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filtrexx®
SUSTAINABLE TECHNOLOGIES

SECTION 2: POST-CONSTRUCTION

Filtrexx® Compost Erosion Control Blanket [CECB]™ (GrowingMedia™)

PURPOSE & DESCRIPTION

Filtrexx® Compost Erosion Control Blanket [CECB]™ is a **slope stabilization, erosion control, and vegetation establishment** practice used on hill slopes to stabilize bare, disturbed, or erodable soils on and around construction activities. CECB is used for temporary and permanent slope erosion control and vegetation establishment applications. CECB is surface applied to a depth of 1.5 to 2 in (35-50mm) or 200-270 cubic yards/ac (385-513 cubic m/ha), and normally applied to hill slopes with pneumatic blower trucks or similar equipment. Filtrexx® LockDown™ Netting can be used to increase the stabilization and erosion control capabilities of CECB. LockDown Netting is a single net erosion control blanket stapled to the slope prior to application of the CECB (Section 5.4).

APPLICATION

CECB is used for slope stabilization, erosion control and vegetation establishment on disturbed, bare, or highly erodable soils during land disturbing and construction activities. CECB is typically used after final grading for temporary or permanent seeding applications. Custom seed mixes may be added to the CECB and applied directly to the slope. Non-seeded applications shall be considered a temporary form of erosion control. CECB can be used on slopes up to 2:1 without the use of additional soil stabilizers. Slopes greater than 2:1 require the use of LockDown Netting. CECB should not be used in areas of concentrated runoff flow. Filtrexx® SiltSoxx™ for slope interruption may be used with CECB to reduce effective slope lengths, runoff velocity, and the potential for rill erosion. See Figure 1.1 for an example of CECB.

ADVANTAGES AND DISADVANTAGES

Advantages

- CECB can be used for temporary or permanent stabilization, erosion prevention and vegetation establishment on bare, disturbed, and erodable soils on hill slopes.
- CECB can be used with LockDown Netting to increase soil surface roughness and product stability on steep slopes.
- CECB is easily designed as part of a treatment train approach in erosion and sediment control site design.
- CECB is easily applied and can establish vegetation in difficult areas.
- CECB can easily be spot applied, or used in conjunction with rolled erosion control blankets (RECBs) and turf reinforcement mats (TRMs).
- CECB can dissipate the energy of rainfall impact, thereby reducing splash erosion.
- CECB can absorb rainfall and runoff water, thereby increasing infiltration and reducing runoff and sheet erosion.
- CECB can slow down runoff velocity, thereby reducing the erosive energy of runoff and the potential for soil erosion.
- Humus colloids and organic matter in slope protection provide physical structure for seed and establishing seedlings.
- Humus colloids and organic matter in slope protection provide increased water holding capacity and reduced water evaporation to aid in seed germination and the potential for reduced irrigation.
- CECB acts like a mulch and has been shown to reduce invasive weed establishment and cover.
- CECB is a good option for arid and semiarid regions where germination, moisture management, and irrigation can be difficult.
- CECB provides organic nutrients that are slow release for optimum uptake efficiency to establishing vegetation.
- CECB provides organic nutrients that are less prone to transport in storm runoff and pollution of surface waters, relative to mineral nutrients supplied by fertilizers.
- CECB provides organic nutrients which have been correlated to lower growth of invasive weeds relative to mineral nutrient fertilizers.
- CECB has the ability to bind and adsorb phosphorus, metals, and hydrocarbons that may be in storm water runoff.

