



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
HEAVY USE AREA PROTECTION

CODE 561

(sf)

DEFINITION

Stabilization or protection of an intensively used area.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce soil erosion
- Provide a stable, noneroding surface for areas frequently used by animals, people, or vehicles
- Protect or improve water quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where a frequently or intensively used area requires relocation or treatment to address one or more resource concerns.

CRITERIA

General Criteria Applicable to All Purposes

All planned work must comply with Federal, State, Tribal, and local laws and permit regulations.

Design load

Base the design load on the type and frequency of traffic (vehicular, animal, or human) anticipated on the heavy use area.

Foundation

Evaluate the site foundation to ensure that the presumptive bearing capacity of the soil meets the intended design load and frequency of use for the anticipated climate conditions. Prepare the foundation by removal and disposal of materials that are not adequate to support the design loads.

Use a base course of gravel, crushed stone, other suitable material, geotextile, or a combination of materials on all sites that need increased load-bearing strength, drainage, separation of material, and soil reinforcement. Refer to NRCS Technical Note (Title 210), Design Engineering, Design Note 24, "Guide for the Use of Geotextiles," or other State-approved reference for geotextile. Select Geotextiles conforming with NRCS Ohio Construction Specification, "OH-95 Geotextile".

The subgrade must be reasonably uniform without abrupt changes from hard to soft. The upper 12" of the subgrade must be uniform material and compacted to a uniform density throughout. Use fill material in the preparation of the subgrade similar to the in-place material and compacted to the density of the in place material. Compacted aggregate may be used in lieu of in-place material. The entire subgrade must have positive drainage.

Aggregate pads designed primarily for vehicular or livestock usage will consist of a geotextile fabric, overlain with aggregate base material, overlain with surface material as described below. 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.

A “dry subgrade” design must meet the following criteria and be documented in the design folder:

- The soil must be mapped as “well drained” or be in hydrologic soil group A or B.
- The site topography must be such that water will not pond on the planned pad.
- The planned usage does not require access by livestock or vehicles during periods when the subgrade is likely to be saturated.

Surface treatment

Select a surface treatment that is stable and appropriate to the purpose of the heavy use area. Use concrete, bituminous concrete pavement, cementitious materials, mulches, aggregates, geotextiles, or a combination of materials to prevent punching or rutting failure in a heavy use area. Surface treatments must meet the following requirements according to the material used.

Concrete

Design slabs-on-ground subject to distributed stationary loads, light vehicular traffic, or infrequent use by heavy trucks or agricultural equipment in accordance with American Concrete Institute (ACI) Guide for the Design and Construction of Concrete Parking Lots (ACI 330R). Design slabs-on-ground subject to regular or frequent heavy truck or heavy agricultural equipment traffic in accordance with ACI Code to Design of Slabs-on-Ground (ACI 360R). Design liquid-tight slabs in accordance with ACI Code Requirements for Environmental Concrete Structures, Slabs-on-Soil (ACI 350, Appendix H). Refer to Ohio NRCS Concrete Construction Specification for Type S-1 (light vehicular traffic), Type S-2 (heavy vehicular traffic), and Type S-3 (water-tight) concrete slab design criteria.

Design concrete structures and slabs-on-ground in accordance with NRCS National Engineering Manual (NEM) (Title 210), Part 536, “Structural Engineering.”

Bituminous concrete pavement

Refer to the American Association of State Highway and Transportation Officials (AASHTO) “Guide for Design of Pavement Structures” or the applicable State highway department’s specification for design criteria for bituminous concrete paving.

In lieu of a site-specific design for areas that will be subject to light use, pave with a minimum of 4 inches of compacted bituminous concrete over a subgrade of at least 4 inches of well-compacted gravel. Use bituminous concrete mixtures commonly used for road paving in the area. The mixing (ODOT), Item 401 - Asphalt Concrete Pavements or 422 - Chip Seal with Polymer Binder, for the expected loading. Compact the surface with a heavy steel wheel roller until the bituminous concrete is thoroughly compacted and roller marks are eliminated. Asphalt is not permitted where livestock will be using the HUAP.

