Alternative Construction Methods for Bank Stabilization - Sand Bags!!

ARE YOU SERIOUS?

2017 UDFCD Annual Seminar

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Team Learning
VEGETATED BAGS

Common Installations

- Small Channels
- Steep Slopes
- Gentle Slopes
**BAG INSTALLATION**

**INSTALLATION**

1. **Filling and Closing Envirolok Bags**
   - Fill the Envirolok bags with engineered soil using an Envirolok Bag Filler. The soil properties should consist of 60% sand, 20% high sand content, 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 sealed with a UV resistant zipper. 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 base 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 spiles in the excavated trench at the desired location of the first row. Place first bags next to each other, seam side in, horizontally, the full length of the structure. The "horizontal" 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 spiles in the top of each bag about 3' apart. The spile placement will vary with the slope of the structure and should be placed in the center of the bag contact area between courses.

5. **Backfilling and Compacting the Structure**
   - Backfilling and compaction 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 spiles on top of the geogrid and continue placing bag courses. Geogrid should be pulled tight prior to backfilling. 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 adapt root structures that will bind the wall together forming a meandering structure that will renew each 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 seeds are used to ensure proper vegetation.

**Brochure Photo Credits:**
- McQuil LLC • Envirolok West
- Envirolok Canada • Summark Environmental Services
- Bionx Shoreline Landscaping

**Protecting People, Property, & the Environment**
VEGETATED BAGS

- Elevation
  - Face Area: 1 sq ft (0.093 m²)

- Dimensions
  - 2'-2" (65.04 cm)
  - 1'-3" (38.1 cm)

- Envirolok Specication
  - Calculated Unit Fill: 1.05 cu ft (0.0354 m³) / unit
  - Face Area: 1 sq ft (0.093 m²)
  - Mattress Face Area: 0.7 sq ft (0.025 m²) / unit

- Note:
  * Quantities required vary based on unit filling
  * One Envirolok Unit consists of:
    - One Envirolok Bag
    - Two Connector Rigs
    - One Zip Tie Bag Closure

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

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 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, english ivy,

Lower channel bottom;
Rocky Mountain Fescue, Rocky Mountain maple, Serviceberry, Vines: English ivy??

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

Herbaceous plants, plug and seeding: Western wheat grass, blue grama, switch grass, Big bluestem, Woody Sedge, Bristle, Prairie cordgrass, Canada wildrye, Povl Miamigrass, and others.

LANDSCAPE CONCEPT
West Fork Kenney’s Run
Channel Improvements

PROPOSED CHANNEL CONCEPT
TYPICAL FEATURES
WEST FORK KENNEY’S RUN PROJECT

Pre-Construction

Steep & Tight
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

Protecting People, Property, & the Environment
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

Vegetation Stage
Bag seams grow first
May 20, 2016

April 25, 2016
WEST FORK KENNEY’S RUN PROJECT

Looking Good
Seams disappearing

August 4, 2016

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

Anchored Wall

Terrace Wall

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

Complete July 2016
Other Possible Uses

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

Minor Drops

Contaminated Soils Containment

Protecting People, Property, & the Environment
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
Alternative Construction Methods for Bank Stabilization

- Sand Bags?

WHY NOT

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Give it a try?