TERRA-TUBES®

Fiber Filtration Tubes

THE DIFFERENCE IS CLEAR

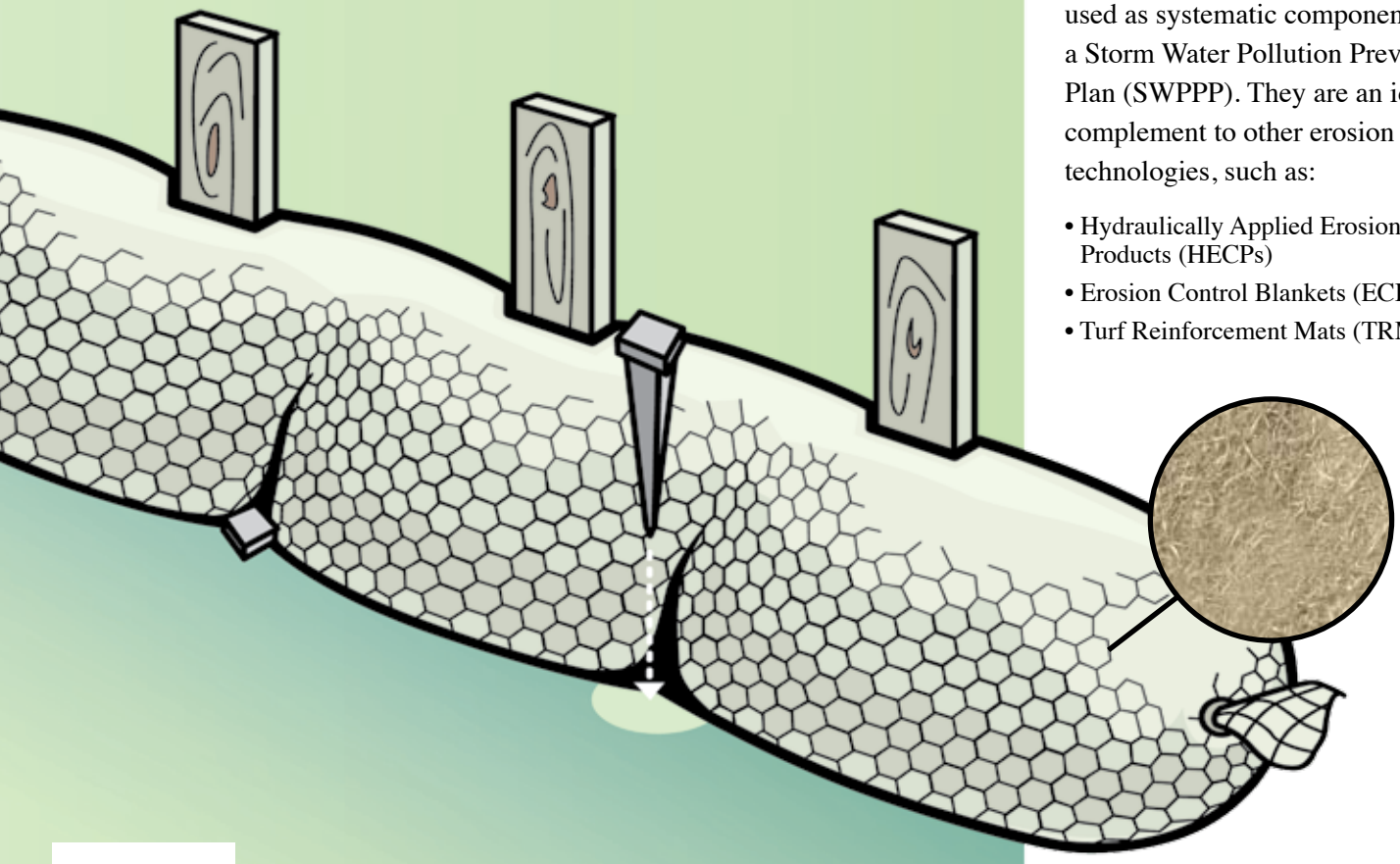
The Next Generation of Storm Water Treatment Technology

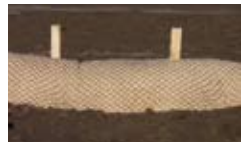
Terra-Tubes® Fiber Filtration Tubes

Terra-Tubes are the industry's most cost effective storm water treatment device designed to effectively trap, filter and treat sediment-laden runoff while reducing hydraulic energy. It is yet another innovative component of Profile Erosion Control Solutions (PECS™). PECS leads the industry with the most effective erosion control blankets and hydraulically applied products, and now—the next generation of storm water treatment technology.

