

# MIRAMESH<sup>®</sup> GR FOR VEGETATED WALLS & SLOPES

Prepared by:

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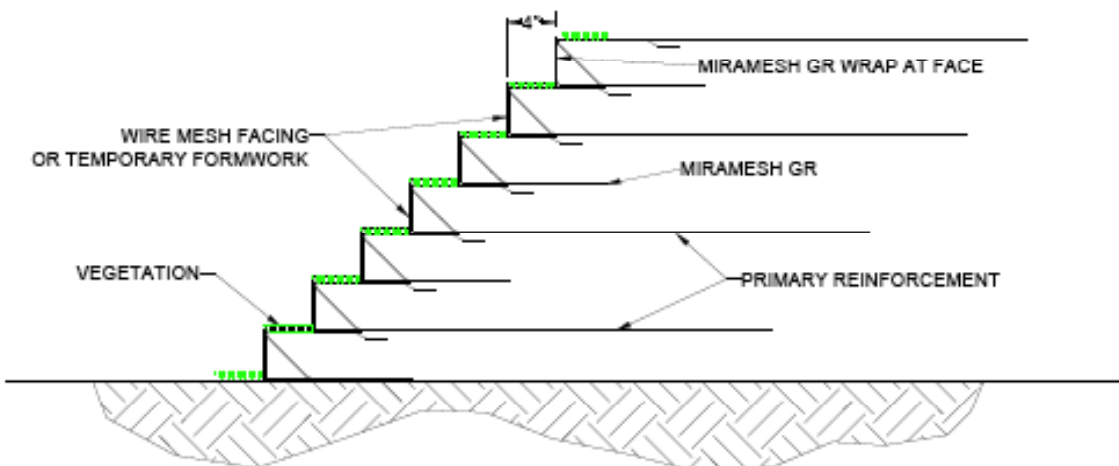
May 18, 2010

**GENERAL**

Miramesh® GR is composed of green high-tenacity monofilament polypropylene yarns that are woven together to produce an open mesh biaxial geotextile. Miramesh® GR is specifically designed for secondary reinforcement and surface erosion protection for steepened slope and retaining wall applications. Miramesh® GR allows for vegetation growth, while holding back soil at the face.

In wrapping the face of a retaining wall with Miramesh® GR, removable facing supports (e.g. wooden forms) or left-in-place welded wire mesh forms are typically used. The recommended maximum vertical spacing between layers of Miramesh® GR is 18 inches (450 mm). The following figure shows a typical Miramesh® GR vegetated wall/slope.

**Facing Details for Wrapped-Face Construction**



**Vegetated Vertical Steps with Welded Wire Mesh or Wooden Formwork**

In assessing these two facia options, there are several considerations. For instance, using a wire mesh face support will typically result in higher material costs, yet lower labor costs than using temporary wooden formwork. However, the wire mesh may provide additional long-term face protection from ultraviolet light degradation and potential vandalism. Further, the use of temporary wooden formwork will require access from the exterior of the slope/wall face in order to insert and remove forms.

### **Inspection**

The owner or the owner's engineer is responsible for certifying that the contractor meets all the requirements of the specification, including material submittals and proper installation of the geosynthetic reinforcements. The Contractor shall check the geosynthetic upon delivery to ensure that the proper material has been received during all periods of shipment and storage.

All geosynthetic materials shall be protected from temperatures greater than 140°F, and all deleterious material that might otherwise become affixed to the geosynthetic and adversely affect its performance.

### **Site Preparation**

The foundation soil shall be excavated to the line and grades as shown on the construction drawings or as directed by the Project Engineer. Over-excavated areas shall be filled with compacted backfill material as per project specifications or as directed by the Engineer. As a minimum, foundation soil shall be proof rolled and level prior to backfill and geosynthetic placement. This exercise should be performed prior to each subsequent geosynthetic layer installed.

### **Placement of Drainage Materials**

Perforated schedule 40 or equivalent pipe, surrounded in drain rock, and wrapped in geotextile, may be placed at the base of the wall/slope as shown on the Construction Drawings. The pipe shall be laid at a minimum longitudinal gradient of 1%. The pipe shall be connected to the specified outlets with T-connectors. Outlet pipes, which pass through the base of the wall facia, shall be wrapped with a geotextile to prevent loss of infill materials. Outlet pipes shall be connected to the site drainage system or discharged in front of the wall in a manner that will not cause surface erosion. Compact all fill placed against the drainage system.

