

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

HEAVY USE AREA PROTECTION

(Acre)

CODE 561

DEFINITION

Protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures. This standard also includes protecting areas used for livestock feeding and watering, loafing, exercising, or confinement by surfacing with suitable materials, and installing control structures, if necessary.

This standard does not apply to Access Roads (560)

PURPOSE

This practice may be used as a part of a conservation management system to support one or more of the following resource concerns.

- Improve soil quality
- Reduce soil erosion
- Improve water quantity and quality
- Stabilize pastures, feeding areas, loafing areas, exercise corrals, livestock traffic lanes or facility areas frequently or intensely used by livestock
- Improve air quality
- Improve aesthetics

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; and areas where soil requires special treatment to protect it from compaction, pugging, erosion or other deterioration caused by human, vehicular or livestock use.

CRITERIA

All planned work shall comply with Federal, State, and local laws and regulations.

Facilities installed under this standard shall be planned and designed for a 10-year minimum functional service life when appropriately maintained.

Drainage and Erosion Control. Provisions shall be made for surface and subsurface drainage as needed, and for disposal of runoff without erosion or transport of contaminants. Drainage provisions need to consider diversion of runoff up slope of the facility, grading to prevent ponding and erosive velocities on the improved surface, and increased down slope runoff resulting from surfacing.

Vehicular Loading. Areas subject to automotive traffic shall be surface treated for a designed minimum wheel load of 4,000 lb. Areas subjected to frequent heavy truck traffic must be designed for the appropriate wheel loading.

Non-Vehicular Usage. Areas subject to intensive human usage shall be permanently vegetated or surfaced. Surface treatment shall be placed on a stable base, and be a minimum of two inches thick unless stated otherwise in the applicable surface treatment section. Concrete placed for non-vehicular & non livestock usage (such as sidewalks) shall have a minimum thickness of 3½ inches.

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

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.

Additional Criteria for Livestock Heavy Use Area Protection

Planning. Feeding pads installed in areas other than total livestock confinement are to be planned as a component of a Grazing Management Plan meeting Conservation Practice Standard 528- Prescribed Grazing.

Other components such as waste storage structures, pasture management, winter feeding planning, livestock watering systems, roof runoff management, fencing, buffer strips, access roads, and diversions shall be considered in the overall conservation plan and incorporated into the design as needed. Livestock stream crossings needed as part of a livestock use area are to follow crossing criteria in Conservation Practice Standard 560- Access Road.

For materials other than concrete, pad durability will be impacted by the amount of manure accumulation, cleaning frequency, cleaning methods, presence of frozen material, exposure to weather conditions, and moisture conditions of the pad surface. Cleaning will require care to prevent removal of the pad surface, or the operator will need to plan on frequent maintenance (resurfacing) to maintain the minimum required base thickness.

Location. To minimize the potential for contamination of streams, pads should be located outside of flood plains. However, if site restrictions require location within a flood plain, protect the pad from inundation and damage from a 25-year flood event, or larger if required by laws, rules, or regulations. If the pad is located within 100 ft of a watercourse that is likely to receive flow during the period the pad is in use, runoff and manure management measures will be incorporated into the design to prevent stream degradation from erosion and/or polluted runoff.

- Locate the pad a minimum 300 ft from neighboring residences
- Not within the 1 year time of travel area for a public water supply well delineated under Ohio's Source Water Assessment and Protection Program, or not within 1000 ft. of a public water supply well when the 1 year time of travel area has not been established
- Not within the emergency management zone of public surface water supply as designated under the Source Water Assessment and Protection Program, or not within 1500 ft. of the surface supply intake when a emergency management zone has not been established
- Not within 300' of a non-community public, or neighboring private water supply well
- Not within 50' of a well controlled by the owner of the facility planned for installation under this standard.

The Federal Emergency Management Agency (FEMA) has designated Established Regulatory Floodways in the floodplains of some Ohio rivers and streams. Do not locate facilities within an Established Regulatory Floodway.

Manure Management. If accumulated manure on the pad needs to be scraped for livestock management objectives, or to prevent environmental degradation while in use, then a manure management system meeting current Ohio Conservation Planning Policy must be developed.

