

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD  
BARNYARD WATER MANAGEMENT SYSTEM  
(acre)  
CODE707

DEFINITION

A planned system to reduce, collect and treat runoff from a barnyard including any concentrated livestock areas.

PURPOSE

To control the amount, rate and quality of runoff or leachate from barnyards including concentrated livestock areas.

CONDITION WHERE PRACTICE APPLIES

This practice applies:

1. As part of an Agricultural Waste Management System (312);
2. Where the barnyard water runoff results in a potential for water pollution;
3. Where barnyard soils, site conditions, or topography are suitable for successful implementation of the component practices.

CRITERIA

Planning: Runoff from barnyards must not be discharged directly into streams, water courses, lakes, aquifers, or other water bodies. Necessary components must be planned and designed to eliminate most outside water from entering the barnyards. The runoff water discharged from barnyards shall be collected for treatment, utilization or storage when a pollution potential hazard exists.

Relocation, reduction, or elimination of the barnyard area will be evaluated, especially where a stream or watercourse flows through or is adjacent to the site.

All federal, state, and local laws, rules, ordinances and regulations governing waste management, pollution abatement health and safety shall be followed.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Design: Barnyard water management systems shall be designed in accordance with the individual practice standards, and be compatible with each other in capacity and function. The system will be designed to be capable of handling a 25 year storm event.

Outside Water Exclusion: All components shall be installed that are needed to keep uncontaminated runoff from entering the barnyard. This includes runoff from:

1. Outside land area: Runoff from outside land areas shall be excluded from the barnyard area by use of diversions, curbs, dikes, drop inlets with underground outlets, etc.
2. Roof Runoff: Runoff from roof areas draining to barnyards shall be excluded using NRCS Conservation Practice Standard ME558; Roof Runoff Management System.
3. Ground Water Seepage: Ground water seepage shall be intercepted by a drainage system sized to carry the anticipated seepage water. Conduits under farm roadways or concentrated tractor traffic areas shall be capable of withstanding the intended load. Installation of drainage systems in the vicinity of silos and barnyards shall not allow silage juices or barnyard water to enter clean water drainage systems.
4. Other Water Sources. Measures will be installed to prevent all other water sources such as overflowing waterers or cooling water from draining into the barnyard.

Polluted Water Control: Polluted runoff and/or seepage from a barnyard shall be excluded from all water courses or streams. This may be accomplished by:

1. Barnyard Relocation: Relocate the barnyard to an area that minimizes the risk of polluted runoff.
2. Barnyard Size Reduction: Evaluate the purpose of the barnyard and size according to Table 1. Round feeders and feeder wagons placed on the slab occupy significant area. Discount this area for animal use and/or increase square footage per animal.

Table 1  
Barnyard Sizes  
(square feet/animal)

Purpose	Dairy	Beef	Heifers
	1,400 lbs.	1,000 lbs.	500 lbs.
Holding	15	12	8
Feeding	60	60	30
Resting	60	60	30
Heat Detection & Exercise	75	65	45

3. Barnyard Grading: Grade the barnyard when there is a need to redirect the runoff to an acceptable land area or collection point for storage or treatment. The animal waste and loose soil mixture will be removed to expose a suitable foundation for subgrade preparation. This material shall be disposed of in a suitable manner. The gravel fill for subgrade should contain approximately 15 percent fines (silty gravel) or similar material which is capable of being compacted to provide a dense base and achieve the elevations and grade for the surface of the barnyard.

4. Barnyard Paving: Pave barnyards for ease of cleaning, cleanliness of the animals, and to minimize animal hoof discomfort. Paving can consist of concrete, asphalt, compacted silty gravel or other suitable material. Asphalt and concrete paving provide for permanent redirection of runoff to planned areas. Daily cleaning reduces the polluted runoff potential from large storms.

Concrete: When using concrete pads or paving, a minimum of 12 inches thickness of compacted drainfill material (about 5 percent fines) shall underlay the concrete pad or paving. Slabs shall be a minimum of four (4) inches thick and shall have a minimum reinforcement of 6"x6", 10 gage by 10 gage welded wire fabric with maximum joint spacing of 30 feet. Slabs that will be subjected to heavy traffic loads or severe weather shall be reinforced with #3 rebar at 18 inches each direction. Leave surface of concrete rough to prevent animal's from slipping. Alternate slab designs shall be based on ACI360R-92, "Design of Slabs-on-Grade".

