



Nedia Enterprises

The Natural Choice for Erosion Control Products



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COMPANY PROFILE

Nedia Enterprises offers a complete line of erosion control, sediment control, and bioengineering products made primarily from natural fibers. We provide innovative quality products and excellent service to our customers in the erosion control and bioengineering industry.

PHILOSOPHY

Nedia is committed to the conservation of the environment. We believe that the proper use of our erosion control products will contribute to improved environmental function and encourage widespread use of innovative and vegetation friendly bioengineering techniques.

INNOVATION

We are constantly striving to develop new and improved products that contribute to the enhancement and the protection of the environment. Some of our products were the result of innovative problem solving with customers who have specific needs. We also tailor our existing products to better suit specific project needs.

QUALITY CONTROL

Our products are subject to stringent quality control measures that meet or exceed industry standards. We routinely submit our products to independent testing laboratories for ASTM testing to ensure the highest quality and document performance.

TECHNICAL SUPPORT

Nedia offers sound technical advice on product selection and installation. We have a thorough understanding of the benefits and limitations of our products. We work closely with a network of experts in various facets of erosion control and bioengineering who offer additional design guidance.

PRICE & AVAILABILITY

We do our best to provide competitive pricing. A large inventory of products in several distribution centers across the country facilitate cost effective and timely delivery of our products.

THE BASICS OF BIOENGINEERING

Soil bioengineering is a cost-effective alternative to conventional engineering relying on vegetation to stabilize erodible soils providing exceptional benefits to the habitat. As a frequent component of modern bioengineering designs, coir erosion control products provide natural erosion protection, during the period of time it takes for the roots and shoots of native plants to colonize and stabilize streambanks, wetlands, or hillside soils. The extended longevity of coir erosion control products provides adequate time for the development of a well-established root system which eventually offers long-term erosion protection. Thus, coir erosion control products have become an important tool in modern bioengineering.

SUCCESS WITH BIOENGINEERING

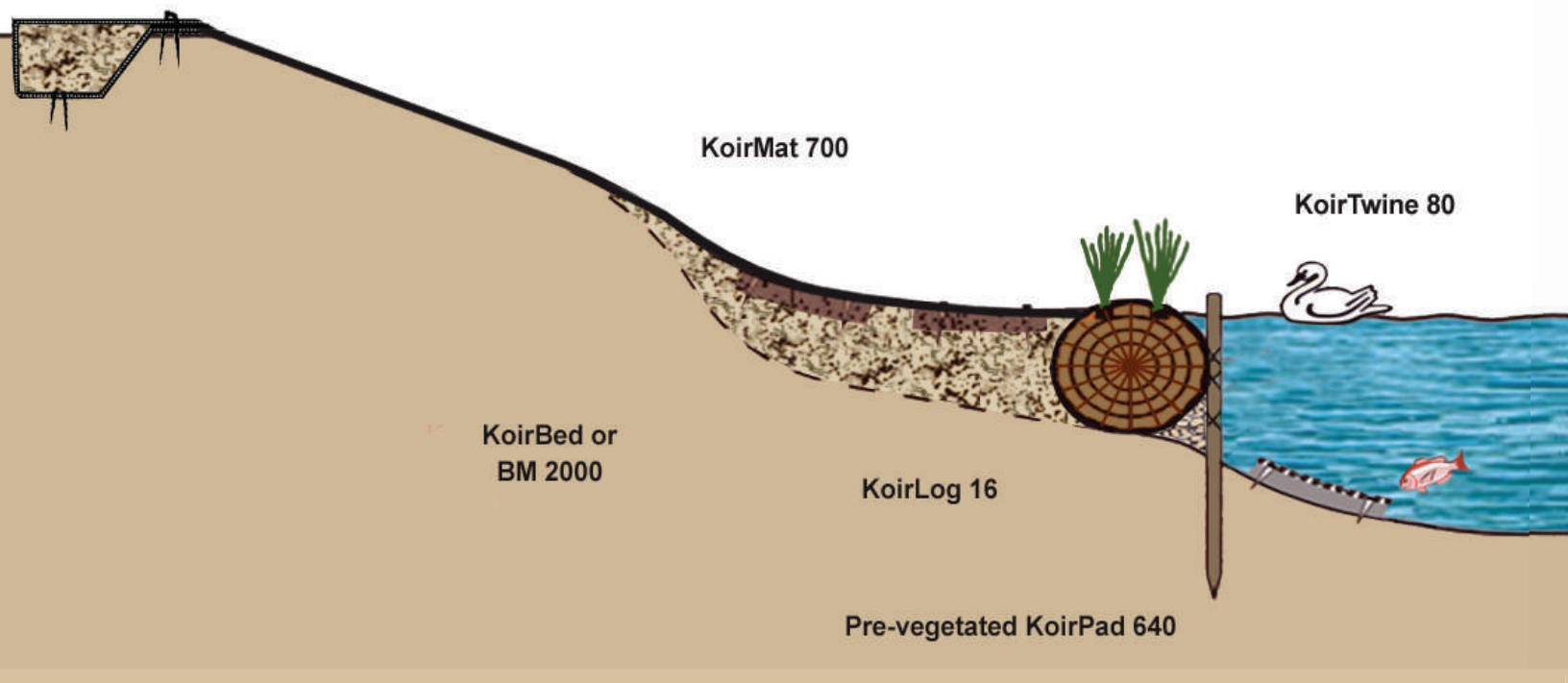
Often bioengineering techniques are used as an alternative to traditional hard armor methods. For example, a riprap bank can be replaced with a well-designed, bioengineered streambank at a lower cost and with better environmental benefits. Since such innovative techniques often receive increased scrutiny, quality design and implementation are necessary. A few generalizations regarding success with bioengineering are given below:

- An ideal design team should consist of experts in various disciplines including engineering, plant ecology, hydrology and earth work.
- Ensure that plant roots and shoots will replace the structural function of erosion control products by the time fabrics weaken and degrade.
- Consider how the local climate and site conditions will affect plant growth rate and erosion control product degradation rate.
- Material installation can be the weak point of a project, even if the best materials are used. Consider the importance of secure staking, adequate fabric overlap, key trenching, skilled construction supervision and aggressive re-vegetation plans.
- Depending on the type of project, it is important to understand the inundation durations, mechanisms of hill slope and streambank failure, the depth to water table, soil compaction, planting densities, post-project land use, as well as the benefits of monitoring and maintenance.
- Understand the limitations of the erosion control product or the technique.

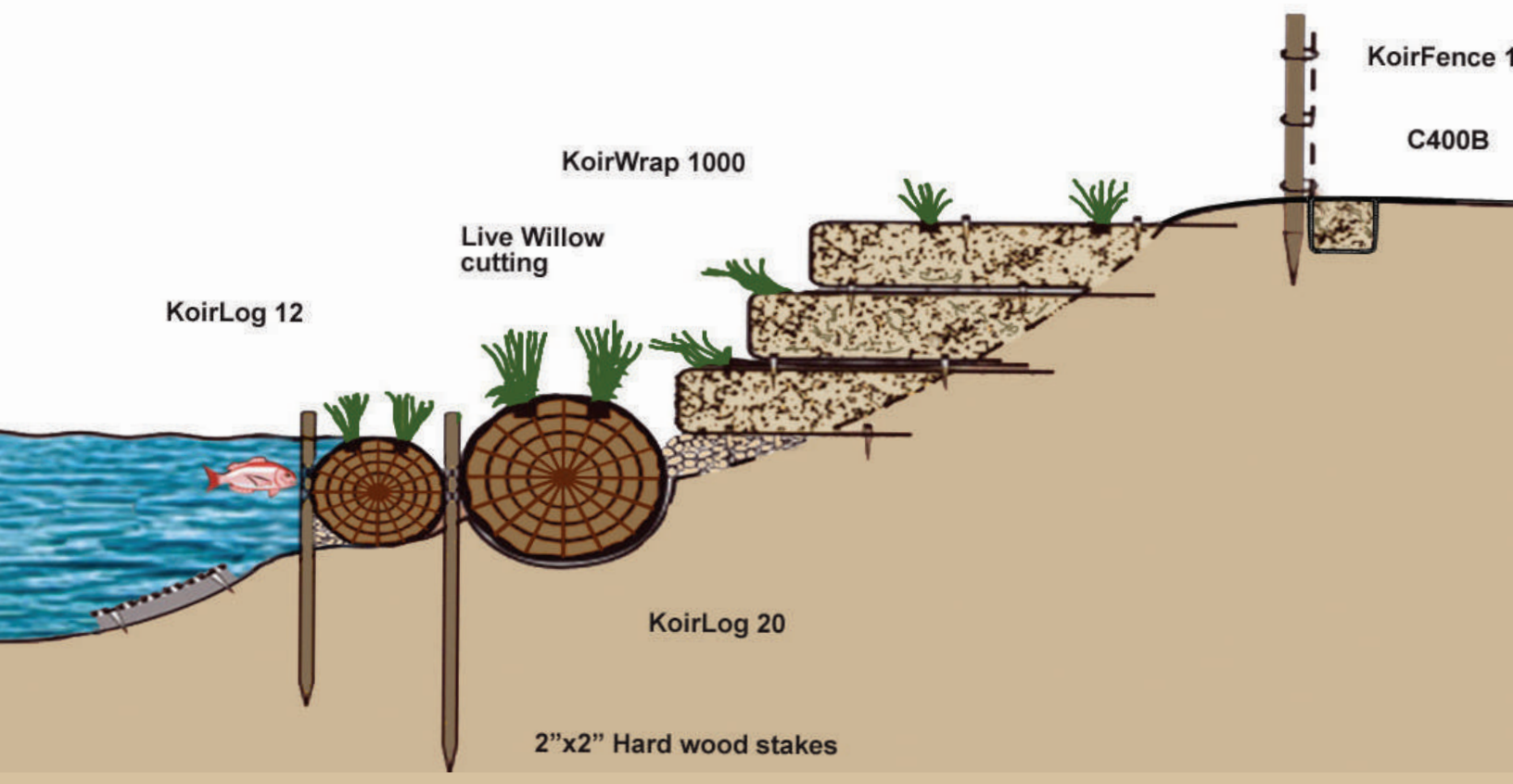
TYPES OF EROSION CONTROL PRODUCTS

Currently there are several varieties of erosion control and bioengineering products made with synthetic, natural or composite materials. Nedia Enterprises focuses primarily on those products made from natural fibers such as coir, jute and straw. We also offer composite products that combine straw or coir with synthetic fibers for additional strength and longevity. See the table on pages 4 and 5 for typical applications of our line of products.





