. This is to reduce drafts that can develop around a large, confined air space. Wind currents deflected from adjacent buildings, silos, feeders, stacks, etc. and that come around the end or over the top of the shed are often the cause of these drafts. Closing the endwalls of the shed and using large doorways that can be opened or closed is often necessary. Windbreak fences are usually installed in the partition fences between feedyard pens. This permits using the

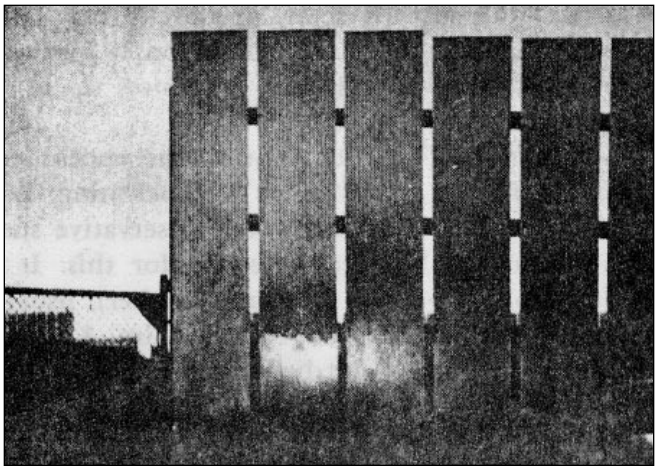

Figure 4. Twelve-foot high sheet metal was used for windbreak at this feedyard. Space between the 26-inch wide sheets was about 4 inches. This provides for only about 13% porosity or opening which is less than the recommended 20% to 25%. Wide slots let more wind through at one space.

fence for dividing the pens as well as for wind protection and also for shade. Sliding or swinging "doors" or gates are desirable to prevent wind from funneling down through fenceline feed alleys. These can be left open for hot weather air movement. These moveable windbreaks can aid cattle comfort while at the bunk and reduce waste from blowing feed. Windbreak fences are also installed in the fence- lines around the outside of the feedyard. These protect the cattle from general prevailing winter winds. Haystacks, chaff piles, trees, and buildings can also be utilized for this purpose. Recently some operators have installed slatted windbreak fences at the top of earth resting mounds in the central part of the cattle yard area. This permits the cattle to utilize either side of the windbreak fence. It also locates wind protection nearer the feedbunk and waterer areas. These fences are usually installed at an angle northeast to southwest so to provide the best wind protection against prevailing winds, promote sunlight to dry on either side, and provide drainage out of the feedyard.

Preferred direction:	N.E.- S.W
Height:	6 or 8 feet
Mound slope:	4:1 or 5:1
Top width:	12-foot rounded
Wind protection:	8-foot board fence on ridge
Area allowed per head:	25 sq. ft. on each side of fence
Mound stabilization:	Disc lime into upper half

Snow fencing can be used to provide temporary wind and snow control. This could be in a short-term, winter feeding area, for example. Snow fencing several "tiers" high has been constructed and used. The height results in effectiveness being extended over a long distance away. Snow fence is too porous to provide a real good windbreak. Also, it is not heavily constructed so it

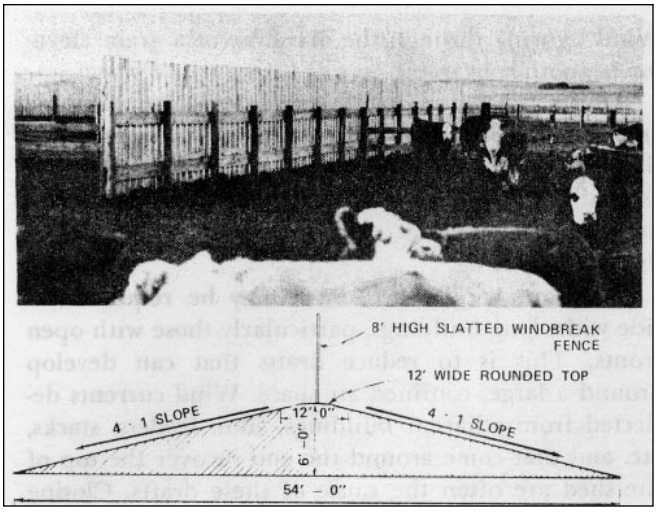

Figure 5. A slatted board windbreak located near center part of feedyard so cattle have access to each side. Diagram shows construction of earth mound under a fence for improved drainage.

