

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

HEAVY USE AREA PROTECTION

(Ac.)

CODE 561

DEFINITION

The stabilization of areas frequently and intensively used by people, animals, or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures.

PURPOSE

Improve or protect riparian areas.

Reduce soil erosion.

Improve water quantity and quality.

Improve air quality.

Improve aesthetics.

Reduce livestock stress and mortality.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to urban, agricultural, recreational, or other frequently and intensively used areas requiring treatment to address one or more resource concerns.

CRITERIA

All planned work shall comply with federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Measures shall be taken to limit the generation of particulate matter.

Safety measures of the users shall be incorporated into the design of the heavy use area protection.

Design Load. Design ground load will be based on the type of traffic (vehicular, animal, or human) anticipated on the heavy use area. The minimum design load for areas that support vehicular traffic will be a wheel load of 4,000 lbs.

Foundation. All site foundations shall be evaluated for soil moisture, permeability, texture, and bearing strength in combination with the design load and anticipated frequency of use.

A base course of gravel, crushed stone, other suitable material, and/or geotextile shall be provided on all sites with a need for increased load bearing strength, drainage, separation of material, and soil reinforcement. The Natural Resources Conservation Service (NRCS), National Engineering Handbook (NEH), Parts 642 and 643 (formerly, NEH, Section 20), and AASHTO M-288 (latest edition), provide guidance in quality specification and geotextile selection.

An impervious barrier shall be provided on sites with a porous foundation (high permeability rate) where there is a need to protect ground water from contamination.

Foundation preparation shall consist of removal and disposal of soil and other material that are not adequate to support the design loads.

Drainage and Erosion Control. Provide surface and subsurface drainage, as needed. Remove runoff without causing erosion or water quality impairment. Exclude unpolluted run-on water from the treatment area.

Structures. All structures shall be designed according to appropriate NRCS standards and specifications or NEH recommendations.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#), or visit the [electronic Field Office Technical Guide](#).

**SDTG Notice 256
Section IV
NRCS-JULY 2007**

Ground Surface Treatment. The surface treatment shall meet the following criteria:

Bituminous Pavement. The thickness of the pavement course, the kind and size of aggregate, the type of proportioning of bituminous materials, and the mixing and placing of these materials shall be in accordance with South Dakota (SD) Department of Transportation criteria for the expected loading.

Concrete. The quality and thickness of concrete and the spacing and size of reinforcing steel shall be appropriate for the expected loading.

Other Cementitious Materials. Soil cement, roller compacted concrete, and coal combustion by-products (flue gas desulphurization sludge and fly ash) may be used as surface material if designed and installed to withstand the anticipated loads and surface abrasion.

Sprays and Artificial Mulches. When utilizing sprays of asphalt, oil, plastic, manufactured mulches, and similar materials, the manufacturer's recommendations shall be incorporated into the design.

Vegetative Measures. Fertilizing, soil preparation, seeding, mulching, sodding, and vegetation management shall be according to the planned use and appropriate conservation practice standard.

Other. Surfacing materials, such as aggregate, cinders, tanbark, bark mulch, brick chips, shredded rubber, and/or sawdust, shall have a minimum layer thickness of two inches.

Additional Criteria for Areas Utilized by Livestock

The treated area shall extend an appropriate distance from facilities such as portable hay rings, water troughs, feeding troughs, mineral boxes, and other facilities where livestock concentrations cause resource concerns.

The SD NRCS conservation practice standards Critical Area Planting (342); Fencing (382); Prescribed Grazing (528); Filter Strip (393); or Use Exclusion (472) shall be used as companion practices, when needed.

Waste management must be provided where needed. If the use area will produce a pollution hazard to Waters of the United States, or will otherwise be subject to Clean Water Act regulations, a nutrient management plan shall be implemented for the area.

General Criteria for Livestock Fabricated Shelters for Winter Grazing

Fabricated shelters shall be located in areas where livestock protection is desired during typical storms. The site should be accessible by vehicle.

Locate the fabricated windbreak on uplands away from riparian areas and concentrated flow areas so any waste concentration will no longer impair water quality.

The shelter should be located on level, uninterrupted terrain, if possible, due to the complications on wind flow caused by hilly terrain. If the shelter must be located downwind of a hill, then place the shelter as far downwind as possible. Shelters upwind of a hill shall be placed a minimum of 75 times shelter height upwind of the base of the hill.