Sizing. For cattle feeding pads within a grazing area, where livestock have continuous access to the pasture, the pad is to be sized to provide stability for the intensively used area under and immediately adjacent to the feeder. The minimum pad dimension for feeding with one 8½' diameter hay ring is 32'x32'.

Where cattle need to be periodically "locked on" to a pad as part of a winter feeding plan for pasture protection, the recommended pad size is from 60 to 75 ft² per head. In this circumstance, cattle are not expected to be confined to the pad more than 30 cumulative days during any 12-month period.

For confined feeding operations (feedlots and pen pack manure), the area is to be sized upon recommendations from Midwest Plan Service or livestock industry publications.

Cleaning Frequency. The facility must be cleaned frequently enough that accumulated manure solids will not run off from the pad. If planning criteria requires the area to be cleaned of manure or waste feed more frequently than three times each year, the surface material needs to be concrete or asphalt. If the planning criteria allow cleaning the area three times each year or less, the area may be surfaced using other acceptable materials.

For confined uncovered beef feedlots, the maximum recommended cleaning interval is two weeks.

Surface Materials

- **All Surfaces.** The subgrade must be reasonably uniform without abrupt changes from hard to soft. The upper 12" of the subgrade shall be of uniform material and compacted to a uniform density throughout. All fill material used in the preparation of the subgrade shall be similar to the in-place material and shall be compacted to the density of the in-place material.

Concrete Slabs. Design slabs considering the required performance and the critical applied loads. The subgrade material must be evaluated as to the suitability and denseness. A 4-inch thick layer of crushed gravel or limestone shall be provided as a uniform subbase. Where the subgrade is uniform and dense, a Type S-1 concrete slab is acceptable. Type S-2 concrete slabs shall be used where the subgrade material is non-uniform or has variable density, and it is not economical or feasible to improve the subgrade. The subgrade thickness in question is generally 12 inches, but could be more, depending on the soil profile. Design Criteria for Type S-1 and S-2 concrete slabs is found in the Ohio NRCS Concrete Construction specification.

Bituminous Pavement (Do not use for livestock applications) 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 Ohio Department of Transportation (ODOT), item 401 - Asphalt Concrete Pavements or 422 - Chip Seal with Polymer Binder, for the expected loading.

Aggregate Pads. Aggregate pads consist of a geotextile fabric, overlain with aggregate base material, overlain with surface material. Where pads are installed on well drained soils and the sub-base will not be subjected to saturation (dry subgrade), the requirement for the geotextile underlayment may be waived by the NRCS Engineer.

Geotextile Fabric Minimum Average Roll Values (MARV):

- Minimum tensile strength (ASTM D 4632) – 120 lb
- Elongation at failure (ASTM D 4632) -- < 50% for woven; ≥ 50% for non-woven
- Minimum burst strength (ASTM D 3786) – 210 psi
- Minimum puncture strength (ASTM D 4833) – 60 lb
- Apparent opening size (ASTM D 4751)
 - ≤ # 40 U.S. Standard Sieve (AOS) ≥ # 100 U.S. Standard Sieve (≤0.42mm (AOS) ≥ 0.149mm)
- Permittivity (ASTM D 4491) ≥ 0.03 sec⁻¹, ≤ 0.70 sec⁻¹
- Minimum ultraviolet light protection (% residual tensile strength, ASTM D4355) – 70%

The minimum compacted base thickness of crushed gravel or limestone, subjected only to livestock access, is 6 inches. Where the pad is subjected to vehicular traffic, an 8 inch compacted base is required.

The minimum thickness for limestone or crushed gravel screenings placed on top the base, for use as a surface on livestock pads, is 3 inches. This 3-inch layer is considered only as a sacrificial wear surface and not part of the structural base.

Table 1 can be used to configure stone pads using alternate base and surface materials.

