HEAVY USE AREA PROTECTION

CODE 561

(sq. ft.)

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

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 use.

When necessary, 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 (NEH), Part 642, Design Note 24, Guide for Use of Geotextiles; or NEH, Part 650, Engineering Field Handbook (EFH), Chapter 17, WI Supplement.

If there is the potential for groundwater contamination from the heavy use area, select another site or provide an impervious barrier. Option G in Table 1, Surface Material Criteria and Separation Distances, shall be used if protection from groundwater contamination is the primary objective.

Separation From Subsurface Saturation or Bedrock. The separation is the closest distance from any point on the top surface of the heavy use area protection to the feature from which separation is required. Separation distances are listed in Table 1.

Subsurface saturation and bedrock are defined in WI NRCS Conservation Practice Standard (WI CPS), Waste Storage Facility (Code 313). The criteria for handling subsurface saturation and bedrock separation is also included in WI CPS 313.

Surface Treatment. Select a surface treatment that is stable and appropriate to the purpose of the heavy use area. Surfacing options are included in Table 1. Surface treatments must meet the following requirements according to the material used.

Concrete. Slabs-on-ground subject to cattle traffic or infrequent use by light agricultural equipment may utilize the surfacing options in Table 1.

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

**Bituminous Concrete Pavement.** Refer to 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.

**Aggregate.** Design aggregate surfaces for expected wear and intended use. In lieu of a site-specific design for areas that will be subject to cattle traffic or infrequent use by light agricultural equipment, utilize the surfacing options in Table 1.

For other applications, use NRCS 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 WI CPS, *Critical Area Planting (Code 342)*.

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

**Structures.** When a roof is needed to address the resource concern, use WI CPS, *Roofs and Covers (Code 367)*. For non-waste applications, design structures according to the accepted engineering practice.

**Drainage and Erosion Control.** Include provisions in the design for surface and subsurface drainage, as needed. Include provisions for disposal and runoff without causing erosion or water quality impairment. To the extent possible, prevent surface water from entering the heavy use area.

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

**Additional Criteria for Livestock Heavy Use Areas**

Other practices shall be utilized to collect, store, utilize, or treat manure and contaminated runoff where contaminated runoff will cause a resource concern.

Animal yards or lots shall be located a minimum of 50 feet from any well or sinkhole.

The animal yard area for various animal types and sizes; lot surfacing and feeding requirements shall be in accordance with the areas shown in the Wisconsin Supplement to Chapter 10 in the NRCS NEH Part 651, Agricultural Waste Management Field Handbook (AWMFH), or in livestock planning handbooks published by Midwest Plan Service.

**Additional Criteria for Recreation Areas**

The American 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.

**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.

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 suctions 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 reduce the potential for air quality problems from particulate matter associated with a heavy use area, consider the use of WI 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 areas 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.

For areas that will need to be cleaned frequently by scraping, loose aggregate or other non-cementitious materials may not be the best choice. Consider a more durable surface such as concrete.

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 should include:

- A plan view showing the location and extent of the practice. Include the location and distances to adjacent features and known utilities.
- Typical section(s) showing the type and required thickness of paving or stabilization materials.
- A graded plan, as needed.
- Where appropriate, plans for required structural details.
- Method and materials used to stabilize areas disturbed by construction.
- 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. Requirements for Environmental Concrete Structures, Slabs on Soil (ACI 350, Appendix H). Farmington Hills, MI: American Concrete Institute.


Table 1: Surface Material Criteria and Separation Distances

<table>
<thead>
<tr>
<th>Option</th>
<th>Foundation Condition</th>
<th>Cross Section Option</th>
<th>Separation to Bedrock or Subsurface Saturation (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Firm(^1)</td>
<td>Raised Earth</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Firm</td>
<td>Minimum 6&quot; crushed stone(^2)</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Firm</td>
<td>Minimum 6&quot; crushed stone over NRCS Wisconsin Construction Specification (WCS)-13, Geotextile, Class IV</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>Firm</td>
<td>Minimum 4&quot; crushed stone over 6&quot; base course of graded rock(^1)</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>Firm</td>
<td>5&quot; non-reinforced concrete with maximum control joint spacing of 16' in both length and width, over 6&quot; sand/gravel</td>
<td>2</td>
</tr>
<tr>
<td>F(^4)</td>
<td>Firm</td>
<td>5&quot; reinforced concrete with designed control joint spacing over 6&quot; sand/gravel</td>
<td>2</td>
</tr>
<tr>
<td>G(^5)</td>
<td>Firm</td>
<td>5&quot; reinforced concrete with waterstop, over 6&quot; sand/gravel</td>
<td>2</td>
</tr>
<tr>
<td>H</td>
<td>Firm</td>
<td>5&quot; concrete reinforced with temperature and shrinkage steel only</td>
<td>2</td>
</tr>
<tr>
<td>I</td>
<td>Firm</td>
<td>Minimum 4&quot; asphalt over 6&quot; sand/gravel</td>
<td>3</td>
</tr>
<tr>
<td>J</td>
<td>Soft(^1)</td>
<td>Minimum 4&quot; crushed stone over 8&quot; base course of graded rock over 6&quot; of sand and fine gravel</td>
<td>3</td>
</tr>
<tr>
<td>K</td>
<td>Soft</td>
<td>Minimum 4&quot; crushed stone over 8&quot; base course of graded rock over NRCS WCS-13, Geotextile, Class IV</td>
<td>3</td>
</tr>
<tr>
<td>L</td>
<td>Soft</td>
<td>Minimum 4&quot; crushed stone over 18&quot; base course of graded rock</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>Soft</td>
<td>Minimum 4&quot; crushed stone over 18&quot; base course of graded rock over 6&quot; sand and gravel</td>
<td>3</td>
</tr>
<tr>
<td>N</td>
<td>Soft</td>
<td>Minimum 8&quot; crushed stone over geogrid over NRCS WCS-13, Geotextile, Class IV</td>
<td>3</td>
</tr>
</tbody>
</table>

\(^1\) Guidance can be found in EFH Chapter 4 and Figure 4-14 for information regarding bearing capacity and foundation properties.

\(^2\) Crushed Stone: 100% passing 3/4" sieve and 10% maximum passing the #200 sieve.

\(^3\) Graded Rock: 100% passing the base course thickness dimension and a maximum of 10% passing the 3/4" sieve. All sizes between the limits shown on the drawings are to be represented.

\(^4\) Reinforcing and control joint spacing according to Subgrade Drag Theory Design as found in ACI 360, Design of Slabs on Grade, or Engineering Field Handbook (EFH), Chapter 17.

\(^5\) Option G is the only option that can be used where the potential for groundwater contamination is the resource concern.

- Option G requires deformed steel reinforcing bars and control joint spacing according to Subgrade Drag Theory Design.
- Option G requires the installation of embedded waterstops at all control, construction, and isolation joints.
- Waterstop to be in accordance with NRCS Wisconsin Construction Specification 4, Concrete.
- Maximum wheel load of 5000 pounds at spacing of 8 feet or to be designed using ACI 360, Design of Slabs on Grade.