

B-1 STANDARDS AND SPECIFICATIONS FOR LAND GRADING

Reshaping the existing land surface to provide suitable topography for building facilities and other site improvements.

- Definition**
- Purpose**
- Conditions Where Practice Applies**

Earth disturbances or extreme grade modifications on steep or long slopes.

The grading plan should be based on the incorporation of building designs and street grade layouts that fit and utilize existing topography and desirable natural surroundings to avoid extreme modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, adjacent properties, drainage patterns, measures for water removal, and vegetative treatment, etc.

- Provisions to safely convey surface runoff to storm drains, protected outlets or stable water courses to ensure that surface runoff will not damage slopes or other graded areas.
- Cut and fill slopes, stabilized with grasses, no steeper than 2:1. (Where the slope is to be mowed, the slope should be no steeper than 3:1, but 4:1 is preferred because of safety factors related to mowing slopes). Slopes steeper than 2:1 require special design and stabilization considerations to be shown on the plans.

- Benching per Detail B-3.1 whenever the vertical interval (height) of any stabilization exceeds 20 feet; for 3:1 slopes, when it exceeds 30 feet; and for 4:1 slopes, when it exceeds 40 feet. Locate benches to divide the slope face as equally as possible and to convey the water to a stable outlet. Soils, seeps, rock outcrops, etc. are to be taken into consideration when designing benches.
 - Provide benches with a minimum width of six feet for each face of the slope.
 - Design benches with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Grade the longitudinal slope of the bench between 2 percent and 3 percent, unless accompanied by appropriate design and computations.
 - The maximum allowable flow length within a bench is 800 feet unless accompanied by appropriate design and computations.

- Diversion of surface water from the face of all cut and fill slopes using earth dikes or swales. Convey surface water down slope using a designed structure, and:
 - Protect the face of all graded slopes from surface runoff until they are stabilized.
 - Do not subject the slope's face to any concentrated flow of surface water such as from natural drainage ways, graded swales, downspouts, etc.
 - Protect the face of the slope by special erosion control materials to include, but not be limited to, approved vegetative stabilization practices, riprap or other approved stabilization methods.

- Serrated slope as shown in Detail B-3.2. The steepest allowable slope for ripable rock is 1.5:1. For non ripable rocks, the slopes are to be 2:1 or flatter. These steps will weather and act to hold moisture, lime, fertilizer and seeds thus producing a much quicker and longer lived vegetative cover and better slope stabilization.
- Subsurface drainage provisions. Provide subsurface drainage when necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

- Proximity to adjacent property. Slopes must not be created close to property lines without adequate protection against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.
- Quality of fill material. Fill material must be free of brush, rubbish, logs, stumps, building debris, and other objectionable material. Do not place frozen materials in the fill nor place the material on a frozen foundation.

- Stabilization. Stabilize all disturbed areas structurally or vegetatively in compliance with Section B-4 Standards and Specifications for Stabilization Practices.

B-2 STANDARDS AND SPECIFICATIONS FOR SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Temporary Stabilization
 - Seedbed preparation consists of loosening soil to a depth of 3 to 5 inches by means of suitable agricultural or construction equipment, such as disc harrows or chisel plows or rippers mounted on construction equipment. After the soil is loosened, it must be rolled or dragged smooth but left in the roughened condition. Slopes 2:1 or flatter are to be treated with ridges running parallel to the contour of the slope.
 - Apply fertilizer and lime as prescribed on the plans.
2. Permanent Stabilization
 - A soil test is required for any earth disturbance of 5 acres or more. The minimum soil conditions required for permanent vegetative establishment are:
 - Soil pH between 6.0 and 7.0.
 - Soluble salts less than 500 parts per million (ppm).
 - Soil contains less than 40 percent clay but enough fine grained material (greater than 30 percent silt plus clay) to provide the capacity to hold a moderate amount of moisture. An exception: 40 percent silt plus clay is permitted, then a sandy soil (less than 30 percent silt plus clay) would be acceptable.
 - Soil contains 1.5 percent minimum organic matter by weight.
 - Soil contains sufficient pore space to permit adequate root penetration.
 - Application of amendments or topsoil is required if on-site soils do not meet the above conditions.
 - Graded areas must be maintained in a true and even grade as specified on the approved plan, then scarified or otherwise loosened to a depth of 3 to 5 inches.
 - Apply soil amendments as specified on the approved plan or as indicated by the results of a soil test.
 - Mix soil amendments into the top 3 to 5 inches of soil by disking or other suitable means. Rake level areas to smooth the surface, remove large objects like stones and branches, and ready the area for seed application. Loosen surface soil by dragging with a heavy chain or other equipment to roughen the surface where site conditions will not permit normal seedbed preparation. Track slopes 2:1 or flatter with tracked equipment leaving the soil in an irregular condition with ridges running parallel to the contour of the slope. Leave the top 1 to 3 inches of soil loose and friable. Seedbed loosening may be unnecessary on newly disturbed areas.