- Microorganisms in CECB have the ability to degrade organic pollutants and cycle captured nutrients in storm water runoff.
- CECB is organic and 100% biodegradable, therefore can be left on site after permanent stabilization is complete, used in the landscape design, and/or seeded and planted with permanent vegetation.
- CECB can improve existing soil structure, soil aggregation, water permeability, aeration, and biological diversity, after construction activity is complete, thereby increasing the likelihood that vegetation will be sustainable.
- CECB can increase soil carbon and organic matter which may increase water holding capacity and infiltration, and reduce runoff and erosion, which can be beneficial to storm water reduction and water quality over the long term.
- CECB may assist in qualification for LEED® Green Building Rating and Certification credits under LEED Building Design & Construction (BD+C), New Construction v4. Awarded credits may be possible from the categories of Sustainable Sites, Water Efficiency, Materials & Resources, and Innovation. *Note: LEED is an independent program offered through the U.S. Green Building Council. LEED credits are determined on a per project basis by an independent auditing committee. Filtrexx neither guarantees nor assures LEED credits from the use of its products. LEED is a trademark of the U.S. Green Building Council.*

ADVANTAGES	LOW	MED	HIGH
Ease of Installation			✓
Erosion Control – Pre Vegetation	✓		
Erosion Control – w/Vegetation		✓	
Vegetation Establishment			✓
Runoff Control		✓	
Sediment Control	✓		

Disadvantages

- If CECB does not use Filtrexx® GrowingMedia™ or follow Filtrexx International specifications performance may be greatly diminished.
- If not installed correctly, maintained or used for a purpose or intention that does not meet specifications, performance may be diminished.
- CECB should not be the only form of site erosion and sediment control.
- CECB should never be used in areas of concentrated runoff flow, including channels and drainage ditches unless in combination with a turf reinforcement mat (TRM).
- CECB should not be used without additional support practices on slopes greater than 2:1, and should be used with caution on slopes greater than 1.5:1.
- CECB may need to be reapplied if severe runoff occurs prior to vegetation establishment or where vegetation fails.

GROWINGMEDIA CHARACTERISTICS

Filtrexx CECB uses only Filtrexx GrowingMedia, which is a composted material that is specifically designed to reduce runoff volume, slow runoff velocity, prevent splash and sheet erosion, and provide rapid establishment and permanent sustainability of vegetation. GrowingMedia has been third party tested and certified to meet minimum performance criteria defined by Filtrexx International. Performance parameters include: percent cover of vegetation, water holding capacity, pH, organic matter, nutrient and metals content, soluble salts, moisture content, biological stability, maturity bioassay, percent inert material, bulk density and particle size distribution. It should be noted that particle size distribution of GrowingMedia is one of the key components to effective performance and capacity of CECB; therefore, Filtrexx International has conducted extensive research and development and review of state and federal specifications to create high performance and reliable CECB. For information on the physical, chemical, and biological properties of GrowingMedia refer to Specification 6.2 Filtrexx® GrowingMedia™.

PERFORMANCE

QA/QC material testing of GrowingMedia, to ensure specifications are met, is conducted by the Soil Control Lab, Inc. Performance testing and research of CECB has been extensive in the last 5 years and is currently on-going. Filtrexx International will continue to conduct and support testing and

research programs to better inform and assist design professionals in erosion control and storm water pollution prevention plan development. Filtrexx International relies on completed and published research or test results from reputable laboratories and verified via field applied research to generate the performance and design information provided herein. Filtrexx International gives preference to research published in peer-reviewed scientific journals, and secondarily to third party research conducted by universities and federal agencies. For a summary of performance testing and research results on CECB see Table 1.1. Supporting technical reports and research papers can be found in the Filtrexx Library (www.filtrexx.com/research-library/). Table 1.2 provides performance and design information on other commonly used erosion control practices.
Note: the Contractor is responsible for establishing a working erosion and sediment control system and may, with approval of the Engineer, work outside the minimum construction requirements as needed. Where the CECB deteriorates or fails, it shall be repaired or replaced with an effective alternative.

DESIGN CRITERIA

CECB is a slope stabilization and vegetation establishment (temporary or permanent) practice used for soil erosion control of disturbed, bare, and erodable soils, on construction and/or land disturbing activities. LockDown Netting can be used to increase the design capacity and performance of CECB.

