



Alternative Construction Methods for Bank Stabilization - Sand Bags!!

ARE YOU SERIOUS ?

2017 UDFCD Annual Seminar



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Team Learning

VEGETATED BAGS



Small Channels



Steep Slopes

Common Installations



Gentle Slopes

BAG INSTALLATION

INSTALLATION

1. Filling and Closing Envirolok Bags

Fill the Envirolok bags with an engineered soil using an Envirolok Bag Filler. The soil properties should consist of 60% sand, 20% high grade compost and 20% top soil. The engineered soil may change to meet the specific project needs. Excavated material may be used to backfill during construction. Clay and silt are not appropriate fill material. All bags should be filled consistently and will be closed with a UV resistant zip tie. Bags may also be sewn or closed using hog-rings.



2. Preparation

Dig a trench no less than 3' deep, 16" wide for the length of the structure. Embankment depth will be specific to the project. Compact bottom of foundation using hand tamper or vibratory plate compactor. This trench serves as toe stabilization and will protect the structure from undermining. Larger structures will require engineering.



3. Placing Bags

The foundation course will begin with placing spikes in the excavated trench at the desired location of the first row. Place filled bags next to each other, seam side in, horizontally, the full length of the structure. The "snorkel" of the bag will land on top of the previously placed bag.



4. Placing Additional Bag Courses

After laying one entire course of bags, compact the soil ensuring a solid and uniform structure.

Insert two spikes in the top of each bag evenly spaced. The spike placement will vary with the slope of the structure and should be placed in the center of the bag contact area between courses.



These installation steps are for general guidance only. It is the responsibility of the project owner to ensure the application of Envirolok into the overall project through a design specification. The specification should include factors which affect the overall integrity of the retaining wall such as location, interaction with other project components, and engineering aspects including but not limited to global slope stability, site soil bearing capacity, presence of underground or surface water, etc.

5. Backfilling and Compacting the Structure

Backfill and compacting after each course ensures strength and stability of the system. Backfill should be compacted to the specifications of the wall design. Backfill must support vegetation and be free draining.



6. Geogrid Placement

Structures that require geogrid reinforcement will be specified by an engineer. After compaction, geogrid placement will begin at the front of the bag course and will go towards the existing material. Place spikes on top of the geogrid and continue placing bag course. Geogrid should be pulled tight prior to backfill. Continue with course compaction.

*Some structures may require additional strength using Envirolok's geo-grid weaving technique. For installation instructions please refer to engineer's drawings or contact an Envirolok distributor near you.



7. Top Row

Install the top row of the structure the same way the other courses have been placed. Tuck the "snorkel" under to give a finished look to the last course. If specified, the top row may need to be anchored into the existing landscape.



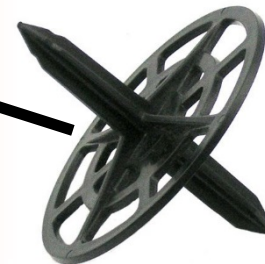
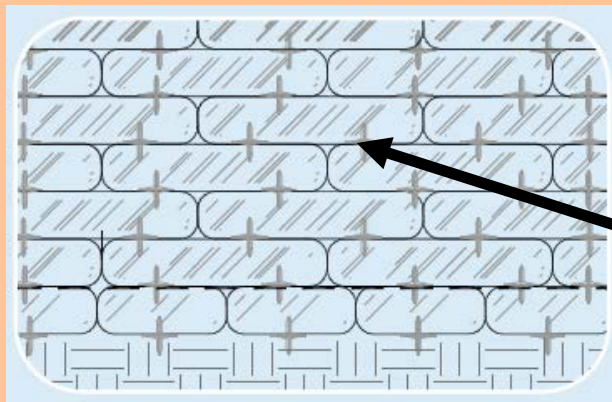
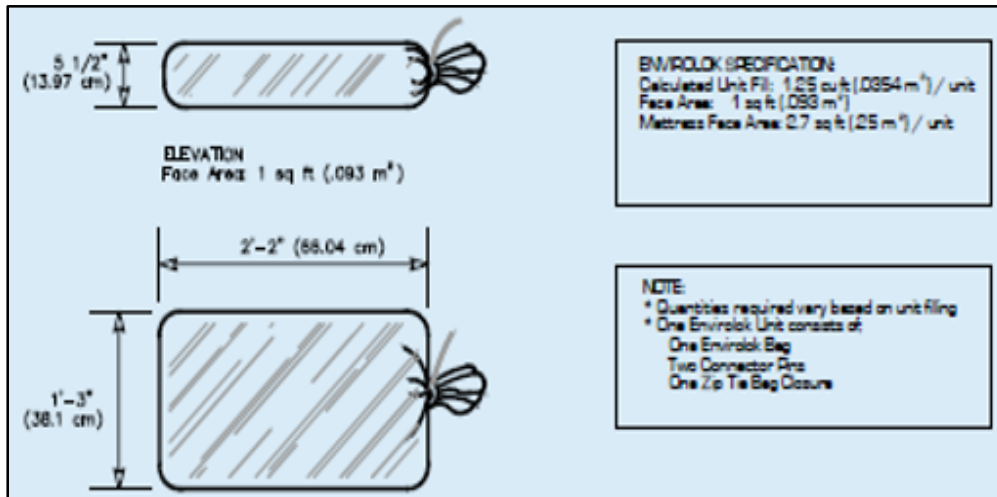
8. Vegetation Establishment