B-4 STANDARDS AND SPECIFICATIONS FOR VEGETATIVE STABILIZATION

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Adequate vegetative stabilization requires 95 percent groundcover.
- If an area has less than 40 percent groundcover, restabilize following the original recommendations for lime, fertilizer, seedbed preparation, and seeding.
- If an area has between 40 and 94 percent groundcover, over-seed and fertilize using half of the rates originally specified.
- Maintenance fertilizer rates for permanent seeding are shown in Table B.6.

B-4.1 STANDARDS AND SPECIFICATIONS FOR INCREMENTAL STABILIZATION

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Excavate and stabilize cut slopes in increments not to exceed 15 feet in height. Prepare seedbed and apply seed and mulch on all cut slopes as the work progresses.
- Construction sequence example (Refer to Figure B.1):
 - Construct and stabilize all temporary swales or dikes that will be used to convey runoff around the excavation.
 - Perform Phase 1 excavation, prepare seedbed, and stabilize.
 - Perform Phase 2 excavation, prepare seedbed, and stabilize. Overseed Phase 1 areas as necessary.
 - Perform final phase excavation, prepare seedbed, and stabilize. Overseed previously seeded areas as necessary.

B-4.2 STANDARDS AND SPECIFICATIONS FOR TEMPORARY STABILIZATION

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Soil tests must be performed to determine the exact ratios and application rates for both lime and fertilizer on sites having disturbed areas of 5 acres or more. Soil analysis may be performed by a recognized private or commercial laboratory. Soil samples taken for engineering purposes may also be used for chemical analyses.
- Fertilizers must be uniform in composition, free flowing and suitable for accurate application by appropriate equipment. Manure may be substituted for fertilizer with prior approval from the appropriate approval authority. Fertilizers must all be delivered to the site fully labeled according to the applicable laws and must bear the name, trade name or trademark and warranty of the producer.
- Lime materials must be ground limestone (hydrated or burnt lime may be substituted except when hydroseeding) which contains at least 50 percent total oxides (calcium oxide plus magnesium oxide). Limestone must be ground to such fineness that at least 50 percent will pass through a #100 mesh sieve and 98 to 100 percent will pass through a #20 mesh sieve.
- Lime and fertilizer are to be evenly distributed and incorporated into the top 3 to 5 inches of soil by disking or other suitable means.

1. Select one or more of the species or seed mixtures listed in Table B.1 for the appropriate Plant Hardiness Zone (from Figure B.3), and enter them in the Temporary Seeding Summary below along with application rates, seeding dates and seeding depths. If this Summary is not put on the plan and