Other cementitious materials

Cementitious materials such as soil cement, agricultural lime, roller-compacted concrete, and coal combustion byproducts (flue gas desulphurization sludge and fly ash) can be used to provide a durable, stable surfacing material. Based on the properties of the surface material, develop a site-specific mix design with compressive strengths necessary for the expected use and loading on the heavy use area. Select materials that are nontoxic and that have chemical properties that are compatible with the intended use.

Aggregate

Design aggregate surfaces for expected wear and intended use. In lieu of a site-specific design for areas that will be subject to light nonvehicular use, install a minimum combined thickness for aggregate surfacing and base course of 6 inches for animals, 8 inches for vehicular traffic and 4 inches for other applications.

For other applications, use NRCS Technical Note (Title 210), Agricultural and Biological Engineering, Agricultural Engineering Technical Note 4, "Earth and Aggregate Surfacing Design Guide," or other appropriate methodology to design aggregate thickness.

Place a 3-inch minimum thickness of AASHTO M 43 No 10 crushed limestone aggregate screenings on top of the base in the designs for "livestock only." Three inches of screenings are not necessary when the pad is for vehicular traffic only. Consider the 3-inch pad surface as a sacrificial wear layer and not part of the structural base.

Table 1 describes alternative base and HUAP pad surface material design options, A, B, C, depending on whether the pad will have livestock only or if the pad will have livestock and vehicular traffic.

TABLE 1- HUAP Pad Material Configurations A, B, and C (minimum compacted thickness)

BASE	MATERIALS <u>1/</u>	DESIGN OPTIONS					
		Livestock Only			Livestock & Vehicular Traffic		
		A	B	C	A	B	C
	AASHTO M43 #1 or #2 <u>2/</u>	4"	4"	—	6"	4"	—
	AASHTO M43 #57 or #67 <u>2/</u>	2"	—	—	2"	—	—
	ODOT 304.02 or 411.02 <u>3/</u>	—	2"	6"	—	4"	8"
PAD SURFACE	SCREENINGS <u>4/</u>	Required			Optional (for Vehicles Only)		
	Crushed Limestone (AASHTO M43 #10 or AASHTO M43 #9)	3"	3"	3"	3"	3"	3"

1/ Materials are to be supplied from sources listed on the most current ODOT Aggregate Producer/Supplier list (see References section) and meet AASHTO M43 gradations. Steel slag and Recycled-Concrete Aggregate (RCA) (also known as Reclaimed Concrete Material (RCM)) from listed sources may be substituted for crushed gravel or limestone, meeting equivalent gradations of the materials listed in Table 1.

2/ The voids between the stone (AASHTO M 43, Nos.1, 2, 57 or 67) are to be choked with fines, ODOT 304 or 411, and/or screenings (AASHTO M 43 No.9 or AASHTO M 43 No.10) to create a smooth surface.

3/ Compaction is required for materials containing fines (e.g., 304 and 411). 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.

4/ Select screening materials appropriate to the type of livestock that utilize the pad. Exception- 3-inches of screenings are not necessary when the pad is for vehicular traffic use only (the right hand side columns A, B or C are viable options). An additional 3" of ODOT 304 or 411 may be used in lieu of screenings.

Mulches

Use a minimum layer thickness of 6 inches for materials such as limestone screenings, cinders, tanbark, bark mulch, brick chips, or shredded rubber. Mulches are not recommended for livestock or vehicular applications.

Vegetation

Use vegetative measures only on areas where traffic can be managed so the vegetative cover can be maintained. Select grass species or other plant materials that are wear resistant, have fast recovery from

heavy use, and are suitable to the site. Establish the vegetation in accordance with the criteria in NRCS Conservation Practice Standard (CPS) Critical Area Planting (Code 342) or the appropriate State reference.

For heavy use areas managed as vegetated lots, provide an adequate number of lots in the system to allow the vegetation to be sustained by moving the animals. Establish a rotation that ensures the vegetated lot will be used only when vegetation has had time to recover between animal activities.

Other

Other materials can be used for surface treatment if they will serve the intended purpose and design life.

