Tri Lock

VIBROCOMPACTING CONCRETE ELEMENT SYSTEM

JOINT PAVEMENT

- RECOMMENDED INSTRUCTION MANUAL -

PAVEMENT FOR PARKING AREAS
PAVEMENT FOR REINFORCING FLOOD PROTECTION LEVEES AND POLDERS
EROSION CONTROL PAVEMENT, PAVEMENT FOR PONDS AND BANKS
RETENTION PAVEMENT

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1.TYPICAL TRI-LOCK INSTALLATION AREAS

- **Shore Line Protection from Wave Action**
- **Reservoir Embankment Protection**
- **Culvert Inlet or Outfall Protection**
- **Pipeline Watercourse Crossing Protection**
- **Slope Protection**
- **Parking Areas**
- **Bank Protection from Flow or Wake Action**
- **Channel Lining**
- **Drainage Ditch Lining**
- **Bridge Apron**
- **Boat Launching Ramps**

Tri-Lock can be used as an alternative to the following products:
- Concrete Ditch and Slope Lining,
- Rock Rip-Rap
- Gabions and Reno Mattress
- Grouted Mattress
- Cable Block Systems

Tri-Lock is not a retaining wall. All slopes must be stable before Tri-Lock can be installed.

2.DRAFT SPECIFICATIONS

TRI-LOCK EROSION CONTROL SYSTEMS
Articulating Cellular Concrete Block Erosion Control System

1. General: The interlocking cellular concrete block system shall be as described herein, or approved equal design. Any alternative system submitted for approval must include complete design and hydraulic data including test evidence of compliance to the essential design parameters of this specification.

2. Compressive strength testing of wet cast blocks shall be performed on cylinders, in accordance with ASTM C-31 and C-39. Compressive strength testing of dry cast accordance with ASTM C-140.

3. Design Parameters
- Concrete: The unit weight of the concrete used shall not be less than 125 lbs. per cubic food on an oven dried basis. Pre-cast concret and machine made blocks shall have a compressive strength of 4,000 psi minimum. Machine made concrete blocks strength shall be determined by testing random cubes, cut from the body of the block. The cementitious materials shall conform to ASTM designation C-33 except that the grading requirement shall not necessarily apply.

- Cellular Conrete Blocks: The Cellular concrete blocks shall be interlocking components dimensioned within a 16^{11} module. Each component shall lock into a minimum of thre adjacent components in a manner which inhibits horizontalmovement.

- Permeability: The assembled cellular block system shall have voids at ground/block interface of a minimum of $16^{\%}$ and shall provide, when required, adequate channels between cells below the top level of the blocks for the migration of vegetation from cell to cell.

- Flexibility: The assembled cellular concrete block system shall flex to a minimum of 3^{1}:00^{11} (three foot) radius in any two directions a minimum of 60 degrees apart without separation of the blocks at the base.

The interlock must remain securely fastened at this radius.

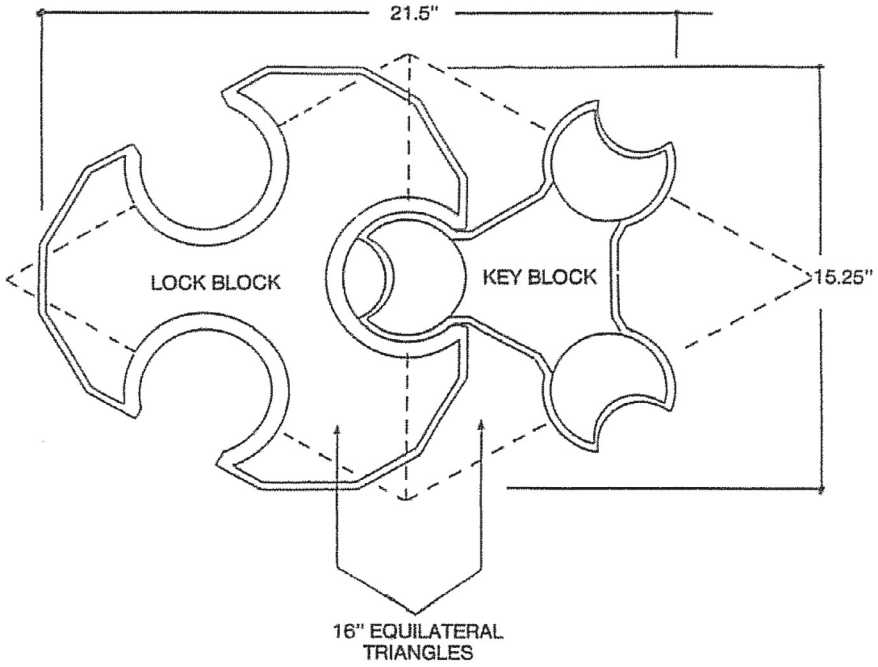


Fig.2 Typical Tri-lock specification (continued)

Mannings 'N ,026							
TRI-LOCK BLOCK SYSTEM SPECIFICATIONS							
Class	Height	Approx. Weight lbs/sq/ft.	Compress Strength lbs/cu.ft.	Area Covered	Approx Weight Blk. pair	Open Area	Sq.Ft.Per Pallet
4010	4"	32 lbs	Min, 4,000	1.54	50	20%	73.92
4110	4"	35 1bs.	Min. 4,000	2.00	70	20%	80.00
4015	6"	45 1bs.	Min. 4,000	1.54	70	20%	55.44