Outperforming Competitive Technologies

- Does everything better than common fiber rolls and wattles…and more!
- Proven to be far more effective in independent testing
- 15 times more effective in reducing turbidity
- 15 times more effective in controlling sediment loss
- Lightest weight and easiest to ship, handle and install





What Are Fiber Filtration Tubes?

Terra-Tubes Fiber Filtration Tubes (FFTs) are engineered composites of wood fibers, man-made fibers and performance-enhancing polymers—all encased in heavy-duty, knitted cylindrical tubes. This revolutionary filtration medium is available as a superior polymer delivery system or as stand alone, high performance fiber tubes to accommodate specific applications, including:

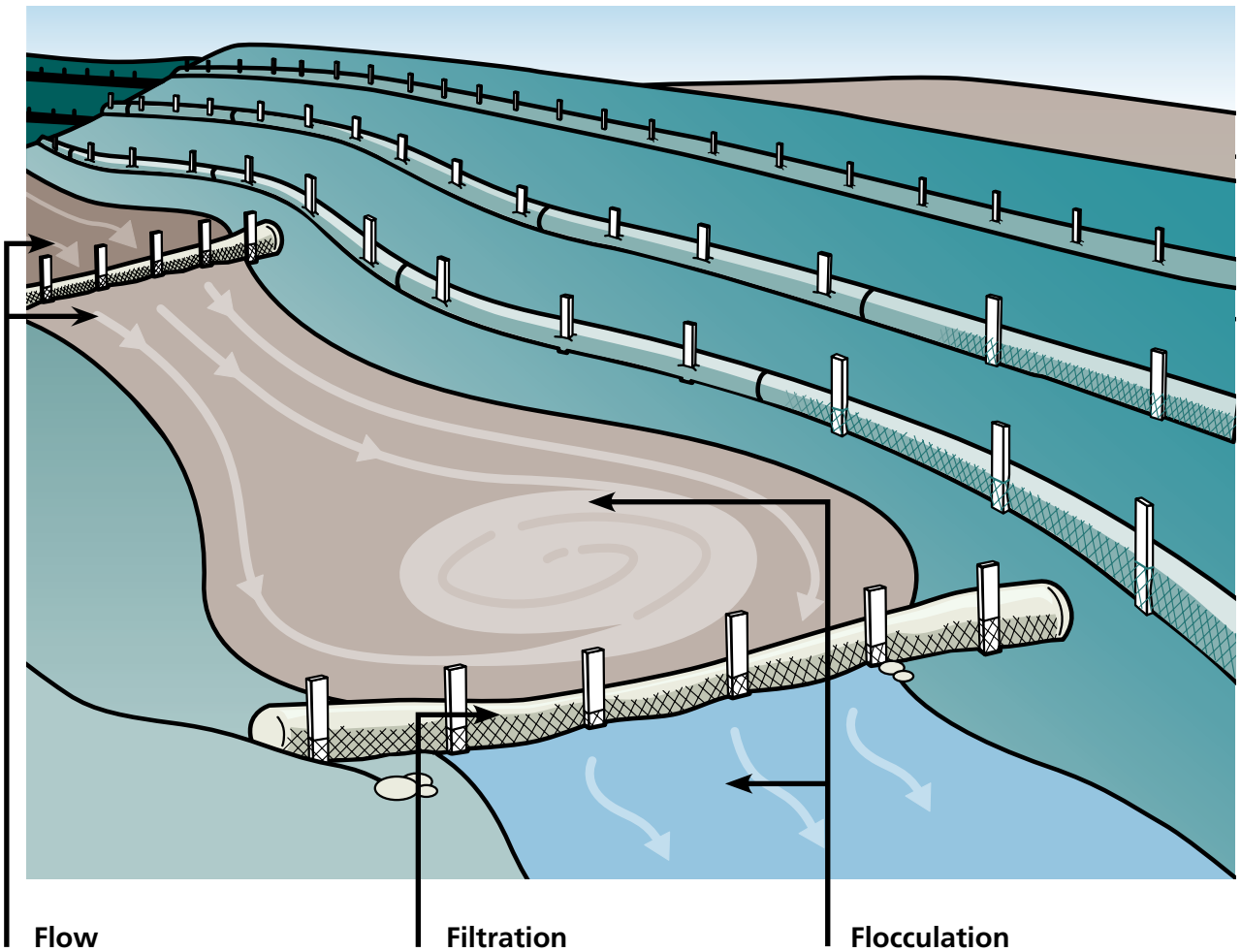
- Slope Interruption Devices (SIDs)
- Channel/Ditch Flow Checks
- Bio-Swale/Storm Water Treatment Systems
- Drain Inlet Protection
- Perimeter Sediment Control