### **Placement of Welded Wire Mesh Facia**

Place the wire baskets adjacent to one another at the elevation shown on the plans. Ties may be used to keep wire baskets aligned. *Note: the first two vertical rows of welded wire baskets may be pushed forward during compaction of the backfill (It may be necessary to adjust their setback or install vertical braces along the proposed alignment of the wall facia at a minimum spacing of 60 inches center to center).*

### **Geosynthetic Reinforcement Placement**

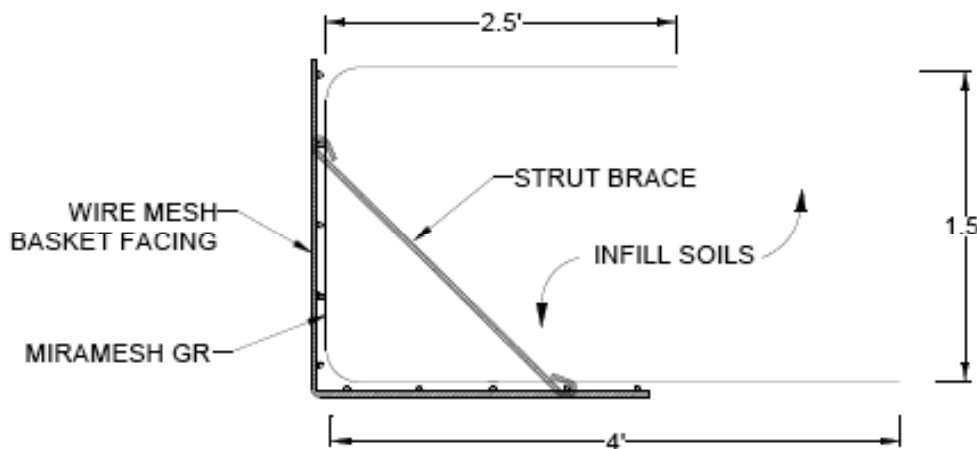
The geosynthetic reinforcement (Miragrid® XT geogrids or Mirafi® PET fabric) shall be laid at the proper elevation and orientation as shown on the construction drawings or as directed by the Engineer. Correct orientation of the geosynthetic shall be verified by Contractor. The geosynthetic shall be cut to length as shown on the construction drawings using a razor knife, scissors, sharp knife, or equivalent.

The geosynthetic reinforcement leading edge shall be placed up to the front of the welded wire mesh form and tensioned by hand until taut, free of wrinkles and lying flat. Adjacent geosynthetic panels, in the case of 100 percent coverage in plan view, should be butted up to one another, as necessary to ensure 100 percent coverage, unless otherwise specified on the construction drawings. The geosynthetic reinforcement and Miramesh® GR may need to be slit (perpendicular to the wall face) to stagger the wire basket support struts. Geosynthetic panels may be secured in-place with staples, pins, sand bags, or backfill as required by fill properties, fill placement procedures, or weather conditions, or as directed by the Engineer.

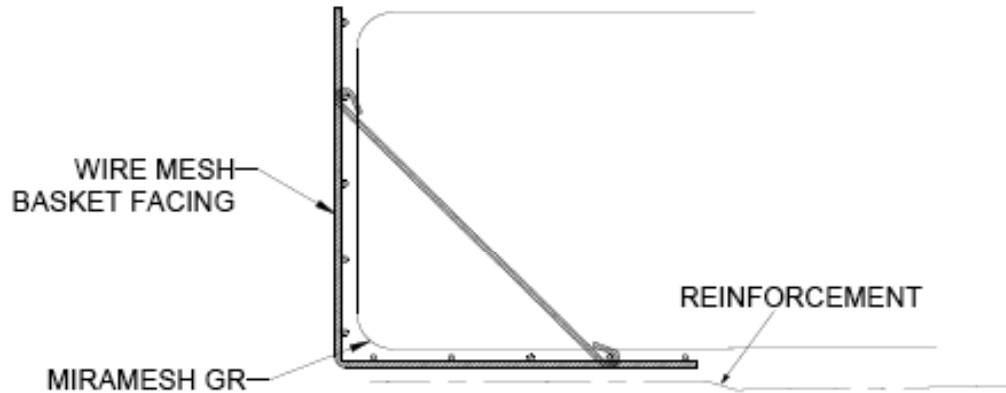
The geosynthetic may **not** be overlapped or connected mechanically to form splices in the primary strength direction. Single panel lengths are required in the primary strength direction. Therefore the geosynthetic should be installed in one continuous piece with the primary strength direction extending the full length of the reinforced area. No overlapping is required between adjacent rolls unless specified by the Engineer.