Pad Material Configurations (minimum compacted thickness)						
Pad Material	Livestock only			Livestock & Vehicular Traffic		
	A	B	C	A	B	C
1 /AASHTO M 43 # 1 or 2	4"	4"		6"	4"	
AASHTO M 43 # 57 or 67	2"			2"		
2 /ODOT 304.02 or 411.02		2"	6"		4"	8"
Screenings (pad surface) AASHTO M 43 No. 9 or 10 limestone aggregate	3"	3"	3"	3"	3"	3"

Table 1

1/ The voids between the stone are to be choked with fines (57s', 67s', 304s' or 411s') to create a smooth surface.

2/ Compaction is required for materials containing fines (e.g. 304's & 311's). Compact by tracking over the entire surface with a minimum of 4 passes of a drum roller, or vibratory drum roller. Rubber tired equipment having a 4000 lb minimum wheel load may be used when the entire surface can be uniformly tracked. Addition of water may be necessary to obtain maximum compaction. The moisture content should be sufficient that a hand held ball can be formed, and material will stain the hands.

For dry subgrade installations, without geotextile fabric, alternate "A" or "B" is to be used. When placing pad materials containing fines, compact by tracking with rubber tired equipment. Addition of water may be necessary to obtain adequate compaction.

FGD. (Use only in livestock applications) Wet Flue Gas Desulfurization (FGD) material is available to areas near the Conesville (Coshocton Co) and Gavin (Gallia Co) coal-burning power plants operated by American Electric Power (AEP).

FGD installations for livestock heavy use areas were made in 1997, 1998 and 1999. FGD material is acceptable under this standard for installations where scraping more frequently than three times each year will not regularly occur.

Wet FGD generated by the AEP Conesville and Gavin plants is to be installed following OSU Extension Factsheet (AEX-332-99) and Ohio EPA Permit to Install (PTI), Application No. 07-0037 dated June 25, 1997.

Additional power generators may also have wet FGD available. To meet this standard, the FGD material must be manufactured in accordance with OSU Extension Factsheet AEX-332-99, and be approved by the Ohio EPA for its intended use. The FGD supplier is to furnish these certifications prior to delivery.

Other power plants also produce dry FGD. OSU Extension does not currently have a factsheet for this material. Usage of dry FGD within this standard may be approved by NRCS Engineers, on a case by case basis, in consultation with appropriate OSU Extension personnel after OEPA permits are obtained. Although FGD material used within this standard is acceptable for construction of pads, NRCS does not warranty the performance of the material. If installed FGD material does not perform as indicated in the maintenance section of AEX-332-99, the landowner is responsible for follow-up maintenance, which may include contacting the FGD supplier for an overlay.

Equine Use Area Protection

This section addresses special criteria for pads installed for equine loafing, travelways, exercising, or temporary confinement.

- Pads may be installed within 300 ft. of neighboring residents. Where pads are to be located within 50 ft. of a neighboring residence, the landowner is to provide written evidence that the neighbor has been contacted and has no objection to the location.
- The recommended minimum pad size ranges from 40'x40' for a single horse up to 60'x60' for multiple horses on the pad at once. These minimum pad sizes consider the horses to be stabled the majority of the time and brought onto the pad periodically for exercise and training. Where horses are planned for confinement to the pad for long periods, the recommended pad size needs to be increased as recommended by an equine specialist. Livestock feeding on the pad is not recommended unless measures are made to remove excess/discarded feedstock from the pad surface. Accumulated manure or waste hay will soften the pads.
- The pads shall be designed and maintained to minimize the potential of foot/h hoof damage by preventing contact with course aggregate.
- Aggregate pads consist of a geotextile fabric, overlain with a finished thickness of 6" of compacted AASHTO M 43 No. 9 or 10 limestone aggregate, as specified in the ODOT Construction and Material Specifications, 703 Aggregate. Where required for weak subgrade conditions, 4 to 6" of AASHTO No. 1, 57, or ODOT 304 limestone aggregate may be used to stabilize the pad foundation.
- Pads are to be graded for positive drainage to prevent ponding and excessive velocities that could displace fines on the pad surface. Grades between 1 and 2 percent are recommended.

Fencing may be necessary to restrict animal access or for confinement purposes. Where fencing is necessary, consideration should be given to fencing that is highly visible and will not pose a safety hazard to the animal(s). Such fencing can include rail/board, rubber, high-tensile polymer, mesh,

electric or combinations of these types. Minimum height for fencing shall be 60 inches to deter most horses from jumping over. The minimum height from the ground shall be no lower than 6 inches.