Tab.1

3.TYPICAL TRI-LOCK INSTALLATION SPECIFICATION

3.1. SITE PREPARATION

The Slope must be stable independent of the erosion control system and filled slope shall be compacted to not less than 900/0 density. Before placing either the concrete block system or the underlaying filter fabric, the slope shall be inspected to insure that it is free from obstructions, such as tree roots projecting stones or other foreign matter. Voids or soft areas should be filled with suitable material and well compacted. Although some variation in contour will be permitted, no sudden changes in level can be accepted. The maximum difference in level between any cuts will be 1.5^{11}. Hand dress where necessary.

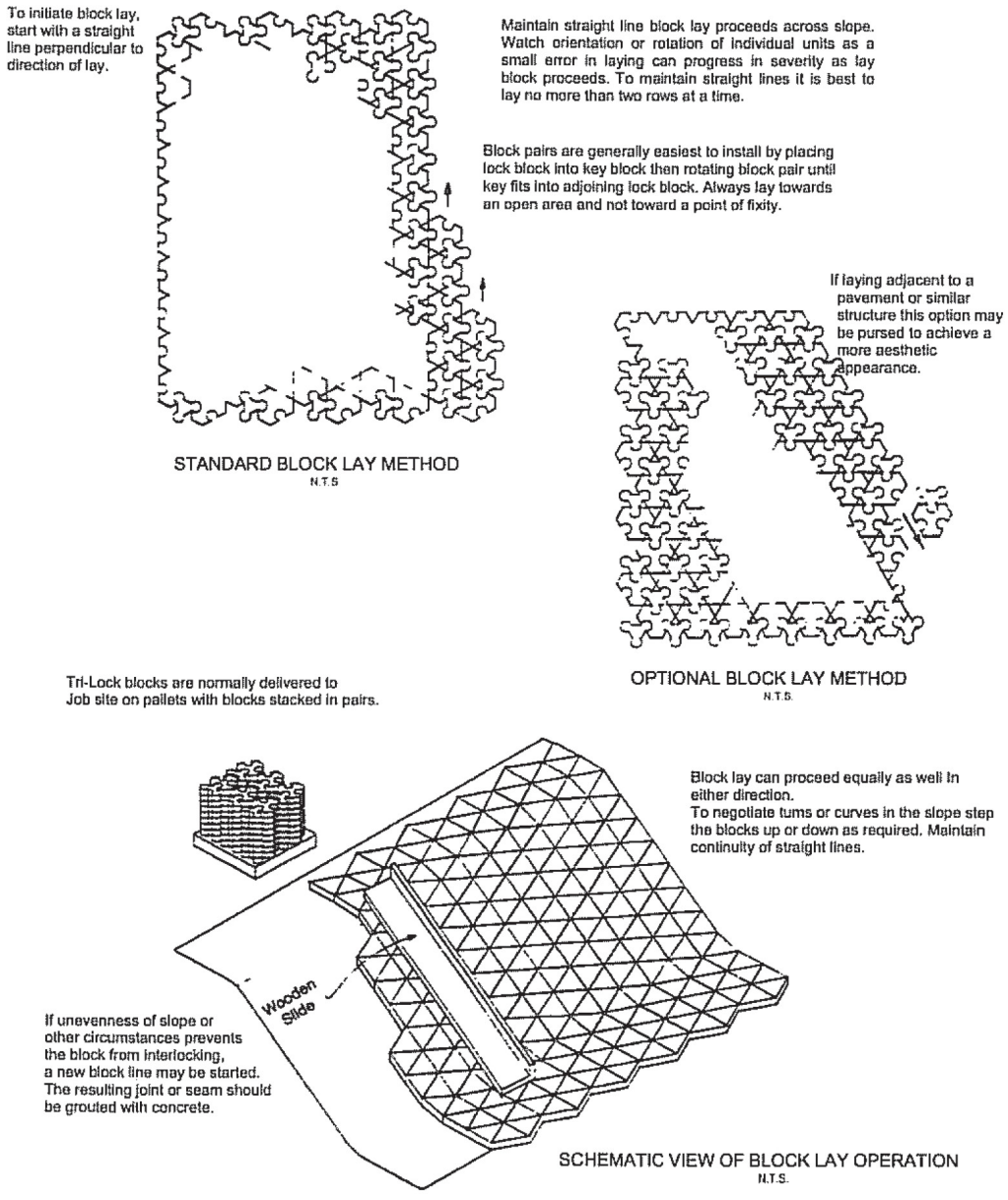
3.2. INSTALLATION

The entire perimeter of the cellular concrete block erosion ontrol system shall be turned into, and buried the adjacent ground level to a depth of not less than three (3) feet, or as shown on the drawings. Any junction with other structures shall be made as noted on drawings, but shall always provide a permanent soiltight joint to prevent the migration of soil between the structures. Grouting if necessary.