PRODUCT SELECTION GUIDELINES	Applications		Techniques
	Slope Stabilization (Typically Uplands)	Mild to moderate slopes, Landscaping	Fabric covered slope
		Fire rehabilitation, Disturbed sites	Coir wattles and silt fence
		Steep or severely eroding slopes, Moist climates	Fabric reinforced brush layer
	Streambank Stabilization	Low bank heights, Low to moderate bank slopes	Fabric covered bank
		Lower erosion potential, Moderate bank slopes	Coir log reinforced bank
		Moderate to high energy, Steeper bank slopes	Fabric wrapped soil lifts
		Higher erosional forces, Steeper bank slopes	Composite bank treatment
	Shoreline / Lakeshore Stabilization	Poorly-vegetated lakeshore, Low erosion risk	Fabric covered bank
		Shorelines with low height, Moderate slope and erosion risk	Coir log reinforcement
		Higher erosion potential, Steeper or taller shorelines	Composite bank treatment
	Wetlands/Tidal Marshes/Bays	Poorly-vegetated sites requiring rapid vegetation cover	Pre-vegetated mat
		Poorly-vegetated areas with moderate to high erosion	Composite treatment
		Damaged grass beds	Palletized submerged aquatic vegetation
	Sediment Control	Construction sites, Roadsides, Agricultural runoff areas	Biodegradable Coir silt fence
		Curb inlets, Drop inlets, Streams, Channels	Coir wattles, Coir silt fence
		Forests damaged by fire	Coir wattles, Coir silt fence
	Channel Lining	Drainage ditches, Reservoir overflows	Fabric covered channel
	Temporary Haul Roads	Temporary haul roads in forests, Mine sites and construction sites	Biodegradable stabilizer fabric
	Waste water Treatment	Waste water treatment lagoons	Biological treatment using pre-vegetated mats
		Effluent treatment ponds	Pre-vegetated mats with mature vegetation
	Nursery Products	Inter-plant in rip-rap slopes or shorelines	Coir plant containers
		Install rooted willow cuttings between fabric lifts	Coir willow sleeves
		Growth medium for rooted plants in wetland and shoreline use	Pre-vegetated mats



Recommended Products

KoirMat 400, 700, 900; KoirWrap 1000, S400, SC400, C400, CTRM 500C

KoirWattle 6 and 9, KoirFence 1250

KoirMat 700, 900; KoirWrap 1000

KoirMat 700, 900; KoirWrap 1000, C400, CTRM 500C

KoirLog 12, 16, 20 - various densities

KoirMat 700 or 900 (w/optional C400 as inner fabric), KoirWrap 1000

KoirMat 900 or CTRM 500C with KoirLog 12, 16, 20 - various densities

SC400, C400, KoirMat 700, 900; KoirWrap 1000

KoirLog 12, 16, 20 - various densities

Stacked KoirLogs, KoirLog 16 or 20 with KoirMat 900

KoirBed, KoirPad 640, BM 2000

KoirMat or pre-vegetated KoirBed combined with KoirLog

KoirBed, KoirPad 640, BM 2000

KoirFence 1250

KoirWattle 6 or 9, KoirFence 1250

KoirWattle 6 or 9, KoirFence 1250

KoirMat 400, 700, 900; KoirWrap 1000, C400, CTRM 500C

BioJute 500

KoirBed, KoirPad 640, BM 2000

KoirBed, KoirPad 640, BM 2000

KoirPot

KoirTube

KoirBed, KoirPad 640, BM 2000

WHAT IS COIR ?



Coir (pronounced as "coy-er") is a vegetable fiber extracted from the fibrous husk (mesocarp) covering the inner shell of the coconut fruit grown on coconut trees (botanical name *cocos nucifera*). It contains approximately 46% by weight of lignin. This makes it one of the strongest and most durable of all natural fibers. Coir fiber is an ideal raw material for erosion control products because it has high tensile strength and extended longevity. It eventually biodegrades into humus adding fertility to the soil.



KOIRMAT™ 400



KOIRMAT™ 700



KOIRMAT™ 900

WOVEN COIR FABRICS

KOIRMAT™ 400, 700, 900

OVERVIEW: Nedia offers a full line of 100% natural woven coir (coconut fiber) erosion control fabrics. Our line of products in this category include: KoirMat™ 400, KoirMat™ 700, KoirMat™ 900.

KoirMat is made from well cleaned, high strength, fresh water cured coconut fiber. Coconut fiber is extracted from coconut husks which are submerged in fresh water streams or storage tanks for a period of several months. During this process known as retting, water constantly flows through the coir fiber matrix removing impurities present in the fiber. The clean fiber is extracted and spun into yarn which is then woven into KoirMat.

KoirMat erosion control matting is highly versatile with a wide array of applications in bioengineering and erosion control. KoirMat by far exceeds the demand for an environmentally friendly and economic erosion control product.

BENEFITS: Coir fiber has one of the highest durability and tensile strength among all natural fibers. The high lignin content (46% by weight) of KoirMat makes it naturally resistant to mold and rot and hence requires no chemical treatment.

KoirMat naturally absorbs and retains water while retaining its integrity providing an ideal microclimate for the growth of vegetation. KoirMat resembles the soil in its ability to absorb solar radiation to prevent overheating - a problem with many synthetic materials. The natural color of KoirMat makes it aesthetically pleasing. After years of effective erosion control and vegetation anchoring, KoirMat decomposes and joins the natural ecological cycle, providing soil nutrients in the process. Environmentally safe and biodegradable, KoirMat is the preferred choice of erosion control specialists around the world.

LONGEVITY: Depending on its application and exposure, KoirMat lasts about two to five years. This extended longevity period allows enough time to establish adequate vegetation allowing erosion control the way nature intended.

TYPICAL APPLICATIONS

- Stream and river bank stabilization
- Wetland construction
- Highways and rail embankments
- Dams and reservoirs
- Slope and channel stabilization
- Construction sites
- Mining operations and landfills
- Detention ponds
- Ski slopes and ski lift tracks
- Tidal marshes
- High altitude planting
- Golf courses

FOR INSTALLATION GUIDELINES.... SEE PAGE 20

WHY SHOULD YOU CHOOSE KOIRMAT™?

- 🌿 KoirMat is made from coir fiber which is 100% natural, organic and biodegradable.
- 🌿 Available in rolls up to 4 meters (13.1 ft.) wide without stitched seams.
- 🌿 More flexible than mattings made from stiff bristle coir fibers. This allows KoirMat to better hug the soil surface.
- 🌿 High tensile strength and durability make it suitable for severe erosion problems.
- 🌿 Easy to handle and install.
- 🌿 Two to five years longevity allowing for complete vegetation establishment in most climates.
- 🌿 Absorbs water and acts as a mulch on the surface as well as a wick in the soil mantle. This creates an ideal microclimate for the germination of seeds.
- 🌿 Open mesh construction provides an excellent opportunity for vegetation growth.
- 🌿 Safe for wildlife.
- 🌿 Adds to the fertility of the soil after biodegradation.
- 🌿 Accelerates the development of aquatic and riparian habitat.
- 🌿 Accepts hydraulically applied products.
- 🌿 Traps sediments and encourages deposition. Environmentally and aesthetically pleasing.
- 🌿 Provides effective erosion control of steep slopes and high velocity channels.
- 🌿 Provides economic and environmentally sound stabilization of streambank and shorelines.
- 🌿 Ideal for most landscaping and bioengineering applications.



Technical Specifications for KoirMat™ 400, 700, 900				
Property	Test Method	KoirMat™ 400	KoirMat™ 700	KoirMat™ 900
Material	n/a	Woven matting of coir yarn made from high strength white (retted) coconut fiber		
Color	n/a	Natural/Earth tone		
Thickness	ASTM D 5199	0.35 in.	0.35 in.	0.35 in.
Mass per unit area (min)	ASTM D 5261	11.8 oz/sq. yd	20.6 oz/sq. yd	26.5 oz/sq. yd
Wide width tensile strength - Dry MD x CD	ASTM D 4595	504 x 480 lbs/ft.	1512 x 1032 lbs/ft.	1968 x 1416 lbs/ft.
Maximum Elongation - Dry MD x CD	ASTM D 4595	33% x 31%	40% x 33%	46% x 34%
Wide width tensile strength - Wet MD x CD	ASTM D 4595	456 x 360 lbs/ft.	924 x 684 lbs/ft.	1260 x 768 lbs/ft.
Maximum Elongation - Wet MD x CD	ASTM D 4595	36% x 31%	69% x 34%	43% x 36%
Flexural Rigidity (Stiffness) MD x CD	ASTM D 1388	4070 x 3923 mg - cm	12896 x 8132 mg - cm	14019 x 9329 mg - cm
Slope (Recommended)	Observed	< 1 : 1	> 1 : 1	> 1 : 1
Shear Stress (Recommended)	Flume Tests	3.2 psf	4.5 psf	5.0 psf
Water Velocity (Recommended)	Flume Tests	8 ft./sec	12 ft./sec	16 ft./sec
Water Absorption	ASTM D 1117	163%	146%	132%
"C" Factor	Flume Tests	0.002	0.002	0.003
Open Area	Measured	65%	50%	39%

STANDARD ROLL SIZES: 13.1' X 165' (4M X 50M)

*KOIRMAT IS ALSO AVAILABLE IN D SERIES

COCONUT FIBER LOGS

KOIRLOG™ 12, 16, & 20

OVERVIEW: KoirLogs are natural coconut fiber logs with applications in wetland mitigation, shoreline stabilization and streambank/channel protection. Nedia's KoirLogs are made from double cleaned, unsorted coconut fiber encased in a high tensile strength coir twine netting. KoirLogs help to dissipate the impact from wave action and flowing water, trap sediments and encourage vegetation growth. During installation, seedlings or plant cuttings can be planted into the KoirLog. Sediments trapped by the KoirLog as well as the inherent property of the coir fiber to absorb and retain moisture provides an ideal medium for vegetation establishment and growth.