Asphalt: When using asphalt paving, a minimum of 12 inches thickness of compacted drainfill material (about 5 percent fines) shall underlay the pavement. Aggregate gradation for the binder course shall be MDOT grading "B". The asphalt shall be placed in two layers at a temperature of 300F + 25F and compacted to a total finished thickness of 3 inches.

Gravel Paving: Gravel paving shall be considered where redirection of runoff is not critical for collection and/or where use for small herds reduce the need for frequent cleaning. A woven geotextile material shall be specified for placement on the completed subgrade prior to any base course placement. The gravel paving shall consist of a compacted base course and top course. The base course shall be a drainable granular fill which has a minimum thickness of one (1) foot. If a soft subgrade potential exists, a thicker base course should be considered. The granular fill may be cobbles (3 to 12 inches) with some course gravel (3/4 to 3 inches) well graded gravel or similar material. The top course shall be a minimum 6 inch thick surface layer of compacted silty gravel or similar material. A thicker top course layer can prolong time before re-paving is needed.

5. Runoff Control: When barnyard runoff is collected, it shall be transferred to a treatment or storage system.

A. Collection and Transfer: Concrete paved barnyards shall have adequately reinforced curbs to prevent solids from leaving the pavement during cleanup. The pavement and curbing should direct the runoff to desired collection point(s).

Curb Purpose	Minimum Height (inches)
Runoff Control	6
Scraping	8
Bump Wall	18
Runoff Storage	25 year storm event

Gravel paved barnyards shall have a runoff collection system that is appropriate and compatible with the treatment or storage system being used.

If barnyard runoff is to be transferred to a waste storage facility, a settling basin is not required. Design settling basin curb height based on a 25 year storm event. Consider grading and shaping the barnyard to incorporate the settling basin into the barnyard itself.

A filter area for barnyard runoff shall conform to the criteria set forth in NRCS Conservation Practice Standard ME393; Grass Filter Area. To prevent continuous flows onto the grass filter positive control of urine and other liquid sources must be achieved.

The settling basin will fill the deposition at variable rates based upon runoff and cleanliness of feedlot. Regular cleaning

is essential for proper functioning of a filter treatment system receiving barnyard runoff.

B. Storage and Treatment: Barnyard runoff can be collected and stored for field application during growing season. Storages shall conform to the criteria in NRCS Conservation Practice Standard ME313:Waste Storage Facility.

C. Roofing of Barnyard: When all above measures are not feasible due to site conditions or economics, then a barnyard roof may be considered. Roofs shall be designed to meet BOCA snow and wind loads.

6. Fencing: Barnyard will be fenced to contain livestock in accordance with NRCS Conservation Practice Standard ME382; Fencing.

7. Silage Leachate: Where needed and appropriate, silage leachate control will be provided as part of the overall barnyard water management system. Collection of silage leachate may be done on a seasonal condition, when silage is weeping.

#### CONSIDERATIONS

The use of an intensive rotational grazing system to reduce or eliminate large barnyards should be considered where appropriate.

Concrete paving will increase the amount of runoff that must be stored or treated.

#### PLANS AND SPECIFICATIONS

Plans and specifications for barnyard water management shall be prepared to show measures needed to meet the requirements of Outside Water Exclusion and/or Polluted Water Control portion of this standard and the standards of component practices. The sequence of installation shall provide for the installation of all outside water exclusion practices before or simultaneously with any other components of a barnyard water management system.

#### OPERATION AND MAINTENANCE

An Operation and Maintenance plan shall be provided that includes the scraping interval and collection and treatment requirements. When concrete pads are installed, cleaning shall be accomplished daily to weekly, depending on manure deposition rate. Fences shall be maintained in locations originally installed and properly mended. Gravel paving of a barnyard area is a temporary measure and may need re-grading with time, depending on cattle traffic and existing sub-base conditions.

## REFERENCES

Beef Housing and Equipment Handbook. Mid West Plan Service. 4th ed. Ames, IA:1987.

Agricultural Waste Management Field Handbook, Part 651 National Engineering Handbook. USDA-NRCS, Washington, D.C.

Protecting Water Quality While Raising Heifers Outside. Wright, Peter E. Calves, Heifers and Dairy Profitability: Facilities, Nutrition, and Health. Northeast Regional Engineering Service. NRAES-74.1996.

Design of Slabs on Grade. ACI360R-92; American Concrete Institute, Detroit, MI, 1992.