

BMP-36

BMP: SOIL STABILIZATION BLANKETS & MATTING

Definition

The installation of a protective covering (blanket) or a soil stabilization mat on a prepared planting area of a steep slope, channel or shoreline.

Purpose

To aid in controlling erosion on critical areas by providing a microclimate which protects young vegetation and promotes its establishment. In addition, some types of soil stabilization mats are also used to raise the maximum permissible velocity of turf grass stands in channelized areas by "reinforcing the turf" to resist the forces of erosion during storm events.

Conditions Where Practice Applies

On short, steep slopes where erosion hazard is high and planting is likely to be too slow in providing adequate protective cover; in vegetated channels where the velocity of design flow exceeds "allowable" velocity; on streambanks or tidal shorelines where moving water is likely to wash out new plantings; or in areas where the forces of wind prevent standard mulching practices from remaining in place until vegetation becomes established.

Planning Considerations

Soil stabilization blankets and mats can be applied to problem areas to supplement nature's erosion control system (vegetation) in its initial establishment and in providing a safe and "natural" conveyance for high velocity stormwater runoff. They are being used today in many applications where previously a structural lining would have been required. Care must be taken to choose the type of blanket or matting which is most appropriate for the specific needs of a project. Two general types of blankets and mats are discussed within this management practice. However, with the abundance of soil stabilization products available today, it is impossible to cover all the advantages, disadvantages and specifications of all manufactured blankets and mats. Therefore, as with many erosion control-type products, there is no substitute for a thorough understanding of the manufacturer's instructions and recommendations and a site visit by a designer or plan reviewer to verify a product's appropriateness,

Treatment-1 is a degradable soil stabilization blanket which includes "combination" blankets consisting of a plastic netting which covers and is intertwined with a natural organic or manmade mulch; or, a jute mesh which is typically homogeneous in design and can act alone as a soil stabilization blanket.

It should be used to help establish vegetation on previously disturbed slopes - normally problem slopes of 3:1 or greater. Since the materials which compose the soil stabilization blankets will deteriorate over time, they should be used in permanent conveyance channels with the realization that the system's resistance to erosion is based on the type of vegetation planted and the existing soil characteristics. During the establishment of vegetation, **Treatment-1** should not be subjected to shallow or deep concentrated flows moving at greater than 1 meter per second (4 feet per second).

Treatment-1 provides the following benefits in the achievement of vegetative stabilization when properly applied over seed and required amendments:

1. Protection of the seed and soil from raindrop impact and subsequent displacement.
2. Thermal consistency and moisture retention for seedbed area.
3. Stronger and faster germination of grasses and legumes.
4. Planing off excess stormwater runoff.
5. Prevention of sloughing of topsoil added to steeper slopes.

Treatment-2 is a soil stabilization matting which consists of a non-degradable, 3-dimensional plastic structure which can be filled with soil prior to planting. This configuration provides a matrix for root growth where the matting becomes entangled and penetrated by roots, forming continuous anchorage for surface growth and promoting enhanced energy dissipation. **Treatment-2** can be used on problem slopes (normally 3:1 or greater), and in stormwater conveyance channels.

In addition to those benefits noted for **Treatment-1**, **Treatment-2** provides the following benefits in the achievement of vegetative stabilization and in the replacement of more traditional channel linings such as concrete and riprap:

1. Causes soil to drop out of stormwater and fill matrix with **fine** soils which become the growth medium for the development of roots.

2. When embedded in the soil within stormwater channels, it acts with the vegetative root system to form an erosion resistant cover which resists hydraulic lift and shear forces.

Since **Treatment-2** is non-degradable, it can be used in permanent conveyance channels and can withstand higher velocities of flow than the vegetation and soil would normally allow. However, a 3 meter per second (10 feet per second) of flow should be the maximum allowed in a conveyance system which utilizes **Treatment-2**.

TREATMENT-1: SOIL STABILIZATION BLANKET

Allowable Velocity Range During Vegetation Establishment: 0 - 3 meters per second (0 - 4 feet per second).