SIZES: KoirLogs are available in 12", 16" and 20" diameters. The logs are typically 10' or 20' long.

DENSITIES: KoirLogs are available in Normal Density (ND Series) of 7 lbs/cu.ft. and High Density (HD Series) of 9 lbs/cu.ft. KoirLogs with a normal density of 7 lbs/cu.ft. (ND Series) are easier to handle, install and plant. The normal density logs also encourage rapid root development. Designers must evaluate the site conditions in order to choose the appropriate size, density and number of tiers of KoirLogs to be used. Some parameters to consider are flow velocity, wave height, stream energy, soil type and accessibility to the project site.

LONGEVITY: KoirLogs generally last for two to five years. As the KoirLog biodegrades, the plants develop a well established root system in the shoreline sediment which will retain the soil in place preventing further erosion. The decomposing KoirLogs provide valuable humus to the soil.

TYPICAL APPLICATIONS

- Streambank stabilization
- Shoreline protection
- Wetland mitigation
- Channel edge liner
- Wildlife habitats
- Landscaping

ADVANTAGES

- Safe for wildlife and the environment
- 100% biodegradable
- An excellent planting medium
- Encourages deposition
- Easy to install
- Economical



FOR INSTALLATION GUIDELINES.... SEE PAGE 22



Technical Specifications for KoirLog™ 12, 16, 20 (ND Series)

Product Specification	Unit Weight	Diameter	Length *	Core Density	Outer Netting			Inner Core
					Material	Breaking Strength	Mesh Size	
KoirLog 12 ND	5.5 lbs/ft (8.2 kg/m)	12" (30 cm)	10' or 20' (3.05 m or 6.10 m)	7 lbs/cu.ft (112 kg/cu.m.)	3 ply coir 0.40 in dia. (1 cm dia.)	80 lbs (356 N)	2" x 2" Rhombic mesh with hand-knotted junctions	Unsorted, double cleaned, well-graded, coir fiber
KoirLog 16 ND	9.5 lbs/ft (14.1 kg/m)	16" (40 cm)						
KoirLog 20 ND	15 lbs/ft (22.3 kg/m)	20" (50 cm)						

*CUSTOM LENGTHS AVAILABLE.

KoirLogs are also available in **KOIRLOG HD**, **KOIRLOG HDP** and **KOIRLOG NDP** Series in 12", 16" and 20" diameters.

KOIRLOG HD Series has a core density of 9 lbs/cu.ft and high strength coir netting with a breaking strength of 100 lbs.

KOIRLOG HDP Series has a core density of 9 lbs/cu.ft and has a synthetic fiber netting with a breaking strength of 200 lbs.

KOIRLOG NDP Series has a core density of 7 lbs/cu.ft and has a synthetic fiber netting with a breaking strength of 200 lbs.

KOIRLOG HDP and **KOIRLOG NDP** are available in hand-knotted as well as knotless synthetic netting.

EROSION CONTROL BLANKETS & COMPOSITE TRM

Nedia offers a variety of straw & coconut stitched blankets for erosion control on slopes and channels. These blankets help to stabilize and reinforce the soil until vegetation is established. All blankets are available in photodegradable as well as biodegradable netting (denoted by suffix "B").

STRAW BLANKETS

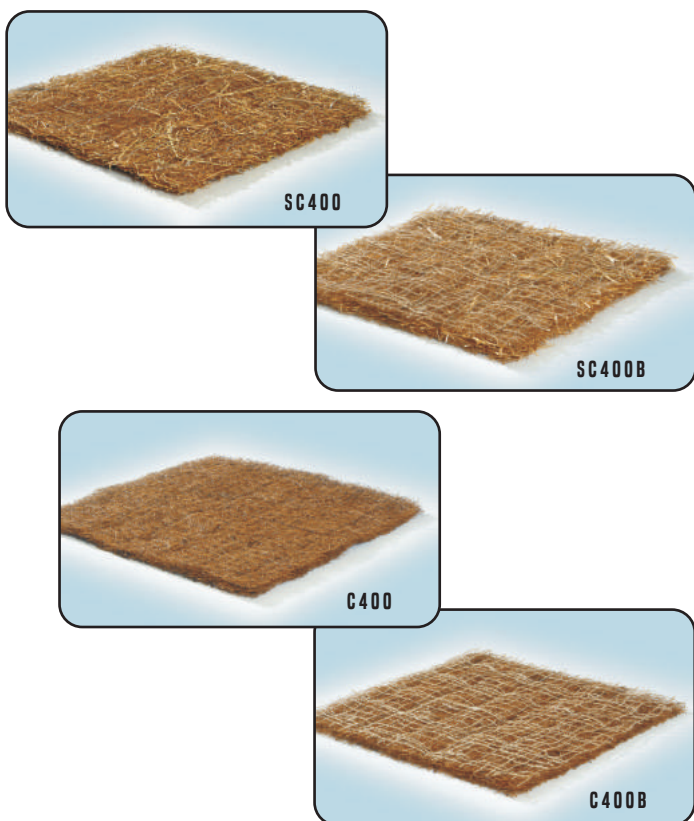
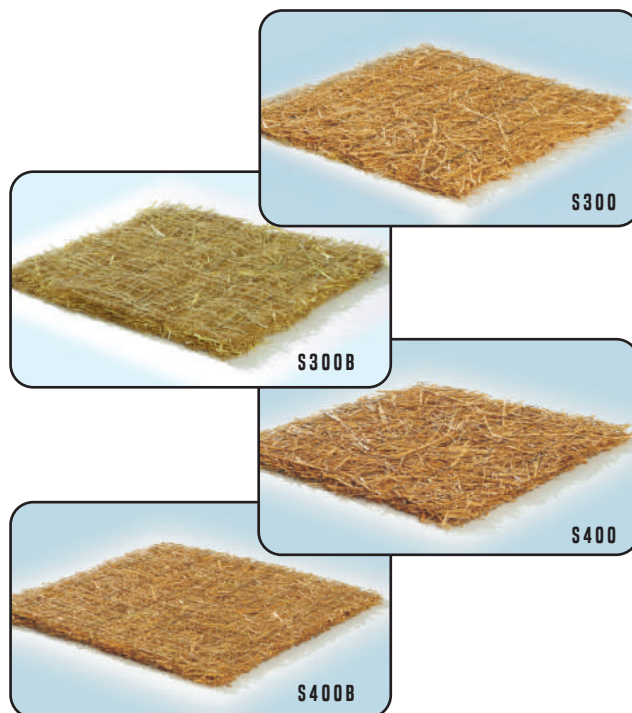
S300: Straw blanket with single lightweight photodegradable netting.

S300B: Straw blanket with single biodegradable netting.

S400: Straw blanket with top and bottom lightweight photodegradable netting.

S400B: Straw blanket with top and bottom biodegradable netting.

The single-netted straw blankets (S300 and S300B) are typically used on slopes 3:1 and flatter as well as in low flow channels. The double netted straw blankets (S400 and S400B) are ideal for 3:1 to 2:1 slopes and for moderate flow channels.



STRAW / COCONUT BLANKETS

SC400: 70% Straw / 30% Coconut blanket with top heavyweight UV stabilized polypropylene netting and bottom lightweight photodegradable polypropylene netting.

SC400B: Straw/Coconut blanket with top and bottom biodegradable netting.

These blankets can be used on 2:1 to 1:1 slopes and in channels with moderate to severe flow conditions.

COCONUT BLANKETS

C400: Coconut blanket with top and bottom heavyweight UV stabilized polypropylene netting.

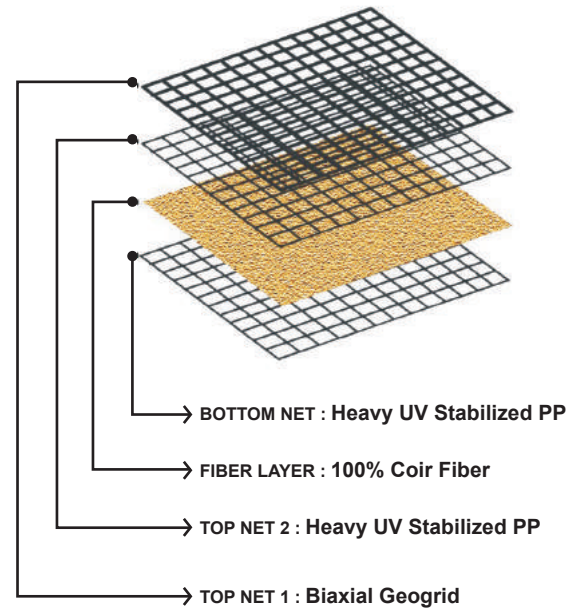
C400B: Coconut blanket with top and bottom biodegradable netting. Suitable for steep slopes (1:1 or greater) with heavy run-off conditions. These blankets are made of double cleaned coconut fibers.

The C400B blankets have top and bottom biodegradable netting for more ecologically sensitive. These blankets with durable coconut fiber matrix create a highly effective liner for channels and shorelines where vegetation establishment is challenging.