Penetrations through the erosion control system may be made by ommitting sufficient blocks to provide space for the penetration. It will be necessary to provide extra filter fabric in the form of a tightly fitting flage around the pipe or device so that it may be overlaid with the erosion control system filter fabric (minimum overlap 18˚˚.) Any voids around the penetration should be filled with grout and floated smooth.

Dress the entire revetment with topsoil. Apply fertilizer and seed with native grass as approved by the engineer. If the drawings do not indicate that revegetation is required, than dress with - crushed rock as approved by the engineer.

3.3. STANDARD & OPTIONAL BLOCK LAYING MATHODS



Obr. 3.3a,b,c Standard Block Lay Metod, Optional Block Lay Maetod, Schematic View of Block Lay Operation

3.4. TRENCHES / VEGETATION

The key trench depth should increase with site-job conditions such as length of slope, degree of grade, soil conditions, stc. While a general rule on the keytrench depth is not available, Southwest Erosion Control will assist and advise as needed.

THE TOE TRENCH (Bottom Trench) is needed under most conditions. While some site circumstances do not allow the toe trench, such as certain shallow water installationsm it is necessary where conditions are dry to utilize the toe trench at a depth of 12'' - 18'' minimum with geotextile being recommendations, Southwest Erosion Control should be contacted.

LATERAL OR FLANK TRENCHES (Diagram C-5) should be utilized on all Tri-lock installations. The lateral trench prevents extreme lateral stress on the revetmentsystem during unusually heavy flow. Lateral trench also allows modules to ''knuckle'' at interlock points providing added strength.

EXCEPTIONS and alterations are sometimesnecessary due to site specific conditions. Shallow or deep water installations and installations which involve joiningof Tri-Lock to a fixed object at the top, bottom, or lateral points of the Tri-Lock System are just a few circumstances. These situations are easily reconciled without loss of the flexibility or integrity of the Tri-Lock System. Site specific recommendations are available from Southwest Erosion Control.

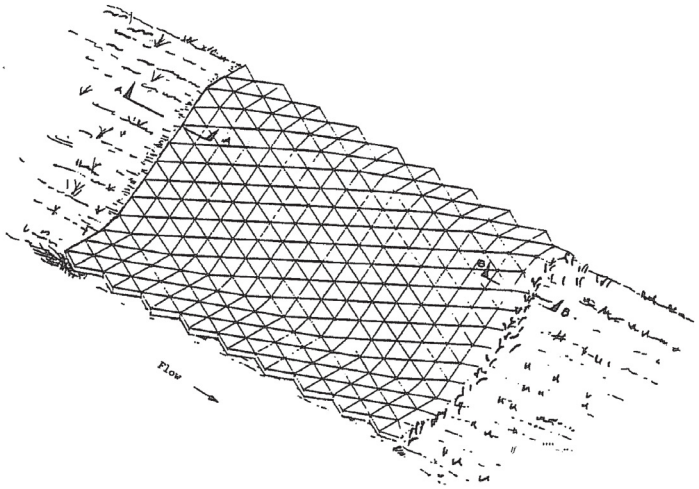
90° CORNER (Diagram C-S) Due to the flexibility of the Tri-Lock System, 90° cornenrs may be installed without incurring a grout line, while it may be necessary to step up or down some block modules to maintain straight lines, this is normally a minor process. A joint may be avoided at the angle, but a reorientation of the leading edge of the block will occur.

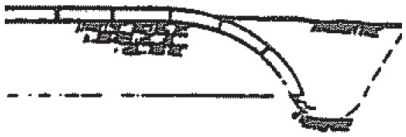
COMPLETION OF INSTALLATION Upon completion of installation, all key, toe, and lateral trenches should be backfilled.

FOR VEGETATION ESTABLISHMENT, for areas to be revegetated as identified on Drawings, backfill openings flush with the top surface of the blocks using topsoil at approximately one cubic yard per 45 square yards of surface area for 4 inch thick blocks, per 33 square yards of surface area for 6 inch thick blocks and per 22,5 square yards of surface area for 8 inch thick blocks.

NON-VEGETATED INSTALLATIONS, for areas not requiring revegetation as identified on Drawings, backfill openings with ½ inch nominal size crushed rock to a minimum depth of 2 inches, regardless of block thickness, or approximately one cubic yard of backfill per 90 square yards of surface area.

