



1. **Avoid Voids**

Prepare the substrate so it is well compacted, geotechnically stable and has a smooth and uniform surface.

- For soil substrates, remove any vegetation, sharp or protruding rocks and fill any large void spaces. Ensure the CC makes direct contact with the substrate to minimize soil bridging or potential soil migration under the layer.
- For concrete substrates, remove any loose or friable material, cut away any protruding exposed rebar and fill cracks or voids.



2. **Secure CC**

It is important to ensure that CC is **Jointed** at every overlap and that those layers are **Fixed** to the prepared subgrade or substrate.

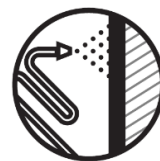
- **Jointing:** Overlapped CC layers are typically jointed using stainless steel screws applied with an auto-fed screw gun at regular intervals. Correct screw placement will help ensure intimate contact between CC layers, prevent undermining and limit potential weed growth. An adhesive sealant can be applied between the layers to improve the joint impermeability.
- Thermally bonding (welding) the CC layers together is a non-penetrative method of jointing. This also improves joint impermeability. For more jointing options see the CC Installation Guide.
- **Fixing:** When fixing to a soil substrate, ground anchors are typically used. On rock or concrete substrates, CC layers can be jointed together and fixed to the substrate using masonry bolts, percussion anchors or shot-fired masonry nails



3. **Prevent Ingress**

It is important to prevent water or wind ingress between the CC and the substrate, both around the perimeter of the installation and along the joints.

- For soil substrates, this is typically achieved by capturing the entire perimeter edge of the CC within an anchor trench.
- On rocky or concrete substrates, the perimeter edge should be sealed with a concrete fillet or an adhesive sealant.
- All CC layers should be overlapped in the direction of water flow.



4. **Hydrate Fully**

It is critical to consider the site environmental conditions and ambient temperature in order to properly hydrate CC.

- Always ensure CC is sufficiently hydrated by spraying the fibrous top surface with water until it is wet to the touch (“Thumb Test”).
- Follow the CC Hydration Guide

Concrete Cloth GCCM Installation:

SUBSTRATE PREPARATION (Prior to GCCM Deployment)

Examine substrates and conditions where materials will be applied. Ensure that the surface is relatively smooth to achieve intimate contact of the GCCM with soil surface (unless it is the desire of the designer to create an energy dissipation structure with considerable roughness). Erosion features such as rills, gullies, etc. must be graded out of the surface before GCCM deployment.

Apply the GCCM only to geotechnically stable slope(s), compact the surface (as required by the Engineering plans/specifications) before deploying GCCM. Place the GCCM to ensure direct contact with the surface to minimize soil bridging or potential soil migration under the GCCM. Do not proceed with installation until satisfactory conditions are established.

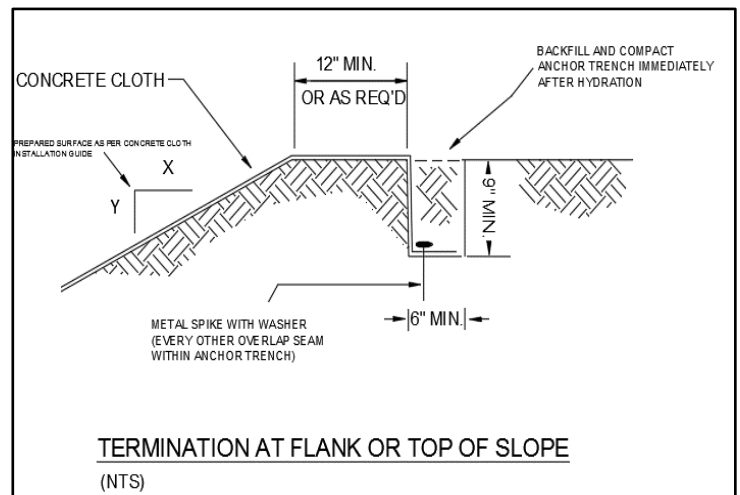
Rocks or foreign objectives larger than ¾ inch in diameter and any other material which could damage the GCCM or not allow the GCCM to be directly in contact with the surface shall be removed from the surface



ANCHORING DEVICES

Optimal performance requires that Concrete Cloth GCCM be properly secured to the ground surface based on site conditions as well as dead loads and live loads (wind, rain, snow, water flow, accumulation of ice, maintenance crews, slope angle, etc.) that may be encountered once the GCCM is installed.