Planning Considerations

CECB should be used as one treatment in a treatment train approach to site erosion and sediment control. Runoff control and runoff diversion practices may be designed to help prevent seed washing and soil erosion prior to vegetation establishment and to protect seedlings prior to maturity. Preconstruction meetings should be conducted to educate construction site personnel about the devices/practices used and acceptable traffic patterns that avoid running over CECB with vehicles and heavy equipment. Vehicular traffic and heavy equipment will reduce the effectiveness of CECB and contribute to soil compaction, which may increase runoff and erosion and reduce vegetation establishment.

Successful planning for any vegetation establishment project should consider climate, prevailing weather, temperature, sun exposure, available moisture/irrigation requirements, topography, soil type, soil pH, soil amendments, nutrient requirements, drought tolerance, site preparation/coordination with construction phases, time to establishment/coordination with construction phases, protection from erosion and sedimentation, and seed mix/plant selection (Fifield, 2001).

Vegetation Establishing in Temporary Seeding

Temporary vs. Permanent Vegetation

Temporary vegetation is typically designed for disturbed soils that will undergo future disturbance, such as: cut and fill slopes under construction, soil storage areas and stockpiles, permanent vegetation establishment that requires a nurse crop, stabilization of temporary runoff diversion devices, dikes, and sediment containment systems (Fifield, 2001). Quick establishing annual grasses and legumes are normally specified for these applications.

Permanent vegetation is usually specified for: slopes where erosion control blankets are required, drainage ditches and channels that require liners or turf reinforcement mats, areas that have undergone final clearing and grading and require soil stabilization. Perennial grasses are typically specified and if possible native grasses should be utilized (Fifield, 2001).

Local Landscape Architects, NRCS, or university/cooperative extension should be consulted and used as resources for temporary and/or permanent vegetation seed selection. Many state erosion and sediment control manuals have specifications for seed selection and application rates.

Preparation and Application

Where possible, slopes should be vertically tracked to increase soil roughness. This will increase the CECB contact with the soil, reduce runoff velocity, and increase vegetation establishment success. Reducing runoff velocity can reduce seed wash prior to and during germination and reduce stress on young plants during the establishment phase. CECB shall be applied to and cover 100% of the exposed

or disturbed area where stabilization/vegetation is required. CECB shall be applied at a depth of 1.5-2 in (35-50mm) or 200-270 cubic yards/ac (385-513 cubic m/ha). Thicker CECB may reduce runoff during large storm events, which can lead to less soil erosion; however, this is at the discretion of the Engineer. See Installation guidelines in the following section for further details on application and installation specifications of CECB.

Establishing & Sustaining Vegetation
Although CECB increases water holding capacity and reduce evaporation, irrigation may be required to ensure successful vegetation establishment. Runoff diversion devices may be utilized to prevent storm runoff from washing seed prior to germination and establishment and reduce soil erosion prior to permanent stabilization.

CECB can supply humus, organic matter, beneficial microbes, and slow release organic nutrients that can contribute to better soil quality and plant health. In arid and semi-arid regions, or hot and dry weather, regular irrigation may be required.

Runoff Conditions
CECB should not be used in areas where concentrated flow exists or where runoff velocities will damage or undermine vegetation, unless used in combination with TRMs. For most grasses a maximum velocity of 4 ft/sec (1.2 m/sec) or a maximum hydraulic shear stress of 2 lbs/ft^2 (10 kg/m^2) is recommended (Maryland Storm Water Design Manual, 2000).

High Wind Conditions
In regions or seasons prone to high velocity wind conditions (such as arid regions, mountainous regions, and regions with distinct hurricane seasons) it is recommended that LockDown Netting is installed on top of the CECB to prevent wind erosion and movement of the CECB.

Mulch Function
CECB covers 100% of the soil surface, and therefore provide the beneficial affects characteristic to mulches, including: reduced raindrop impact and splash erosion, reduced runoff energy and sheet erosion, buffered soil temperature for plants, decreased moisture evaporation, increased moisture holding capacity at the soil surface, reduced runoff volume and velocity, and increased infiltration.

