Construction Phasing/Sequencing (CPS)

Practice Description

Construction phasing/sequencing is the coordination of the construction schedule with the necessary erosion, sediment, and stormwater BMP installation. The purpose of construction sequencing is to reduce the amount of on-site erosion and off-site sedimentation. The construction sequence is an orderly listing of all major land-disturbing activities together with the necessary erosion- and sedimentation-control measures planned for a project. This type of schedule guides the contractors on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided. Construction sequencing also allows for a potential reduction in the amount of land area disturbed at any one time during construction.

Planning Considerations

Construction sequencing can ultimately lower the cost of construction by retaining sediment on-site. Studies have shown that land disturbances at construction sites can cause soils to be 2 to 40,000 times more erodible (Harbor, 1999). Erosion leads to sedimentation, often times off-site. Additional costs from permit non-compliance or sedimentation of wetlands or other sensitive areas can occur if stormwater controls are not properly installed. Proper construction phasing begins with preservation of natural vegetation. Existing vegetation should be preserved in areas where it is likely to have the most benefit to hydrology. Preserving as much native vegetation as possible can reduce the impacts of land-disturbance activities. Also, protecting nearby vegetated areas with proper erosion and sediment controls will help maintain the adjacent areas' natural hydrology and help prevent off-site erosion and sedimentation.

Design Criteria and Construction

Vegetation Protection

Identify and map areas requiring special protection, i.e., wetlands, buffer zones, filter strips, and trees. Be sure these areas are clearly marked on drawings, maps, and properly flagged on-site.

Access Points

Define areas for construction-site access, construction routes, and equipment parking. Construction-site access pads must be installed prior to land disturbances. See Construction-Exit Pad (CEP) for details.

Sediment Traps

Install sediment traps (basins, fences, outlet protection) after site access has been established. Additional sediment basins or fencing may be required as land grading begins. Installation information can be found in the *Sediment Control* section.

Runoff Controls

Controlling runoff can be accomplished through diversions, dikes, silt fence and outlet protection. These measures should be installed after sediment practices and before land grading. Additional runoff-control measures may be required during the course of construction. Additional information on runoff-control practices is available in the *Runoff Conveyance* section.

Runoff Conveyance Systems

Runoff conveyance can be accomplished through stabilization of stream banks, check dams, diversion, drop structures, channels or swales, inlet and outlet protection, temporary-slope drains, etc. Whenever possible, stabilize stream banks as early as possible. Install runoff conveyance systems with runoff controls and before land grading. Additional runoff conveyance measures may be required during the course of construction. Additional information is available in the *Runoff Conveyance* section.

Land Clearing and Grading

Begin site preparation including cutting, filling, and grading only after sediment and runoff controls are installed. Install additional control measures as needed.

Surface Stabilization

Surface stabilization includes temporary and permanent seeding, mulching, sodding and installing riprap. These items should be installed immediately on all disturbed areas where work has been completed or significantly delayed.

Building Construction

During the construction phase, any additional erosion and sediment controls should be installed as needed.

Landscaping and Final Stabilization

During the last phase of construction, all open areas should be stabilized through topsoiling, planting trees and shrubs, seeding, mulching, sodding, and final riprap placement. At this point, all non-biodegradable, temporary-control measures should be removed.

Common Problems

Consult with a qualified design professional if any of the following occur:

Sensitive areas such as wetlands have not been properly protected and have been impacted by sediment.

The site's erosion- and sediment-control plan does not adequately address stormwater issues on-site. If site limitations require changes to construction plan, be sure the erosion and sediment plan is amended.

Maintenance

Maintenance inspections should be conducted weekly and after rainfall events of ≥0.5 inch in a 24-hour period. All maintenance repairs should be made immediately after periods of rainfall. Pre-storm inspections can prevent BMP failures during large rain events.

References

BMPs from Volume 1

Chapter 4

Land Grading (LG) 4-16
Preservation of Vegetation (PV) 4-64

BMPs from Volume 2

Chapter 2

General Planning Concepts for Stormwater Runoff Management and Overview of Low Impact Design and Smart Growth Concepts 2-1

Chapter 4

Infrastructure Planning

Protection of Natural Features

Construction-Exit Pad (CEP)

Practice Description

A construction-exit pad is a stone-base pad designed to provide a buffer area where mud- and caked-soil can be removed from the tires of construction vehicles to avoid transporting it onto public roads. This practice applies anywhere traffic will be leaving a construction site and moving directly onto a public road or street.

Planning Considerations

Roads and streets adjacent to construction sites should be kept clean for the general safety and welfare of the public. A construction-exit pad (Figure CEP-1) should be provided where mud can be removed from construction vehicle tires before they enter a public road.

If the action of the vehicle traveling over the gravel pad does not sufficiently remove the mud, or if the site is in a particularly sensitive area, a washing facility should be included with the pad (Figure CEP-2). When a washing facility is required, all wash water shall be diverted into a sediment trap or basin.