COMPOSITE TURF REINFORCEMENT MATTING

CTRM

The CTRM Composite Turf Reinforcement Matting was developed for high velocity channels, steep slopes and other applications where temporary vegetation reinforcement as well as permanent erosion protection are required. CTRM consists of a coconut fiber matrix stitch-bonded between two layers of heavyweight UV stabilized polypropylene nettings overlaid with a permanent heavy-duty flexible biaxial geogrid. The coconut fiber matrix provides temporary erosion control and creates an ideal medium for rapid establishment of vegetation. The flexible biaxial grid offers permanent stem reinforcement and root zone protection for the established vegetation. Independent laboratory tests have shown that unvegetated CTRM can resist flow velocity of up to 20 ft/sec and shear stress of up to 8 psf. This level of erosion protection is equivalent to 24" rock riprap. Most other TRMs can provide this level of protection only in fully vegetated conditions.



FOR INSTALLATION GUIDELINES.... SEE PAGE 20

Technical Specifications for Erosion Control Blankets & Composite TRM 800

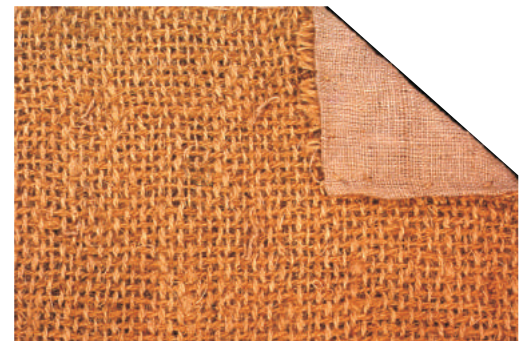
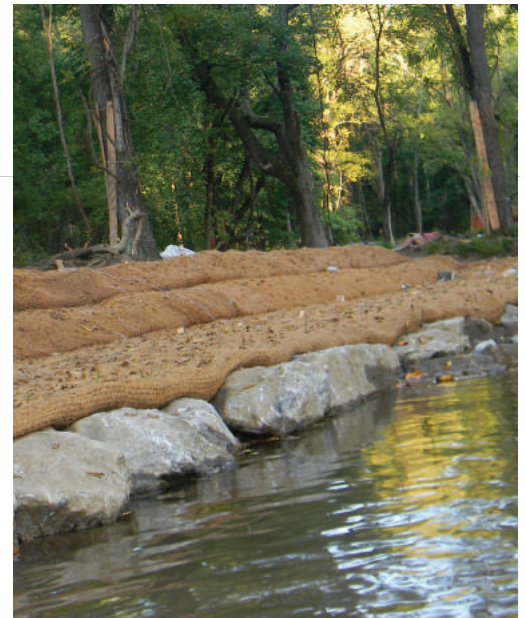
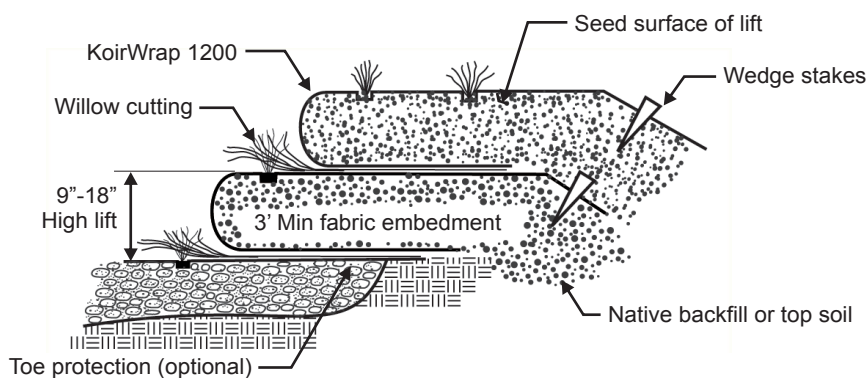
PRODUCT NAME	S300	S300B	S400	S400B	SC400	SC400B	C400	C400B	CTRM 800
Fiber type	Straw	Straw	Straw	Straw	Straw/Coir	Straw/Coir	Coir	Coir	Coir/Geogrid
Functional Longevity (years)	1	1	1	1	1 to 2	1 to 2	2 to 3	2 to 3	>3
Top Netting Type	Light PP	Natural	Light PP	Natural	Heavy PP	Natural	Heavy PP	Natural	Biaxial Geogrid Heavy PP
Bottom Netting Type	None	None	Light PP	Natural	Light PP	Natural	Heavy PP	Natural	Heavy PP
Top Netting Mesh Size (Inch x Inch)	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8	1/2 x 1/2	N/A
Bottom Netting Mesh Size (Inch x Inch)	N/A	N/A	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8	1/2 x 1/2	5/8 x 5/8
Top Netting Wt. (lbs/1000 sq.ft.)	1.6	9.3	1.6	9.3	3.0	9.3	3.0	9.3	40+3
Bottom Netting Wt. (lbs/1000 sq.ft.)	N/A	N/A	1.6	9.3	1.6	9.3	3.0	9.3	3.0
ASTM STANDARD									
D 5261 Mass per unit area minimum (oz/sy)	8	8	11.2	11.2	11.2	11.2	11.2	11.2	15.2
D 5199 Thickness Minimum (Inches)	0.25	0.25	0.35	0.35	0.35	0.35	0.35	0.35	0.32
D 4595 Tensile Strength - Dry (lb/ft.)	108 x 100	76 x 56	180 x 73	103 x 89	144 x 114	144 x 112	300 x 180	293 x 185	1788 x 1284
D 4595 Elongation - Dry (%)	22 x 23	8 x 4	25 x 16	9 x 11	5 x 11	5 x 12	26 x 22	27 x 20	14 x 15
D 4595 Tensile Strength - Wet (lb/ft.)	188 x 92	76 x 44	156 x 82	156 x 120	228 x 180	156 x 144	312 x 156	308 x 186	1740 x 1320
D 4595 Elongation - Wet (%)	23 x 18	5 x 5	20 x 17	5 x 6	19 x 26	6 x 6	25 x 20	27 x 19	12 x 11
D 1117 Water Absorption (%)	313	267	272	444	236	356	251	136	137
D 4491 Flow Velocities, Short Term (fps)	6	6	9	9	10	10	14	14	20
Recommended Slope	4:1 to 3:1	4:1 to 3:1	3:1 to 2:1	3:1 to 2:1	2:1 to 1:1	2:1 to 1:1	1:1 or >	1:1 or >	1:1 or >
Maximum Permissible Shear Stress (lbs/sq.ft.)	1.55	1.55	1.7	1.7	1.85	1.85	2.25	2.25	8.00
"n" Value Roughness Coefficient	0.021	0.021	0.019	0.019	0.018	0.018	0.014	0.014	0.026

STANDARD ROLL SIZES: 8' X 67.5', 7.5' X 96', 15' X 96' EXCEPT FOR CTRM 800 WHICH IS 7.5' X 72'

SOIL WRAP FABRIC

KOIRWRAP™ 1000 & KOIRWRAP™ 1200

Fabric Wrapped Soil Construction is one of the most resilient bioengineering techniques to stabilize streambanks. This technique relies on the strongest type of coir fabric construction to reinforce soil lifts, high density plantings of rows of willow cuttings, native seeds, and in many cases a reinforced stone toe to protect against toe scour. Like all bioengineered designs using degradable fabric, the concept is to rely on fabrics during the initial (two to five years) soil stabilization period. As the fabric degrades, the installed vegetation provides the necessary erosion protection and aesthetic benefits. KoirWrap1000 is an excellent fabric for this type of bank treatment. KoirWrap 1000 is a double-layered biodegradable erosion control fabric made up of an outer layer of high strength continuous-ly woven coir matting and an inner layer of lightweight jute fabric connected together at regular intervals. KoirWrap 1000 is ideal for fabric wrapped soil construction on steep slopes and along streambanks.



FOR INSTALLATION GUIDELINES....SEE PAGE 23

TYPICAL APPLICATIONS

- 🌿 Slope and streambank stabilization
- 🌿 Landscaping and bioengineering
- 🌿 Revegetation of construction damaged slopes
- 🌿 Trapping sediment and to encourage deposition
- 🌿 Reduction of pollution from storm -water run-off

ADVANTAGES

- 🌿 An excellent product for Fabric Wrapped Soil Construction
- 🌿 Outer layer of woven coir fabric provides strength
- 🌿 Inner layer of woven jute fabric retains fines during period of plant establishment
- 🌿 Easy to handle and install
- 🌿 Cost effective and long lasting
- 🌿 Ideal for steep slopes and high velocity channels

Technical Specifications for KoirWrap™ 1000		
Property	Test Method	Typical Value
Thickness	ASTM D 5199	0.35 in (0.90 cm)
Mass per unit area	ASTM D 5261	33.3 oz/sq.yd.(1130 g/sq.m)
Wide Width Tensile Strength MD x CD (Primary Layer)	ASTM D 4595	1008 x 936 lbs./ft. (14.7 x 13.7 KN/m)
Maximum Elongation MD x CD (Primary Layer)	ASTM D 4595	30% X 26%
Wide Width Tensile Strength MD x CD (Secondary Layer)	ASTM D 4595	612 x 468 lbs./ft. (8.94 x 6.83 KN/m.)
Maximum Elongation MD x CD (Secondary Layer)	ASTM D 4595	8% X 9%
Puncture Strength (Secondary Layer)	GRI GS1	553 lbs. (2,461 N)
Flexural Rigidity (Stiffness)	ASTM D 1388	0.692 x 0.690 oz-in. (49.8 x 49.7 g-cm)
Water Absorption	ASTM D 1117	146%
Permittivity	ASTM D 4491	3.07/sec.
Permeability	ASTM D 4491	1.03 in/sec (2.61 cm/sec)
Flow Rate	ASTM D 4491	229 gal/min/sq.ft. (9.36 cu.m/min/sq.m)

Standard roll size: 9.84' x 83' (3m x 25m)