3.4. UP-STEAM & DOWN-STEAM FLANKS





Down-Stream Flank

Fig. 3.5a,b Diagram C-S, Section a-a, Schematic View of Flank Details

3.6. 90°- DEGREE CORNER

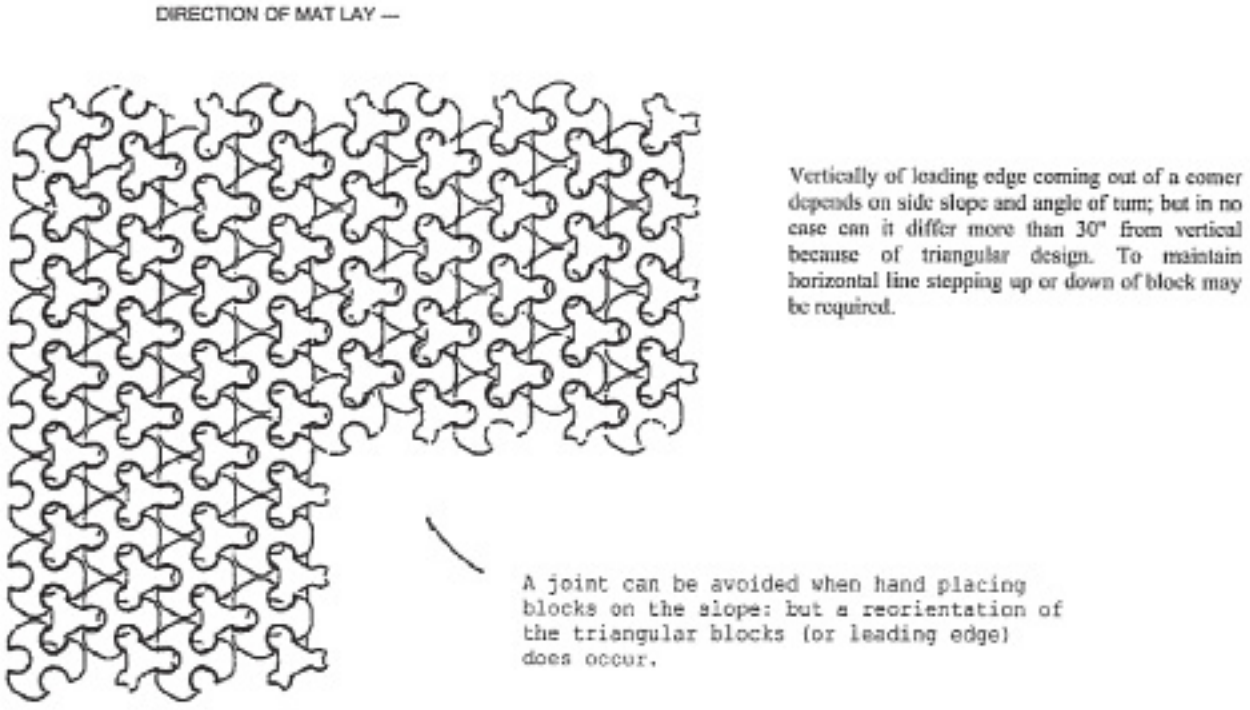


Fig. 3.6 Diagram c-c-, Plan View of 90°Corner - Handplaed mat installation

3.7. SLOPE PROTECTION

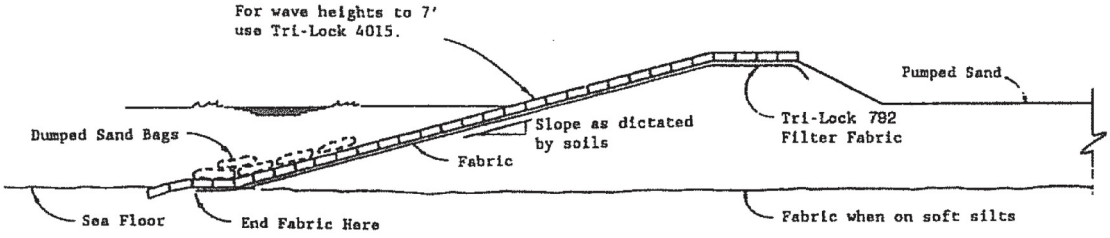


Fig. 3.7a Slope protection

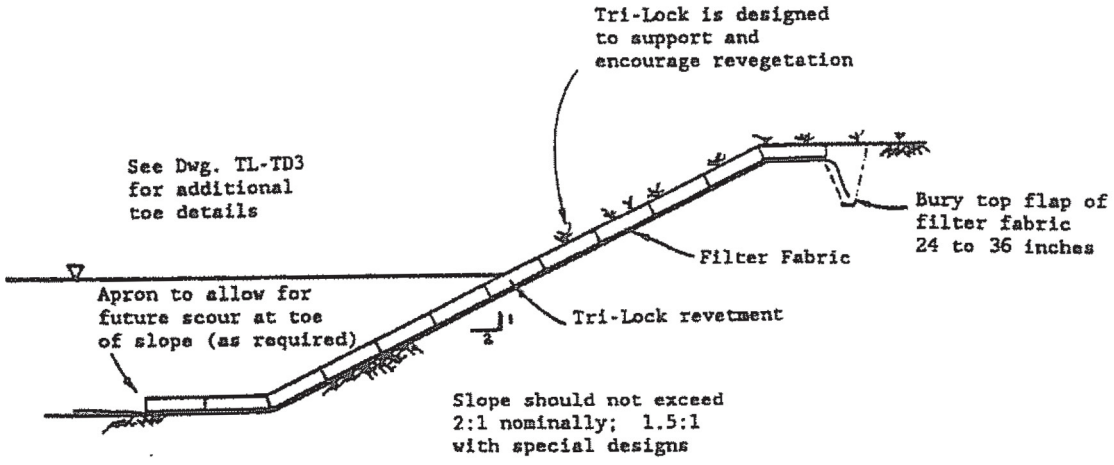


Fig. 3.7b Typical Section for Erosion Control on Slopes