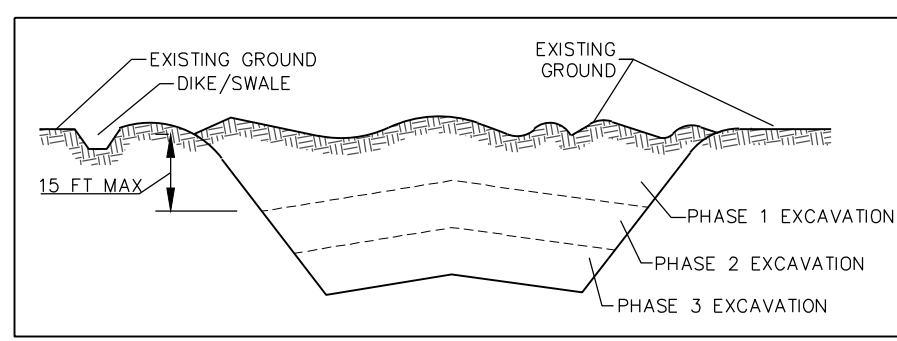


Figure B.2: Incremental Stabilization - Cut

B-4.3 STANDARDS AND SPECIFICATIONS FOR SEEDING AND MULCHING

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Construct and stabilize fill slopes in increments not to exceed 15 feet in height. Prepare seedbed and apply seed and mulch on all slopes as the work progresses.
- Stabilize slopes immediately when the vertical height of a lift reaches 15 feet, or when the grading operation ceases as prescribed in the plans.
- At the end of each day, install temporary water conveyance practices, as necessary, to intercept surface runoff and convey it down the slope in a non-erosive manner.
- Construction sequence example (Refer to Figure B.2):
 - Construct and stabilize all temporary swales or dikes that will be used to divert runoff around the fill. Construct silt fences on low side of fill unless other methods shown on the plans address this area.
 - At the end of each day, install temporary water conveyance practices, as necessary, to intercept surface runoff and convey it down the slope in a non-erosive manner.
 - Place Phase 1 fill, prepare seedbed, and stabilize.
 - Place Phase 2 fill, prepare seedbed, and stabilize.
 - Place final phase fill, prepare seedbed, and stabilize. Overseed previously seeded areas as necessary.

1. Provisions to safely convey surface runoff to storm drains, protected outlets or stable water courses to ensure that surface runoff will not damage slopes or other graded areas.
- Cut and fill slopes, stabilized with grasses, no steeper than 2:1. (Where the slope is to be mowed, the slope should be no steeper than 3:1, but 4:1 is preferred because of safety factors related to mowing slopes). Slopes steeper than 2:1 require special design and stabilization considerations to be shown on the plans.
- Benching per Detail B-3.1 whenever the vertical interval (height) of any stabilization exceeds 20 feet; for 3:1 slopes, when it exceeds 30 feet; and for 4:1 slopes, when it exceeds 40 feet. Locate benches to divide the slope face as equally as possible and to convey the water to a stable outlet. Soils, seeps, rock outcrops, etc. are to be taken into consideration when designing benches.
 - Provide benches with a minimum width of six feet for each face of the slope.
 - Design benches with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Grade the longitudinal slope of the bench between 2 percent and 3 percent, unless accompanied by appropriate design and computations.
 - The maximum allowable flow length within a bench is 800 feet unless accompanied by appropriate design and computations.

- Diversion of surface water from the face of all cut and fill slopes using earth dikes or swales. Convey surface water down slope using a designed structure, and:
 - Protect the face of all graded slopes from surface runoff until they are stabilized.
 - Do not subject the slope's face to any concentrated flow of surface water such as from natural drainage ways, graded swales, downspouts, etc.
 - Protect the face of the slope by special erosion control materials to include, but not be limited to, approved vegetative stabilization practices, riprap or other approved stabilization methods.
- Serrated slope as shown in Detail B-3.2. The steepest allowable slope for ripable rock is 1.5:1. For non ripable rocks, the slopes are to be 2:1 or flatter. These steps will weather and act to hold moisture, lime, fertilizer and seeds thus producing a much quicker and longer lived vegetative cover and better slope stabilization.
- Subsurface drainage provisions. Provide subsurface drainage when necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