PHASES OF FABRIC WRAPPED SOIL CONSTRUCTION



STEP 1



STEP 2



STEP 3



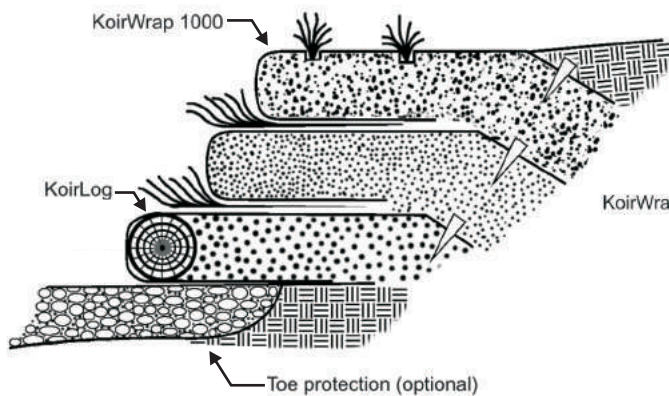
STEP 4



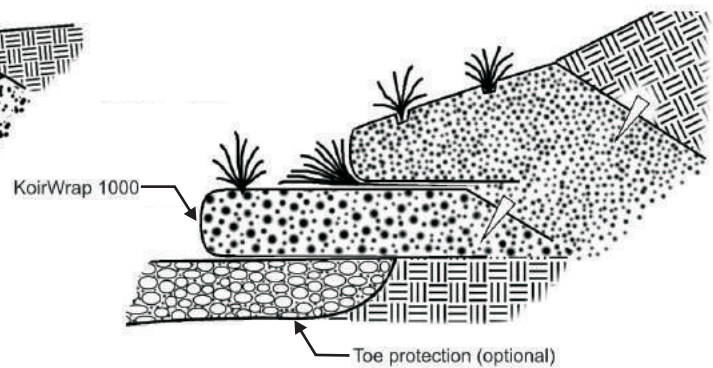
STEP 5



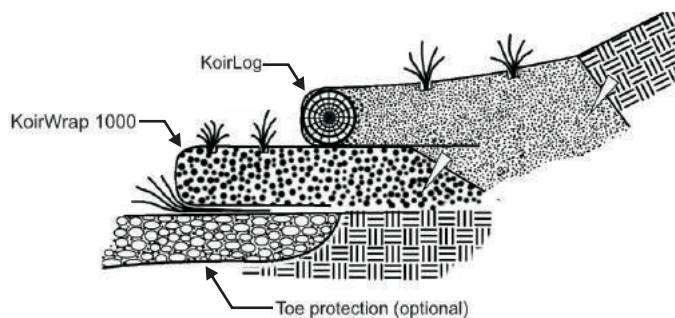
STEP 6



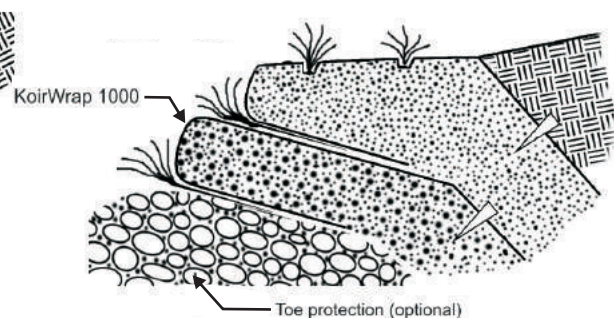
ALTERNATE DETAIL # 1



ALTERNATE DETAIL # 2



ALTERNATE DETAIL # 3



ALTERNATE DETAIL # 4

COIR SEDIMENT CONTROL PRODUCTS

KOIRFENCE™ 1250

KoirFence™1250 is a tightly woven biodegradable silt fence made of high strength coir.

TYPICAL APPLICATIONS

- 🌿 Perimeter sediment control
- 🌿 To contain wind blown snow
- 🌿 Storm drain inlet protection
- 🌿 Matting for walkways

ADVANTAGES

- 🌿 100% natural and biodegradable -
- 🌿 eliminates need for removal
- 🌿 Environmentally friendly
- 🌿 Safe for wildlife
- 🌿 Easy and economical to install
- 🌿 Excellent alternative to plastic silt fence in ecologically sensitive areas
- 🌿 Excellent filtration characteristics



Technical Specifications for KoirFence™ 1250		
Property	Test Method	Typical Value
Thickness	ASTM D 5199	0.38 in (1.0 cm)
Mass per unit area	ASTM D 5261	37oz/sy (1250 g/sq.m)
Wide Width Tensile Strength MD x CD	ASTM D 4595	2508 x 948 lbs/ft (36.60x13.80 KN/m)
Elongation at break MD x CD	ASTM D 4595	32% x 22%
Grab Tensile Strength MDxCD	ASTM D 4632	345 x 107 lbs (1535 x 475 N)
Elongation at peak MD x CD	ASTM D 4632	42% x 22%
rapezoidal Tear Strength MD x CD	ASTM D 4533	337 x 115 lbs (1500 x 512 N)
Apparent Opening size	ASTM D 4751	18-20 US Standard Sieve size (0.85 -1.0 mm)
Puncture Resistance	ASTM D 4833	209 lbs. (930 N)
Permittivity	ASTM D 4491	2.72/sec.
Permeability	ASTM D 4491	1.06 in/sec (2.69 cm/sec)
Flow Rate	ASTM D 4491	203 gal/min/sqft. (8.2 cu.m/min/sq.m)
Mullen Burst Strength	ASTM D 3786	>800 lbs/sq.in (>5516 KPa)
Flexural Rigidity (Stiffness)	ASTM D 1388	1.76 x 0.60 oz-in (127 x 43 g-cm)

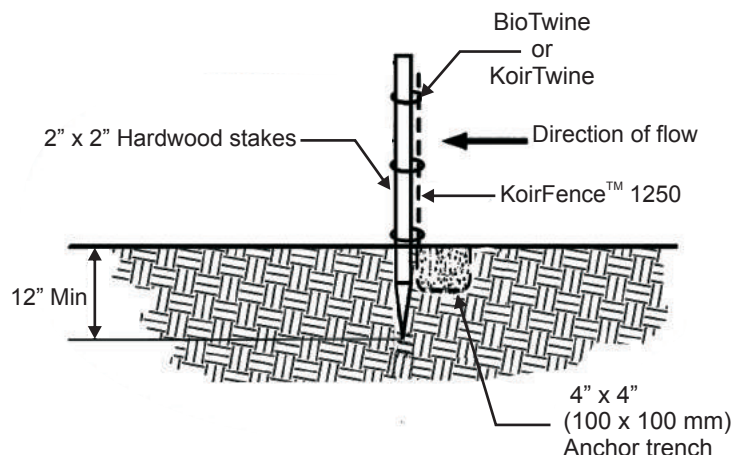
Standard roll size: 3' x 100' (0.92m x 30.5m)

KoirFence 1250 shall be installed using 2" x 2"

hardwood stakes at 3' to 6' on center. Bury the bottom edge of KoirFence in a 4" x 4" anchortrench.

Tie KoirFence at top, bottom and midheight of the wood stakes using KoirTwine or BioTwine (See page 18).

KoirFence shall be placed along the slope contours to maximize ponding efficiency. Inspect and repair KoirFence after each storm event and remove sediment when necessary. Removed sediment shall be deposited in an area that can be permanently stabilized.



KOIRWATTLE™ 6 AND 9

KoirWattle is a flexible cylindrical module of coir fiber encased in a tubular netting made of high strength coir. KoirWattle generally lasts two to five years and can replace silt fence and straw bales as a cost effective means of controlling erosion. It effectively traps sediments and improves water quality.

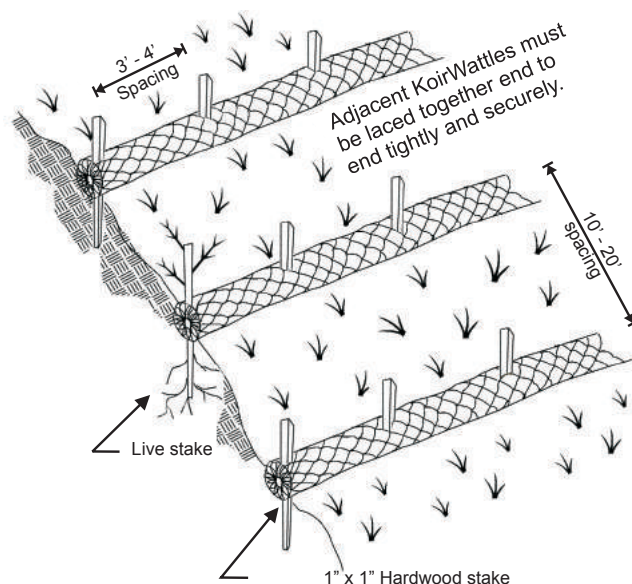


TYPICAL APPLICATIONS

- Storm drain inlet protection
- Check structure in swales and water ways
- Forest fire rehabilitation
- Storm water and construction run-off pollution control
- Vineyard erosion control
- Landscape edging
- Alternate to silt fence for perimeter sediment control

ADVANTAGES

- Reduces slope length
- Slows water flow velocity
- Reduces sheet erosion as well as rill and gully development
- 100% natural and biodegradable
- Cost effective
- Easy to install in shallow soils and hard substrates
- Safe for the environment
- Superior filtration & durability compared to straw and excelsior wattle
- Works as a vegetative filter
- Blends in well with existing landscape
- Excellent growing medium for vegetation



Technical Specifications for KoirWattle™		
Property	KoirWattle 6	KoirWattle 9
Diameter	6.0 inch (15.3 cm)	9.0 inch (22.9 cm)
Unit Weight	1.5 lbs/ft (2.23 kg/m)	3.0 lbs/ft (4.46 kg/m)
Inner core	Double cleaned unsorted coconut fiber	
Outer netting	High strength coir with knotted junctions	
Outer netting Mesh opening	2" x 2" rhombic shaped mesh opening	
Core Density	7.0 lbs/cu.ft (112 kg/cu.m)	

Standard sizes: 6" and 9" dia x 10' and 20' long

FOR INSTALLATION GUIDELINES...SEE PAGE 24

COIR PLANTING MEDIA

KOIRBED™

KoirBed features a 100% coir fiber matrix encased both top and bottom in high strength coir netting. The mesh opening size of the netting varies according to the application. KoirBed can be custom designed to various sizes and built-in holes can be incorporated for easy pre-planting.