Soil Amendment Function
CECB also amends the soil which can provide the following functional benefits: increased soil structure, increased soil aggregates, increased soil aeration, increased infiltration and percolation, increased moisture holding capacity, increased activity of beneficial microbes, increased availability of nutrients, decreased runoff volume and velocity, decreased erosion, and increased plant health and long-term sustainability.

Organic vs. Fertilizer Nutrients
Although most specification and design manuals include fertilizer recommendations or requirements for vegetation establishment, mineral nutrients from fertilizers may not be preferable where vegetation sustainability and water quality are a concern. CECB provides organic nutrients which: are slow release, provide plant micronutrients, and are less likely to be transported in storm runoff to receiving waters – which can reduce pollution and eutrophication of waterways (Faucette et al, 2005). In site sensitive areas where nutrient runoff is a concern, CECB may release up to 1/10 of the nutrient load compared to conventional hydroseeding and hydromulching (Faucette et al, 2005).

Weed Establishment
The effects of mulching are known to suppress weed establishment. In addition, invasive weed growth has been more closely associated with mineral fertilizers than organic fertility practices (Faucette et al, 2004)

INSTALLATION

1. CECB used for slope stabilization, erosion control, and vegetation establishment shall meet Filtrexx® CECB Specifications and use Filtrexx® GrowingMedia™.
2. Contractor is required to be a Filtrexx® Certified℠

Installer as determined by Filtrexx International, (877-542-7699). Certification shall be considered current if appropriate identification is shown during time of bid or at time of application. Look for the Filtrexx Certified Installer Seal.

3. CECB will be placed at locations indicated on plans as directed by the Engineer.
4. CECB shall be applied to 100% of the area where erosion control and vegetation is required.
5. CECB shall cover 100% of the bare or disturbed soil area, whereas, no native soil shall be visible in or through the CECB.
6. CECB shall be applied at a minimum depth of 1.5-2 in (35-50mm) or 200-270 cubic yards/ac (385-513 cubic m/ha), as specified by the engineer.
7. Seed shall be thoroughly mixed with the GrowingMedia prior to application or surface applied to GrowingMedia at time of application.
8. CECB shall not be installed in areas of concentrated runoff flow.
9. CECB shall be installed at least 10 ft (3m) over and beyond the shoulder of the slope and/or into existing vegetation to ensure runoff does not undercut the blanket.
10. CECB installed on slopes: greater than or equal to 4:1 shall be tracked; greater than or equal to 2:1 shall be tracked and use LockDown Netting; greater than 1:1 shall use erosion control blankets or turf reinforcement mats.
11. When required, LockDown Netting shall be installed prior to the application of the slope protection.
12. LockDown Netting shall be anchored to the soil using 6-8 in (150-200mm) sod staples to be driven along the entire perimeter of the net and netting area.
13. Staples for LockDown Netting shall be spaced no more than 24 in (600mm) apart on all sides.
14. Where more than one roll of LockDown Netting is required for slope width or slope length, netting edges shall be overlapped by a minimum of 6 in (150mm).
15. LockDown Netting shall be installed from top to bottom (never across) on the slope.
16. LockDown Netting shall be installed under the entire area of the CECB, including 10 ft (3m) over the shoulder of the slope.
17. LockDown Netting may be installed on top of the CECB where wind velocities and wind erosion are above normal. All other installation procedures and specifications are the same as described above.

INSPECTION

Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the regulating authority. If rilling occurs or vegetation does not establish, the area of application should be reapplied with CECB. If failure continues, the use of runoff diversion devices, erosion control support practices, soil stabilizers, turf reinforcement mats, or hard armoring practices should be considered. CECB should be inspected until permanent vegetation is established and land disturbing/construction activities have ceased. Temporary and permanent vegetation practices should always be inspected for noxious or invasive weeds. Any area not covered by vegetation should be reseeded. LockDown Netting should be repaired if it has been moved by wind or storm runoff and/or part or whole is not in contact with the soil surface.