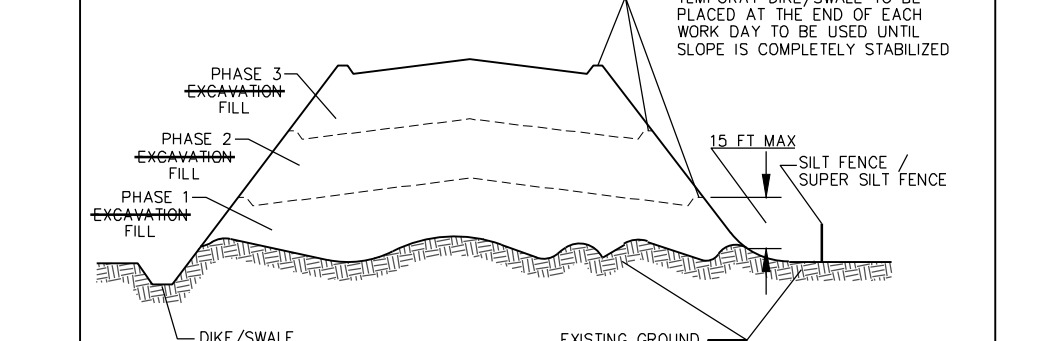


Figure B.2: Incremental Stabilization - Fill

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

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 - Seedbed preparation consists of loosening soil to a depth of 3 to 5 inches by means of suitable agricultural or construction equipment, such as disc harrows or chisel plows or rippers mounted on construction equipment. After the soil is loosened, it must be rolled or dragged smooth but left in the roughened condition. Slopes 2:1 or flatter are to be treated with ridges running parallel to the contour of the slope.
 - Apply fertilizer and lime as prescribed on the plans.
2. Permanent Stabilization
 - A soil test is required for any earth disturbance of 5 acres or more. The minimum soil conditions required for permanent vegetative establishment are:
 - Soil pH between 6.0 and 7.0.
 - Soluble salts less than 500 parts per million (ppm).
 - Soil contains less than 40 percent clay but enough fine grained material (greater than 30 percent silt plus clay) to provide the capacity to hold a moderate amount of moisture. An exception: 40 percent silt plus clay is permitted, then a sandy soil (less than 30 percent silt plus clay) would be acceptable.
 - Soil contains 1.5 percent minimum organic matter by weight.
 - Soil contains sufficient pore space to permit adequate root penetration.
 - Application of amendments or topsoil is required if on-site soils do not meet the above conditions.
 - Graded areas must be maintained in a true and even grade as specified on the approved plan, then scarified or otherwise loosened to a depth of 3 to 5 inches.
 - Apply soil amendments as specified on the approved plan or as indicated by the results of a soil test.
 - Mix soil amendments into the top 3 to 5 inches of soil by disking or other suitable means. Rake level areas to smooth the surface, remove large objects like stones and branches, and ready the area for seed application. Loosen surface soil by dragging with a heavy chain or other equipment to roughen the surface where site conditions will not permit normal seedbed preparation. Track slopes 2:1 or flatter with tracked equipment leaving the soil in an irregular condition with ridges running parallel to the contour of the slope. Leave the top 1 to 3 inches of soil loose and friable. Seedbed loosening may be unnecessary on newly disturbed areas.

B-4.4 STANDARDS AND SPECIFICATIONS FOR STOCKPILE AREA

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. The stockpile location and all related sediment control practices must be clearly indicated on the erosion and sediment control plan.
- The footprint of the stockpile must be sized to accommodate the anticipated volume of material and based on a side slope ratio no steeper than 2:1. Benching must be provided in accordance with Section B-3 Land Grading.
- Runoff from the stockpile area must drain to a suitable sediment control practice.
- Access the stockpile area from the upgrade side.
- Clear water runoff into the stockpile area must be minimized by use of a diversion device such as an earth dike, temporary swale or diversion fence. Provisions must be made for discharging concentrated flow in a non-erosive manner.
- Where runoff concentrates along the toe of the stockpile, an appropriate erosion/sediment control practice must be used to intercept the discharge.
- Stockpiles must be stabilized in accordance with the 37 day stabilization requirement as well as Standard B-4.1 Incremental Stabilization and Standard B-4.4 Temporary Stabilization.
- If the stockpile is located on an impervious surface, a liner should be provided below the stockpile to facilitate cleanup. Stockpiles containing contaminated material must be covered with impermeable sheeting.

