Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

HEAVY USE AREA PROTECTION

CODE 561

(sf)

DEFINITION

Heavy Use Area Protection is used to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles.

PURPOSE

Heavy Use Area Protection is used:

- To provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles
- To protect or improve water quality

CONDITIONS WHERE PRACTICE APPLIES

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

CRITERIA

General Criteria Applicable to All Purposes

All planned work shall comply with federal, state, and local laws and regulations.

Take measures to limit the generation of particulate matter.

Incorporate user safety into the design of the heavy use area protection.

Design Load

Base design load(s) on the type and frequency 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 4000 pounds.

Foundation

Evaluate all site foundations for soil moisture, permeability, textures, and bearing strength in combination with the design load and anticipated frequency of use.

Provide a base course of gravel, crushed stone, other suitable material and/or geotextile on all sites with a need for increased load bearing strength, drainage, separation of material, and soil reinforcement. Refer to Natural Resources Conservation Service (NRCS), National Engineering Handbook, Part 642; Design Note 24, Guide for Use of Geotextiles and AASHTO M-288 (latest edition); which provides guidance in quality specification and geotextile selection.

If there is the potential for ground water contamination from the heavy use area, select another site or provide an impervious barrier.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at https://www.nrcs.usda.gov/ and type FOTG in the search field.

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

Surface treatment
Select a surface treatment that is stable and appropriate to the purpose of the 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 *Guide 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).*

Design concrete structures in accordance with NRCS National Engineering Manual (NEM), Part 536, *Structural Engineering*.

Bituminous Concrete Pavement
Design the thickness of the pavement course, aggregate size and type, the type of proportioning of bituminous concrete materials, and the mixing and placing of these materials in accordance with The Alabama Department of Transportation (ALDOT) criteria for the expected loading.

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.

Compact the surface with a heavy steel wheel roller until the bituminous concrete is thoroughly compacted and roller marks are eliminated.

Other Cementious Materials
Cementitious materials, such as soil cement, agricultural lime, roller-compacted concrete, and coal combustion by- products (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 non-toxic 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 non-vehicular use, install a minimum combined thickness for aggregate surfacing and base course of 6 inches for livestock and 4 inches for other applications.

For other applications, use Agricultural Engineering Note 4, *Earth and Aggregate Surfacing Design Guide*, or other appropriate methodology to design aggregate thickness.

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
Select vegetation that can withstand the intended use. Establish the vegetation in accordance with the criteria in NRCS CPS *Critical Area Planting (Code 342)* or the appropriate State reference.

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

Structures
Design any structures associated with the heavy use area including roofs, according to appropriate NRCS standards. Where NRCS standards do not exist, design structures according to the requirements of the particular construction material and accepted engineering practice. When a roof is needed to address the resource concern, use NRCS CPS *Roofs and Covers (Code 367)*. For non-waste applications, design structures according to the accepted engineering practice.

Base environmental design loads for buildings associated with heavy use areas on criteria in ASCE 7-10 – Minimum Design Loads for Buildings and Other Structures: ASCE/SEI 7-10.

Drainage and erosion control
Include provisions in the design for surface and subsurface drainage, as needed. Include provisions for disposal of runoff without causing erosion or water quality impairment. To the extent possible, prevent surface water from entering the heavy use area. Make provisions to treat contaminated surface runoff from the impervious area.

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.

Vegetative Measures
Lime, fertilize, prepare soil, seed, mulch, sod, and conduct vegetation management according to the planned use and appropriate conservation practice standard in the technical guide. In areas where traffic can be managed to maintain vegetative cover, grass species which are wear resistant and have fast recovery from wear may be used. Common bermudagrass, hybrid bermudagrass, bahiagrass, and tall fescue are species that may be used. Selection will be based on specific site and soil conditions. Vegetative cover will be established and managed according to the AL NRCS conservation practice standard, Code 342, Critical Area Planting. If vegetation is not appropriate, use other measures to accomplish the intended purpose.

Additional Criteria for Areas Utilized by Livestock
Use Alabama NRCS conservation practice standards: Critical Area Planting - Code 342; Fence - Code 382; Prescribed Grazing - Code 528A; Filter Strip - Code 393; Watering Facility - Code 614, or Access Control - Code 472, as companion practices, when needed, to meet the intended purpose of the heavy use area protection.