Drainage

Include provisions in the design for surface and subsurface drainage, as needed. Design positive grade in the planned direction of flow. Fill low areas that may contribute to subgrade instability or ground water contamination.

Diversion of clean water

To the extent possible, prevent surface water from entering the heavy use area. Refer to NRCS CPSs Diversion (Code 362), Underground Outlet (Code 620), Roofs and Covers (Code 367), Roof Runoff Structure (Code 558), or other appropriate CPSs for drainage control.

Stabilization and erosion control

Stabilize all areas disturbed by construction as soon as possible after construction. Refer to the criteria in NRCS CPS Critical Area Planting (Code 342) for establishment of vegetation. If vegetation is not appropriate for the site, use the criteria in NRCS CPS Mulching (Code 484) to stabilize the disturbed area.

Water quality

If there is the potential for ground water contamination from the heavy use area, select another site or provide an impervious surface to reduce infiltration of pollutants.

For heavy use areas with surface water quality concerns, relocate the site or make provisions to collect, store, treat, or utilize contaminated surface runoff from the heavy use area. Include provisions to address runoff without causing erosion or water quality impairment. Use NRCS CPSs Waste Transfer (Code 634), Vegetated Treatment Area (Code 635), Critical Area Planting (Code 342), Fence (Code 382), Prescribed Grazing (Code 528), Filter Strip (Code 393), Access Control (Code 472), or other similar CPSs as supporting practices, when needed.

Recreation

Address accessibility requirements for new construction and when existing facilities are being altered. The Americans with Disabilities Act of 1990 (ADA) requires recreation areas that are used by the public to be accessible to people with disabilities.

Additional Criteria for Livestock Heavy Use Areas

Include other practices to collect, store, utilize, or treat manure and contaminated runoff where contaminated runoff will cause a resource concern. When one of the purposes of the HUAP is to improve animal distribution or to allow better pasture utilization, planning for the HUAP must be documented in a Grazing Management Plan (Conservation Activity Plan (CAP) 110 or equivalent) or Prescribed Grazing (Code 528). Consider the use of NRCS Conservation Practice Standard guidelines in Short Term Storage of Animal Waste and Byproducts (318) for management of manure accumulation on heavy use areas.

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, 24-hour duration rainfall event, or larger if required by laws, rules, or regulations.

When a pad is located within 100 ft. of a watercourse that is likely to receive flow during the period when the pad is in use, incorporate runoff and manure management measures into the design to prevent stream degradation from erosion and/or polluted runoff.

Do not locate facilities within an established Federal Emergency Management Agency (FEMA) regulatory floodway.

Sizing. For the feeding pads located 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 adjacent to the feeder.

Where livestock need to be periodically confined to a pad as part of a winter feeding plan for pasture protection or on a feedlot adjacent to housing, the pad size is to be determined from recommendations from Midwest Plan service, livestock industry publications, or from written recommendations from an experienced livestock housing specialist working as a consultant to the producer. The following stocking densities may be used in lieu of specific recommendations.

Table 2: Pad area per species

Species	Pad Area (ft ² /head) ^{1/}
400-800 lb beef calves	40-50
800 to 1200 lb beef cattle	50-60
Beef cows	60-75
Mature dairy cows	50

^{1/} Plus area of feeders located on the pad

Cleaning Frequency. If planning criteria requires the area to be cleaned of manure or waste feed more frequently than three times each year or less, the area may be surfaced using other acceptable materials.

Equine Use Area Protection

This section addresses special criteria for pads installed for equine loafing, travel ways, 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 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/hoof damage by preventing contact with coarse 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.

CONSIDERATIONS

Heavy use areas can have a significant impact on adjoining land uses. These impacts can be environmental, visual, and cultural. Select a treatment that is compatible with adjoining areas. Consider such things as proximity to neighbors and the land use where the stabilization will take place.

Vegetated heavy use areas may need additional materials such as geogrids or other reinforcing techniques or planned periods of rest and recovery to ensure that vegetative stabilization will succeed.

When planning a heavy use area protection for livestock feeding, consider siting livestock water on or as close to the pad as possible, to prevent degradation to large areas of the adjoining pasture.

