

Heavy Use Area Protection (Acre) 561

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 and 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.

A resource concern must be addressed related to unstable soil, erosion, nutrient leaching, and runoff to surface waters.

CRITERIA

General Criteria Applicable To All Purposes

Heavy use area protection shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

Safety of the users shall be incorporated into the design of the heavy use area protection. Items such as traction surfaces, guard rails, and bump guards shall be used as needed. Avoid slippery surfaces, sharp corners or surfaces and structures.

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 all site foundations for soil moisture, permeability, texture, and bearing strength based on the design load and planned frequency of use.

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 Natural Resources Conservation Service (NRCS), National Engineering Handbook, Parts 642 and Design Note 24, Guide for Use of Geotextiles, for guidance on geotextile selection.

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.

Make provisions to treat contaminated surface runoff from the impervious area.

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 the thickness and compressive strength of concrete according to the anticipated load and use. Use American Concrete Institute Publication ACI 360, Design of Slabs-on-Ground, *when subject to distributed stationary loads, light vehicular traffic, or infrequent use by heavy trucks or agricultural equipment in accordance with 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).

Where vehicle traffic is expected, place concrete on a 4 inch minimum thickness of sand and/or gravel.

For installations where it is necessary to limit the permeability of the concrete, *Design liquid-tight slabs in accordance with ACI Code Requirements for Environmental Engineering 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. The thickness of the pavement course, the kind and size of aggregate, the proportioning of bituminous materials, and the mixing and placing of these materials shall be in accordance with Michigan Department of Transportation criteria for the expected life and loading.

Other Cementitious Material/Aggregate Pavements.

Other cementitious material/*aggregate pavements*, such as soil cement, agricultural lime, and roller compacted concrete, and coal combustion by-product/aggregate mixtures (flue gas desulphurization sludge and fly ash) can be used to provide a durable, stable surfacing material. Where coal combustion by-products are used, consult the Michigan Department of Environmental Quality regarding conditions for use and/or permits required.

Develop site specific mix designs and compaction requirements based on the properties of the material with durability and compressive and tensile strengths necessary for the expected use and loading on the heavy use area.

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.* . If the aggregate will be compacted, choose well graded aggregate materials.

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

Sprays and Artificial Mulches. When utilizing sprays of asphalt, oil, plastic, manufactured mulches, and similar materials, follow the manufacturer's recommendations for design requirements.

Vegetation. Vegetative cover for heavy use area protection shall be established and maintained according to Critical Area Planting Practice Standard (342). The vegetative species selected must be tolerate and persist under heavy use conditions including any anticipated treading and miring.

Other. Surfacing materials, such as limestone screenings, cinders, tanbark, bark mulch, brick chips, shredded rubber and/or sawdust, shall have a minimum layer thickness of 6 inches.

Structures. Design any structures associated with the heavy use area, according to appropriate NRCS conservation practice standards. The appropriate NRCS conservation practice standard for buildings and roofs is Roofs and Covers (367). The appropriate NRCS conservation practice standard for walls and curbs higher than 2 foot is Waste Storage Facility (313). Where NRCS conservation practice standards do not exist, design structures according to the requirements of the particular construction material and accepted engineering practice.

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 runoff from entering the heavy use area.

Vegetative Measures. Where appropriate, stabilize all areas disturbed by construction with vegetation as soon as possible after construction. Vegetation will be applied to cut or fill slopes or other disturbed areas adjacent to heavy use area protection measures. Refer to NRCS Conservation Practice Standard, Critical Area Planting (342). If vegetation is not appropriate, other measures shall be used to accomplish the intended purpose.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to the Field Office Technical Guide, Section II, Invasive Plant Species, for plant materials identified as invasive species.

Additional Criteria for Livestock Heavy Use Areas

The treated area can include all areas where livestock congregate and *are causing soil erosion and/or water quality problems*. This includes feeding areas, portable hay rings, watering facilities, feeding troughs, mineral boxes and other facilities where livestock concentrations cause resource concerns.

Use NRCS Conservation Practice Standards Waste Transfer (634), Critical Area Planting (342), Fencing (382), Prescribed Grazing (528), Filter Strip (393), Vegetated Treatment Area (635), Access Control (472) or other similar standards as companion practices when needed to meet the intended purpose of the heavy use area protection.

Do not specify or install sharp aggregates that might injure livestock hooves.

Provisions shall be made to collect, store, utilize, and/or treat manure accumulations and contaminated runoff in accordance with the Comprehensive Nutrient Management Plan *and documented resource concerns*, where applicable.