If the construction-exit pad is located in an area with soils that will not support traffic when wet, a geotextile liner located beneath the aggregate will be required to provide stability to the pad.

Construction of stabilized roads throughout the development site should be considered to lessen the amount of mud transported by vehicular traffic. The construction-exit pad

should be located to provide for maximum use by construction vehicles. Consideration should be given to limiting construction vehicles to only one ingress and egress point. Measures may be necessary to make existing traffic use the construction-exit pad.

Design Criteria and Construction

Site Preparation

Remove all vegetation and other unsuitable material from the foundation area.

Grading

Grade and crown the area for positive drainage. Utilize a diversion to direct any surface flow away from the construction-exit pad. Any runoff from the pad should be diverted into a sediment trap or basin. Install a pipe under the pad, if needed, to maintain drainage ditches along public roads.

Aggregate Size

Aggregate should be Mississippi Department of Transportation Size 1 Stabilizer. Aggregate surface shall be left smooth and sloped for drainage.

Pad Dimensions

The exit pad shall have a minimum aggregate thickness of 6″. The exit pad must be a minimum of 50 feet long and shall provide for entering and parking the longest construction vehicles anticipated. MDOT Drawing ECD-15 provides an example of a stabilized construction entrance. The exit pad shall have a typical width of 20 feet, but may be narrower or wider to equal the full width of the vehicular egress.

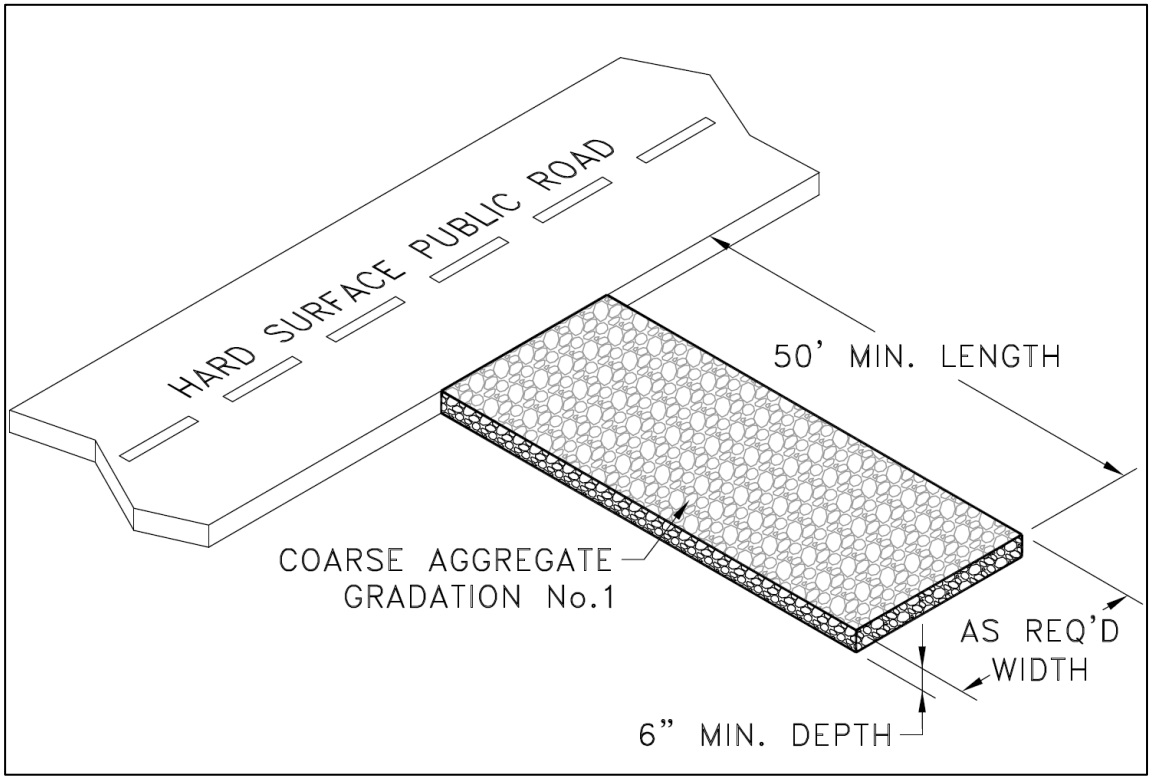


Figure CEP-1 Gravel Construction Exit

Geotextiles

A non-woven geotextile meeting the requirements shown in the table below for Class IV geotextiles should be used under the rock when the subgrade is soft or the blow count is less than 10.