**Miramesh® GR Placement**

Install Miramesh® GR parallel to the wall/slope face, or as directed by the project engineer. Place the Miramesh® GR against the inside front face of welded wire mesh form with 4' of embedment. When placing the Miramesh® GR, drape the geotextile over the wire face, allowing for the required wrap embedment (typically 2.5'). Install the reinforcing struts at 24 inch center to center (typical).



When the fill soil has been placed and compacted to the elevation of the next welded wire form, the Miramesh® GR shall be laid back on top of the compacted soil, pulled taut and secured with compacted soil. Place geosynthetic reinforcement from the fascia to the required embedment length. Slide the next welded wire fascia unit into place against the prongs (optional) of the lower unit.



Place only the amount of geosynthetic required for immediately pending work to prevent undue damage. After a layer of geosynthetic has been placed, the succeeding layer of soil shall be placed, compacted and prepared as appropriate. After the specified soil layer has been placed, the next geosynthetic layer and/or facing unit shall be installed. Miramesh<sup>®</sup> GR should be seeded/vegetated as recommended by the project engineer.

### **Fill Placement**

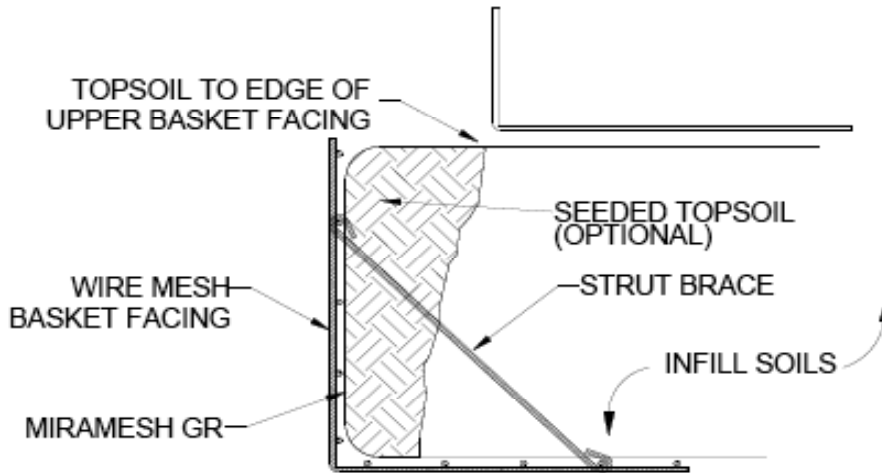
Fill should be placed in 6-8 inch thick lifts near the face of the wire baskets and then proceed toward the tails of the Miramesh<sup>®</sup> GR and Geosynthetic reinforcement to help tension the grid/fabric. Backfill material shall be compacted to a minimum 90% modified proctor or as directed by the project engineer. Backfill shall be placed, spread and compacted in such a manner as to minimize the development of wrinkles in and/or movement of the geosynthetic. Backfill shall also be placed in such a manner as to minimize the disturbance and/or the misalignment of the wall facing. A minimum fill thickness of 6 inches is required prior to the operation of tracked vehicles over the geosynthetic.

Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geosynthetic. Rubber tired equipment may pass over the geosynthetic reinforcement at low speeds, less than 5 mph. Sudden braking and sharp turns shall be avoided. Any geosynthetic damaged during installation shall be replaced by the Contractor.

Backfill within 3 ft. of the wall/slope face will typically be compacted with hand equipment. Density tests shall be made every lift or as directed by the Project Engineer. Backfill shall be graded away from the wall crest and rolled at the end of each work day to prevent the freezing and/or the ponding of water on the surface of the reinforced soil mass. The site shall be maintained to prevent the flow of water from adjacent areas from entering the wall area from overtopping the retaining wall during construction and after the completion of the wall.