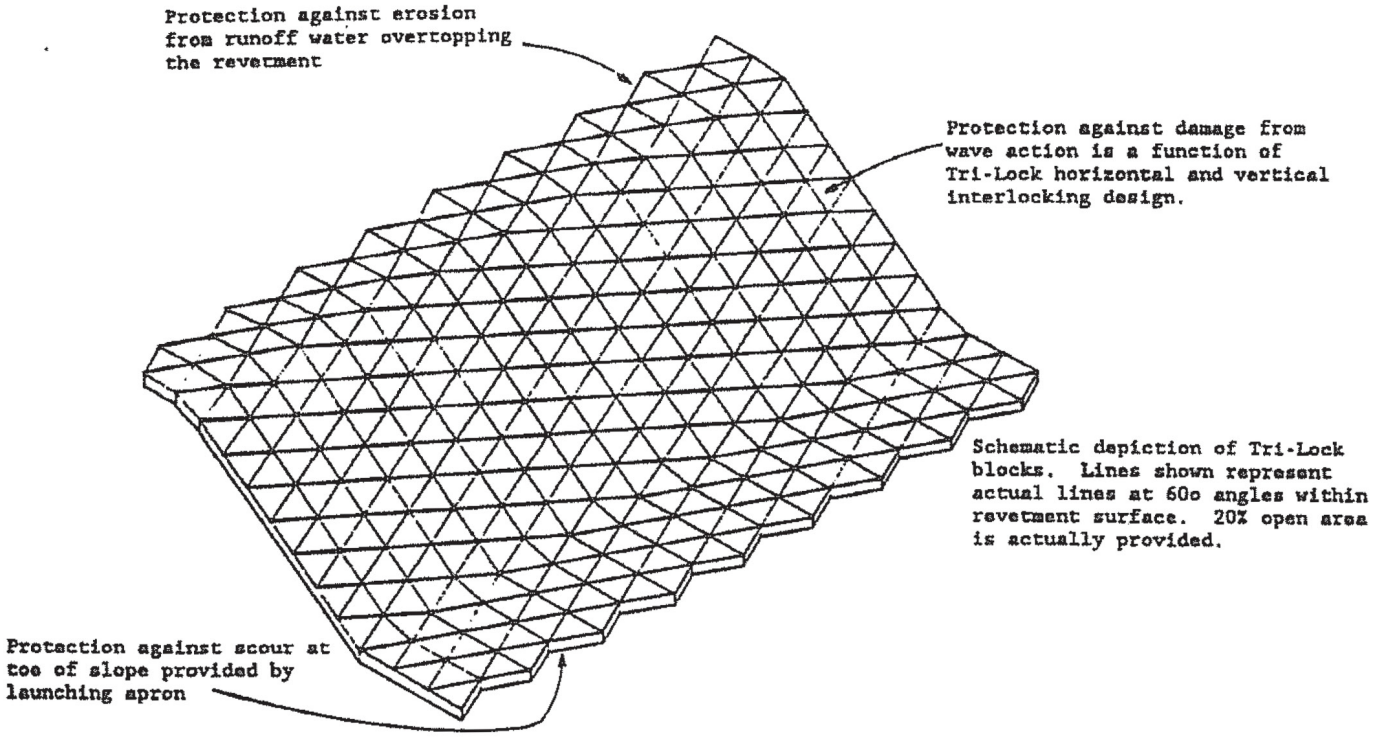


Fig. 3.7 c Schematic View of Slope Protection Detail

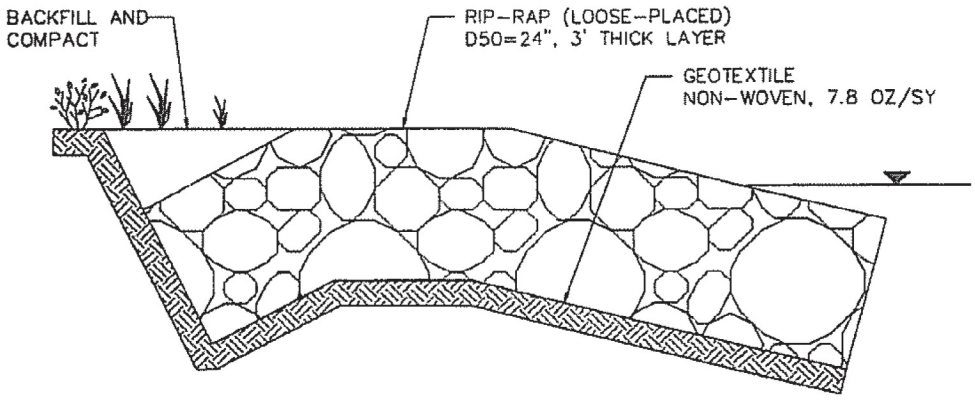


Fig. 3.7 d Rip-Rap Cross-Section, Typical

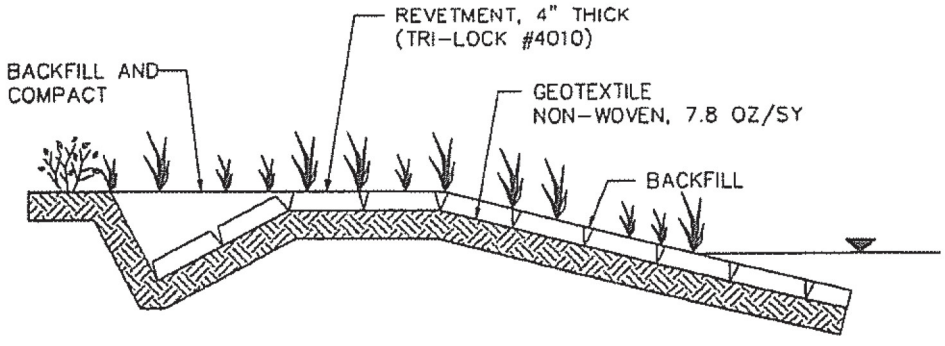


Fig. 3.7 e Revetment Cross-Section, Typical

3.8. TOE PROTECTION

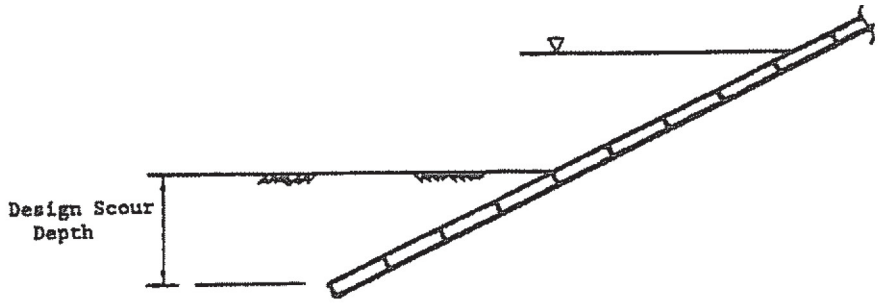


Fig. 3.8 a - Type I. - Burie Toe

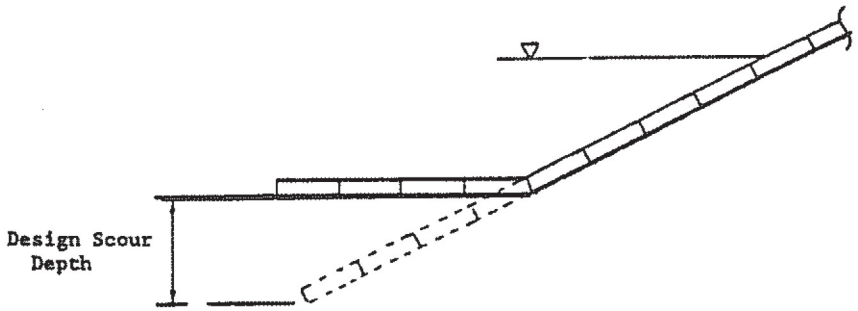


Fig. 3.8 b - Type II. - Launching Apron

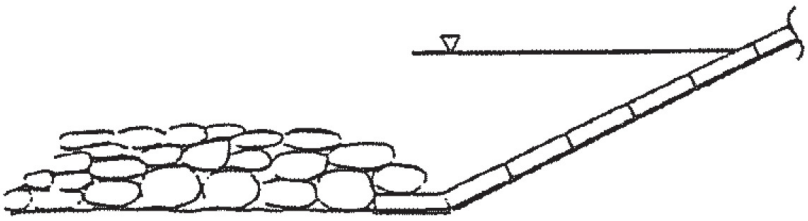