MAINTENANCE

1. The Contractor shall maintain the CECB in a functional condition at all times and it shall be routinely inspected.
2. CECB shall be maintained until a minimum of 70% uniform cover of the applied area has been vegetated or as required by the jurisdictional agency, and land disturbing/construction activities have ceased.
3. CECB may need to be irrigated during hot and dry weather, or arid and semi-arid climates to ensure vegetation establishment.
4. Where CECB fails, rilling occurs, or vegetation does not establish the Contractor will repair or provide an approved and functioning alternative.
5. If gullies form in CECB, the area shall be re-graded prior to reinstallation of slope protection or alternative.
6. If a CECB is damaged by storm water runoff, runoff diversion devices installed above the CECB

may be required.
7. If LockDown Netting has been moved by wind or runoff it shall be repaired by restoring contact between soil and CECB interface; additional staples and CECB application may be required.
8. Once vegetation is established in temporary applications, final seeding and/or permanent vegetation may not be required.
9. No additional fertilizer or lime is required for vegetation establishment and maintenance.
10. No disposal is required for this product/practice.

METHOD OF MEASUREMENT

Bid items shall show measurement as 'Filtrexx® Compost Erosion Control Blanket [CECB]™ per square ft, per square yd, per square meter, per hectare, or per acre installed.

Engineer shall notify Filtrexx of location, description, and details of project prior to the bidding process so that Filtrexx can provide design aid and technical support.

ADDITIONAL INFORMATION

For other references on this topic, including additional research reports and trade magazine and press coverage, visit the Filtrexx website at www.filtrexx.com

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Call for complete list of international installers.

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TABLES & FIGURES:

Table 5.1. Filtrexx® Compost Erosion Control Blanket [CECB]™ Performance[1] and Design Specifications.

Rainfall Total/ Duration / Design & Performance	4.4 in (112mm) /2.4 hr	1.8 in (45mm) /35 min	3.2 in (80mm) /1 hr	4.0 in (100mm) /1 hr	4.0 in (100mm) /1 hr	4.0 in (100mm) /1 hr	8.0 in (200mm) /2 hr
Depth of slope protection	3.0 in (75mm)	2.0 in (50mm)	1.5 in (35mm)	1.5 in (35mm)	1.5 in (35mm)	1.5 in (35mm)	2.0 in (50mm)
Support Practice				w/mulch	fines only	Tackifying agent (w/fines only)	
Slope	2:1	3:1	10:1	10:1	10:1	10:1	3:1
Soil Type	Silty sand	clay	Sandy clay loam	Sandy clay loam	Sandy clay loam	Sandy clay loam	Loamy sand
C Factor[2]	0.02	0.008	0.01	0.01	0.065	0.03	0.0393
Soil Loss Reduction	98%	99.2%	99%	99%	93.5%	97%	96.1%
Runoff Volume Reduction	6%[4]	35%	49%[5]	23%	52%	52%	ND
Runoff Rate Reduction	ND	ND	36%	20%	34%	34%	79%
Reference Publication	New England Transportation Consortium & Federal Highway Administration – NETCR 20	ASAE International Meeting	Journal of Soil and Water Conservation	USDA SBIR	USDA SBIR	USDA SBIR	Transactions of ASAE
Test/Research Facility	University of Connecticut	Texas A&M	University of Georgia	University of Georgia	University of Georgia	University of Georgia	Iowa State University
Authors	Demars et al, 2000	Mukhtar et al, 2004	Faucette et al, 2005	Faucette et al 2006	Faucette et al 2006	Faucette et al 2006	Persyn et al 2004