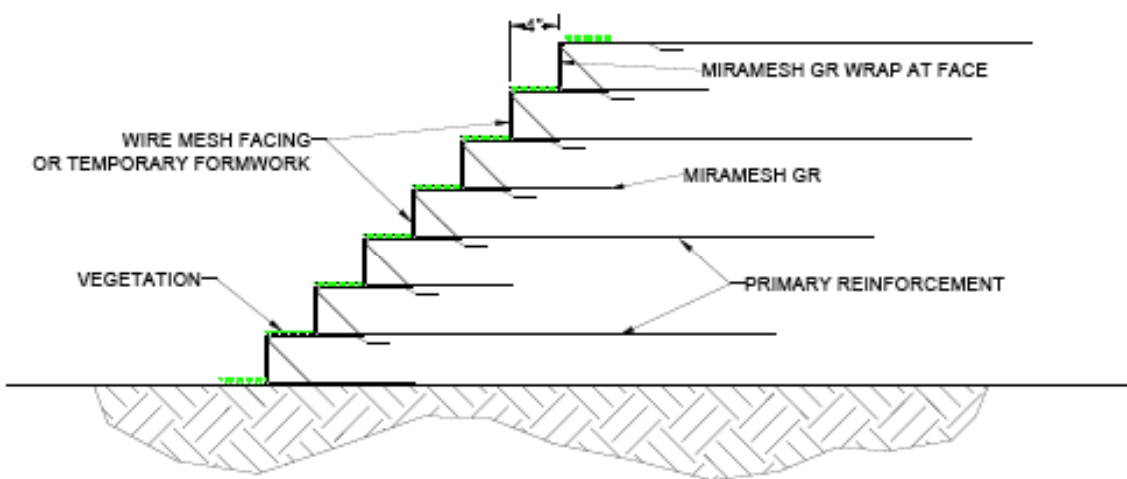
**Seed Placement While Backfilling**

Miramesh® GR is manufactured with an open weave that holds soil in, but allows vegetation to grow through it. A mix of seed (optional if hydroseeding) and topsoil be placed directly against the Miramesh® GR fabric face for each lift, as shown below.



**Hydroseeding/ Hydromulching Wall Face**

To vegetate the wall by hydroseeding, the welded wire baskets should be set back with a 4" (typical) offset at each lift, as shown below. This results in an overall batter of 78°. Each 4" shelf will create a flat surface for vegetative growth. The face should be hydro seeded during the local growing season. The face should be watered prior to hydroseeding. An irrigation system and maintenance program may be needed – depending on local climate and environmental conditions.



**Seed Selection**

Seed performs best when planted during spring or early autumn.

Three general climate zones are shown below. Areas in the cool climate zone use cool season grasses. Areas in the warm climate zone use warm climate grasses. The transition zones typically use a mixture of both cool and warm season grasses, but generally favor cool climate grasses more. Local suppliers generally have excellent knowledge of seed selection for their local climate and environment.

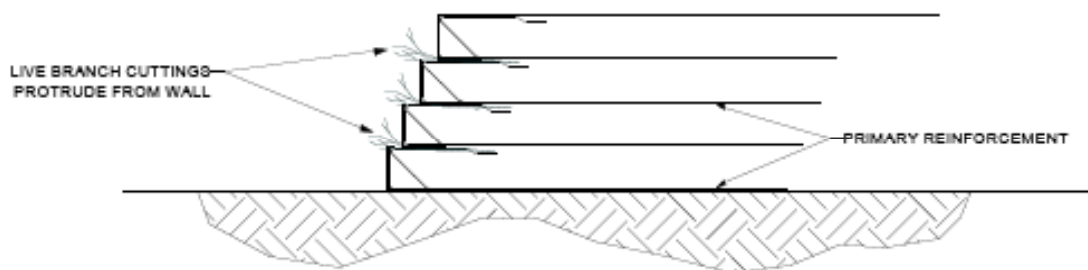


The table below shows some common seed choices.

WARM SEASON	COOL SEASON
Buffalo	Bent grass
Centipede	Bluegrass
Common Bermuda	Fine Fescue
Hybrid Bermuda	Ryegrass
St Augustine	Tall Fescue
Tall Fescue	
Moesia	

### Live Branch Cuttings

Live branch cuttings or rooted woody stem cuttings of plants that root easily may be used with the Miramesh® GR /wire mesh facia. Live branch cuttings should be ½” to 1” in diameter and placed between Miramesh® GR layers, as shown below. Live cuttings should only be harvested while the dormant. Installation of live cuttings should be performed between the fall and early spring, while the cuttings are still dormant. Cuttings should be stored in a cool moist area that is well shaded (never store cuttings in direct sun). Choosing the correct species for a given environment is very important for long-term success. In wet environments, willows are very successful. In dry climates, upland species perform better. In dry climates, a watering system may be required to vegetate native and non-native species of plants.



### Live Staking

Live staking may be performed with the Miramesh® GR /wire mesh facia. Live stakes are woody stem cuttings of plants that root easily. Live stakes should be taken while a plant is dormant (before spring) and planted directly into the face of the wall/slope. Live stakes should be spaced 2 – 3’ apart in all directions. Installation of live stakings should be performed between the fall and early spring, while the plants are still dormant. Live staking should be performed only in very moist environments or with plants known to survive in the local environment.

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