1. Select one or more of the species or seed mixtures listed in Table B.1 for the appropriate Plant Hardiness Zone (from Figure B.3), and enter them in the Temporary Seeding Summary below along with application rates, seeding dates and seeding depths. If this Summary is not put on the plan and

2. For sites having soil tests performed, use and show the recommended rates by the testing agency. Soil tests are not required for Temporary Seeding.
- When stabilization is required outside of a seeding season, apply seed and mulch or straw mulch alone as prescribed in Section B-4.3-A.1.b and maintain until the next seeding season.

Table B.1: Temporary Seeding for Site Stabilization

Plant Species	Seeding Rate lb/ac	Seeding Depth (inches)	Recommended Seeding Dates by Plant Hardiness Zone ¹	
			6a	7a
Cool-Season Grasses				
Annual Ryegrass	40	1.0	0.5	1/15 to May 15; Aug 1 to Oct 15
Barley	96	2.2	1.0	Mar 1 to May 15; Aug 1 to Oct 15
Oats	72	1.7	1.0	Mar 1 to May 15; Aug 1 to Oct 15
Wheat	120	2.8	1.0	Mar 1 to May 15; Aug 1 to Oct 15
Cereal Rye	112	2.8	1.0	Mar 1 to May 15; Aug 1 to Nov 15
Warm-Season Grasses				
Centennial Fescue	30	0.7	0.5	May 15 to Aug 31
Perennial Fescue	20	0.5	0.5	May 15 to Aug 31

1. Fertilizer Rate (10-20-20): 435 lb/ac (10 lb/1000 sq ft)
Lime Rate: 2 tons/ac (90 lb/1000 sq ft)

- Notes:**
- Seeding rates for the warm-season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates shall be adjusted to reflect percent seed germination and purity, as tested. Adjustments are usually not required for the cool-season grasses.
- Seeding rates listed above are for temporary seedings, when planted alone. When planted as a nurse crop with permanent seed mixtures, use 1/3 of the seeding rate listed above for ryegrass, oats, and wheat. For smaller-seeded grasses (annual ryegrass, pearl millet, foxtail millet), do not exceed more than 5% (by weight) of the overall permanent seeding mix. Cereal rye generally should not be used as a nurse crop, unless planting will occur in very late fall following the seeding dates for other temporary seedings. Cereal rye has allelopathic properties that inhibit the germination and growth of other plants. If it must be used as a nurse crop, seed at 1/3 of the rate listed above.

B-4.5 STANDARDS AND SPECIFICATIONS FOR PERMANENT STABILIZATION

- Definition**
- Purpose**
- Conditions Where Practice Applies**
- Criteria**

1. Dry Seeding. This includes use of conventional drop or broadcast spreaders.
- Incorporate seed into the subsoil at the rates prescribed on Temporary Seeding Table B.1, Permanent Seeding Table B.3, or site-specific seeding summaries.
- Apply seed in two directions, perpendicular to each other. Half the seeding rate in each direction. Roll the seeded area with a weighted roller to provide good seed to soil contact.
- Drill or Outdrill Seeding: Mechanized seeders that apply and cover seed with soil.
- Cultivating seeders are required to bury the seed in such a fashion as to provide at least 1/4 inch of soil covering. Seedbed must be firm after planting.
- Apply seed in two directions, perpendicular to each other. Half the seeding rate in each direction.
- Hydroseeding: Apply seed uniformly with hydroseeder (spray includes seed and fertilizer).
- If fertilizer is being applied at the time of seeding, the application rates should not exceed the following: nitrogen, 100 pounds per acre total of soluble nitrogen; P2O5 (phosphorus), 200 pounds per acre; K2O (potassium), 200 pounds per acre.
- Lime: Use only ground agricultural limestone (up to 3 tons per acre may be applied by hydroseeding). Normally, not more than 2 tons are applied by hydroseeding at any one time. Do not use burnt or hydrated lime when hydroseeding.
- Mix seed and fertilizer on site and seed immediately and without interruption.
- When hydroseeding do not incorporate seed into the soil.