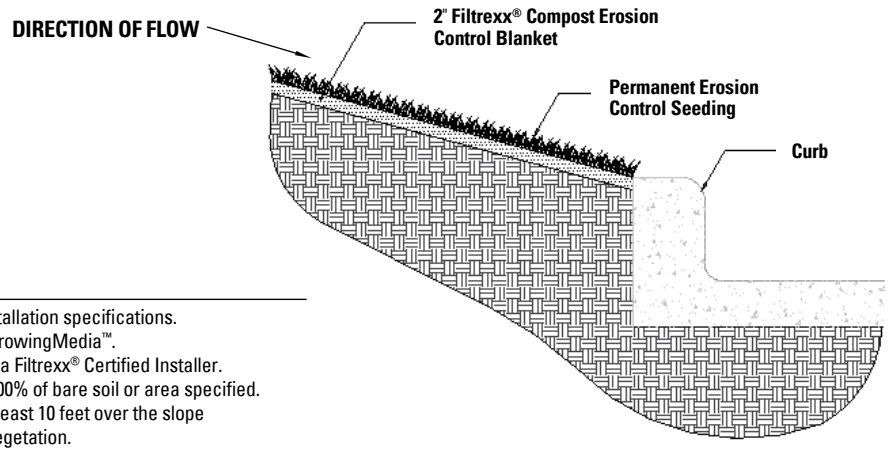
ND: no data reported
[1]Slope protection in studies that met Filtrexx Specifications.
[2]Cover-Management Factor: A C Factor of .02 indicates that erosion is reduced to 2% of what would occur under fallow conditions
[3]Determined from interrill erosion rate.
[4]Average of 10 runoff events was 76% runoff volume reduction.
[5]Cumulative over 3 runoff events.

Table 8.2. Performance and Design Criteria References for Various Erosion Control Technologies.

Product/Practice (reference)	C Factor	Influencing Factors
Hydraulic mulch + synthetic or fiber netting (ECTC, 2004)	<0.10	5:1 slope; ECTC test method
Netless rolled erosion control blanket (bound by polymers or chemical adhesion) (ECTC, 2004)	<0.10	4:1 slope; ECTC test method
Single net erosion control blanket (natural materials woven/mechanically bound) (ECTC, 2004)	<0.15	3:1 slope; ECTC test method
Double net erosion control blanket (natural materials woven/mechanical bound between 2 layers) (ECTC, 2004)	<0.20	2:1 slope; ECTC test method
Erosion control blanket/open weave textile (slow degrading, continuous weave double net ECB) (ECTC, 2004)	<0.25	1.5:1 slope; ECTC test method
Turf reinforcement mat (permanent/nondegradable, 3- dimensional thickness, used in concentrated flows) (ECTC, 2004)	None (usually tested for max shear stress or CFS)	0.5:1 slope; ECTC test method
Straw Blanket (Demars & Long, 1998)	0.08	2:1 slope; natural rainfall (max. 1.6 in [40mm]/24 hr); 10 ft x 35 ft (3m x 10.5m) test plot; on silty sand
Straw blanket w/PAM (Faucette et al, 2006)	0.19	10:1 slope; 4 in (100mm)/hr 1hr rainfall; 3 ft x 16 ft (1m x 5m) test plot; clay subsoil; 2 in (50mm) blanket
Mulch Blanket (Demars & Long, 1998)	0.075	2:1 slope; natural rainfall (max. 1.6 in [40mm]/24 hr); 10 ft x 35 ft (3m x10.5m) test plot; on silty sand; 3 in (75mm) blanket
Mulch Fines (Faucette et al, 2004)	0.16	10:1 slope; 3.2 in (80mm)/hr 1 hr rainfall; 3 ft x 3 ft (1m x1m) test plot; clay subsoil; 1.5 in (40mm) blanket
Mulch Overs (Faucette et al, 2004)	0.11	10:1 slope; 3.2 in (80mm)/hr 1 hr rainfall; 3 ft x 3 ft (1m x 1m) test plot; clay subsoil; 1.5 in (40mm) blanket
Wood chips @ 7 tons/ac (16 Mg/ha) (GA SWCC, 2000)	0.08	
Wood chips @ 12 tons/ac (27 Mg/ha) (GA SWCC, 2000)	0.05	
Wood chips @ 25 tons/ac (56 Mg/ha) (GA SWCC, 2000)	0.02	
Forest duff layer (GA SWCC, 2000)	0.001-0.0001	