Technical Specifications for KoirBed™	
Property	Typical Value
Thickness	2" to 4" (50 mm to 100 mm)
Top Netting	High strength coir fabric
Intermediate Layer	Unsorted, double cleaned coconut fiber
Bottom Netting	High strength coir fabric
Standard Size	2 in x 3 ft x 15 ft
Sizes	Thickness 2 in to 4 in Width 2 ft to 12 ft Length 2 ft to 30 ft

TYPICAL APPLICATIONS

- Hydroponic growing of pre-vegetated mats
- Rapid vegetation of wetlands
- Seed germination
- Protecting high wave impact shorelines
- Aquatic plant propagation
- Sediment trapping in construction run-off

ADVANTAGES

- Convenient, economic, and easy to install
- 100% natural and biodegradable
- Dimensionally sound and stable
- No need for removal after vegetation is established

INSTALLATION GUIDELINES SIMILAR TO "BLANKETS & MATTINGS" ON PAGE 20

KOIRPAD™ 640

KoirPad 640 is a needle-punched coir fiber matrix bonded with latex binder.

TYPICAL APPLICATIONS

- 🌿 Rapid restoration of disturbed sites
- 🌿 Erosion control on steep slopes and high velocity channels
- 🌿 Bioengineering planting media for live stake layering, live facines and brush layering
- 🌿 Biodegradable filter fabric in fabric wrapped soil construction
- 🌿 Streambank and shoreline stabilization Wetland remediation



ADVANTAGES

- 🌿 100% organic and biodegradable
- 🌿 Has excellent moisture retention qualities
- 🌿 Effectively filters fine sediments
- 🌿 Safe for the environment

Technical Specifications for KoirPad™ 640

Property	Test Method	Typical Value
Thickness	ASTM D 5199	0.25 in (0.64 cm)
Mass per Unit Area	ASTM D 5261	20.6 oz/sy (700 gms/sq.m)
Wide Width Tensile Strength MD x CD	ASTM D 4595	384 x 216 lbs/ft. (5.59 x 3.15 KN/m)
Elongation at Break MD x CD	ASTM D 4595	13% x 14%
Trapezoidal Tear Strength MD x CD	ASTM D 4533	32 x 28 lbs (142 x 125 N)
Permittivity (Constant Head)	ASTM D 4491	3.98/sec
Permeability	ASTM D 4491	1.34 in/sec (3.41 cm/sec)
Flow rate	ASTM D 4491	297 gal/min/sq.ft (12.0 cu.m/min/sq.m)
Water Holding Capacity	ASTM D 4250	166 oz/sy (5.63 kg/sq.m)

Standard roll size: 3' x 100' (0.92m x 30.5m)

INSTALLATION GUIDELINES SIMILAR TO “BLANKETS & MATTINGS” ON PAGE 20

BM 2000™

BM 2000™ is a three dimensional coir fiber matrix needle - punched and bonded with latex adhesive.

ADVANTAGES

- ✓ Natural, organic and biodegradable
- ✓ Excellent for pre-planting in the nursery and for on-site planting
- ✓ Ideal for rapid re-vegetation of wetlands, tidal marshes, streambanks & shorelines
- ✓ Traps sediments and encourages deposition
- ✓ Easy to install



Technical Specifications for BM 2000™

Property	Test Method	Typical Value
Thickness	ASTM D 5199	1.5 to 2.0 in (5 cm)
Mass per Unit Area	ASTM D 5261	30.3 oz/sy (1027 gsm/sq.m)
Wide width Tensile Strength MD x CD	ASTM D 4595	180 x 96 lbs/ft. (2.62 x 1.40 KN/m)
Elongation at Break MD x CD	ASTM D 4595	41% x 25%
Trapezoidal Tear Strength MD x CD	ASTM D 4533	52 x 20 lbs (231 x 89 N)
Permittivity (Constant Head)	ASTM D 4491	5.3/sec
Permeability	ASTM D 4491	8.2 in/sec (20.8 cm/sec)
Flow rate	ASTM D 4491	397 gal/min/sq.ft (16.1 cu.m/min/sq.m)
Water Holding Capacity	ASTM D 4250	75 oz/sy (2.54 kg/sq.m)

Standard roll size: 3' x 15' (0.95m x 4.6m)

INSTALLATION GUIDELINES SIMILAR TO "BLANKETS & MATTINGS" ON PAGE 20

BIODEGRADABLE STABILIZER FABRIC

BIOJUTE™ 500

BioJute™ 500 is a 100% biodegradable geotextile made of tightly woven jute yarn.



TYPICAL APPLICATIONS

- Geotextile separator fabric for temporary haul roads
- As a liner for KoirMat in fabric wrapped soil construction
- Erosion control in channels

ADVANTAGES

- Fully biodegradable
- No need for removal
- Alternate to synthetic geotextiles
- Large coverage area

Technical Specifications for BioJute™ 500

Property	Test Method	Typical Value
Grab Tensile Strength MD x CD	ASTM D4632	161 x 129 lbs (718 x 572N)
Elongation at Peak	ASTM D4632	72% x 9.4%
Wide Width Tensile Strength MD x CD	ASTM D4595	1272 x 1020 lbs/ft (18.6 x 14.9 KN/m)
Elongation at Break	ASTM D 4595	4% x 4%
Puncture Resistance	ASTM D 4833	90.6 lbs (403.2 N)
Trapezoidal Tear Strength MD x CD	ASTM D 4533	134 x 103 lbs (597 x 458 N)
Mullen Burst Strength	ASTM D 3786	268.5 lbs/sq.in (1,851 Kpa)
Apparent Opening Size	ASTM D4751	18 U.S. Std. Sieve
Permittivity	ASTM D 4491	2.39/sec
Permeability	ASTM D 4491	0.11 in/sec (0.29 cm/sec)
Flow rate	ASTM D 4491	179 gal/min/sq.ft (7.3 cu.m/min/sq.m)

Standard roll size: 12.5' x 300' (3.8 m x 9.5 m)

FOR INSTALLATION GUIDELINES...SEE PAGE 20

Accessorial Products



Wedge shaped, pencil point and chisel point hardwood stakes are available in various sizes.

Hardwood Stakes

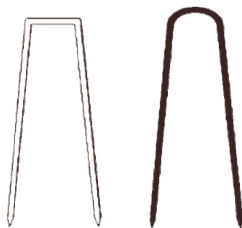
High strength 2 ply coconut fiber twine with a breaking strength of 80 lbs. Ideal for securing KoirLog, KoirWattle, KoirFence, etc.



Standard spool size: 500 LF

KoirTwine™ 80

Size : 6" to 12" . Gage : 8 to 11 ga



Metal Staples

High strength single ply natural fiber twine with a breaking strength of 80 lbs and 150 lbs.

Standard spool size:
2250 LF (BioTwine 80)
1000 LF (BioTwine 150)



BioTwine™ 80 / 150

Molded coir fiber pot reinforced with natural latex adhesive.

Size : 2" to 16" dia



KoirPot™

Woven coir fiber pot made from high strength coir yarn

Size : 3" to 20" dia



KoirTube™

INSTALLATION GUIDELINES FOR EROSION CONTROL BLANKETS & MATTINGS

GENERAL GUIDELINES

Site Preparation:

Grade and shape the area of installation. If applicable, prepare seedbed by loosening 2" to 3" of topsoil. Application of lime and mixed grade fertilizer is recommended prior to seeding and installation of blankets & mattings. Make sure soil is free of clods, rocks, wood and other obstructions so that the blankets & mattings are in direct contact with soil.

Seeding:

In most cases, it is recommended that seeding be done prior to installation of blankets. For turf reinforcement mat and open weave matting, seeding is often done after matting installation. Best results are achieved when a veneer of soil is raked over the broadcast seeded surface. Straw or hay mulch may be added after seeding. All check slots and other areas disturbed during installation process should be re-seeded.

Anchoring:

U-shaped metal staples (11-gauge minimum, 6" to 12" long) or wooden stakes (at least 12" long) can be used to anchor blankets to the ground. Keep a minimum edge distance of 2" from the edge of the blanket to the center of the staples or stakes.

INSTALLATION ON SLOPES

- Grade soil, fertilize and seed as per general guidelines above.
- Begin at the top of the slope and anchor blankets in a 12" deep and 12" wide initial anchor trench (see Fig. 2) and anchor with staples at 18" spacing.
- Unroll blanket down slope in the direction of the water flow (see Fig. 1). The blanket should not be stretched but should have full contact with the soil. Anchor blanket using staples or stakes. See "Staple Pattern Guide for Slopes" on the right.
- Overlap edges of adjacent parallel rolls by approximately 6" and anchor with staples at 24" to 36" spacing depending on the slope.
- When blankets have to be spliced, place upper blanket end over lower blanket end (shingle style) with 12" overlap and anchor with two staggered rows of staples at 12" spacing.
- Anchor, fill and compact ends of blankets in 12" deep and 6" wide terminal anchor trench. Anchor with staples at 18" spacing (see Fig. 7).

