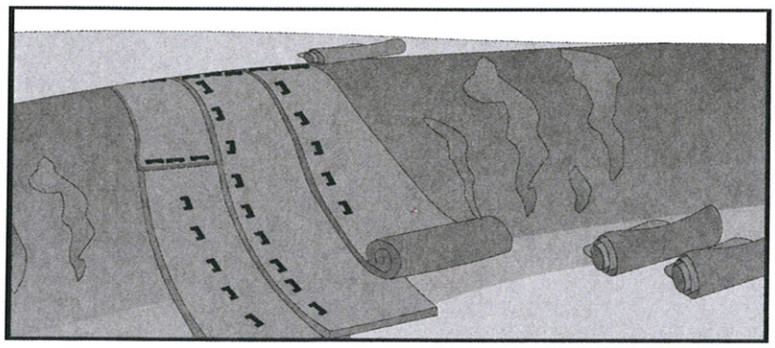
ACTIVITY: Erosion Control Geotextiles and Mats

WTCP-07



Targeted Constituents				
● Significant Benefit		◗ Partial Benefit		○ Low or Unknown Benefit
● Sediment	○ Heavy Metals	○ Floatable Materials	○ Oxygen Demanding Substances	
○ Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes

Implementation Requirements				
● High		◗ Medium		○ Low
● Capital Costs	◗ O & M Costs	◗ Maintenance	● Suitability for Slopes >5%	○ Training

Description

Prevent or reduce the discharge of pollutants to the storm drain system or to watercourses as a result of construction activity by stabilizing soil utilizing rolled and bound fiber material to reduce erosive impacts from rain, intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some removal of sediment from runoff. This management practice is likely to create a significant reduction in sediment.

Suitable Applications

Construction sites where disturbed soils must be stabilized. Site conditions that may warrant use of blankets and mats include:

- Slopes and disturbed soils where mulch must be anchored and other methods such as crimping or tacking agents are not cost-effective, feasible or adequate.
- Steep slopes, generally steeper than 3:1 (H:V).
- Slopes where the erosion hazard is high.
- Critical slopes adjacent to sensitive areas, such as streams, wetlands, or other highly valued resources needing protection.
- Disturbed soil areas where plants are slow to develop adequate protective cover.
- Channels with flows exceeding 2 ft/s (0.6 m/s).
- Channels intended to be vegetated and where the design flow exceeds the permissible velocity. The allowable velocity for some turf reinforcement mats after vegetative establishment is up to 10 ft/s (3 m/s).

Appropriate mat and/or blanket materials must be selected for the specific site application.

Installation/ Application Criteria

Material Selection

There are many types of erosion control blankets and mats, and selection of the appropriate type should be based on the type of application and site conditions. The following criteria should be considered in the selection of the appropriate material:

- Cost
  - Material cost
  - Preparation cost
  - Installation cost
  - Add-ons
- Effectiveness
  - Reduction of erosion
  - Reduction of flow velocity
  - Reduction of runoff
- Acceptability
  - Environmental compatibility
  - Institutional/regulatory acceptability
  - Visual impact
- Vegetation Enhancement
  - Native plant compatibility
  - Germination rate
  - Growth rate
  - Moisture retention
  - Temperature modification
  - Open space/coverage
  - Nutrient uptake
- Installation
  - Durability
  - Longevity
  - Ease of installation
  - Safety
- Operation and Maintenance
  - Maintenance frequency

Site Preparation

- Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.
- Grade and shape the installation area.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.

- Prepare seedbed by loosening 2 in. (50 mm) to 3 in. (75 mm) of topsoil.
- Incorporate amendments, such as lime and fertilizer, into the soil according to soil tests, the seeding plan, and manufacturer's recommendations.