The primary anchoring devices include anchor trenches and ground anchors in the form of metal spikes. Percussion driven earth anchors (PDEAs) are often used as important secondary anchoring devices. Because site soil conditions greatly affect the overall results, pullout tests should be done on mechanical anchors before installation to verify which anchors are required as well as spacing and depth of anchor.



Shown below are some specific anchoring devices that are used as primary or secondary GCCM anchor devices:

ANCHOR / INTERMEDIATE / TERMINATION TRENCH

Install an anchor trench at the top of the slope or channel beginning and termination trench at the bottom of the slope or end of channel to be protected by GCCM. Intermediate anchor trenches may be required at critical locations along the slope or channel.

The typical anchor trench should be a minimum of 9 inches deep and 6 inches wide. The Concrete Cloth GCCM will be secured with a ground anchor (typically a metal spike with a washer) at every other overlap within the corner of the anchor trench. The perimeter anchor trench should be a minimum 6 inches deep to prevent undermining of the GCCM.



GROUND ANCHORS



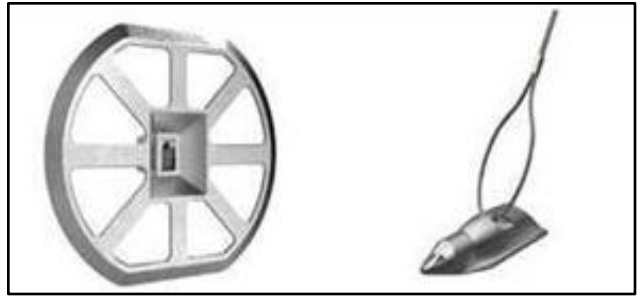
A typical ground anchor consists of a minimum $\frac{3}{8}$ in. diameter metal spike/stake that is 8-12 inches long with a $1\frac{1}{2}$ inch metal washer. This is the minimum requirement to secure the GCCM to the ground surface.

Longer metal stakes might be required depending on the site soil conditions (see details and drawings for general locations).

Additionally, ground anchors should be installed as needed along the slope, at the toe of the slope and within the channel to secure the GCCM to the soil surface and minimize potential shrinkage of GCCM during the hydration process.



PERCUSSION DRIVEN EARTH ANCHOR (PDEA)



For potentially aggressive hydraulic conditions in channel or along shorelines, and on steeper slopes conditions, including some number of PDEAs will be helpful to ensure intimate contact and prevent undermining.

Examples of PDEAs are shown above and on right.

PDEAs generally employ a metal head attached to a steel cable that is driven to a predetermined depth and the loaded by applying a pullout force to "set" the anchor.



Following is a simplified illustration of typical PDEA Installation Process:

- To install the anchor head, make a maximum 1 inch slit through the GCCM.
- Drive the anchor head through the GCCM and continue to the desired depth.
- Apply caulk/adhesive into the slit and around the top plate and then proceed to load the anchor with a Jack-jaw tool.



Drive PDEA through GCCM



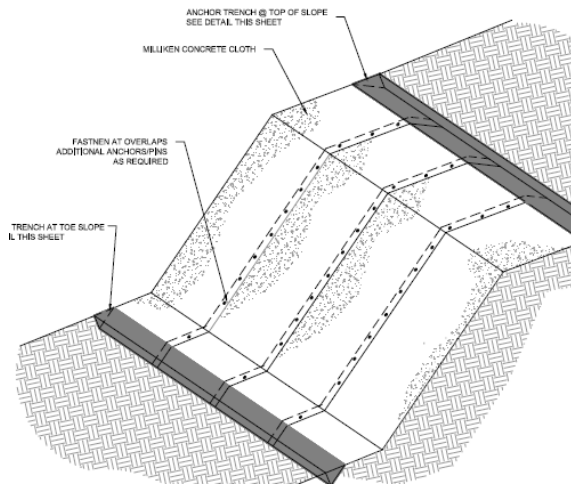
Check depth of PDEA



Apply load to set PDEA

DEPLOYMENT OF CONCRETE CLOTH GCCM

GCCM should be deployed directionally to minimize stresses at the seams/overlaps and to reduce maintenance of GCCM protected area. The following information is provided to address both slope and channel installations.