Materials -

1. Combination Blankets - They shall consist of a photo-degradable plastic netting which covers and is entwined in a natural organic or man-made mulching material.

The mulching material shall consist of wood fibers, wood excelsior, straw, coconut fiber, or man-made fibers, or a combination of the same. The blanket shall be of consistent thickness with the mulching material/fibers evenly distributed over its entire length. The mulching material/fibers must interlock or entwine to form a dense layer which not only resists raindrop impact, but will allow vegetation to penetrate the blanket.

The blanket shall be nontoxic to vegetation and to the germination of seed and shall not be injurious to the unprotected skin of humans. At a minimum, the plastic netting must cover the top side of the blanket and possess a high web strength. The netting shall be entwined with the mulching material/fiber to maximize strength and provide for ease of handling.

2. Jute Mesh - It shall be of a uniform, open, plain weave, of undyed and unbleached single jute yam. The yam shall be of loosely twisted construction and shall not vary in thickness by more than one half of its normal diameter. Jute mesh shall be new and shall conform to the following:

- a. Length of jute mesh shall be marked on each roll.
- b. There shall be 15 millimeter (0.60-inch) openings (+/- 25%) between strands, lengthwise.
- c. There shall be 23 millimeter (0.90-inch) openings (+/- 25%) between strands, lengthwise.
- d. Weight shall average 0.5 kilograms per square meter (0.90 lbs per square yard) with a tolerance of 5%.

As previously noted, jute mesh provides such good coverage (large surface area of strands) and contains such small openings that it can be used alone as a blanket.

3. Other Treatment-1 Products - These shall conform to manufacturer's specifications and be approved by the Plan-Approving Authority prior to being specified for a particular application. These products should be installed in accordance with manufacturer's recommendations, provided those recommendations are at least as stringent as this specification.
4. Staples - Staples for anchoring **Treatment-1** shall be No. 11-gauge wire or heavier. Their length shall be a minimum of 150 millimeters (6 inches). A larger staple with a length of up to 300 millimeters (12 inches) should be used on loose, sandy, or unstable soils.

Installation Requirements

Site Preparation - After site has been shaped and graded to approved design, prepare a friable seedbed relatively free from clods and rocks more than 25 millimeters (1 inch) in diameter and any foreign material that will prevent uniform contact of the protective covering with the soil surface.

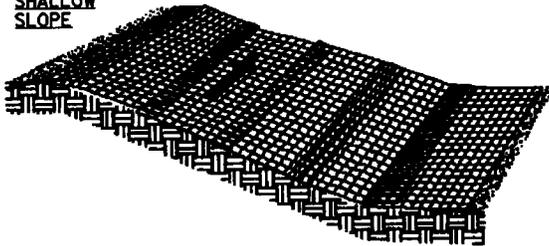
Planting - lime, fertilize, and seed in accordance with seeding or other type of planting plan. When using jute mesh on a seeded area, apply approximately one-half the seed after laying the mat. The protective covering can be laid over sprigged areas where small grass plants have been inserted into the soil. Where ground covers are to be planted, lay the protective covering first and then plant through the material as per planting design.

When open-weave nets are used, lime, fertilizer, seed and mulch should be applied before laying the net. When a combination blanket (such as an "excelsior" blanket) is used, seed and soil amendments must also be applied -before the blanket is laid.

Orientation - See Figure 36-1 for orientation of **Treatment-1** for different topographic conditions.