Structures

All structures shall be designed in accordance with appropriate NRCS standards and specifications or Engineering Handbook procedures.

Sprays and Artificial Mulches

Sprays of asphalt, oil, plastic, manufactured mulches and similar materials will be installed in accordance with the manufacturer's recommendations.

Vegetative Measures

Liming, fertilizing, seeding and will follow the recommendations in Section IV, FOTG Appendix A as appropriate for the intended purpose of the vegetated area. Sodding and vegetative establishment in highly erodible areas will follow Conservation Practice Standard 342, Critical Area Planting.

If vegetative treatment is not appropriate, structural or bio-engineering measures will be used to control erosion.

Safety

Necessary safety features, considering the intended use and site topography, will be included in the plan.

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.

Plants, landscaping timbers, traffic control measures, wooden walkways, etc. shall be evaluated for effectiveness, aesthetics and accessibility as covered by 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.

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, oils and chemicals associated with vehicular traffic, and soluble and sediment-attached substances carried by runoff should be considered in selection of companion conservation practices.

If the purpose of the heavy use area protection is improvement of water quality, the heavy use area should be (re)located as far away from the waterbody or watercourse as possible. Any work in and/or discharges near streams, wetlands or water bodies may require a permit from the US Army Corps of Engineers, state water quality (permitting) authority, or local authority.

Screenings consisting of # 10 crushed stone and smaller particles may be used as wear surface for pedestrian traffic. However, this material is easily tracked into buildings and vehicles when wet. Concrete or asphalt pavement should be used as an alternate surfacing material when cleanliness is a consideration.

PLANS AND SPECIFICATIONS

Plans and specifications for heavy use area protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. 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, amount and quality of materials to be used.

OPERATION & MAINTENANCE

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the landowner or 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 service life of the practice.

The landowner is to be given an O&M plan with the design that address the following considerations as appropriate:

Assumptions used to design the pad need to be reviewed if the herd size or livestock management methods change.

FGD and Aggregate pads will degrade over time with animal usage and cleaning, and will likely need periodic resurfacing to sustain a 10-year service life:

- FGD: Once the pad thickness wears down to 6 to 8 inches the FGD may begin to break up. The landowner is to coordinate with the FGD supplier to resurface the pad following AEX-332-99.
- Stone Pads: The 3" screening surface is considered to be a sacrificial wear surface. Once base material is exposed, the pad is to be resurfaced with additional screenings. Screenings and fine graded materials, such as No.10 limestone, are very loose until wetted down. As a minimum, the material needs to be thoroughly wetted after it is placed before being exposed to livestock tracking. Roller compaction after wetting will result in higher durability.

The area adjacent to the pad and installed runoff and pollution control measures are to be maintained for stability.

REFERENCES

ACI. 1992. 360R. Design of Slabs on Grade. ACI, P.O. Box 9094, Farmington Hills, MI.

Midwest Plan Service. 1987, MWPS-6, *Beef Housing and Equipment Handbook*, Iowa State University, Ames, IA.

Midwest Plan Service. 1983, MWPS-1, *Structures and Environment Handbook*, Iowa State University, Ames, IA. (No longer in publication)

Ohio Conservation Planning policy (180-GM, Part 409) :

http://www.oh.nrcs.usda.gov/intranet/GenManual/180_gm_cons_plan_applic.html

OSU Extension, 1997, AEX-304-97, *Using Geotextile Fabric in Livestock Operations*, The Ohio State University, Columbus, Ohio: <http://ohioline.osu.edu/aex-fact/0304.html>

OSU Extension, 1999, AEX-332-99, *Construction of Livestock Feeding and Hay Bale Storage Pads Using FGD Material*, The Ohio State University, Columbus, Ohio:
<http://ohioline.osu.edu/aex-fact/0332.html>

Construction & Material Specifications (NRCS Ohio concrete standard & ODOT Construction & Material Specifications):
<http://www.oh.nrcs.usda.gov/technical/engineering/neh20.html>

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