

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**LIVESTOCK SHADE STRUCTURE**

(Each)

CODE 717

**DEFINITION**

A permanent or portable framed structure with a mesh fabric roof to provide shade for livestock.

**PURPOSES**

This practice may be applied as part of a resource management system to provide shade areas for livestock, helping protect surface waters from pollution and the livestock from excessive heat.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies in areas:

- (1) Where animal productivity and well being is adversely affected by heat generated from sunshine; or
- (2) Where livestock are excluded from natural shade along streambanks or other watercourses.
- (3) Where conditions and time of year allow adequate grazing.

**CRITERIA**

**Federal, State and Local Laws.** All planned work shall comply with all Federal, State and Local laws or regulations.

**General.** Livestock shade structures can be permanent or be made to be moveable with farm equipment. The structure(s) shall be sized to meet the needs of the livestock operation but shall not be less than 80% of the recommended shade requirement (See Table 1). The maximum size of an individual portable unit (shade frame) shall be limited to 25 feet by 42 feet.

**Orientation.** If it is desirable for the area to be kept dry, the long axis shall be oriented in the north to south direction. This will permit a greater amount of sunshine to affect the total shaded area. If the animals are to be confined under the structure, then an east to west orientation of the long axis is more desirable.

**Protection.** The top of the structure shall be relatively flat so the strong winds will have a minimum effect on the structure. A 1.0-foot pitch for the top of the structure is permissible to provide faster rain runoff from the roof.

**Location.** The structure shall be located on a well-drained site, if possible, and as far as practicable, but no less than 200 feet from any surface water, at least 150 feet from any up gradient well and at least 300 feet from any down gradient well. If a well-drained site is not possible, a portable structure shall be used. The structure shall be located a minimum of 50 feet from any type structure that could be an obstruction to the circulating air. Portable structures shall be moved to new locations periodically to prevent destruction of vegetation in the immediate area. The structure shall not be located in the general vicinity of a water source or mineral block in order to create a desired livestock grazing pattern. Water and minerals can be part of the shade structure if:

1. The structure will be moved when vegetative cover under it approaches 75% or...
2. It is moved with the rotated animals being grazed to the next paddock.

**Materials.** Planning, design, and construction shall ensure the structure is sound and of durable materials commensurate with the anticipated life of 10 years.

**Steel Structural Members.** The main structural members shall be constructed of 2-inch

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minimum, nominal diameter pipe meeting or exceeding the requirements of ASTM A-53 for Schedule 40 pipe (wall thickness of 0.154 inch). Longitudinal members of the top frame shall be constructed of 1.25 inches minimum nominal diameter steel pipe meeting or exceeding the requirements of ASTM A-53 for Schedule 40 pipe (wall thickness of 0.140 inch). All structural members, welds and areas of damaged coatings shall be galvanized or otherwise protected with a zinc dust-oxide coating. The protective coating of the pipe is not required if the pipe wall thickness exceeds the minimum wall thickness by at least 20 percent.

Vertical members spacing shall not exceed 21 feet in the longitudinal direction and 15 feet in the traverse direction. The length of vertical members shall not exceed 12 feet except that length may be increased to 13 feet to provide for a slope (pitch) to the top of the structure. A minimum of 7 feet shall be provided for a swine shade structure.

Bracing shall be provided at the junction of all structural members. The corners of the roof frame shall be braced with a 0.75-inch diameter steel bar, 1.25 inches minimum diameter steel pipe, or other methods providing equivalent rigidity. At junctions of vertical members with roof frame and ground frame, knee bracing of equivalent section shall provide bracing to the main members, 0.25 inch gusset plates or other methods providing equivalent rigidity. All welding shall be continuous, professionally completed, and suitable for the material used.

Wooden Structural Members. Wood design for permanent or portable structures shall be in accordance with sound engineering principles. Pressure treatment requirements shall be in accordance to Vermont Regulations.