Once the wall is completed, vegetation is the final step. Native vegetation is recommended because of its adept root structures that will bind the wall together forming a monolithic structure that will renew itself year after year. Using vegetation suitable for your local climate is necessary for a successful project. You may build the wall and place live plants in the courses as you build the structure. Live plant material should always be placed in between the courses. Cutting the bags open and planting into this cavity is NOT recommended. It is recommended that a combination of live plants and seed are used to ensure proper vegetation.



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 Dixon Shoreline Landscaping

VEGETATED BAGS



Pin

VEGETATED BAGS



GOAL

Interlocking Root
Growth Holds It All
Together!

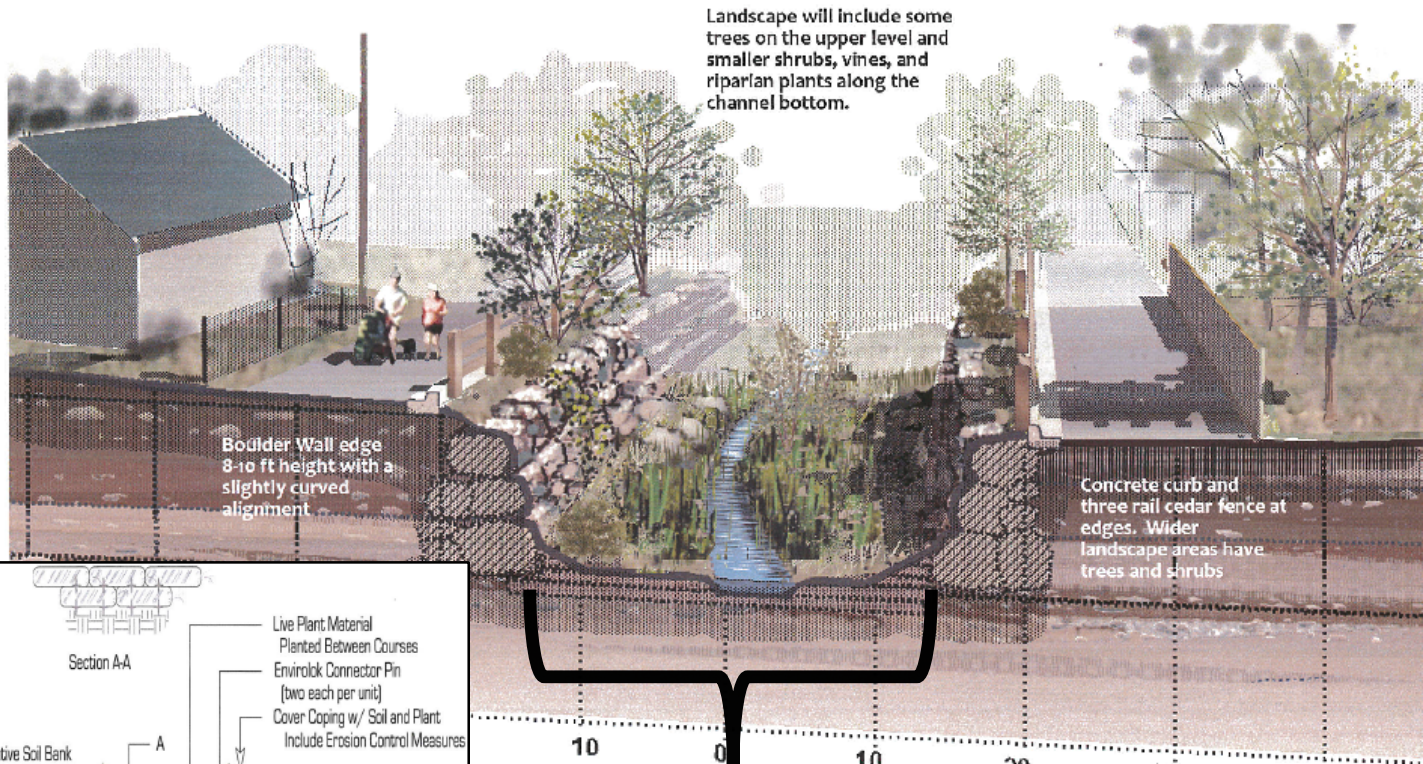


VEGETATED BAGS



**“It looks
strange but
let’s give it
a try”**

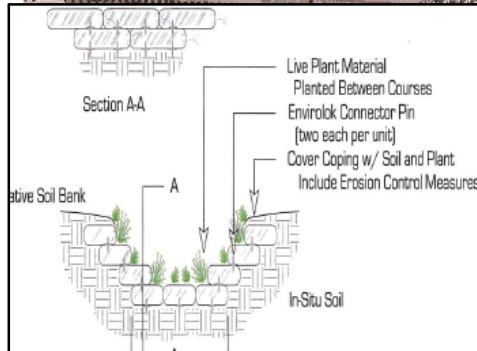
WEST FORK KENNEY'S RUN PROJECT



Landscape will include some trees on the upper level and smaller shrubs, vines, and riparian plants along the channel bottom.

Boulder Wall edge 8-10 ft height with a slightly curved alignment

Concrete curb and three rail cedar fence at edges. Wider landscape areas have trees and shrubs



The channel improvements include widening and deepening the drainage channel to more effectively handle larger storm events. Most of the existing trees along the channel bottom will need to be removed for this construction. The new channel will include native stone boulder walls, a soft vegetated bottom, and new riparian tree and shrub planting. A fence and a curb will be included near the top of the wall in most places.