1. Mowing
 - Mulch materials (in order of preference)
 - Straw consisting of thoroughly threshed rye, oat, or barley and reasonably bright in color. Straw is to be free of noxious weed seeds as specified in the Maryland Seed Law and not musty, moldy, caked, decayed, or excessively dirty. **Note: Use only sterile straw mulch in areas where one species of grass is desired.**
 - Wood Cellulose Fiber Mulch (WCFM) consisting of specially prepared wood cellulose processed into a uniform fibrous physical state.
 - WCFM is to be dyed green or contain a green dye in the package that will provide an appropriate color to facilitate visual inspection of the uniformly spread straw.
 - WCFM, including dye, must contain no germination or growth inhibiting factors.
 - WCFM materials are to be manufactured and processed in such a manner that the wood cellulose fiber mulch will remain in uniform suspension in water under agitation and will blend with seed, fertilizer and other additives to form a homogeneous slurry. The mulch material must form a blotter-like ground cover, on application, having moisture absorption and percolation properties and must cover and hold grass seed in contact with the soil without inhibiting the growth of the grass seedlings.
 - WCFM material must not contain elements or compounds at concentration levels that will be phytotoxic.
 - WCFM must conform to the following physical requirements: fiber length of approximately 10 millimeters, diameter approximately 1 millimeter, pH range of 4.0 to 5.5, ash content of 1.6 percent maximum and water holding capacity of 90 percent minimum.

1. Application
 - Apply mulch to all seeded areas immediately after seeding.
 - When straw mulch is used, spread it over all seeded areas at the rate of 2 tons per acre to a uniform loose depth of 1 to 2 inches. Apply mulch to achieve a uniform distribution and depth so that the soil surface is not exposed. When using a mulch anchoring tool, increase the application rate to 2.5 tons per acre.
 - Wood cellulose fiber used as mulch must be applied at a net dry weight of 1500 pounds per acre. Mix the wood cellulose fiber with water to attain a mixture with a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water.

1. Anchoring
 - Perform mulch anchoring immediately following application of mulch to minimize loss by wind or water. This may be done by one of the following methods (listed by preference), depending upon the size of the area and erosion hazard:
 - A mulch anchoring tool is a tractor drawn implement designed to push and anchor mulch into the soil surface a minimum of 2 inches. This practice is most effective on large areas, but is limited to flatter slopes where equipment can operate safely. If used on steeper land, this practice should follow the contour.
 - Wood cellulose fiber may be used for anchoring straw. Apply the fiber binder at a net dry weight of 750 pounds per acre. Mix the wood cellulose fiber with water at a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water.

1. Netting
 - Synthetic binders such as Acrylic DLR (Apro-Tack), DCA-70, Patrosel, Terra Tex II, Terra Tack AR or other approved equal may be used. Follow application rates as specified by the manufacturer. Application of liquid binders needs to be heavier at the edges where wind catches mulch, such as in valleys and on crests of banks. Use of asphalt binders is strictly prohibited.
 - Lightweight plastic netting may be overlaid on the mulch according to manufacturer recommendations. Netting is usually available in rolls 1 to 15 feet wide and 300 to 3,000 feet long.

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 - A mulch anchoring tool is a tractor drawn implement designed to push and anchor mulch into the soil surface a minimum of 2 inches. This practice is most effective on large areas, but is limited to flatter slopes where equipment can operate safely. If used on steeper land, this practice should follow the contour.
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 - Wood cellulose fiber may be used for anchoring straw. Apply the fiber binder at a net dry weight of 750 pounds per acre. Mix the wood cellulose fiber with water at a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water.

1. Netting
 - Synthetic binders such as Acrylic DLR (Apro-Tack), DCA-70, Patrosel, Terra Tex II, Terra Tack AR or other approved equal may be used. Follow application rates as specified by the manufacturer. Application of liquid binders needs to be heavier at the edges where wind