Fig. 3.8 c - Type III. - Rip- Rap Apron

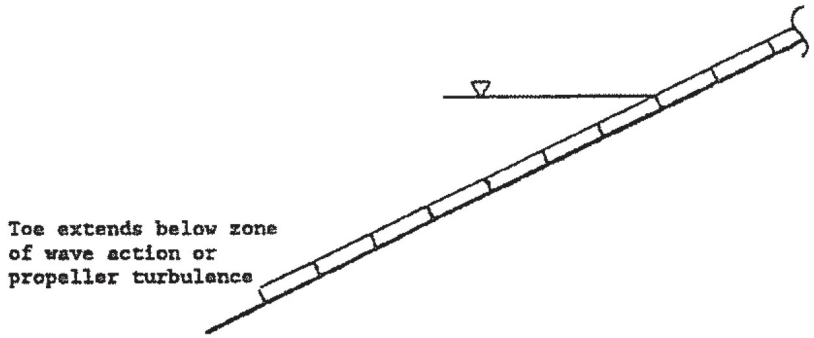


Fig. 3.8 d - Type IV. - Deep Extension

3.8. TOP PROTECTION

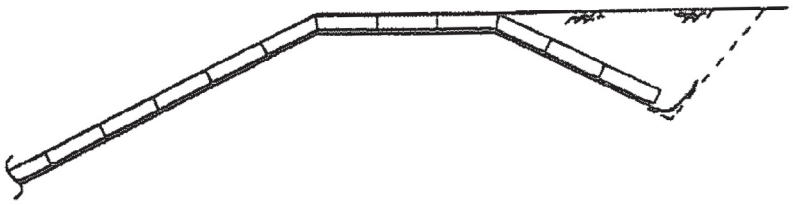


Fig 3.8 e Type I. - Top Protection with Anchor Trench

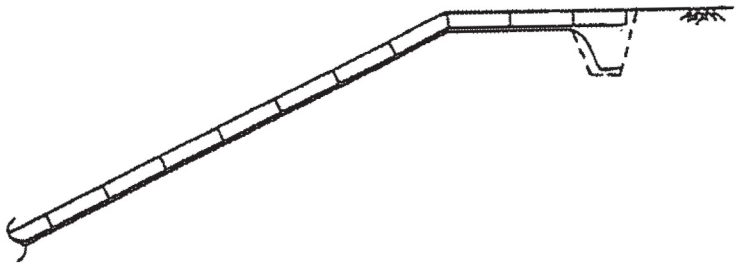


Fig 3.8 f Type II. - Top Protection

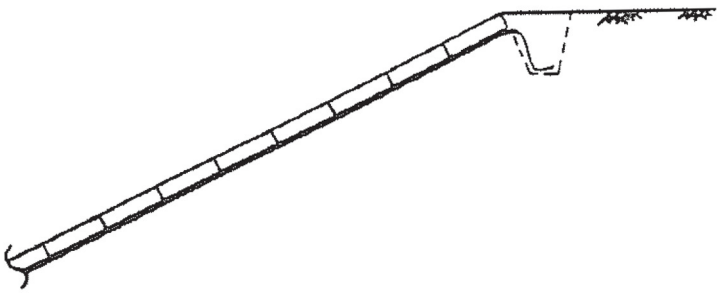


Fig 3.8 g Type III. - Exposed Slope Protection Only

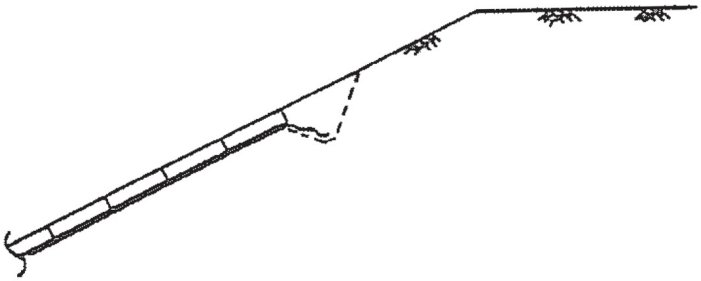