PLANT LIST, mostly native species.

Upper dry area;
Trees; Cottonwood?? Hackberry, Honey locust, Douglas fir,

Shrubs; Choke cherry, native rose, American plum, Three leaf sumac, Creeping mahonia, engleman ivy,

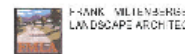
Lower channel bottom:
 Rocky Mountain Birch, Rocky Mountain maple, Serviceberry, Vines; Engleman ivy??

Shrubs: Red twig dogwood, Gold currant, Potentilla, Choke cherry.

Herbaceous plants, plug and seeding: Western wheat grass, blue grama, switch grass, Big bluestem, Woolly Sedge, Bulrush, Prairie cordgrass, Canada wildrye, Fowl Mannagrass, and others.



LANDSCAPE CONCEPT
 West Fork Kenney's Run
 Channel Improvements



Shared Vision

Concept Plan

PROPOSED CHANNEL CONCEPT
 TYPICAL FEATURES

FM 11414
 sheet 2 of 2



WEST FORK KENNEY'S RUN PROJECT

Pre-Construction



WEST FORK KENNEY'S RUN PROJECT

Mixing and Filling bags



Mixing



On-Site Filling

60% Sand 20% Compost 20% Topsoil
Buy pre-filled or fill on-site



Hand Labor !





WEST FORK KENNEY'S RUN PROJECT

Bags Installed
March 1 2016



Seeding and Mulching
on Top of Bags



WEST FORK KENNEY'S RUN PROJECT



April 25, 2016

Vegetation Stage

Bag seams grow first

May 20, 2016





WEST FORK KENNEY'S RUN PROJECT



August 4, 2016

Looking Good

Seams disappearing

October 6, 2016





WEST FORK KENNEY'S RUN PROJECT

Was this the best application?
It's working!