Table CEP-1 Requirements for Nonwoven Geotextile

Property	Test method	Class I	Class II	Class III	Class IV [1]
Tensile strength (lb) [2]	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) [2]	ASTM D 4632	≥ 50	≥ 50	≥ 50	≥ 50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size (AOS)	ASTM D 4751	As specified max. #40 [3]	As specified max. #40 [3]	As specified max. #40 [3]	As specified max. #40 [3]
Permittivity sec^{-1}	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

Table copied from NRCS Material Specification 592.

1 Heat-bonded or resin-bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle-punched geotextile required for all other classes.

2 Minimum average roll value (weakest principal direction).

3 U.S. standard sieve size.

Washing

A washing facility shall be provided, if necessary, to prevent mud- and caked-soil from being transported to public streets and highways. It shall be constructed of concrete, stone, and/or other durable materials. Provisions shall be provided for the mud and other material to be carried away from the washing facility into a sediment trap or basin to allow for settlement of the sediment from the runoff before it is released from the site.

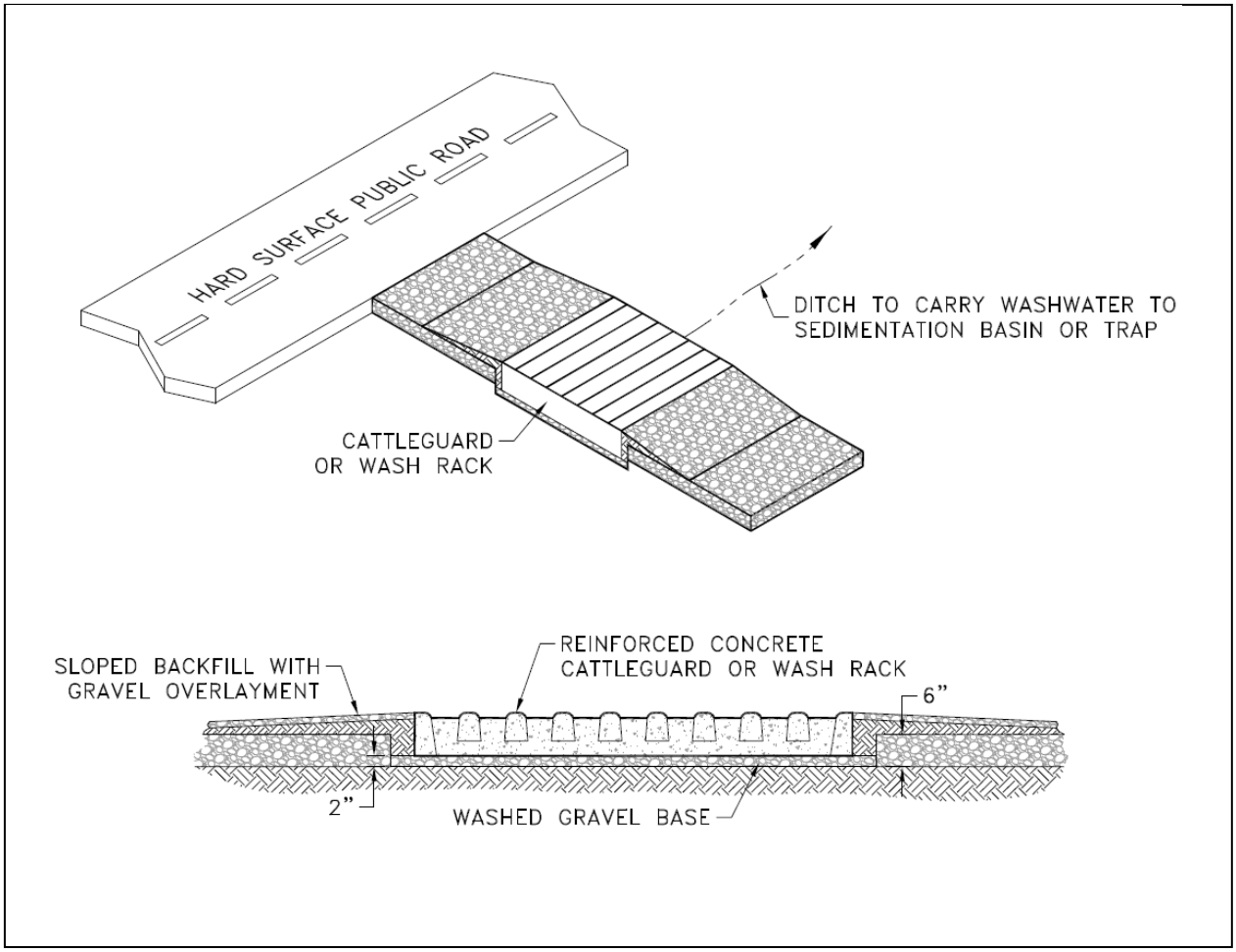


Figure CEP-2 Construction Exit with Wash Rack

Common Problems

Consult with a qualified design professional if any of the following occur:

Inadequate runoff control and sediment washes onto public road: install diversions or other runoff-control measures.