Figure 8.1. Engineering Design Details for Compost Erosion Control Blanket [CECB]

FILTREXX® COMPOST EROSION CONTROL BLANKET™



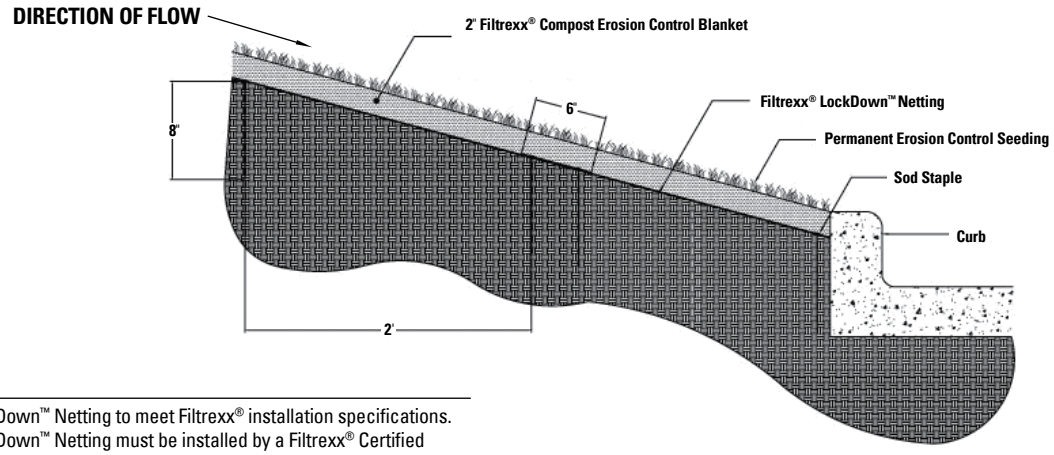
CECB SECTION VIEW

NOTES:

1. CECB to meet Filtrexx® installation specifications.
2. CECB must use Filtrexx® GrowingMedia™.
3. CECB must be installed by a Filtrexx® Certified Installer.
4. CECB shall be applied to 100% of bare soil or area specified.
5. CECB shall be installed at least 10 feet over the slope shoulder or into existing vegetation.
6. Erosion control seeding shall meet jurisdictional agency specifications or will be at the discretion of the engineer.
7. CECB shall not be installed in areas of concentrated flow where max. flow exceeds 4 CFS or shear stress exceeds 2lbs./sq. ft.

Figure 8.2. Engineering Design Details for LockDown™ Netting.

FILTREXX® LOCKDOWN™ NETTING



SECTION VIEW

NOTES:

1. LockDown™ Netting to meet Filtrexx® installation specifications.
2. LockDown™ Netting must be installed by a Filtrexx® Certified Installer.
3. LockDown™ Netting is recommended for slopes between 3:1 and 2:1 and is required for slopes greater than 2:1.
4. LockDown™ Netting is not sufficient to be used alone as a form of slope stabilization or erosion control; LockDown™ Netting shall be installed prior to the application of CECB.
5. LockDown™ Netting shall be anchored to the soil using 8" sod staples to be driven along the entire perimeter of the netting area.
6. Staples for LockDown™ Netting shall be spaced no more than 24" apart on all sides.
7. Where more than one roll of LockDown™ Netting is required for slope length or slope width, netting edges shall be overlapped by a minimum of 6".
8. LockDown™ Netting shall be installed from top to bottom (never across) on the slope.
9. LockDown™ Netting shall be installed under the entire area of the CECB, including 10 feet over the shoulder of the slope.