**FIGURE 36-1: TYPICAL ORIENTATION OF TREATMENT-1
(SOIL STABILIZATION BLANKET)**

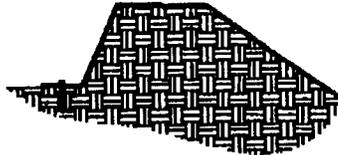
**SHALLOW
SLOPE**



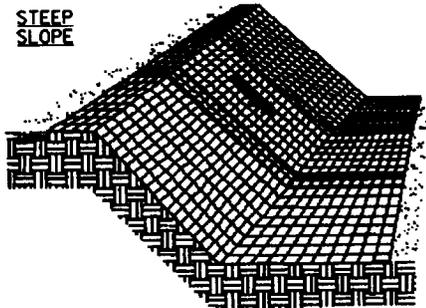
ON SHALLOW SLOPES, STRIPS OF NETTING PROTECTIVE COVERINGS MAY BE APPLIED ACROSS THE SLOPE.

BERM

WHERE THERE IS A BERM AT THE TOP OF THE SLOPE, BRING NETTING MATERIAL OVER THE TOP AND ANCHOR BEHIND THE BERM.



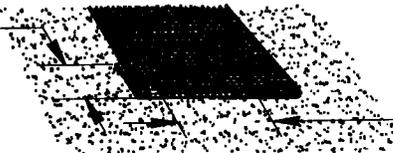
**STEEP
SLOPE**



ON STEEP SLOPES, APPLY PROTECTIVE COVERING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY.

BRING MATERIAL DOWN TO A LEVEL AREA BEFORE TERMINATING THE INSTALLATION. TURN THE END UNDER 100mm (4") AND STAPLE AT 300mm (12") INTERVALS.

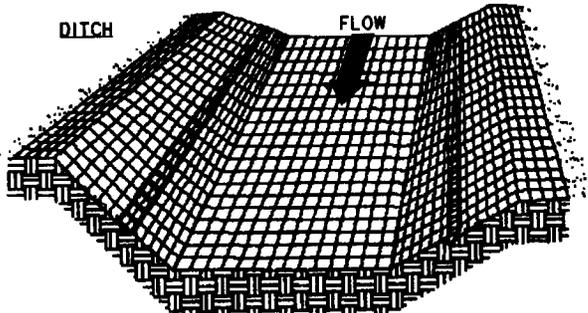
100mm (4")



300mm (12")