SLOPE/BERM INSTALLATIONS

Concrete Cloth GCCM should be deployed from the top of the slope and proceed down the slope. This is accomplished by either cutting and placing individual panels or employing equipment to unroll down the slope.

The panel can be angled slightly (5-10 degrees) to ensure that the overlap has a shingle effect and minimize water running along the seam down the slope.



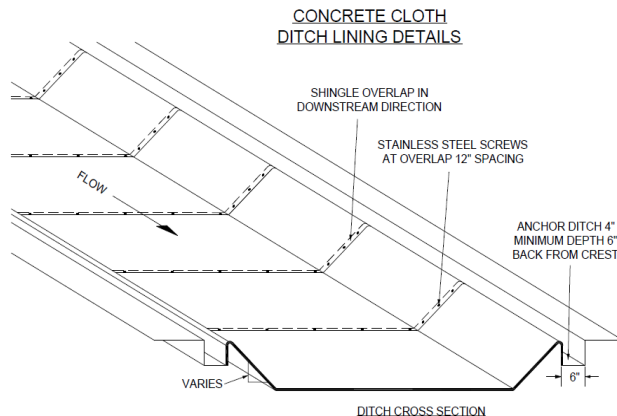
Secure anchor devices from the top to the bottom to minimize tension on GCCM and enhance intimate contact with the soil surface.

Application of the adhesive/caulk should be applied from top of the slope downward to minimize wrinkling of the overlaps.



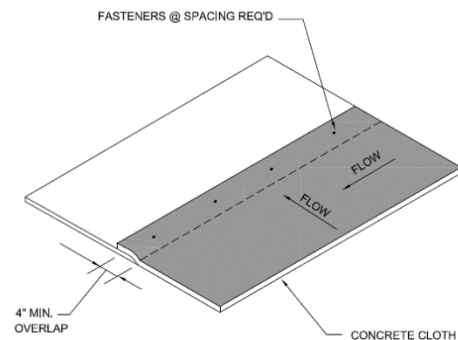
CHANNEL/DITCH INSTALLATIONS

Concrete Cloth GCCM should be deployed perpendicular to direction of flow or the centerline of the channel, beginning at the lowest elevation working back to the highest elevation with overlaps providing a shingled effect. This is accomplished by either cutting and placing individual panels or employing equipment to unroll the GCCM across the channel width.



Seams/Overlaps with Screws and Adhesive Caulk

Seams/Overlaps should be installed to provide a shingle effect to allow water to flow over the seam/overlap. The proper overlap is a minimum of 4 in. Care should be taken to minimize water flow along the seam/overlap.



Adhesive/Caulk

Sikaflex 1A or BASF NP1 is recommended. Other adhesive/caulk that is approved for submerged applications and has demonstrated in laboratory tests to adhere to both sides of the GCCM may be employed if approved by the engineer. Strict compliance with adhesive/caulk manufacturer's installation instructions is recommended.

The bead of caulk applied should be a minimum of $\frac{3}{8}$ in. diameter. The caulk is to be applied to all overlaps. The bead should be placed at a minimum distance of $\frac{3}{8}$ in. from the edge but no further than $\frac{3}{4}$ inch from the edge.



Fasteners/Screws:



Fastening screw can be either stainless steel or coated protection #10 or #12 hex head self-tapping or sharp pointed coarse thread

Minimum 1 inch in length used for securing all overlaps together.

The head of the screw should have a minimum diameter of $\frac{7}{16}$ in. or use a washer that is a minimum of $\frac{7}{16}$ in. diameter.

Install fastening screws within 30 minutes after applying adhesive caulk to overlaps.

Spacing between fastening is a maximum of 4 inches and should be applied to all seams.

Spacing between fastening within the anchor trenches only is a maximum of 6 inches.

Screws should be placed a minimum of $\frac{1}{2}$ inch from the edge but no further than $\frac{3}{4}$ inch from the edge and ensure screws penetrate the bead of adhesive.



Material Requirements for Project/Demo:

- a. Concrete Cloth Material: TBD Total Square Feet
Panel lengths: TBD Linear Feet per Panel (length varies per design)
- b. Caulk: supplied by others – TBD per project design estimate
- c. Screws: supplied by others– TBD per project design estimate
- d. Ground anchors/Metal spikes with washers: – supplied by others – TBD
- e. Percussion anchors: – supplied by others (if required) – TBD