Terra-Tubes are most beneficial when used as systematic components of a Storm Water Pollution Prevention Plan (SWPPP). They are an ideal complement to other erosion control technologies, such as:

- Hydraulically Applied Erosion Control Products (HECPs)
- Erosion Control Blankets (ECBs)
- Turf Reinforcement Mats (TRMs)

The Keys to Terra-Tubes® Performance

Terra-Tubes leave wattles, fiber rolls and similar technologies in the dust. No other product provides Terra-Tubes' three primary functions: flow, filtration and flocculation. For the best sediment retention and storm water treatment option, turn to the superior technology of Terra-Tubes.



Flow

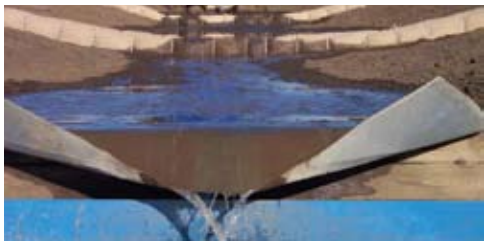
The light, lofty and resilient composite of thermally fused wood and man-made fibers creates air space and cavities to facilitate flow. Water passes through the engineered matrix, allowing soil particles to become trapped throughout the three-dimensional tube profile. Flow is critical to the filtration process. Without sufficient flow, failure may result from the product being under-mined or sediment washing over top of the filtration system.

Filtration

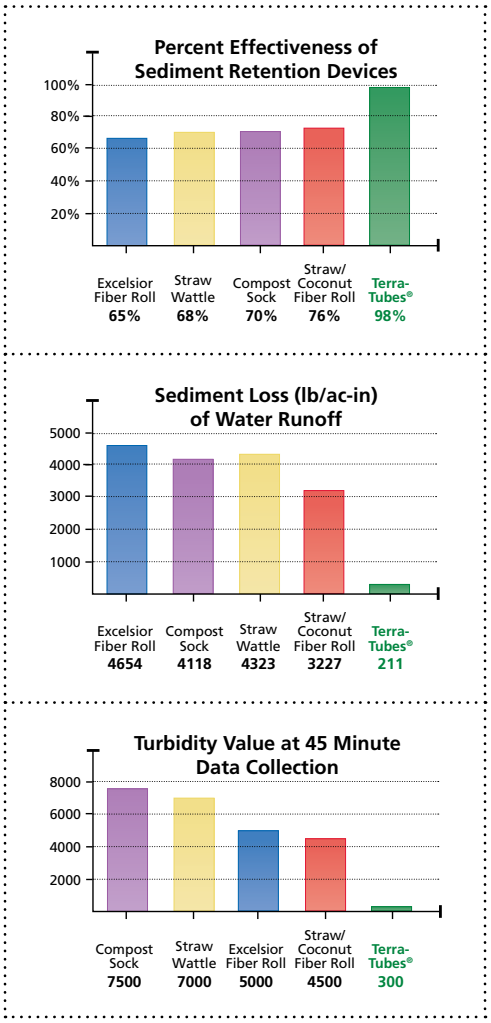
Thermally Refined™ wood utilizes intense heat and pressure to create fine fibers designed to maximize surface area and water retention. These, combined with crimped, man-made fibers, generate far greater surface area than the agricultural or horticultural by-products in common fiber rolls. Greater surface area results in greater filtration. The engineered fiber composite is the reason that Terra-Tubes trap more sediment than the closest competitor—even without the inclusion of flocculating polymers.

