TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE CASPER, WYOMING NRCS

Engineering No.24 February 8, 2011

Fabricated Windbreaks for Livestock Shelter

Fabricated shelters should be located in areas where the herd is likely to congregate during typical storms. Locate the fabricated windbreak on uplands away from riparian areas and concentrated flow areas so any waste concentration will no longer impair water quality.

If the shelter must be located downwind of a hill, then place the shelter as far downwind as possible. Shelters constructed upwind of a hill shall be placed a minimum of 75 times shelter height upwind of the base of the hill. Shelters designed for both wind and drifting snow must be constructed in a semicircular or V shape with a solid face to divert drifting snow around ends of the barrier. The length of each wing is chosen to give the optimum shelter width. The optimum shelter width is 10 to 15 times the shelter height. Studies at the University of Wyoming show that if the shelter is constructed longer than 15 times the height, drifting snow will be forced up, over the shelter into the protected area.

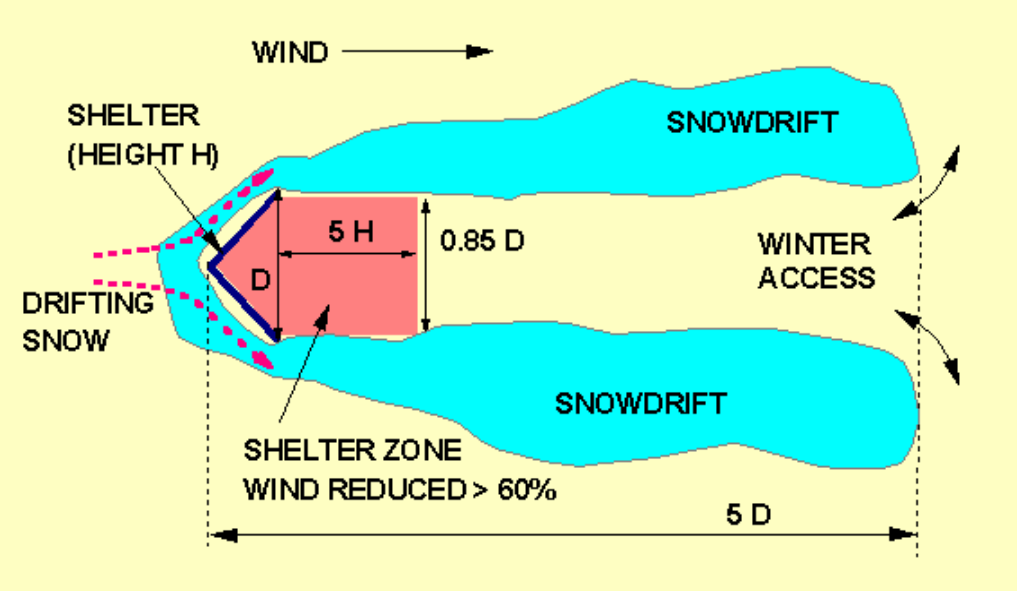

Figure A - Typical Layout for Livestock Shelters

The height and length of the shelter should be adjusted to provide the required protection area for a given herd size. It is recommended that a minimum protected area of 50 square feet per beef cow, 35 square feet per yearling, and 15 square feet per sheep be provided in the sheltered area. Recommended shelter sizing is shown in Table A. The wing lengths shown with the given barrier height will create the optimum shelter width. The protected area for each height and wing length is also shown.

Table A - Sizing Recommendations for Livestock Shelters

Barrier Height (feet)	Wing Length (feet)	Shelter Width (feet)	Protected Area (Square feet)
6	60	85	3,970
8	80	113	7,040
10	100	141	10,990
12	120	170	15,870
14	140	198	21,580

The fabricated shelter should be constructed so that the “V” of the structure faces into the prevailing wind. The prevailing wind direction should be determined by field investigation.

Tables B and C show maximum post spacing by post material and size, shelter height and post bury depth. Table B is for lumber posts and Table C is for steel pipe posts or posts from steel structural shapes.

Table D shows recommended girt sizing and materials based on shelter height and post spacing.

Panel covering shall be 100% solid and shall be constructed from minimum nominal 1 inch boards, 28 gauge coated corrugated steel, or similar durable material.

Tables B, C, and D are based on a design wind speed at 33 feet height of 90 miles per hour, a foundation soil density of 125 lbs. per cubic foot, and the posts will be set in 16 inch diameter holes and backfilled with 3000 psi concrete. A resultant wind speed of 65 miles per hour normal to the wall surface was used in the analysis.

A Wyoming standard drawing, WY-561.DWG has been developed for use with fabricated windbreaks for animal shelter. The design tables in this design note are also included on the standard plan.

Table B - Maximum Post Spacing By Material, Height, and Bury Depth

			Bury Depth 4’	Bury Depth 5’	Bury Depth 6’	Bury Depth 7’
Post Material		Barrier Height	Max Post Spacing	Max Post Spacing	Max Post Spacing	Max Post Spacing
Douglas Fir – Select Grade No. 1 – Fb = 1200 lbs/in^2	6” Dia. Round	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	6’-11”	6’-11”	6’-11”	6’-11”
		10’	X	X	X	X
		12’	X	X	X	X
		14’	X	X	X	X
	8” Dia. Round	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	10’-7”	10’-7”	10’-7”
		12’	X	7’-4”	7’-4”	7’-4”
		14’	X	X	X	X
	10” Dia. Round	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	12’-0”	12’-0”	12’-0”
		12’	X	9’-2”	12’-0”	12’-0”
		14’	X	7’-2”	10’-6”	10’-6”
	6”X6” Square	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-1”	9’-1”	9’-1”	9’-1”
		10’	X	X	X	X
		12’	X	X	X	X
		14’	X	X	X	X
	8”X8” Square	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	12’-0”	12’-0”	12’-0”
		12’	X	9’-2”	10’-3”	10’-3”
		14’	X	7’-2”	7’-6”	7’-6”
	10”X10” Square	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	12’-0”	12’-0”	12’-0”
		12’	X	9’-2”	12’-0”	12’-0”
		14’	X	7’-2”	11’-6”	12’-0”