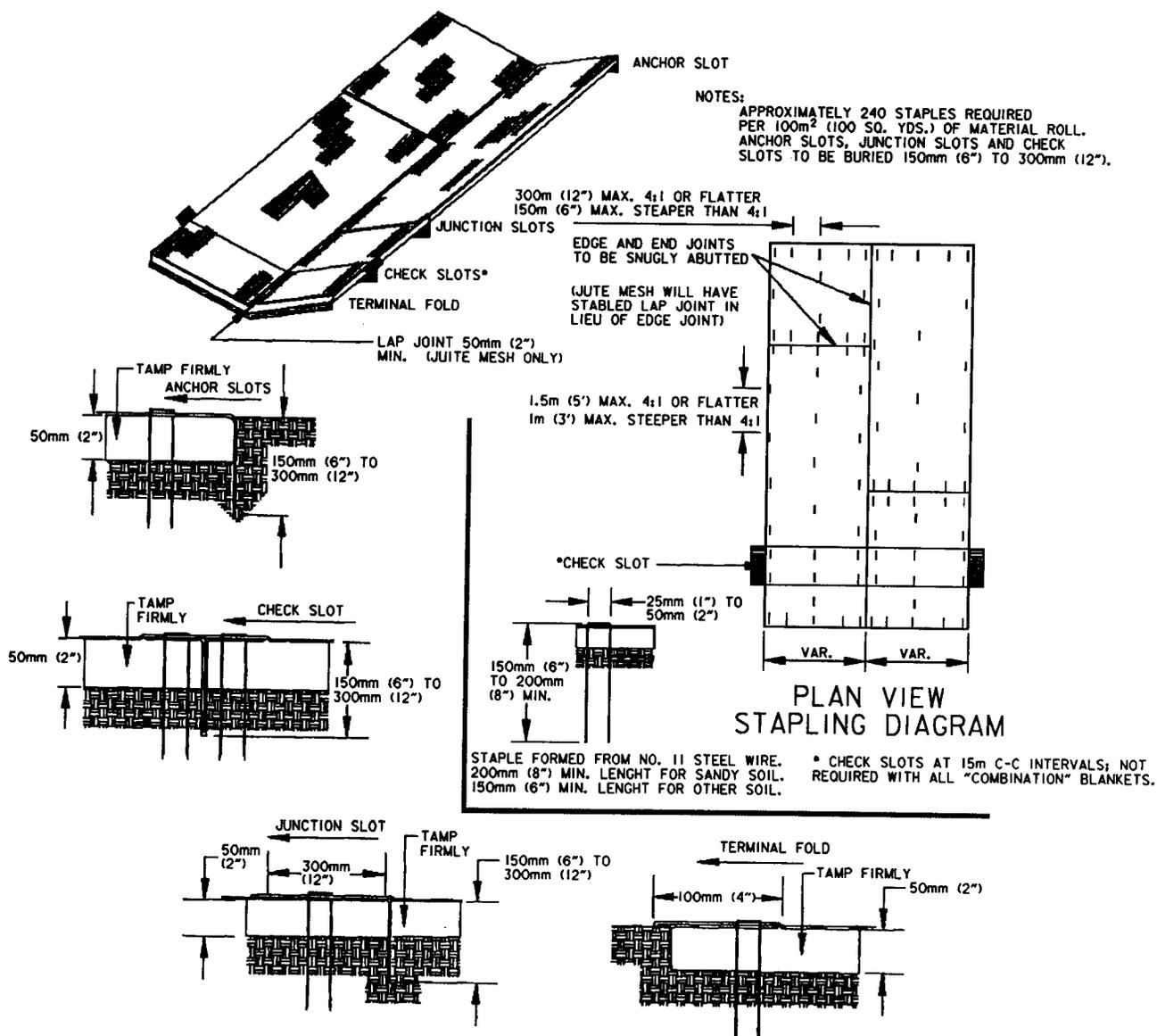
DITCH

FLOW



IN DITCHES, APPLY PROTECTIVE COVERING PARALLEL TO THE DIRECTION OF FLOW. USE CHECK SLOTS AS REQUIRED. AVOID JOINING MATERIAL IN THE CENTER OF THE DITCH IF AT ALL POSSIBLE.

FIGURE 36-2: TYPICAL TREATMENT-1
(SOIL STABILIZATION BLANKET)
INSTALLATION CRITERIA



Laying and Stapling (see Figure 36-2) - If instructions have been followed, all needed check slots will have been installed, and the protective covering will be laid on a friable seedbed free from clods, rocks, roots, etc. that might impede good contact.

1. Start laying the protective covering from the top of the channel or top of slope and unroll down-grade.
2. Allow to lay loosely on soil - do not stretch.
3. Upslope ends of the protective covering should be buried in a anchor slot no less than 150 millimeters (6-inches) deep. Tamp earth firmly over the material. Staple the material at a minimum of every 300 millimeters (12 inches) across the top end.
4. Edges of the material shall be stapled every meter (3 feet). Where multiple widths are laid side by side, the adjacent edges shall be overlapped a minimum of 50 millimeters (2 inches) and stapled together.
5. Staples shall be placed down the center, staggered with the edges at 1 meter (3 foot) intervals.

Check slots - On highly erodible soils and on slopes steeper than 4:1, erosion check slots should be made every 15 meters (50 feet) (see Figure 36-2). Insert a fold of the material (separate piece) into a 150 millimeter (6-inch) trench and tamp firmly. Staple fold to "main" blanket at minimum 300 millimeter (12 - inch) intervals across the upstream and downstream portion of the blanket.

Note: Many combination blankets are designed and manufactured to resist movement and uplift to a point which check slots may not be required. Plan designers and review authorities are urged to study manufacturers' recommendations and site conditions.

Joining Protective Coverings - Insert a new roll of material into an anchor slot, as with upslope ends. Overlap the end of the previous roll a minimum of 300 millimeters (12 inches), and staple across the end of the roll just below the anchor slot and across the material every 300 millimeters.