Ruts and muddy conditions develop as stone are pressed into soil: increase stone size or pad thickness, or add geotextile fabric.

Pad too short for heavy-construction traffic: consult design professional about extending pad to the necessary length

Maintenance

Remove large chunks of mud- or caked-soil from construction-exit pad daily to minimize sediment buildup.

Inspect stone pad and sediment-disposal area weekly and after storm events or heavy use.

Reshape pad as needed for drainage and runoff control.

Top-dress with clean-specified stone as needed to maintain effectiveness of the practice.

Immediately remove mud or sediment tracked or washed onto public road.

Repair any broken-road pavement immediately.

Remove unneeded exit-pad materials from areas where permanent vegetation will be established.

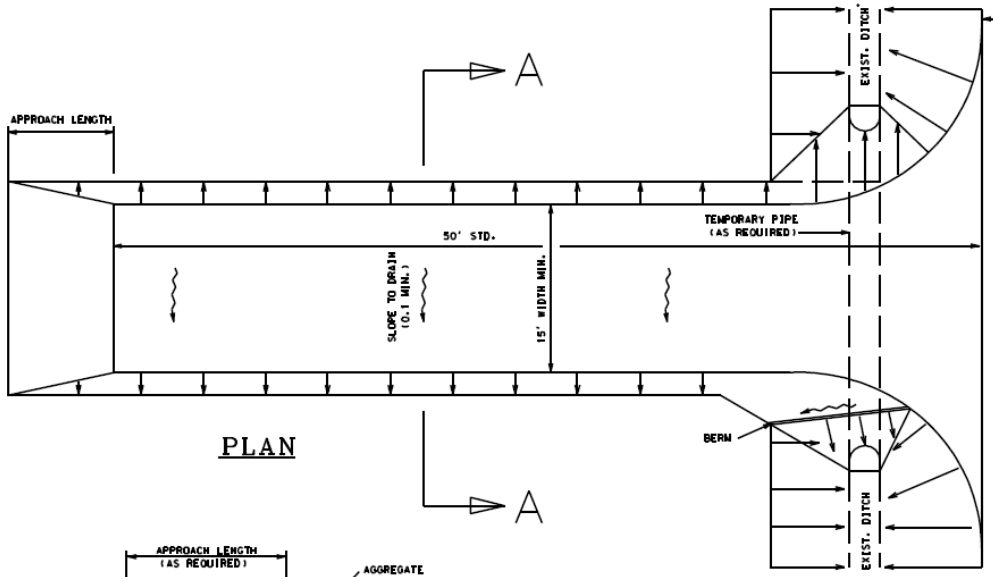
References

BMPs from Volume 1

Chapter 4

MDOT Drawings Referenced

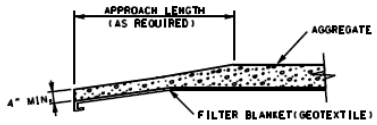
STATE	PROJECT NO.
MISS.	



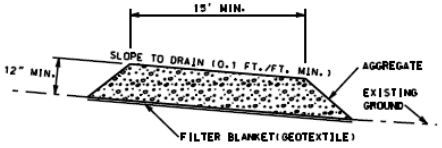
PLAN

NOTES:

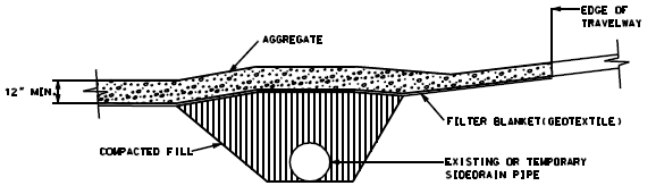
1. A STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED AT POINTS OF EGRESS FROM UNSTABILIZED AREAS OF THE PROJECT TO PUBLIC ROADS WHERE OFFSITE TRACKING OF MUD COULD OCCUR. TRAFFIC FROM UNSTABILIZED AREAS OF THE PROJECT SHALL BE DIRECTED THRU THE STABILIZED ENTRANCE. BARRIERS, FLAGGING, OR OTHER POSITIVE MEANS SHALL BE USED AS REQUIRED TO LIMIT AND DIRECT VEHICULAR EGRESS ACROSS THE STABILIZED ENTRANCE.
2. THE CONTRACTOR MAY PROPOSE AN ALTERNATIVE TECHNIQUE TO MINIMIZE OFFSITE TRACKING OF SEDIMENT. THE ALTERNATIVE MUST BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO IT'S USE.
3. ALL MATERIALS SPILLED, DROPPED, OR TRACKED ONTO PUBLIC ROADS (INCLUDING THE STABILIZED CONSTRUCTION ENTRANCE AGGREGATE AND CONSTRUCTION MUD) SHALL BE REMOVED DAILY, OR MORE FREQUENTLY IF SO DIRECTED BY THE ENGINEER.
4. SIZE 1 STABILIZER AGGREGATE SHALL BE USED
5. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL ALLOW IT TO PERFORM IT'S FUNCTION TO PREVENT OFFSITE TRACKING. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE RINSED WHEN NECESSARY TO MOVE ACCUMULATED MUD DOWNWARD THRU THE STONE. ADDITIONAL STABILIZATION OF THE VEHICULAR ROUTE LEADING TO THE STABILIZED ENTRANCE MAY BE REQUIRED TO LIMIT THE MUD TRACKED.
6. THE NOMINAL SIZE OF A STANDARD STABILIZED CONSTRUCTION ENTRANCE IS 15' x 50' UNLESS OTHERWISE SHOWN IN THE EROSION CONTROL PLAN