Fig 3.8 h Type IV. - Partial Slope Protection

3.9. CHANNEL LINING CROSS SECTION

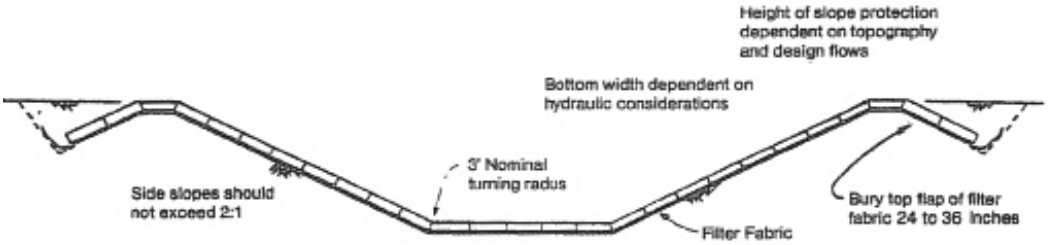


Fig 3.9 a Typical Cahnnel Linning Cross Section

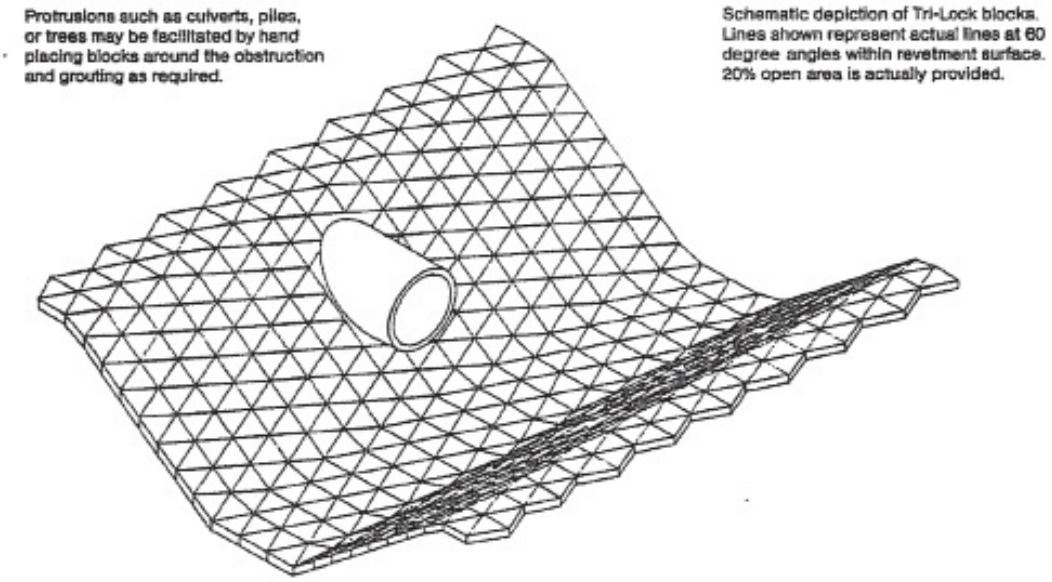


Fig 3.9 b Schematic View of Channel Lining Revetment

3.10. INSTALLATION RATE

The extreme versatility of Tri-Lock provides a variety of site-specific conditions which affect installation in subtle manners.
Certain proceduras are constant in the proper installation of Tri-Lock.