Seeding

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be reseeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring

U-shaped wire staples, metal geotextile stake pins or wooden stakes can be used to anchor mats and blankets to the ground surface. Organic stakes may be used for temporary erosion prevention and sediment control blankets and mats. Wire staples should be minimum of 11 gauge. Metal stake pins should be 0.188-in. (5-mm) diameter steel with a 1.5-in. (40-mm) steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6 in. (150 mm) to 18 in. (450 mm) long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6-in. (150-mm) deep by 6-in. (150-mm) wide anchor trench. Backfill anchor trench and tamp earth firmly.
- Unroll blanket downslope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 in. (50 mm) to 3 in. (75 mm) and staple every 3 ft (1 m).
- When blankets must be spliced, place blankets end over end (shingle style) with 6-in. (150-mm) overlap. Staple through overlapped area, approximately 12 in. (300 mm) apart.
- Lay blankets loosely and maintain direct contact with the soil do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2 (2 staples/m^2). Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 12 staples/yd^2 (12 staples/m^2), placing 1 staple/yd (1 staple/m) on centers. Gentle slopes require a minimum of 1 staple/yd^2 (1 staple/m^2).

Installation in Channels

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- Dig initial anchor trench 12 in. (300 mm) deep and 6 in. (150 mm) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. (150 mm) deep and 6 in. (150 mm) wide across the channel at 25 ft. (8 m) to 30 ft. (10 m) intervals along the channels.
- Cut longitudinal channel anchor slots 4 in. (100 mm) deep and 4 in. (100 mm) wide along each side of the installation to bury edges of matting, whenever possible, extend matting 2 in. (50 mm) to 3 in. (75 mm) above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12-in. (300-m) intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in. (75 mm).
- Secure these initial ends of mats with anchors at 12-in. (300-mm) intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench.
- Unroll adjacent mats upstream in similar fashion, maintaining a 3-in. (75-mm) overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12-in. (300-mm) intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Anchor, fill, and compact upstream end of mat in a 12-in. (300-mm) by 6-in. (150-mm) terminal trench.
- Secure mat to ground surface using wooden or organic stakes, U-shaped wire staples, or geotextile pins.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- After seeding, spread and lightly rake 0.25 in. (6 mm) to 0.5 in. (13 mm) of fine

topsoil into the mat apertures to completely fill mat thickness. Use backside of rake or other flat implement.

- Spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling; just exposing top netting of mat.

Fiber Rolls

- Fiber rolls shall be either prefabricated rolls or tightly rolled tubes of erosion control blanket.
- Assembly of Field Rolled Fiber Roll: Tightly roll length of erosion control blanket into a tube of minimum 8-in. (200-mm) diameter. Then, bind roll at each end and every 6 ft. (1.8 m) along length of roll with jute-type twine.

Installation

- Locate fiber rolls on level contours spaced 8 to 10 ft. (2.4 to 3.0 m) along the face of slope.
- Stake fiber rolls into a 2 to 4 in. (50 to 100 mm) trench.
- Drive stakes at the end of each fiber roll and spaced 4 ft. (1.2 m) maximum on center.
- Use wood stakes with minimum 3/4 by 3/4-in. (19 by 19-mm) cross section, and minimum length of 24 in. (600 mm).
- If more than one fiber roll is placed in a row, the rolls shall be butted; not overlapped.

Removal

- Fiber rolls are typically left in place.
- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Maintenance

- All blankets and mats shall be inspected periodically after installation.
- Installation shall be inspected after significant rain storms to check for erosion and undermining. Any failures shall be repaired immediately.

- If washout or breakages occur, re-install the material after repairing the damage to the slope or channel.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform required maintenance.
- Inspect fiber rolls following rainfall events and at least daily during prolonged rainfall. Perform required maintenance.

Limitations

Blankets and mats are typically more expensive than other erosion control measures, primarily due to labor costs. This usually limits their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels. Blankets and mats are generally not suitable for excessively rocky sites, or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).

Primary References

California Storm Water Best Management Practice Handbooks, CDM et.al. for the California SWQTF, 1993.

Caltrans Storm Water Quality Handbooks, CDM et.al. for the California Department of Transportation, 1997.