TRANSITION DETAIL



SECTION A-A



RURAL CONNECTION DETAIL

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

STABILIZED CONSTRUCTION ENTRANCE

WORKING NUMBER
ECD-15

SHEET NUMBER

FILENAME: EROSION CONTROL\ECD-15.DGN

DESIGN ITEM _____ CHECKED _____ DATE _____

Construction Road Stabilization (CRS)

CRS

Practice Description

This practice describes the temporary stabilization of construction-access roads and parking areas. The purpose of this BMP is to reduce erosion of temporary and permanent roadbeds between the time of initial clearing and grading and final stabilizations.

Planning Considerations

A construction-exit pad should be provided in conjunction with stabilized construction roads where mud can be removed from construction-vehicle tires before they enter a public road.

If the construction-access road is located in an area with soils that will not support traffic when wet, a geotextile liner located beneath the aggregate will be required to provide stability to the pad.

Construction of stabilized roads throughout the development site should be designed so that construction vehicles are limited to only one ingress and egress point. The existing site contour should be followed as much as possible with slopes of the roads remaining less than 10 percent. Parking areas should be designed at naturally flat areas.

Permanent roads and parking areas should be paved as soon as possible after grading. However, it is understandable that funds for this purpose may not be available in the early phases of the development project. As an alternative, the early application of stone may solve potential erosion and stability problems and eliminate potential costs. Some of the stone will also probably remain in place for use as part of the final base course of the road.

Design Criteria and Construction

Site Preparation

Remove all vegetation and other unsuitable material from the roadway area.

Grading

Stabilize the side slopes of all cuts and fills by grading all slopes to 2:1 or flatter for clay soils and 3:1 or flatter for sandy soils. All exposed slopes should be seeded and/or mulched as soon as possible (see Temporary Seeding, Mulching, and Dust Control).

Aggregate Size

A 6″ course of DOT No. 1 aggregate shall be applied immediately after grading or after the completion of the utility installation within the right-of-way. A geotextile may be applied to the roadbed for additional stability.

Drainage

Ensure that proper drainage is provided for and that all drainage along construction roads is directed to sediment control BMPs.

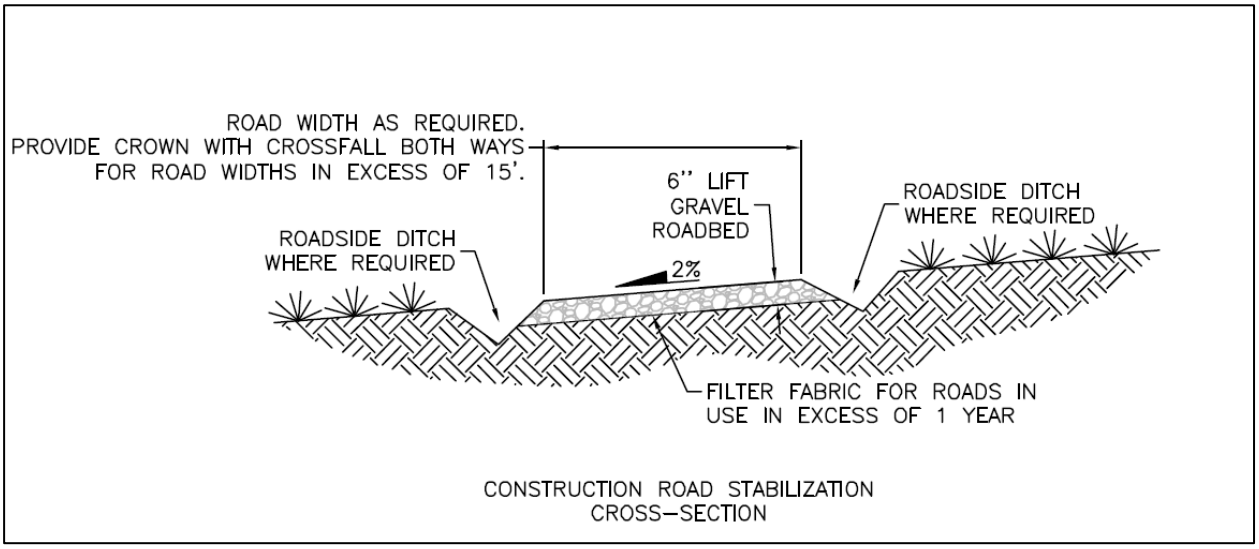


Figure CRS- 1 Construction Road Stabilization

Geotextiles

A non-woven geotextile meeting the requirements shown in the table below for Class IV geotextiles should be used under the rock when the subgrade is soft or the blow count is less than 10.