Shelters must be constructed with a solid face to divert drifting snow around ends of the barrier.

Shelters shall be 90° "V" shaped or semi-circular shaped, for optimum protection from wind and drifting snow. Wind speed reduction of 60-80 percent is possible in the protected area extending 5H downwind of the barrier (Figure A). The V, or closed end, should point in the direction of winter and early spring prevailing winds. The shelters cause the snow to be diverted around the shelter and deposited in drifts extending five times the shelter width (D) downwind.

Shelter width (D) as measured across the opening between the two end posts of the shelter must be 15H or less. A minimum length is needed to protect from eddy currents (whirlwinds) at shelter ends, however if the shelter is too long, drifting snow is forced up, over the shelter into the protected area rather than being diverted around it. Generally, the

length of each wing of the shelter should be 7-10 times the shelter height.

Design the shelter following Tables 1 and 2.

Table 1. Minimum Protected Area Needed

	Yearling cattle	Beef cows	Sheep
ft ² /animal	35	50	10-15

Table 2. Protected Area at Maximum Wing Length (See Figure A)

Barrier height, ft.	Wing L, ft.	Width D, ft.	Protected area, ft ²
6	60	84.8	3,964
8	80	113.1	7,047
10	105	148.5	11,823
12	125	176.8	16,828
14	145	205.1	22,714

Semi-circular shaped shelters can be built with approximately the same quantity of materials as the "V" design. The ratio of protected area to shelter length is also about 27 percent higher than the "V" shape. Dimensions for the semi-circular shaped barriers should be based on a radius equal to one-half D for the "V" shaped barriers as shown in Table 2. Semi-circular shelters are generally the most economical (material cost per protected square foot); however, the type of material used for board or panels can be a limiting factor due to the shape. The semi-circular shape also tends to be self-bracing.

Criteria for Fence (Straight Line) Shelters for Feedlots.

Fabricated windbreak protection for open feedlots is usually straight line windbreak fences. These windbreaks are not as effective as the "V" shaped design since less protection is provided if wind direction varies from anything perpendicular to the fence. Snow is forced over the fence and deposited downwind of the structure rather than diverted around it.

Fence shelters may be designed either as solid barriers or as porous (open) fences.

Solid fences are typically located adjacent to the lot to be protected along the lot perimeter since snow accumulation does not usually extend out far from the fence. Wind protection is good in the area next to the fence. Wind drops the snow upwind of the fence a distance of 1 fence height (1H) and downwind of the fence 5H. The wind protection area extends 15H downwind of the fence (10H below the snow drop zone). See Figure C.

Porous or open fences are more effective at controlling wind than solid fences and drop more snow. The porous fences are usually located upwind of the lot far enough to keep the area to be protected out of the snow drop zone. The major snow drop zone is of shallower depth than a solid fence but extends downwind a greater distance (10H) from the barrier. The wind protection area extends 20H downwind of the fence (10H below the snow drop zone). See Figure D.

Porous barriers must have approximately 80 percent solid and 20 percent open surface area (Figure B). The openings may run vertically or horizontally. Porous barriers must be mounted approximately 12 inches above the ground to reduce eddy currents (whirlwinds) and allow wind to keep sweeping the snow downwind of the fence.

General Structural Criteria for Fabricated Windbreaks

Panel covering shall be minimum nominal 1-inch lumber, 28-gage coated corrugated steel, or similar durability material. Boards or panels should be attached to the windward side of the shelter. Provide rub rails or other features as needed to protect the structure from animal damage.

Wood installed within eight inches of the ground must be pressure treated (or equal). Where a fabricated shelter is to be constructed of wood, the structure may be designed by an engineer, or sizes and spacing shown in Table 3 may be used.

Table 3. Post Spacing for Fabricated Windbreaks (Minimum 6" Tops)

Barrier height, feet	Pole length, feet	Min. depth, feet	Pole spacing feet	Girt Number & size
6	8	3.5	10	3, 2x8
8	10	3.5	10	4, 2x8
10	12	4	8	5, 2x6
12	14	4	6	6, 2x4

Additional Criteria for Areas Utilized for Recreation

The treated area shall be conducive to the overall recreation area and aesthetically blend with the general landscape and surroundings.

Areas used for public recreation must conform to the Americans with Disabilities Act.