Inspection Checklist

- Are there any indications that additional site preparation is needed? Note areas where: grading or shaping is required, rocks, vegetation or other debris must be removed, and topsoil has not been sufficiently prepared.
- Was seeding performed in a way that meets the requirements of the geotextile used?
- See temporary seeding for other requirements.
- Is there sufficient anchoring?
- Are anchor trenches used at the top and bottom of slopes?
- Are anchor trenches used to start, join and terminate geotextiles placed in channels?
- Are anchor trenches sufficiently deep?
- Is soil filling even and flat?
- Are fiber rolls entrenched and staked?
- Are the fiber rolls tightly wound and/or are there any frays or other damage to the outer most layer?

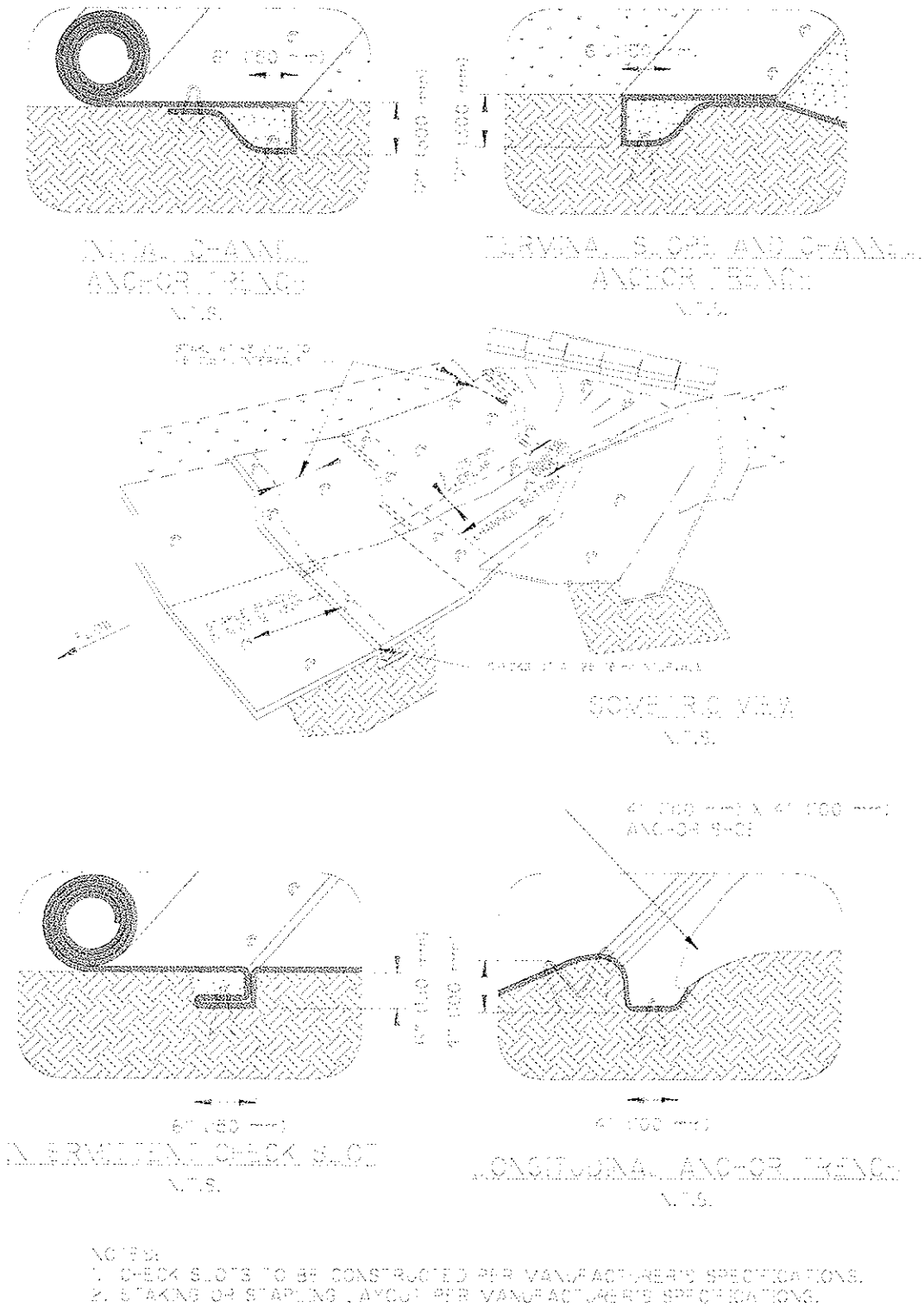


Figure WTCP-07-1
Anchoring Geotextiles in Channels

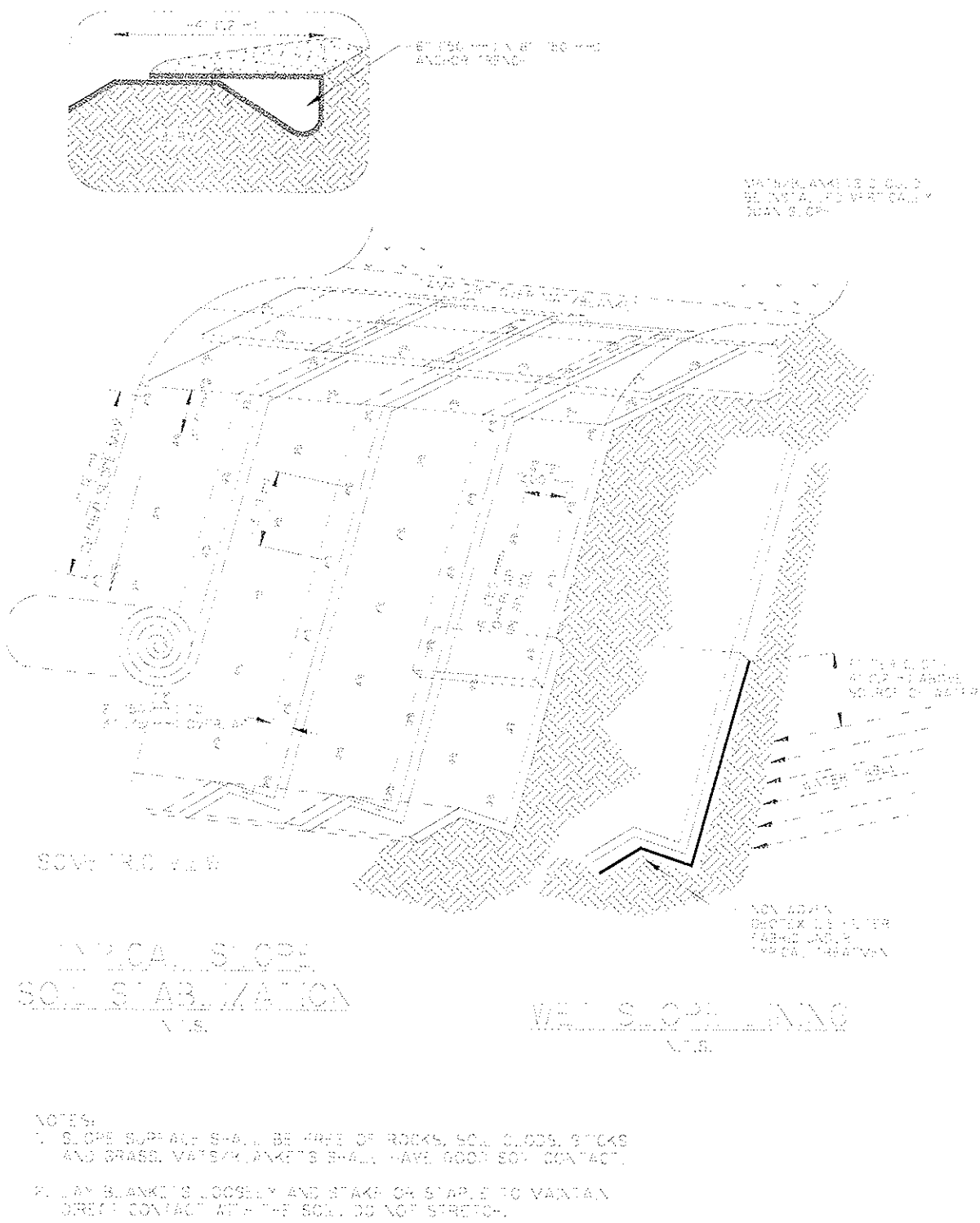


Figure WTCP-07-2
Anchoring Geotextiles on Embankments

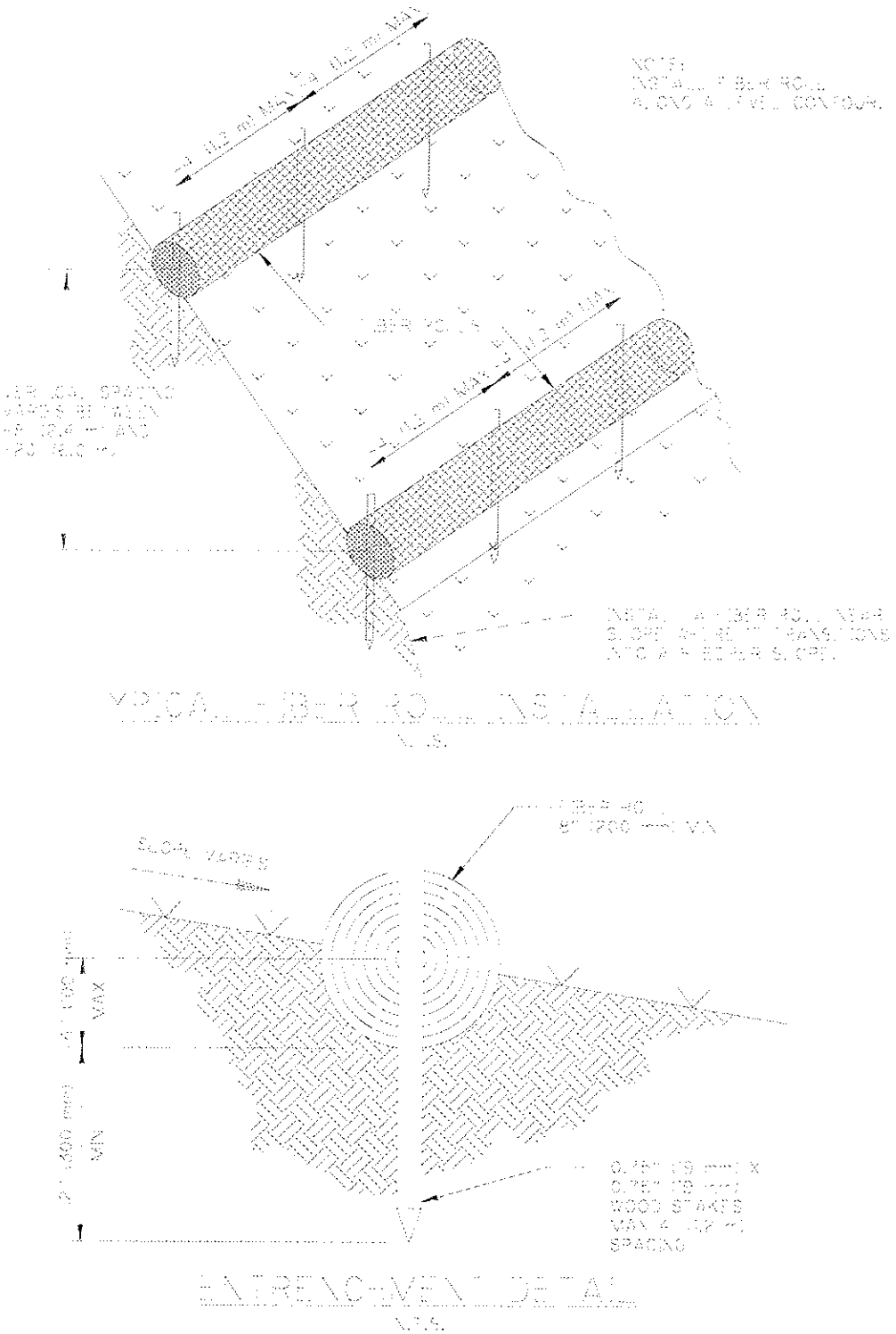


Figure WTCP-07-3
Fiber Rolls