Staple Pattern Guide for Slopes

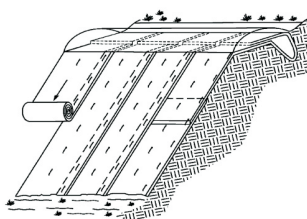


Fig. 1 Installation on slopes

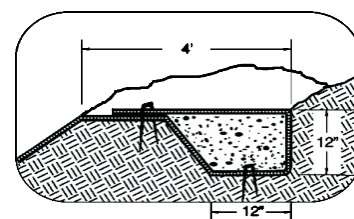
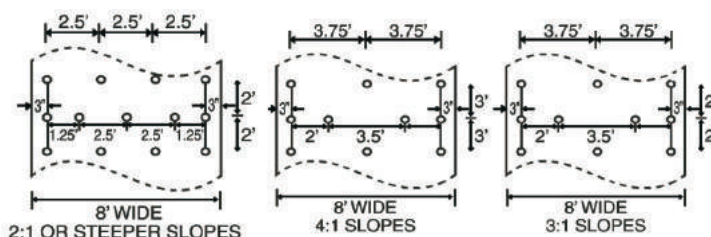
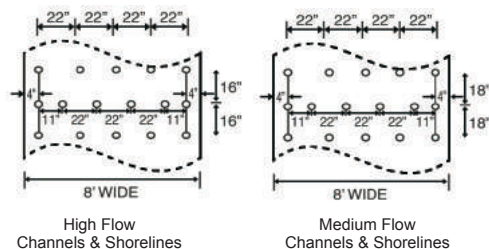


Fig. 2 Initial anchor trench for slopes



INSTALLATION IN CHANNELS

- Grade soil, fertilize and seed as per General Guidelines on page 20
 - Dig a 12" x 12" initial anchor trench at the upstream end (Fig. 4). If there is concentrated flow at channel entrance, it is recommended that the initial anchor trench be made at least 12" upstream from the pipe opening. It is also recommended to adopt measures to reduce the velocity of flow at pipe opening.
 - Dig intermittent check slots (6" deep and 6" wide) across the channel at 25' to 50' intervals depending on the slope gradient of the channel (Fig. 5).
 - Dig 6" deep and 6" wide longitudinal trenches at the top of side slopes to anchor the blanket edges (Fig. 6).
 - Dig 12" deep and 12" wide terminal anchor trench at downstream end (Fig. 7).
 - Install the first blanket in the initial anchor trench, upstream, in the center of the channel and anchor with two staggered rows of staples at 6" spacing, backfill and compact. Do not stretch, but make sure there is full contact between blanket and soil.
 - In the same manner, position adjacent blankets in the initial anchor trench overlapping the preceeding blanket a minimum of 8" and anchor.
 - Unroll center strip downstream.
 - Unroll adjacent mats downstream in a similar fashion, maintaining an 8" wide overlap. Anchor the overlapped area with staples at 16" to 18" spacing depending upon the flow velocity.
- For anchoring the middle of the blankets see "Staple Pattern Guide for Channels" below.
- Secure the edges of the blankets along the longitudinal trenches on the top of slopes with staples at 12" centers (Fig. 6).
 - Fold and secure the matting snugly into all transverse check slots. Lay the matting in the bottom of the slot and then fold back against itself. Anchor through both layers of blanket at 6" intervals then backfill and compact soil (Fig. 5).
 - For noncritical installations, place two staggered rows of staples at 6" spacing in lieu of check slots.
 - When blankets need to be spliced, place upstream blanket over the downstream blanket with an overlap of at least 12". Use two staggered rows of staples at 6" spacing.
 - Anchor, fill and compact downstream end blankets in terminal anchor trench (Fig.7).



Staple Pattern Guide for Channels

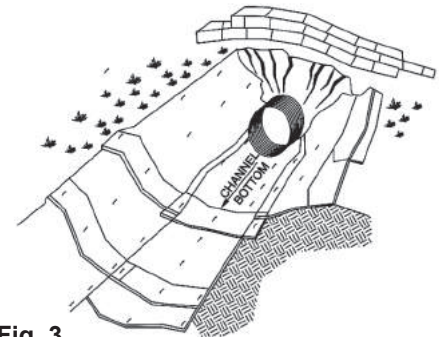


Fig. 3
Installation in channels

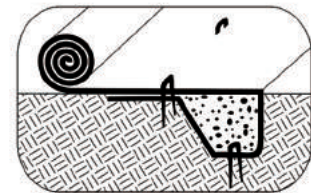


Fig. 4
Initial anchor trench for channels

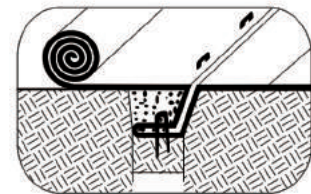


Fig. 5
Intermittent check slot

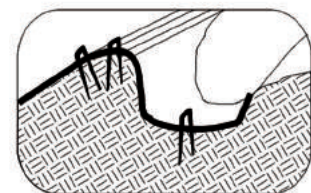


Fig. 6
Longitudinal anchor trench

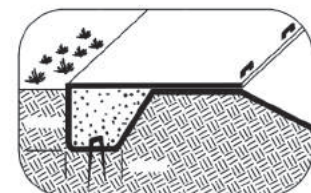


Fig. 7
Terminal anchor trench for
slopes and channels

INSTALLATION GUIDELINE FOR KOIRLOGS

Determine on site where the installation should begin and end. Usually installation begins downstream. Sediment and erosion control measures such as silt fence and sediment barriers should be in place of disturbances on work site. Prepare the site of installation by removing large rocks or other such obstructions. Re-grade slope, if necessary. Gradual slopes flatter than 2:1 are preferred.

Determine the mean water elevation. Mark the level on a stake driven into the substrate 1 to 2 feet off-shore. KoirLogs should be 1/2 to 2/3 below mean water elevation for the survival of vegetation (Fig. 1).

KoirLogs must be level, installed along a horizontal contour and parallel to the streambank. KoirLogs can be installed adjacent to the shoreline (Fig. 2 & Fig. 3) or away from the shoreline (Fig. 4 & Fig. 5) depending on the prevailing physical conditions.

When KoirLogs are installed adjacent to the shoreline, drive pencil point hardwood stakes (2" x 2" x 36") through at least 2 loops of the outer netting of the KoirLog on the waterside. Stakes can be spaced 3' on center for medium flow conditions and 2' on center for rapid flow conditions. KoirTwine or BioTwine can be used to tie the logs to the stakes. Stakes should be driven down so that the top of the stake is level with the top of the KoirLog. KoirLogs shall be placed along the streambanks at a height sufficient to protect the shore from flows or waves. Additional KoirLogs may be stacked above the lower logs to protect the upper shore or streambank (Fig. 3).

When KoirLogs are installed away from the shoreline, the area behind the logs can be backfilled and covered with KoirMat to create an aquatic shelf (Fig. 5). Alternatively, the area behind the log can be stabilized using pre-vegetated KoirBed (Fig. 4). For off-shore applications, drive stakes 1 to 2 feet on center along both sides of the KoirLog in parallel rows. Lacing across the stakes is a good method to hold the KoirLogs in place. Weave lacing back and forth across the KoirLog and attach the lacing to each stake using knots, notches, staples or nails.

Adjacent KoirLogs must be laced together, end to end, tightly and securely with KoirTwine or BioTwine (Fig. 6).

Ends of the KoirLog not abutting another KoirLog must be bent towards the shore and dug into the bank to prevent the water from flowing behind the KoirLogs causing them to be pulled out.

Plant the KoirLog with appropriate native plant species after the KoirLog has been submerged in water for a short period of time. Insert fingers or a planting iron through the outer netting to create a hole for the plant plug. Gently push the plug deep into the KoirLog. Recommended spacing of the plant plugs is 4" to 12" along two lines in a staggered pattern.

Cover the root ball by wrapping coir fiber around the base of the stem. Check to ensure that the plants have been firmly installed in the substrate. Plants and materials have to be monitored approximately 3-4 weeks after installation to ensure the success and survival of the plants and the integrity of the materials.