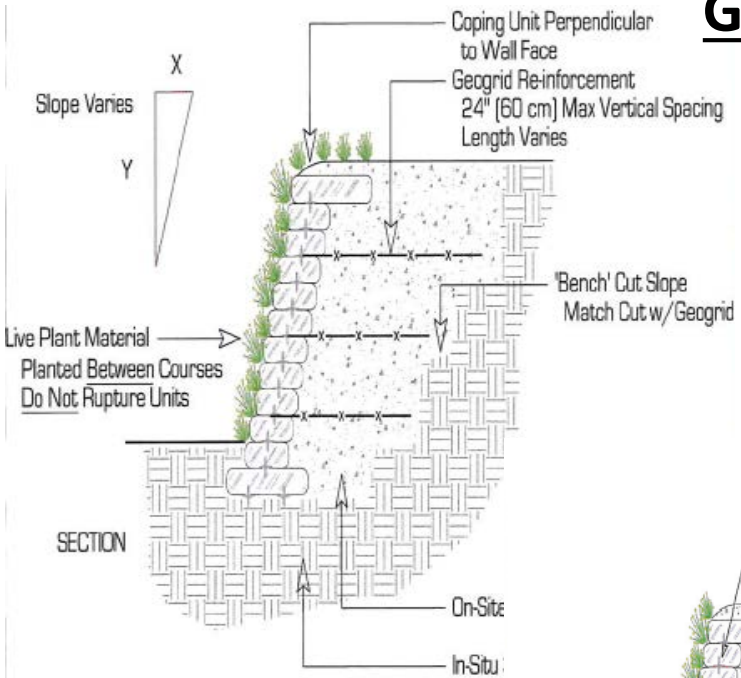


Contractor: Naranjo Civil

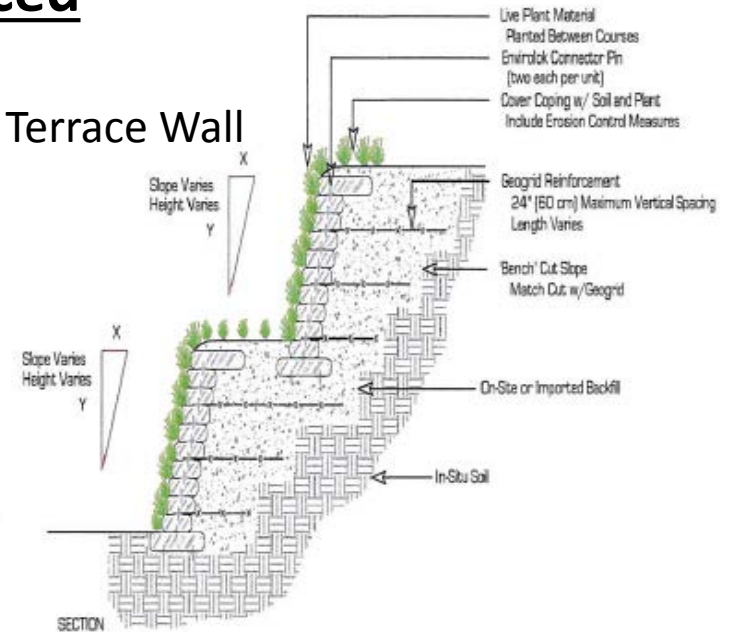
Engineer: Icon Engineering

STEEP SLOPES

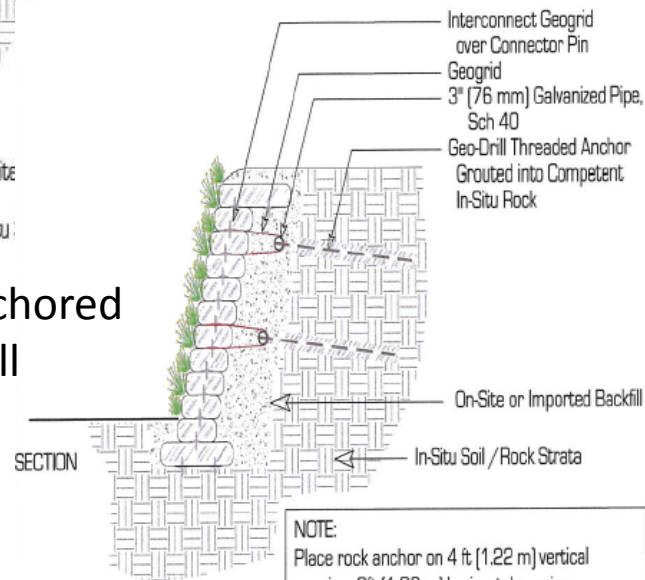
Geogrid Reinforced



Terrace Wall



Anchored Wall



NOTE:
Place rock anchor on 4 ft (1.22 m) vertical
spacing, 6ft (1.83 m) horizontal spacing.
(Placement may vary with specific site conditions.)

LAKWOOD COUNTRY CLUB WALL



Complete July 2016



"Did you win?"

Other Possible Uses



Minor Drops

- Minor Drops
- Contaminated Soils Containment
- Vegetated Berms
- Quick Emergency repairs
- Repairs in Remote areas



Contaminated Soils Containment



Benefits

- Encapsulates soil - No soil loss
- Native roots lock system together becoming stronger over time
- Native bioengineered facings
- Bags are non-rigid and move freely with freeze-thaw cycles
- Can be placed along existing bank face
- Remote areas with limited access
- Form tight bends where needed or desired

(West Fork Kenney's Run)



Drawbacks

- Labor time (filling on site)
- Material cost > \$8/bag not filled
- Must protect bags from vandals before/during vegetation stages
- Artificial watering typically needed in CO
- UV damage if not vegetated
- Initially exposed plastic Geogrid around bags
- No plant plugging into bags – up for debate – Recommend install in seams only



Envirolok Dibble

Dibble tool pierces bags to install live native plants into the sand/soil bags



Alternative Construction Methods for Bank Stabilization - Sand Bags ? **WHY NOT**

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Give it a try ?