Consider the safety of the users during the design. Avoid slippery surfaces, sharp corners, or surfaces and structures that might entrap users. For heavy use areas used by animals, avoid the use of angular aggregates that might injure livestock. When concrete is used for livestock imprint or texture concrete to provide traction in wet or freezing conditions.

Paving or otherwise reducing the permeability of the heavily used area can reduce infiltration and increase surface runoff. Depending on the size of the heavy use area, this can have an impact on the water budget of the surrounding area. Consider the effects to ground and surface water.

Consider the effects on improved animal health from the installation of heavy use area protection on muddy sites. Mud transmits bacterial and fungal diseases and provides a breeding ground for flies. Hoof suction makes it difficult for cattle to move around in muddy areas. In addition, mud negates the insulation value of hair coat and the animals must use more energy to keep warm. As temperatures fall, animal bunching may occur, which can reduce or eliminate vegetative cover and lead to erosion and water quality concerns.

To reduce the negative water quality impact of heavy use areas, consider locating them as far as possible from water bodies or water courses. In some cases, this may require relocating the heavily used area rather than just armoring an area that is already in use.

To the extent possible, maintain a 2-foot separation distance between the bottom of the surface material and the seasonal high water table or bedrock.

To reduce the potential for air quality problems from particulate matter associated with a heavy use area, consider the use of NRCS CPSs Windbreak/Shelterbelt Establishment (Code 380), Herbaceous Wind Barriers (Code 603), Dust Control from Animal Activity on Open Lot Surfaces (Code 375), or Dust Control on Unpaved Roads and Surfaces (Code 373) to control dust from heavy use areas.

Consider ways to reduce the size of the heavy use area as much as possible. This may require changes in how the livestock are managed but in the long run may result in less maintenance and a more efficient operation.

Consider a concrete or other durable surface for areas that require frequent scraping.

PLANS AND SPECIFICATIONS

Prepare plans and specifications that describe the requirements for installing the practice according to this standard. Requirements for all drawings prepared by NRCS/SWCD as well as by others (Professional

Engineer or Registered Architect) are contained in the National Engineering Manual (NEM) Part 541 - Drafting and Drawings.

As a minimum the plans and specifications shall include—

- A plan view showing the location and extent of the practice. Include the location and distances to adjacent features and known utilities.
- Typical sections showing the type and required thickness of paving or stabilization materials.
- A grading plan, as needed.
- Where appropriate, plans for required structural details.
- Methods and materials used to stabilize areas disturbed by construction.
- Construction specifications with site-specific installation requirements.
- Vegetative establishment specifications, as applicable.
- Quantities
- Reference O&M and Ohio NRCS Concrete Specification

OPERATION AND MAINTENANCE

Prepare an operation and maintenance (O&M) plan and review it with the operator prior to practice installation. The minimum requirements to be addressed in the O&M plan are—

- Periodic inspections—annually and immediately following significant rainfall events.
- Prompt repair or replacement of damaged components, especially surfaces that are subjected to wear or erosion.
- Requirements for the regular removal and management of manure, as needed, for livestock heavy use areas.
- Restricted uses, as needed, to protect the stand and to allow vegetative recovery for vegetated heavy use areas.

REFERENCES

American Concrete Institute. 2010. Guide to Design of Slabs-on-Ground. ACI 360R-10. Farmington Hills, MI.

American Concrete Institute. 2008. Guide for the Design and Construction of Concrete Parking Lots. ACI 330R-08. Farmington Hills, MI.

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OH-NRCS Field Office Technical Guide (FOTG), Section IV, Engineering Specifications “OH-95 Geotextile”

ODOT Construction Management Reporting System (CMRS), Contractors Reports, Certified Aggregate <http://www.odotonline.org/cmsportal/>

ODOT Construction & Material Specifications:
<http://www.dot.state.oh.us/Division/ConstructionMgt/OnlineDocs/Pages/2016-Online-Spec-Book.aspx>

USDA-NRCS, National Engineering Handbook, NEH, Part 642, Material Specification MS 592, Geotextile, Washington, DC. <https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=36262.wba>

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<http://www.cement.org/learn/concrete-technology/concrete-design-production/recycled-aggregates>