Flocculation

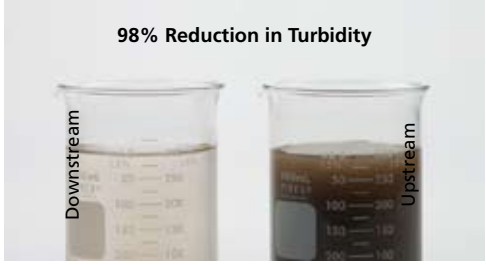
Impregnated flocculants are slowly dissolved and released by the kinetic energy of water flowing through the tubes. This flow through process provides a superior polymer delivery system to treat sediment-laden water. The flocculants react with suspended soil particles initiating coagulation and aggregation. The tube's matrix entrains the majority of these coagulated particles, while particles that pass through will settle or be captured by complementary erosion control devices.



Turbidity Sampling at the Storm Water Lab



Data Derived from ASTM D7351 Test Protocol



The Terra-Tube difference is clear!

Proof is in the Performance

One of the greatest problems in achieving NPDES sediment reduction goals has been the lack of quantifiable criteria for performance of Best Management Practices (BMPs). Until recently there has been little performance data available for Sediment Retention Devices (SRDs) due to no recognized standard test procedures.

Independent testing of various SRDs was conducted in 2004 at the Storm Water Lab in Ankeny, Iowa, following the recently developed protocol established in ASTM D7351—*Standard Test Method for Determination of Sediment Retention Device Effectiveness in Sheet Flow Applications*. This state-of-the-art facility was developed to provide quantifiable large scale performance evaluations of SRDs under conditions designed to model "real world" runoff conditions. A 10-year, 6-hour design event was selected because this return frequency is commonly used to design sediment retention structures. This equated to a 4-inch rainfall falling on a theoretical contributory slope area 100-ft long by 20-ft wide creating sheet flow conditions over a silty sand substrate.

Each SRD was installed to manufacturer specifications and subjected to the prescribed design event. The devices were monitored for flow characteristics and installation integrity. Using the prescribed collection methodology samples for turbidity, total suspended solids (TSS) and sediment concentrations were taken upstream of the devices. Samples were subsequently taken below the devices every 5 minutes for the entire 45 minutes of discharge at the specified flow rate. Additional samples were collected until all water flow ceased (or 90 minutes elapsed). All samples were then evaluated by two laboratories to insure accuracy of the data.

The difference is clear! The other technologies failed to even approach the turbidity reductions, sediment retention efficiencies, water quality improvements and structural integrity of Terra-Tubes.

PROPERTY	Terra-Tubes®	Excelsior Fiber Roll	Straw Wattle	Straw/ Coconut Fiber Roll	Compost Sock
FLOW RATE	moderate	high	low	high	moderate
UNDERMINED	no	yes	yes	no	yes
3-D FILTRATION	yes	no	no	no	no
FLOCCULATION	yes	no	no	no	no
SEDIMENT RETENTION	excellent	poor	poor	fair	fair
EASE OF INSTALLATION	easiest	fair	fair	difficult	difficult

FFT Installation Overview—

Slopes:

Vertical spacing for slope installations should be determined by site conditions. Key parameters include slope gradient, length of slope, soil type, climate, design event and anticipated runoff. General guidelines follow:

Slope Gradient	FFT Interval
1H:1V	15' (4.6 m)
2H:1V	25' (7.6 m)
3H:1V	35' (10.7 m)
4H:1V	50' (15.2 m)

When installing on highly erosive soils, decrease interval distance. On less erosive soils, increase interval distance.