Table CEP-1 Requirements for Nonwoven Geotextile

Property	Test method	Class I	Class II	Class III	Class IV [1]
Tensile strength (lb) [2]	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) [2]	ASTM D 4632	≥ 50	≥ 50	≥ 50	≥ 50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size (AOS)	ASTM D 4751	As specified max. #40 [3]	As specified max. #40 [3]	As specified max. #40 [3]	As specified max. #40 [3]
Permittivity sec^{-1}	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

Table copied from NRCS Material Specification 592.

1 Heat-bonded or resin-bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle-punched geotextile required for all other classes.

2 Minimum average roll value (weakest principal direction).

3 U.S. standard sieve size.

Width

Roadbeds shall be at least 14feet wide for one-way traffic and 20feet wide for two-way traffic.

Vegetation

All roadside ditches, cuts, fills, and disturbed areas adjacent to parking areas and roads shall be stabilized with appropriate temporary or permanent vegetation according to the applicable practices contained in this manual.

Common Problems

Consult with a qualified design professional if any of the following occur:

Inadequate runoff control and sediment washes onto public road: install diversions or other runoff-control measures.

Ruts and muddy conditions develop as stone are pressed into soil: increase stone size or pad thickness, or add geotextile fabric.

Maintenance

Reshape roadway as needed for drainage and runoff control.

Inspect stone pad and sediment-disposal area weekly and after storm events or heavy use.

Top-dress with clean, specified stone, as needed, to maintain effectiveness of the practice.

References

BMPs from Volume 1

Chapter 4

Land Grading (LG)

Practice Description

Land grading is reshaping of the ground surface to provide suitable topography for buildings, facilities, and other land uses; to control surface runoff; and to minimize soil erosion and sedimentation, both during and after construction. This practice applies to the following sites: where the existing topography must be modified to prepare for another land use and/or where adapting proposed development to the existing landscape can reduce the erosion potential of the site and the cost of installing erosion- and sediment-control measures. In some instances, other practices such as diversions can be used to reduce the length of continuous slopes and reduce erosion potential.

Planning Considerations

A detailed plan should be developed by a qualified design professional for all land-grading activities at the project site. The plan should show all areas to be disturbed, the areas of cut, areas of fill, and the finished elevation for all graded areas.

The grading plan should be designed to protect existing vegetation where possible, especially around natural drainageways. Grading activities should be scheduled to minimize the area disturbed at any one time during the construction process. The plan should include provisions for stabilizing disturbed areas immediately after final grading is completed. Provisions should also be made to protect existing underground utilities. Finally, topsoil should be removed and stockpiled for use in revegetating the site.

The grading plan should also include necessary practices for controlling sediment and erosion at the site. These practices could include stable outlets and slope breaks.

Design Criteria and Construction

Site Preparation

A detailed survey of the construction site should be performed by a qualified surveyor prior to grading-plan development. This survey should include existing topographic information at the site including existing elevations, existing drainage patterns, locations of existing overhead and underground utilities, and construction-limit boundaries.

The grading plan should require that the existing topsoil at sites to be graded be removed as the first step in the grading process. The plan should include a location on the construction site where topsoil will be stockpiled. Stockpiled topsoil should be protected by temporary vegetation (see *Temporary Seeding* P*ractice*) until it is used to cover disturbed areas.

The plan should include a schedule of disturbance activities that minimizes the area disturbed at any point in time. In areas where clearing of existing vegetation is planned, the area should be cleared and grubbed by removing trees, vegetation, roots, and other debris, such as trash. In areas to be filled, all loose or weak soil and oversized rocks should be removed from the area. The foundation of the area to be filled should consist of soil or rock material of adequate strength to support the proposed fill material and the structures to be built at the site. The exact depth of material to be removed should be determined by a qualified geotechnical professional according to accepted engineering standards.

Grading

A plan for placement of fill should be developed by a qualified geotechnical professional. The plan should specify the source of fill materials, which should be obtained on-site if possible. Materials used for fill, when placed according to the plans and specifications, should provide sufficient strength to support structures planned for construction at the location.

Loose fill material should be placed in layers not exceeding 9″ in thickness. The materials should be compacted at a moisture content and to a dry density that will produce the design-bearing strength required for structures planned at the site. A qualified geotechnical engineer should provide fill placement specifications using standard, accepted engineering practices.