GENERAL INSTALLATION RATE

4010 TRI-LOCK	- 3:1 Slope	- Four Person Crew
	- Dry Terrain	- Prepared Slope (graded-dressed)
	- 2000-3000 Sq.Ft. per Day	
4110 TRI-LOCK	- 3:1 Slope	- Four Person Crew
	- Dry Terrain	- Prepared Slope (graded-dressed)
	- 2800-3800 Sq.Ft. per Day	
4015 TRI-LOCK	- 3:1 Slope	- Four Person Crew
	- Dry Terrain	- Prepared Slope (graded-dressed)
	- 1500-2000 Sq.Ft. per Day	

4.SELECTION OF TRI-LOCK BLOCK

The selection of the proper Tri-Lock System, 4'' or 6'' is affected by site or project conditions such as soil permeability, flow or wave intensity, soil compaction and slope or grade conditions.

Generally acceptable guidelines are:

4010 (Nominal 4'' Tri-Lock)	Flow - 10-16 fps,	Wave - 4' Height
4015 (Nominal 6'' Tri-Lock)	Flow - 16-20 fps,	Wave - 7' Height

5.GEOTEXTILE SPECIFICATIONS

Filter Fabric: The cellular concrete block erosion control system shall be laid over a plastic filter fabric as herein specified. The characteristics of the woven filter fabric will be not less than the following:

Tensile Strength	ASTM 0-4632	330 x 400 lbs.
Burst Strength	ASTM D-3786	805 PSI
Puncture Strength	ASTM 0-4833	1651 lbs.
Trapezoid Tear Strength	ASTM 0-4533	120 lbs.x120 lbs.
Abrasion Resistance (0/0 strength retained)	ASTM 0-3884	58^0/0 x 81^0/0
Apparent Opening Size	ASTM 0-4751	40 U.S. std.sieve
Permeability	ASTM 0-4491	.12 em/Sec

Filter fabric shall be free of defects, rips, holes or flaws and shall be either overlapped by a minimum of 18'' or sewn into panels to suit the application. Sewn seams shall have strength atleast equal to that specified for the fabric.
Soil samples shall be analyzed to assure that the soil particle size is compatible with thespecification abo-ve. Generally, if 100/0 of the particle analysis is bigger than the AOS, a graded filter wil develop under the fabric capable of filtering much smaller particles. Should to install a supplementary filter, either with fabric or sand.

6.STABILITY CHARTS AND DISCLAIMER

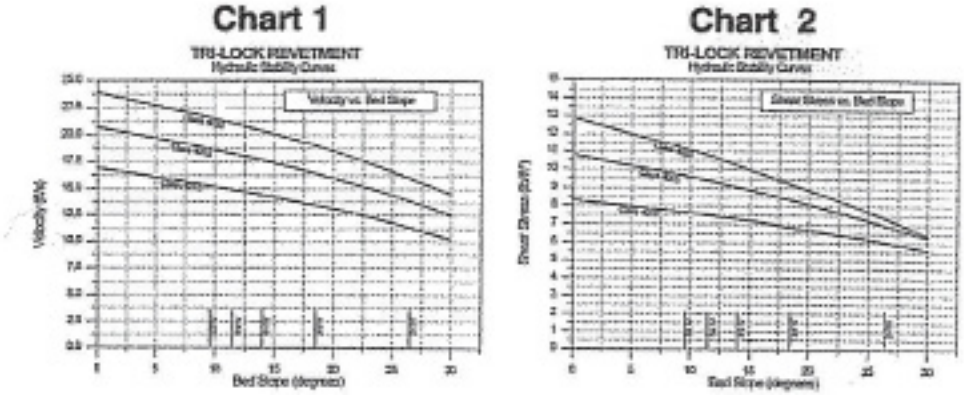


Table 1

Sideslope Reduction Factors for Tri-Lock Revetment				
		Shear Stress and Velocity Reduction Factors Kd		
Revetment Type	[illegible]	[illegible]	[illegible]	[illegible]
Class 4010	0.953	0.938	0.912	0.854
Class 4015	0.934	0.914	0.879	0.803

Tri-Lock is a revetment system for minimizing erosion. Although is some circumstances Tri-Lock may enhance the stability for a slope, Tri-lock is not soldor intended to be used as a structural component of a slope stability design. The slopes on which the Tri-Lock system is placed must be stable, and should be designed by a registered Engineer pursuant to a slope stability analysis performed by a qualified Geotechnical Engineer.
Tri-Lock is not sold or intended to be used when design hydraulic conditions exceed the threshold stabilities established by Charts 1 and 2, in conjunction with Table 1, or when hydraulic pressures are due to substantial changes in grades or flow directions. Additionally, Tri-Lock systems must be installed in accordance with the Tri-Lock Design Manual.

To the extent Tri-lock is misused in applications for which the product not sold or intended to be uses, Southwest Erosion Control and Tri-Lock disclaim any liability arising out of or related to the product´s misuse.

Tri Lock

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