CONSIDERATIONS

When stabilizing heavily used areas, consider adjoining land uses and the proximity to residences, utilities, cultural resource areas, wetlands or other environmentally sensitive areas, and areas of special scenic value.

For heavy use areas, conducive to protection by vegetation, consideration must be given to the effect(s) of treading and/or miring. The vegetative species selected should tolerate and persist under heavy use conditions. If practicable, consider increasing the size of the area and/or establishing a rest/non-use period to allow plant recovery and increase vigor.

Consider effects on the water budget, especially on volumes and rates of runoff, infiltration, and transpiration due to the installation of less pervious surfaces.

Heavy use area protection effects on the water budget, especially on volumes and rates of runoff, infiltration, and transpiration due to the installation of less pervious surfaces should be considered in the selection of surfacing materials.

The transport of sediments, nutrients, bacteria, organic matter from animal manures; oils, chemicals, and particulate matter associated with vehicular traffic; and soluble and

sediment-attached substances carried by runoff should be considered in selection of companion conservation practices.

Consider using additional air quality conservation practices such as Windbreak/Shelterbelt Establishment (380) or Herbaceous Wind Barriers (603) to impede transport of particulate matter.

Consider locating the fabricated windbreak or heavy use area away from water bodies or riparian areas. Consider installing a water facility adjacent to a fabricated windbreak.

Work in and/or discharges near streams, wetlands, or water bodies may require a permit from the U.S. Army Corps of Engineers, SD Department of Environment and Natural Resources, or local authority.

PLANS AND SPECIFICATIONS

Plans and specifications shall meet this standard and include requirements needed to achieve the purpose.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the owner/operator. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

For livestock operations, the O&M plan for heavy use areas may be included as a part of the overall waste management plan. Periodic removal and management of manure accumulations.

REFERENCES

Jairell, R. L. and R. A. Schmidt. 1991. Taming Blizzards for Animal Protection, Drift Control, and Stock Water. Proceedings, The Range Beef Cow Symposium XII, Dec. 3-5, 1991, Fort Collins, CO, 11 pages.

Johnson, D. Windbreak/shelter Fences. 1975. Great Plains Beef Cattle Feeding Handbook, GPE-5200. P. 5200. 1-4.

Jones, D. D. and W. H. Friday. Wind and Snow Control for the Farmstead. Emergency Management in Agriculture AE-102, Purdue

University Cooperative Extension Service. 11 pages.

Meiman, P. 1993. Cost Analysis of Wind Protection Structures for Range Beef Cattle. Range Livestock Problem, University of Wyoming RGMG 4540-03. 15 pages.

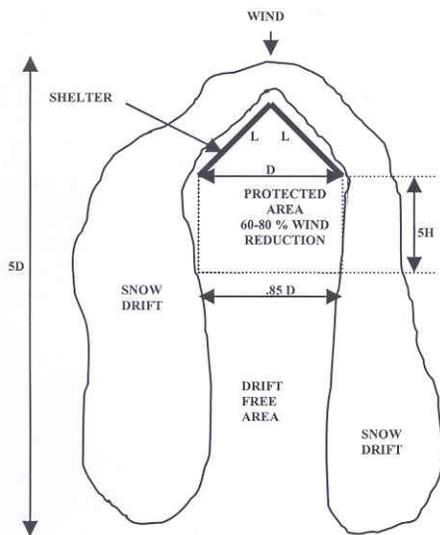


Figure A. Snowdrift Protection (Plan View)

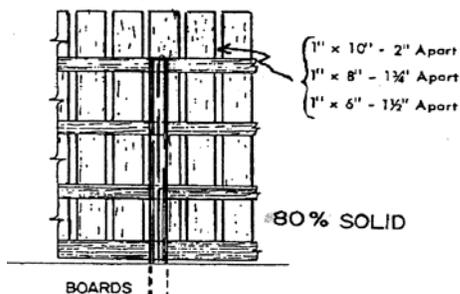


Figure B. 20 Percent Porous - 80 Percent solid Structure



Figure C. Protection zone for a solid windbreak fence.

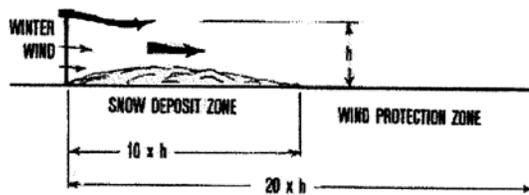


Figure D Protection zone for a porous windbreak fence.