Table C - Maximum Post Spacing By Material, Height, and Bury Depth

			Bury Depth 4’	Bury Depth 5’	Bury Depth 6’	Bury Depth 7’
Post Material		Barrier Height	Max Post Spacing	Max Post Spacing	Max Post Spacing	Max Post Spacing
ASTM A36 Structural Steel Shapes	2 7/8” Dia. SCH 40 Round	6’	11’-4”	11’-4”	11’-4”	11’-4”
		8’	6’-5”	6’-5”	6’-5”	6’-5”
		10’	X	X	X	X
		12’	X	X	X	X
		14’	X	X	X	X
	4” Dia. SCH 40 Round	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	X	9’-5”	9’-5”	9’-5”
		12’	X	6’-6”	6’-6”	6’-6”
		14’	X	X	X	X
	6” Dia. SCH 40 Round	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	12’-0”	12’-0”	12’-0”
		12’	X	9’-2”	12’-0”	12’-0”
		14’	X	7’-2”	11’-6”	11’-6”
	W5, W6 C6, C8	6’	12’-0”	12’-0”	12’-0”	12’-0”
		8’	9’-10”	12’-0”	12’-0”	12’-0”
		10’	6’-11”	12’-0”	12’-0”	12’-0”
		12’	X	9’-2”	12’-0”	12’-0”
		14’	X	7’-2”	11’-6”	11’-6”

Table D - Girt Size and Spacing Selection Chart

		Post Spacing			
		6’	8’	10’	12’
Barrier Height	6’	(3)-2X4 @ 30” (3)-3” Dia. Wood @ 30” (3)-2” Dia. Steel @ 30”	(3)-2X4 @ 30” (3)-3” Dia. Wood @ 30” (3)-2” Dia. Steel @ 30”	(4)-2X4 @ 20” (3)-2X6 @ 30” (4)-3” Dia. Wood @ 20” (3)-2” Dia. Steel @ 30”	(4)-2X6 @ 20” (3)-2X8 @ 30” (5)-3” Dia. Wood @ 15” (3)-3” Dia. Wood @ 30” (3)-2” Dia. Steel @ 30”
	8’	(3)-2X4 @ 42” (3)-3” Dia. Wood @ 42” (3)-2” Dia. Steel @ 42”	(4)-2X4 @ 28” (3)-2X6 @ 42” (3)-3” Dia. Wood @ 42” (3)-2” Dia. Steel @ 42”	(4)-2X6 @ 28” (3)-2X8 @ 42” (4)-3” Dia. Wood @ 28” (3)-2” Dia. Steel @ 42”	(5)-2X6 @ 22” (4)-2X8 @ 28” (4)-4” Dia. Wood @ 28” (4)-2” Dia. Steel @ 28” (3)-3” Dia. Steel @ 42”
	10’	(3)-2X4 @ 54” (3)-3” Dia. Wood @ 54” (3)-2” Dia. Steel @ 54”	(5)-2X4 @ 27” (4)-2X6 @ 36” (3)-2X8 @ 54” (4)-3” Dia. Wood @ 36” (3)-4” Dia. Wood @ 54” (3)-2” Dia. Steel @ 54”	(7)-2X4 @ 18” (5)-2X6 @ 27” (5)-2X8 @ 36” (6)-3” Dia. Wood @ 21” (3)-4” Dia. Wood @ 54” (3)-2” Dia. Steel @ 54”	(7)-2X6 @ 18” (5)-2X8 @ 27” (4)-2X10 @ 36” (4)-4” Dia. Wood @ 36” (4)-2” Dia. Steel @ 36” (3)-3” Dia. Steel @ 54”
	12’	(4)-2X4 @ 44” (4)-3” Dia. Wood @ 44” (4)-2” Dia. Steel @ 44”	(6)-2X4 @ 26” (4)-2X6 @ 44” (5)-3” Dia. Wood @ 33” (4)-4” Dia. Wood @ 44” (4)-2” Dia. Steel @ 44”	(8)-2X4 @ 19” (6)-2X6 @ 26” (5)-2X8 @ 33” (7)-3” Dia. Wood @ 22” (4)-4” Dia. Wood @ 44” (4)-2” Dia. Steel @ 44”	(8)-2X6 @ 19” (6)-2X8 @ 26” (5)-2X10 @ 33” (5)-4” Dia. Wood @ 33” (5)-2” Dia. Steel @ 33” (4)-3” Dia. Steel @ 44”
	14’	(5)-2X4 @ 39” (4)-2X6 @ 52” (4)-3” Dia. Wood @ 52” (4)-2” Dia. Steel @ 52”	(7)-2X4 @ 26” (5)-2X6 @ 39” (6)-3” Dia. Wood @ 31” (4)-4” Dia. Wood @ 52” (4)-2” Dia. Steel @ 52”	(7)-2X6 @ 26” (5)-2X8 @ 39” (4)-2X12 @ 52” (5)-4” Dia. Wood @ 39” (5)-2” Dia. Steel @ 39” (4)-3” Dia. Steel @ 52”	(7)-2X8 @ 26” (6)-2X10 @ 31” (5)-2X12 @ 39” (6)-4” Dia. Wood @ 31” (6)-2” Dia. Steel @ 31” (4)-3” Dia. Steel @ 52”