Make provisions to collect, store, utilize, and/or treat manure accumulations and contaminated runoff in accordance with other NRCS conservation practice standards. Porous heavy use protection for outdoor animal confinement locations will be underlain with good clay material to minimize drainage to groundwater. Surface runoff from these locations will be stored and/or treated.

Treatment area
Select a site having a ground slope of 4 percent or less in order to minimize cut and fill areas. Extend the treated area a minimum of 10 feet. (6 feet for small ruminants that are managed separately from larger animals) outside the limits of facilities such as portable hay rings, watering facilities, feeding troughs, mineral boxes, and other facilities where livestock concentrations cause resource concerns. If concrete is used for the treatment area, the slab thickness will be at least 4 inches and the concrete will meet all other minimum requirements in the Heavy Use Area Construction Specification (design, placement, joints, curing, etc.). Ensure finished surfaces are nearly level with positive drainage away from the center of the treatment area. Grade slopes around treatment area as appropriate to minimize ponding of water.

For walkways the minimum treatment width is 8 feet. (cattle only). A width of 15 feet is generally used for cattle/vehicles type walkways. Fence all walkways.

Provide treatment areas for stream crossings and watering ramps with a minimum bottom width of 10 feet, and a maximum bottom width of 20 feet. “Cattle only” stream crossings may be as narrow as 6 feet. Make provisions to minimize livestock loafing or wading in the stream or pond. Slope ramps at 5 to 1 or flatter toward the water source with side slopes of 2.5 to 1 or flatter. Extend protection for watering ramps into the pond or stream to protect the pond or stream bottom according to the criteria in AL conservation practice standard Code 614 – Watering facility. Where stream channels or pond bottoms are composed of stable coarse rocky material or solid bedrock, the requirement to extend the treatment area into the channel may be waived.

Stream Crossings
Locate crossings where the streambed is stable. Avoid stream crossings in wetland areas. Place crossings perpendicular to the direction of stream flow. Construct stream crossings with a toe trench constructed on the upstream and downstream edges. Install stream crossings in accordance with AL conservation practice standard, Code 578 - Stream Crossing.

Watering Ramps
Install watering ramps in accordance with AL conservation practice standard, Code 614 – Watering Facility. Extend ramps to the center of the stream or no more than 5 feet into the stream, whichever is less.

Fencing
Install fencing as necessary to control all animal traffic. Permanently fence stream crossings and watering ramps to prevent livestock access to the stream or pond except at the access ramps. Build fencing in accordance with AL conservation practice standard, Code 382 - Fence. Alternative fencing procedures, which provide permanent and positive control, may be approved on a case-by- case basis.

Geotextile
Install Class II non-woven needle- punched geotextile fabric under all aggregate treatment areas. Turn the outer edge upward and extend edges to the surface. Geotextile is not required if the foundation is on rock. The minimum requirements for geotextile fabric are as follows:

Property	Test Method	Minimum
Grab Tensile Strength ASTM D 4632	Grab Test ASTM D 4632	157 lb.
Puncture Test	ASTM D 6241	309 lb.

Place geotextile fabric in the toe trenches of stream crossings and watering ramps. In the upstream toe of stream crossings and watering ramps in streams, the fabric will be backlapped over its own trench. Use a minimum 12-inch overlap at all joints.

Surface treatment
Use a maximum stone size of 2 in. for material surface treatment in areas such as watering facilities, hay rings, walkways, paddocks, and loafing areas.

Smooth uniformly and compact all material. Acceptable graded aggregate base materials include ALDOT crushed stone sizes 5, 56, 57, 6, 67, 68, and 610, and Types A or B crushed aggregate base, and other similar products approved by an engineer. Gradation requirements are shown in Table 1. Minimum depth of material is 6 in., uncompacted. Materials that will not result in a smooth walking surface for livestock will be placed 5-inch thick uncompacted with a 1 inch topping of finer grained material.

Materials for treatment of stream crossings and watering ramps shall consist of one or both of the following:

1. Rock riprap

2. Table 1 material

Base selection of rock riprap material for stream crossings on stream velocities and soil conditions at the site according to the AL NRCS conservation practice standard, Code 578 - Stream Crossing.

Determine thickness of the material in accordance with the design. Extend surface material the full length and width of the treatment area. Smooth all surfaces uniformly and compact.

Place all finished material surfaces in the stream channel, at the same grade as the natural streambed above and below the site.