Terminal End - At the point at which the material is discontinued, or at which time the protective covering meets a structure of some type, fold 100 millimeters (4 inches) of the material underneath and staple every 300 millimeters (12 inches) (minimum).

At bottom of slopes - Lead net out onto a level area before anchoring. Turn ends under 100 millimeters (4 inches), and staple across end every 300 millimeters (12 inches).

Final Check - These installation techniques must be adhered to:

1. Protective blanket is in uniform contact with the soil.
2. All lap joints are secure.
3. All staples are driven flush with the ground.
4. All disturbed -areas have been seeded.

TREATMENT-2: SOIL STABILIZATION MATING

Allowable velocity range after vegetative establishment: 0 - 3 meters per second (0 - 10 feet per second).

Materials -

Matting - The majority of these products provide a three dimensional geomatrix of nylon, polyethylene, or randomly oriented monofilaments, forming a mat. These products contain ultra violet (UV) inhibiting stabilizers, added to the compounds to ensure endurance and provide "permanent root reinforcement."

The three dimensional feature creates an open space which is allowed to fill with soil. The roots of the grass plant become established within the mat itself, forming a synergistic root and mat system. As the grass becomes established, the two actually "reinforce" each other, preventing movement or damage to the soil. Allowable velocities are increased considerably over natural turf stands.

Selection of the appropriate matting materials along with proper installation become critical factors in the success of this practice. Consultation with the supplier or the manufacturer and thorough evaluation of performance data to ensure proper selection of a soil stabilization matting are also essential. Although many manufacturers claim their products may inhibit erosion associated with channel velocities of up to 6 meters per second (20 feet per second), it is recommended that any velocities that exceed 3 meters per second (10 feet per second) be properly protected with some form of structural lining (see BMP-17, STORMWATER CONVEYANCE CHANNEL).

Staples - Staples or anchoring methods and recommendations vary by manufacturers. The expectation of high velocities should dictate the use of more substantial anchoring.

Installation Requirements -

Site Preparation - After site has been shaped and graded to approved design, prepare a friable seedbed relatively free from clods and rocks more than 25 millimeters (1 inch) in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. If necessary, redirect any runoff away from the ditch or slope during installation.

Planting - Lime, fertilizer and seed in accordance with the approved plan, paying special attention to the plant selection that may have been chosen for the matted area. If the area has been seeded prior to installing the mat, make sure and reseed all areas disturbed during installation.

Mulching - Mulch (normally straw) should be applied following installation of **Treatment-2** at rates noted in BMP-35, MULCHING.

Laying and Securing - See Figures 36-3 - 36-5. Similar to installing **Treatment-1**, but Plan Approving Authority's requirements or manufacturer's recommendations must be followed as detailed. The key to achieving desired performance is dependent upon proper installation.

Check Slots - See Figure 36-3. Matting manufacturers vary significantly in their check slot requirements. Similar to the installation of **Treatment-1**, a check slot may be required when laying **Treatment-2** to "correct" the flow of water if it has the potential to undermine the matting. Most authorities require that the sides of the matting also be entrenched, creating a slope shelf for the material to rest on, preventing water from entering under the mat on the sides.

Securing the Material and Joining Mats - Again, product specifications vary - upstream and downstream terminal slots, new roll overlaps and multiple width installations differ by various products and manufacturers.

Final Check - These installation techniques must be adhered to:

1. Soil stabilization mat is in uniform contact with the soil.
2. All required slots and lapped joints are in place.
3. The material is properly anchored.
4. All disturbed areas are seeded.

Maintenance

All soil stabilization blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor these areas until which time they become permanently stabilized; at that time an annual inspection should be adequate.

FIGURE 36-5: GENERAL STAPLE PATTERN GUIDE AND RECOMMENDATIONS FOR TREATMENT-2 (SOI; STABILIZATION MATTING)

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