Slope lengths at the site should be minimized using diversions as slope breaks to reduce erosion potential (see *Diversion Practice*). The following table gives guidance on the horizontal spacing of slope breaks:

Table LG-1 Guidelines for Spacing Slope Breaks

Slope	Spacing (Ft)
33-50%	20
25-33%	40
15-25%	60
10-15%	80
6-10%	120
3-6%	200
<3%	300

In areas where seepage and ground water are present, subsurface drains should be installed to improve slope stability or soil-bearing capacity (see *Subsurface Drain Practice*).

Steep slopes should be avoided if possible. Slopes that are to be vegetated should be 2 horizontal to 1 vertical or flatter. If the slope is to be maintained by a tractor or other equipment, the slope should be 3 horizontal to 1 vertical or flatter. Slopes should be designed to blend with surrounding topography as much as possible.

Erosion Control

The grading plan should include provisions for stabilization of graded areas immediately after final grading is completed. On areas that will have no additional disturbance, permanent vegetation should be applied immediately to the site (see *Permanent Seeding Practice*). On areas where work is to be interrupted or delayed for 14 working days or longer, such as topsoil stockpiles, the area should be stabilized using mulch or temporary seeding (see *Mulching* or *Temporary Seeding Practices*). Other stabilization measures such as erosion-control blankets, should be used in extreme conditions, such as steep slopes and channels.

Where practical, runoff from undisturbed off-site areas should be diverted around the construction site to prevent erosion on the disturbed areas (see *Diversion Practice*).

Sediment Control

Any required sediment-control practices should be installed before the land-disturbance activities in the drainage area of the sediment-control practice. Until disturbed areas can be stabilized, appropriate sediment-control measures will be maintained to minimize sediment delivery off-site. Measures should include as a minimum:

Sediment Barriers – Placed along toes of slopes and drainageways (see *Sediment Barrier Practice*).

Sediment Basins – Divert sediment-laden runoff to basins as needed to minimize off-site sedimentation (see *Sediment Basin Practice*).

Inlet Protection – Where sediment-laden runoff is diverted to on-site stormwater-drain inlets, the inlets should be protected with an appropriate sediment-control practice.

Stabilized Outlets – All runoff from the site should be conveyed in stabilized channels (see *Grass Swale, Lined Swale,* or *Channel Stabilization Practices*).

Common Problems

Consult with a qualified design professional if any of the following occur:

Variations in topography on-site indicate grading plan will be ineffective or non-feasible.

Seepage is encountered during construction. It may be necessary to install drains.

Subgrade is soft or has high organic content and can hinder proper compaction of fill. It may be necessary to undercut and replace unsuitable subgrade soil.

Design specifications for sediment-control measures, seed variety, seeding dates, or other erosion-control measures or materials cannot be met. Substitutions may be required. Unapproved substitutions could result in erosion and lead to failure of sediment- and erosion-control measures.

Maintenance

Periodically check all graded areas and the related erosion and sediment-control practices for damage by equipment and especially after heavy rainfalls for damage by runoff.

Repair silt fences and other temporary, sediment-control measures.

Clean sediment out of adjacent diversions and other structures as needed.

Repair any failures that occur in surface stabilization measures, such as plantings.

References

BMPs from Volume 1

Chapter 4

Topsoiling (TSG)

Practice Description

Topsoiling is the removal of a desirable soil surface, referred to as topsoil, at a site prior to construction and using it on areas to be vegetated. Topsoiling a site usually improves the quality of the plant-growth medium at the site and increases the likelihood of successful plant establishment and performance. This practice applies to sites that are to be disturbed by excavation, compaction or filling, and to other areas where the subsoil is unsuitable for plant growth.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as darker than the subsoil due to enrichment with organic matter. It is the major zone of root development and biological activity. Microorganisms that enhance plant growth thrive in this layer. Topsoil can usually be differentiated from subsoil by texture as well as color. Clay content usually increases in the subsoil.

The depth of topsoil may be quite variable. On severely eroded sites it may be non-existent.

Advantages of topsoil include its high organic-matter content, friable consistency (soil aggregates can be crushed with only moderate pressure), its available water-holding capacity, and nutrient content. Most often, it is superior to subsoil in the above characteristics. The texture and friability of topsoil are usually much more conducive to seedling emergence and root growth than subsoils.

In addition to being a better growth medium, topsoil is often less erodible than subsoils, and the coarse texture of topsoil increases infiltration capacity and reduces runoff.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and reapplying topsoil, or importing topsoil, may not always be cost effective. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds, and weeds may compete with desirable species.

In site planning, the option of topsoiling should be compared with that of preparing a seedbed in subsoil. The clay content of subsoils does provide high moisture availability and deter leaching of nutrients. When properly limed and fertilized, subsoils may provide a good growth medium, especially if there is adequate rainfall or irrigation water to allow root development in otherwise high-density material.

Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a recommended procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low-pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

- An adequate volume of topsoil should exist on the site. Topsoil will be spread at a compacted depth of 4″ or greater.
- The topsoil stockpile should be located so that it meets specifications and does not interfere with work on the site, block drainage, or release appreciable amounts of sediment.
- Allow sufficient time in scheduling for topsoil to be spread and bonded to the subsoil prior to seeding, sodding, or planting.
- Care must be taken not to apply topsoil to subsoil if the two soils have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination because as water creeps along the junction between the soil layers, sloughing of the topsoil may occur.
- If topsoil and subsoil are not properly bonded, water will not infiltrate into the soil profile evenly and it will be difficult to establish vegetation.

Design Criteria and Construction

Materials

Field exploration of the site should be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy-clay loam, and clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

Potential topsoil should be tested by a recognized laboratory. It should meet the following criteria:

- Organic-matter content should be not less than 1.0% by weight.
- The pH range should be from 6.0-7.5. If pH is less than 6.0, lime should be added in accordance with soil-test results or in accordance with the recommendations of the vegetative-establishment practice being used.
- Soluble salts shall not exceed 500 ppm.
- If additional off-site topsoil is needed, it should meet the standards stated above.
- The depth of material meeting the above qualifications should be at least 4″. Soil factors such as rock fragments, slope, depth to water table, and layer thickness affect the ease of excavation and spreading of topsoil.

Generally, the upper part of the soil, which is richest in organic matter, is most desirable; however, material excavated from deeper layers may be worth storing if it meets the other criteria listed above.

Stripping

Strip only those areas that will be affected by construction or development. A normal stripping depth is 4-6″, but deeper depths may be satisfactory if the soil is suitable and undercutting is allowable in locations such as buildings, water-impoundment structures, roadways, etc. Appropriate sediment-control measures such as sediment barriers, sediment basins, inlet protection, etc., should be in place before the topsoil is stripped. Stripping should not be done on areas intended to support conventional, on-site effluent, disposal lines (field lines).

Stockpiling

The stockpile location should be out of drainageways and traffic routes. Stockpiles should not be placed on steep slopes where undue erosion will take place. Measures should be taken to prevent erosion of the stockpiles. These would include

- Mulching the stockpile when it is left inactive for 14 days or longer.
- Planting temporary vegetation when the stockpile is to be inactive over 30 days.
- Covering the stockpile with plastic whenever the piles are small or any soil loss would damage existing buildings or facilities.
- Planting permanent vegetation when the stockpile use will be inactive over 12 months.
- In cases where the stockpile is small and will be removed in fewer than 14 days, it may be more practical to use a sediment barrier than an erosion-control practice.

Site Preparation

Areas to be covered with topsoil shall be excavated, graded, filled, and shaped to the proper lines, grades, and elevations before topsoil placement is started.

The subgrades should be checked for pH and limed if the pH is less than 6.0. Liming shall be done in accordance with soil tests and in relation to the seeding mixture to be planted. Incorporate lime to a depth of at least 2″ by discing.

Applying Topsoil

Immediately before placement of topsoil, the subsoil should be disced or scarified to a depth of 2″ to enhance bonding of the subsoil and topsoil. Topsoil should be uniformly spread to a minimally compacted depth of 4″. Required volumes of topsoil may be determined using Table TSG-1.

Table TSG-1 Volume of Soil Needed for Topsoiling

Depth to Spread (inches)	Cubic Yards Per 1,000 Sq. Ft.	Cubic Yards Per Acre
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

When applying topsoil, maintain needed erosion-control practices such as diversions, grass swales, lined swales, etc. Topsoil should not be spread when it or the subgrade is frozen or muddy.

Precautions should be taken to prevent layering of the topsoil over the subsoil. Mixing and bonding of the two soils should be enhanced by use of discing or cultivation tools.

Settling of the topsoil is necessary to bond the soils together, but undue compaction should be prevented. Light compaction is necessary to increase soil strength, reduce erosion, and enhance vegetation establishment. Excessive compaction should be prohibited as it increases runoff and inhibits seed germination and root development.

Surface irregularities that would impede drainage, increase erosion, or otherwise damage the site should be removed in final grading.

Common Problems

Consult with a qualified design professional if any of the following occur:

Depth of surface being stripped is significantly different than anticipated.

Topsoil appears to contain contaminants.

Topsoil appears too compacted during spreading; may need to loosen by discing or scarifying.

Maintenance

Inspect topsoiled areas frequently until vegetation is established.

Repair eroded or damaged areas and revegetate.

Repair sloughing on steep slopes—remove topsoil, roughen subgrade and respread topsoil.

Consult with a qualified design professional if drainage (wetness caused by seepage) or shallowness to bedrock (less than 24″) is involved.

References

BMPs from Volume 1

Chapter 4

Land Grading (LG)	4-16
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