Bituminous pavement is not an acceptable surface treatment for areas utilized by livestock or for aggressive environments, such as silage and silage leachate runoff areas.

Additional Criteria for Recreation Areas

Heavy use protection in recreation areas that are accessible to the public must meet the requirements of the Americans with Disabilities Act of 1990. *Address accessibility requirements for new construction and when existing facilities are being altered.*

CONSIDERATIONS

Consider the potential effects of installation and operation of heavy use area protection on the cultural, archeological, historic, and economic resources.

For heavy use areas conducive to protection by vegetation, consider increasing the size of the area and/or establishing a rest/non-use/recovery period to allow plant recovery and increase vigor. Vegetative stabilization success may also benefit from techniques such as geogrids and other reinforcing techniques.

Heavy use areas will be intensely used by animals, people or both. Consider the safety of the users both human and animal during the design. Avoid slippery surfaces, sharp corners or surfaces and structures that might entrap users.

For livestock heavy use areas, consider providing positive drainage to prevent ponding of water. Such wet areas can have adverse effects on animal health and comfort.

A barrier may be considered to keep livestock and manure accumulations on the heavy use area protection. Barriers may include NRCS Conservation Practice Standard, Access Control (472), and/or Fencing (382). Where reinforced concrete curbing or short walls are used to contain livestock and assist with manure management, consideration maybe given to increasing the wall height to accommodate the barrier needs. Where modular concrete blocks are used to contain and assist with manure management a second layer of blocks may be considered to accommodate the barrier needs.

Heavy use area protection often involves paving or otherwise reducing the permeability of the heavily used area. This can reduce infiltration and increase surface runoff. During the planning and design, consider the effects to ground and surface water.

If a purpose of the heavy use area protection is improvement of surface water quality, consider locating the heavy use area as far away from the water body or watercourse as possible. In some cases this may require relocating the heavily used area rather than just armoring an area that is already in use. Any work in and/or discharges near streams,

wetlands, or water bodies may require a permit from state water quality (permitting) authority or local authority. *Where moving the heavy use site cannot be achieved to obtain a suitable distance to surface waters, then runoff must be prevented, treated, or stored for later land applications. Consider including a roof structure to prevent direct precipitation from coming into contact with the heavy use area surface and creating polluted runoff.*

To reduce the potential for air quality problems from particulate matter associated with heavy use areas, consider the use of NRCS Conservation Practice Standards Windbreak/Shelterbelt Establishment (380), Herbaceous Wind Barriers (603) or the use of surface treatments such as lignosulfonate, synthetic polymers, organic oils, or chloride compounds to control dust from bare heavy use areas.

The size of heavy use areas utilized by livestock is dependent on the landowner's operation including type and number of animals, confinement periods, and/or the intended use. Heavy use protection areas should be kept as small as practicable.

For areas that will need to be cleaned frequently by scraping, loose aggregate or other non-cementitious materials may not be the best choice. *Where aggregate or other non-cementitious materials are used include additional Operation and Maintenance needs to ensure the design depth is maintained.* Consider a more durable surface such as concrete.

The transport of sediments, nutrients, bacteria, organic matter from animal manures; oils, chemicals and dust associated with vehicular traffic; and soluble and sediment-attached substances carried by runoff should be considered in selection of companion conservation practices.

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.

Where muddy sites hinder vehicle movement or livestock management consider using NRCS Conservation Practice Standard, Access Road (560)

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

Support data documentation requirements are as follows:

- Inventory and evaluation records
 - Assistance notes or special report
- Survey notes, where applicable

- Design survey
- Construction layout survey
- Construction check survey
- Design records
 - Physical data, functional requirements and site constraints, where applicable
 - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
 - Location map
 - “Designed by” and “Checked by” names or initials
 - Approval signature
 - Job class designation
 - Initials from preconstruction conference
 - As-built notes
- Construction inspection records
 - Assistance notes or separate inspection records
 - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

REFERENCES

American Concrete Institute. 2010. Guide to Design of Slabs-on-Ground. ACI Standard 360R-10. Farmington Hills, MI. <https://www.concrete.org/>

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

American Concrete Institute. 2006. Requirements for Environmental Engineering Concrete Structures. ACI Standard 350-06. Appendix H. Farmington Hills, MI.

USDA-Natural Resources Conservation Service. 2008. National Engineering Handbook, Part 642. Washington, DC.

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

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