Additional Criteria for Areas Utilized for Recreation

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

Ensure the treated area is conducive to the overall recreation area and aesthetically blends with the general landscape and surroundings.

Evaluate plants, landscaping timbers, traffic control measures, wooden walkways, etc., for effectiveness, and aesthetics.

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.

If vegetation will be part of the stabilization technique, consider the durability of the vegetation. Choose plant species that can withstand the expected use. 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.

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 livestock avoid the use of sharp aggregates that might injure livestock.

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.

Installation of heavy use area protection on muddy sites can improve animal health. 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 waterbodies 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 CPS *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.

The transport of sediments, nutrients, bacteria, organic matter from animal manures, 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.

The size of the heavy use areas utilized by livestock is dependent on the landowner's operation including type and number of animal, confinement periods, and/or the intended use. The size of treatment areas can range from 30 square feet per animal in partial-confinement to 400 square feet per animal in total confinement to 4000 or more square feet for animal exercise areas. Heavy use protection areas should be kept as small as practicable.

When surface treatment such as bark mulch, wood- fiber, or other non-durable materials are used for short-term livestock containment areas, consideration should be given to vegetation of the affected area with a cover crop.

For areas with aggregate surfaces that will be frequently scraped, give consideration to the use of concrete or cementious materials to lessen the recurring cost of aggregate replacement. Four-inch thickness of concrete may be used around watering facilities for agricultural applications. If concrete is used, it should have a roughened surface.

To minimize differential settlement at concrete contraction joints, consider the use of a tooled or formed keyway joint.

Consider changing how livestock are managed to reduce the size of the heavy use area resulting in less expense, less maintenance and a more efficient operation.

Byproducts from coal fired power plants such as fly ash and sludge from scrubbers can vary significantly. Therefore, their toxicity and cementation characteristics should be known to ensure they are compatible with the intended use.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for Heavy Use Area Protection that describe the requirements for installing the practice according to this standard. As a minimum the plans and specifications shall include:

1. A plan view showing the location and extent of the practice. Include the location and distances to adjacent features and known utilities.
2. Typical section(s) showing the type and required thickness of paving or stabilization materials.
3. A grading plan, as needed.
4. Where appropriate, plans for required structural details.
5. Method and materials used to stabilize areas disturbed by construction.
6. Construction specifications with site specific installation requirements.

OPERATION AND MAINTENANCE

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

1. Periodic inspections – annually and immediately following significant rainfall events.
2. Prompt repair or replacement of damaged components especially surfaces that are subjected to

wear or erosion.

3. For livestock heavy use areas, include requirements for the regular removal and management of manure, as needed.
4. For vegetated heavy use areas, restrict use as needed to protect the stand and to allow vegetative recovery.

REFERENCES

American Concrete Institute. 2006. Design of Slabs- on-Ground. ACI Standard 360R-06. Farmington Hills, MI.

Korcak, R. F. 1998. Agricultural Uses of Coal Combustion Byproducts. P. 103-119. *In* Wright, R. J., et al (eds.) Agricultural Uses of Municipal, Animal and Industrial Byproducts. USDA-ARS, Conservation Research Report 44.

USDA-Natural Resources Conservation Service. 2014. Agricultural Engineering Note 4, *Earth and Aggregate Surfacing Design Guide*, Washington, DC.

Watering Systems for Grazing Livestock: Great Lakes Basin Grazing Network and Michigan State University Extension.

Table 1. Coarse Aggregate (crushed Stone) Gradations

Aggregate	Percent Passing by Weight (mass), each Laboratory Sieve										
	2 in.	1.5 in.	1 in.	3/4 in.	1/2 in.	3/8 in.	#4	#8	#16	#50	#200
5		100	90-100	20-55	0-10	0-5					
56		100	90-100	40-85	10-40	0-15	0-5				
57		100	95-100		25-60		0-10	0-5			
6			100	90-100	20-55	0-15	0-5				
67			100	90-100		20-55	0-10	0-5			
68			100	90-100		30-65	5-25	0-10	0-5		
610			100	90-100		25-60		7-30		0-15	
Type “A” Crushed Aggregate Base			100	86-100			26-55	15-41		3-18	5-15
Type “B” Crushed Aggregate Base	100	90-100	75-98		55-80		40-70	28-54	19-42	9-32	7-18