1. For maximum performance Terra-Tubes must be installed to maintain intimate contact with the soil surface. Terra-Tubes should be installed prior to hydraulic or dryland seeding applications. They may be installed before or after the installation of rolled erosion control products (RECPs). Smooth soil surface and remove all obstructions >1"-2" in diameter. Deploy Terra-Tubes FFT where material is to be installed.
2. Anchor the upslope/upstream side of FFT using 6"- 8" U-shaped wire staples or approved devices at 1' intervals. Position anchors 1" inward from upper edge of FFT and drive flush to soil surface.
3. Raise tube to fullest height and drive 12"-18" wooden stakes or approved metal rods through downslope/downstream side of FFT at 2' intervals. Drive stakes 1" inward from downslope/downstream edge of FFT, leaving 2"- 3" of the stake protruding above the FFT. Take care not to compress the FFT structure.
4. The FFT should appear more rectangular than round. Backfill and compact loose soil against upslope/upstream side of FFT.
5. Overlap adjacent FFT roll ends by a minimum of 1'. Reduce stake interval on downslope/downstream FFT to 1' interval making sure to place a stake at the terminus of the FFT. Continue to use wire staples on 1" centers on upslope/upstream side of FFT. Extend next FFT 1' past terminus and upslope/upstream of preceding FFT and place wire staples on 1' intervals. Then, drive stakes through outer 1" of both FFTs to complete the overlap.

Channels:

1. Construct anchor trench 3" deep by FFT roll diameter and place loose soil against upstream side of FFT. For channel gradients of 2% install anchor trenches on 25' intervals. Decrease interval distance of anchor trenches with steeper channel gradients or more highly erosive soils.
2. Follow above installation sequence for slope installations, but decrease interval of both upstream and downstream anchoring devices to 1'.

step 1

step 2

step 3

step 4

step 5

Notes: Consult detailed Terra-Tubes Installation Guidelines for additional information. Site conditions may dictate the following considerations:

- *Recommended anchoring devices and anchor trench intervals may be adjusted.*
- *Anchor trenches on slopes may be advisable.*
- *When warranted, use a 3.25' wide roll of Futerra® F4 Netless® blanket as a scour apron beneath FFT.*

Fiber Filtration Tube Example Specification—

Fiber Filtration Tubes shall be Terra-Tubes® as manufactured by PROFILE Products LLC and shall conform to the property values listed below.

PROPERTY	TEST METHOD	ENGLISH	SI
Tube Diameter	Measured	6 in	15 cm
Mass/Unit Length	Measured	0.5 lb/ft	0.7 kg/m
Water Holding Capacity	Profile Test	1000%	1000%
Functional Longevity	Observed	1-2 yr	1-2 yr

Consult comprehensive CSI formatted specifications for additional details on 6" and 9" FFTs.

TERRA-TUBES PACKAGING[1]

TUBE DIMENSIONS	AVERAGE WEIGHT	TUBES/ BOX	TUBES/ PALLET[2]	TRUCKLOAD QUANTITY
TT 632P[3,4,5] 6" x 32.5' (15 cm x 10 m)	16 lb (7 kg)	4	12	23,400 ft (7134 m)
TT 965P[3,4] 9" x 6.5' (23 cm x 2 m)	6.5 lb (3 kg)	8	24	9360 ft (2854 m)
TT 913P[3,4] 9" x 13' (23 cm x 4 m)	13 lb (6 kg)	4	12	9360 ft (2854 m)

Packaging:
1. Individually wrapped in water resistant plastic film
2. Three boxes per pallet
3. Standard "P" series products contain a polyacrylamide flocculant
4. "C" series products (TT 932C, TT 965C and TT 913C) contain a chitosan flocculant
5. TT 632 available with no flocculant

FIBRAMULCH
HYDRAULIC SEEDING MULCH

For more information, please contact us: 1 888 298-9911
www.fibramulch.com

IECA 2006-2007 Gold Partner