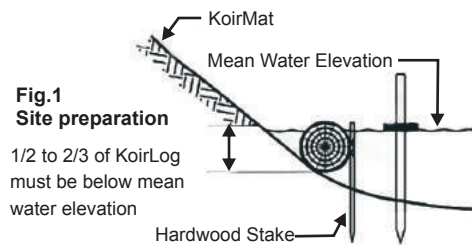


Fig. 1
Site preparation

1/2 to 2/3 of KoirLog must be below mean water elevation

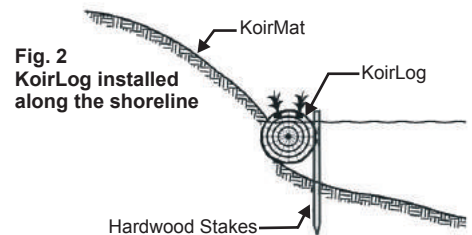


Fig. 2
KoirLog installed along the shoreline

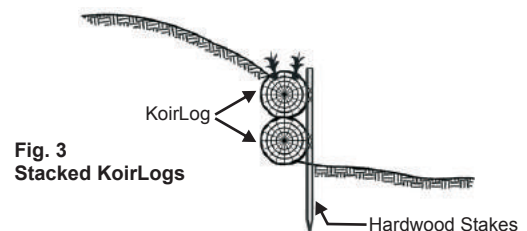


Fig. 3
Stacked KoirLogs

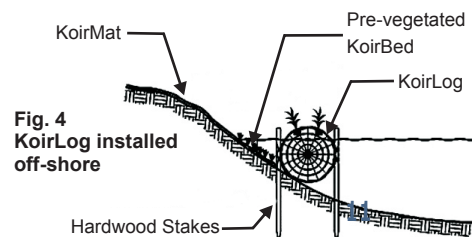


Fig. 4
KoirLog installed off-shore

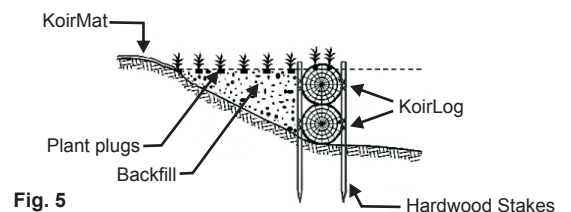


Fig. 5
Stacked KoirLogs to create aquatic shelf

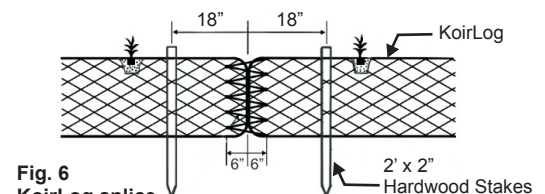


Fig. 6
KoirLog splice detail

FABRIC ENCAPSULATED SOIL CONSTRUCTION USING KOIRWRAP™ 1000*

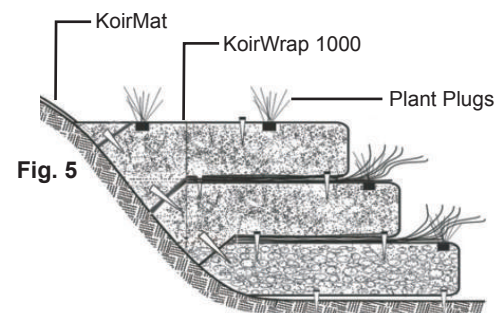
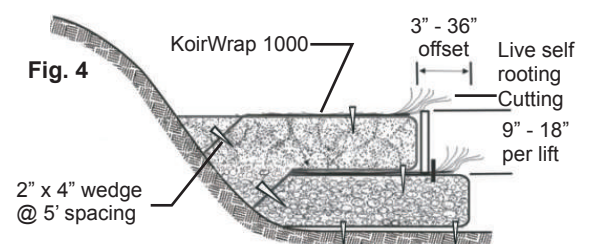
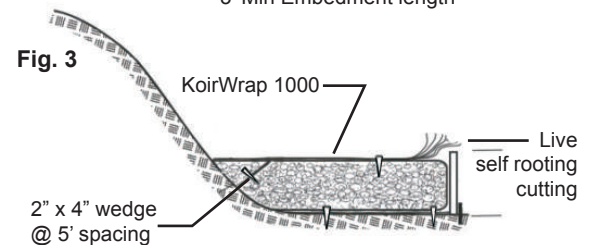
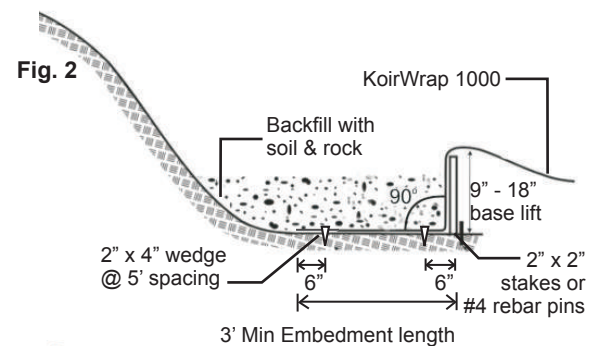
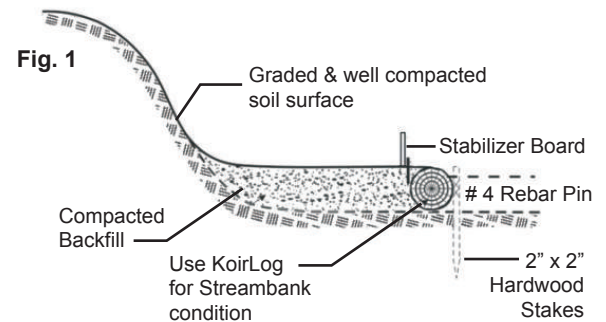
Clean and grade the base of the slope or streambank to create a level and compact soil surface. Place a stabilizer board (3/4" plywood cut to the lift height) vertically on the outside face of the base lift. Lift height usually varies from 9" to 18" depending upon desired slope, soil type, flow velocity, etc. and must be determined by the engineer. Secure the stabilizer board using 2" x 2" wood stakes or # 4 rebar pins. In case of a streambank, KoirLogs can be used along the toe of the bank for additional stability (Fig 1).

Unroll KoirWrap parallel to the streambank or face of the slope as the case may be. Ensure that the secondary layer (jute fabric) is on top**. Drape KoirWrap over the stabilizer board so that it forms a 90° angle where the inner face of the stabilizer board meets the soil surface. Keep a minimum embedment length of 3' as shown in Fig.2. Anchor KoirWrap using 2" x 4" wedge stakes at 3' spacing along a line 6" from the stabilizer board and along a line 6" from the edge of KoirWrap. Backfill with a well graded mixture of rock and soil (Fig 2).

Compact soil to the required degree of compaction specified by the engineer. Spread native seeds on the portion of the lift that will be exposed to sunlight. Stretch KoirWrap over the compacted soil and pull towards the slope. Anchor KoirWrap using wedge stakes at 3' spacing in a key trench. This base lift forms the foundation for the upper lifts and provides adequate stability to the slope. Spread 2" to 3" layer of the soil on the top surface of KoirWrap and place live self-rooting cuttings (Fig 3).

Repeat the same procedure for the upper lifts. Native soil without rock can be used as backfill for upper lifts. Offset each lift 3" to 36" from the previous lift as specified on the plans (Fig 4).

On the topmost lift, spread topsoil, seed and fertilizer. Cover the top soil with KoirMat or an erosion control blanket as appropriate. Container seedlings or plant plugs can be inserted through the KoirWrap along the horizontal benches (Fig 5).



* A combination of KoirMat 700 (or KoirMat 900) and C400 (or KoirPad 640) can be used in place of KoirWrap 1000. In such cases the KoirMat layer should be laid down first followed by the layer of C400 or KoirPad 640. When wrapping the soil, both layers are to be drawn together as tightly as possible around the soil.

**Primary layer (Coir Fabric) on top for installation on slopes and channel liners.

INSTALLATION GUIDELINES FOR KOIRWATTLE

INSTALLATION ON SLOPES

Place KoirWattle along horizontal contour of slopes in 2" to 4" deep anchor trenches (see Ig1.0, K.)

Successive rows of KoirWattle can be placed 10' to 20' apart. Drive 1" x 1" x 24" hardwood stakes every 3' to 4' on center through the middle and ends of each KoirWattle. Place KoirWattle end to end, tying ends together securely with KoirTwine or BioTwine.

The selection of trench depths and the placement of stakes depends on the slope and soil conditions.

KoirWattle should always be placed and secured such that water flows through or over the KoirWattle and never underneath.

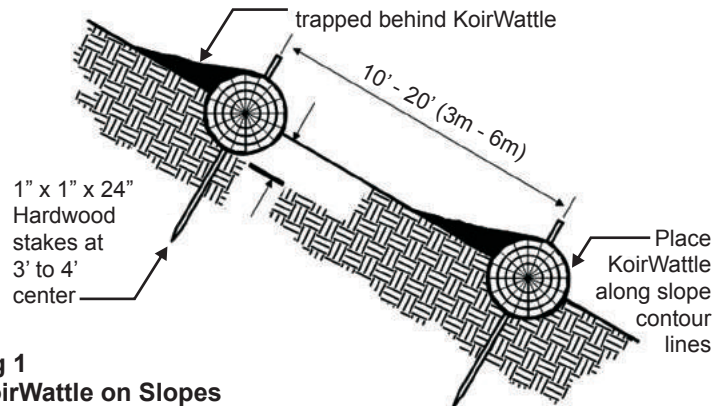


Fig 1
KoirWattle on Slopes

INSTALLATION IN CHANNELS

Place KoirWattle in 2" to 4" deep anchor trenches across the channel perpendicular to the direction of the flow (Fig. 2). Use 1"x1"x 24" hardwood stakes at 2' to 4' intervals on centers and 1' maximum from either ends to secure the KoirWattle. If two or more KoirWattles are used across a section, place KoirWattles end to end and tie the ends together securely with KoirTwine or BioTwine. For other details see "Installation on Slopes."

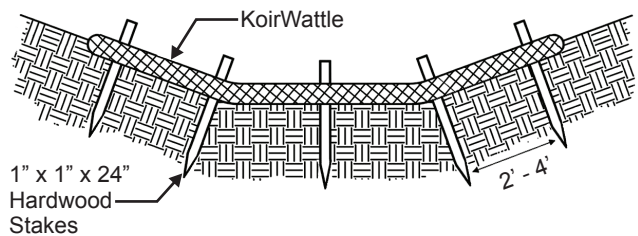


Fig. 2
KoirWattle in Channels

INSTALLATION AROUND DROP INLETS AND CURB INLETS

Place Koirwattle around drop inlet and curb inlet in such a way that there is no space between the ends of the KoirWattle (See Fig. 3 and Fig. 4 respectively). KoirWattles must be secured to the ground using 1" x 1" x 24" hardwood stakes at 2' on center. The top surface of the KoirWattle must be located above the ponding height. Use multiple tiers if necessary. For other details see "Installation on Slopes."

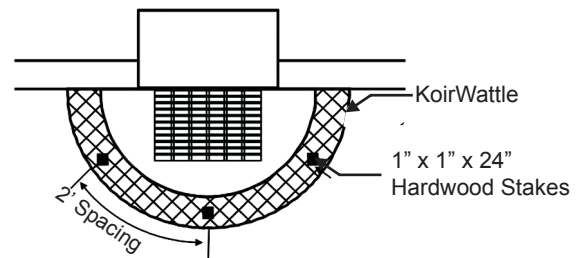


Fig. 3
KoirWattle at Curb Inlet

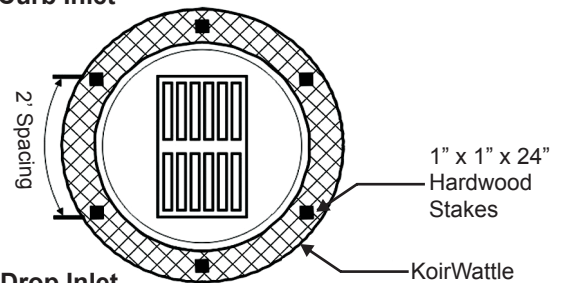


Fig. 4
KoirWattle at Drop Inlet



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