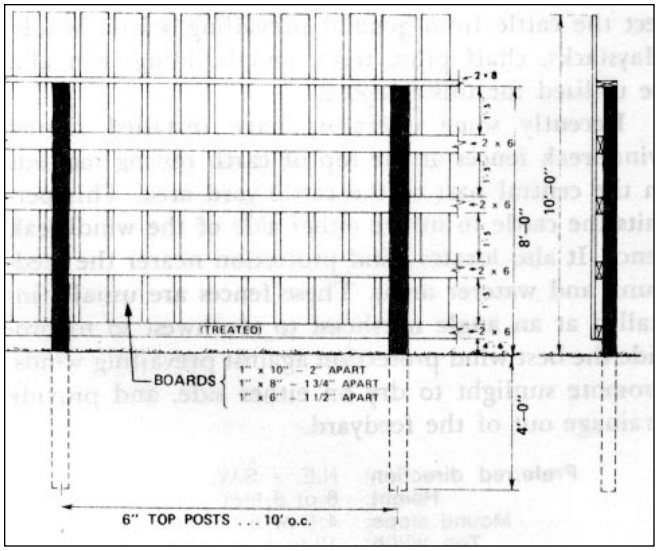

Figure 6. General construction recommendations for slatted board fence construction. Locate cattle next to side with vertical boards or install "rub-rails" if cattle will have access to each side of fence.

will not take long abuse by livestock. Consequently, its limited use is advised.

Construction of Windbreak Fences

As previously explained, several different types of windbreak fences are used. These mainly include solid fences, slatted fences, and snow fencing. However, hay stacks, piles of dirt and snow, buildings, trees, and other types of barriers should be utilized when possible. A minimum height of 10 feet is recommended for a windbreak fence. With slatted or porous type construction, this provides good wind protection over 100 feet downwind. A higher fence can be built and effective windbreak distance (and shade) increased. This requires heavier, costlier construction, however, to withstand wind forces.

Rough, 6-inch wide boards, spaced about 1-1/2 inches apart provide for a 20% open fence. Space 8- inch wide rough boards about 9-1/2 inches on centers. Openings or "slots" up to 2 inches wide can be used for wider boards. Openings wider than 2 inches have been installed and seem to operate satisfactorily. This wider opening generally allows too much air to come through in one place, however, so cattle comfort may be affected. Again, other localized wind barriers have an effect on this. Plywood sheets and metal roofing sheets have been used for building slatted windbreak fences. Generally, these materials are not as effective as narrower boards. The 4 to 8- inch wide open slots between the wide sheets is too wide an air space. This permits too-much air to pass through the fence in one place. Many more, but smaller slots or openings let the same amount of air through. Sharp edges on the metal can be a hazard to livestock and bending of sheets is a problem. Horizontal or vertical slots or open spaces in a slatted fence perform about the same. Leave a 4 to 6-inch high opening from the ground to the bottom of the fence. This prevents rot, permits drainage, drying, and summer air movement under the fence. Close this opening with straw or snow in winter to reduce drafts. Construct the fence so the boards are next to the cattle. This prevents their pushing and rubbing off the boards in use. Install a horizontal rub rail if cattle will have access to either side of the windbreak fence. Galvanized nails are recommended. Install 6-inch top diameter, pressure-treated posts into the ground about 4 feet deep and on 10 foot centers for most types of soils and for fences up to 12 foot high. Many operators want to improve the appearance of their feedyards and corrals. A penetrating, pigmented stain that includes a wood preservative such as pentachlorophenol is recommended for this. It is easier to apply (especially to rough lumber), usually is less costly, and will last longer than paint. A brown colored stain will not show dirt or staining as readily as will white paint.

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This publication was prepared in cooperation with the Extension Beef Cattle Resource Committee and its member states and produced in an electronic format by the University of Wisconsin-Extension, Cooperative Extension. Issued in furtherance of Cooperative Extension work, ACTS of May 8 and June 30, 1914.

BCH-10200 Windbreak Fences