Fabric. Mesh shade cloth shall be constructed of high quality polypropylene fabric or similar materials and shall be recommended by the manufacturer to be suitable for this use. The cloth shall provide at least 80% shade level and be made with ultraviolet light (UV) protective materials. The edges of the fabric shall be taped and/or sewn to not unravel and grommets shall be installed on the edges of the cloth at maximum of 2 feet.

The shade cloth shall be adequately secured to the shade cloth frame with UV protected polypropylene rope or other equivalent

methods so as to provide adequate and even tension on the fabric and accordance with the manufacturer's recommendations.

## CONSIDERATIONS

The recommended shade requirement for livestock is shown in Table 1:

**Table – 1 Recommend Shade Requirement**

| Animal Type               | Recommended Shade Requirement (FT <sup>2</sup> /Head) |
|---------------------------|---|
| 400 Pound Calves          | 23  |
| 800 Pound Feeders         | 32  |
| Beef Cattle               | 40  |
| Dairy Cattle              | 50  |
| Mature Swine and Dry Ewes | 20  |

The manufacturer typically warrants the cloth for at least five years. Replacement of the cloth may be necessary during the life of the structure.

Tie down of portable structures at the four corners is recommended for protection from wind.

Removal and storage during winter months can extend the life of the shade cloth.

Consider the use of fabric designed to allow wind to easily pass through the fabric while still providing shade.

Construct the bottom of portable structures with skids to make relocation easier. For smaller animals, ATV sized tires can be used to make relocation and storage easier.

Consider applying NRCS conservation practice Heavy Use Area Protection, Code 561 where vegetation cannot be maintained underneath the shade structure.

Shade structures will have a minimal or no affect on the water budget.

The shade structure should have an overall positive impact on water quality by reducing the cattle loafing times in riparian areas.

Due consideration should be given to economics, the overall waste management system plan, and safety and health factors.

**PLANS AND SPECIFICATIONS**

Plans and specifications for livestock shade structures shall be in keeping with this standard and shall describe the requirements for applying this practice to achieve its intended purposes. Plans and specifications shall include construction plans, drawings, job sheets or other similar documents. These documents shall specify the requirements for installing the practice, including the kind, dimensions, amount, material coating, and quality of materials to be used.

**OPERATION AND MAINTENANCE**

Shade cloth should always be kept tight so that it will not be damaged by wind.

Replace the cloth when it has deteriorated due to environmental conditions.

Maintenance coatings may need to be replaced on the structural steel components.

Portable structures should be moved periodically to prevent destruction of vegetation in the immediate area.

**REFERENCES**

NRCS Vermont Conservation Practice Standards:

- Code 561 – Heavy Use Area Protection
- Code 313 – Waste Storage Facility



**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**LIVESTOCK SHADE STRUCTURE**

(Each)

CODE 717

**Livestock Shade Structures.** This specification covers the materials and installation of Livestock Shade Structures.

Structural Materials. Structural members shall meet the requirements of conservation practice standard Livestock Shade Structure, Code 717.

Fabric. Fabric shall meet the requirements in conservation practice standard Livestock Shade Structure, Code 717. Fabric shall be constructed of high quality materials and shall be recommended by the manufacturer to be suitable for this use. The mesh fabric shall provide 80 percent shade.

The shade cloth shall be adequately secured to the shade cloth frame with ultraviolet light (UV) protected polypropylene rope or equivalent methods so as to provide adequate and even tension on the fabric in accordance with the manufacturer's recommendations.

**Shop Fabrication.** Shop fabrication of structural elements may be performed for easy field assembly in lieu of welding. All such fabrication shall permit assembly of the structure to have the strength equal to that of a continuously welded structure. All such fabricated-members shall be joined by no less than two-0.5 inch machine bolts with connecting members being no less than double pipe thickness of 0.375-inch steel plate. The designer shall provide plans for such fabrication.

**Variations.** Planned variations from the above materials and installation specifications must be approved before construction by the responsible designer, provided it is determined that such variations will result in an installation that will meet or exceed one installed in accordance with the above specifications. These variations will be documented and recorded on the design.

**Construction Tolerance.** Structural dimensions and materials used shall be documented in writing. Minor construction tolerances may be accepted by the person responsible approving the construction.