

**ITEM 17554.9610 M - GEOSYNTHETIC REINFORCED EARTH SYSTEM (PERMANENT)**  
**ITEM 17554.9620 M - GEOSYNTHETIC REINFORCED EARTH SYSTEM (TEMPORARY)**

**DESCRIPTION**

Provide and install a Geosynthetic Reinforced Earth System at the locations and within the limits shown on the plans.

**MATERIALS**

A. GEOSYNTHETIC REINFORCEMENT

1. Primary Reinforcement:

Provide certified tested geosynthetic meeting the long term design tensile strengths,  $T_D$  as shown on the plans and conforming to the following minimum testing criteria:

$$T_D = \frac{T_{ULT}}{RF}$$

Where:

$T_D$  = Long Term Design Tensile Strength

$T_{ULT}$  = Ultimate Tensile Strength Determined in the Primary Strength Direction in Accordance with ASTM D4595

$RF$  = Total Reduction Factor =  $RF_{CR} \times RF_{CD} \times RF_{DU}$

$RF_{CR}$  = Reduction Factor For Creep Deformation for 100 Year Design Life Calculated in Accordance With Geosynthetic Research Institute Standard Practice GRI-GG4 using ASTM Standard Test Methods D5262 to determine long term strength,  $T_{LT}$  and D4595 to determine short term strength,  $T_{ST}$ .

$RF_{CD}$  = Reduction Factor For Construction Damage Calculated in Accordance with Geosynthetic Research Institute Standard Practice GRI-GG4

The minimum tested  $RF_{CD}$  value permitted is 1.10.

$RF_{DU}$  = Reduction Factor for Durability Determined in Accordance with EPA9090 and ASTM D4595

The minimum tested  $RF_{DU}$  value permitted is 1.10.

The minimum "RF" values permitted based on extrapolation of product specific test data are:

<b>PERMANENT</b>	<b>TEMPORARY</b>
RF = 3	RF = 2

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When product specific test data are not available, use the following total reduction factors:

<b>PERMANENT</b>	<b>TEMPORARY</b>
RF =10	RF = 4

2. Secondary Reinforcement:

Provide certified tested geosynthetic meeting the ultimate tensile strength,  $T_{ULT}$ , (in the direction perpendicular to the slope) shown on the plans.

B. BACKFILL

1. Type A

Provide backfill material, to the lines and grade shown on the plans, meeting the material requirements of Item 203.07 *Select Granular Fill*.

2. Type B

Provide backfill material to the lines and grade shown on the plans, meeting the following requirements:

a) Gradation

<b>SIEVE SIZE</b>	<b>% PASSING</b>
150 mm	100
425 $\mu\text{m}$	0-60
75 $\mu\text{m}$	0-40

b) The ratio of  $\frac{\text{Percent Passing } 75 \mu\text{m sieve} \times 100\%}{\text{Percent Passing } 425 \mu\text{m sieve}}$  must be  $\leq 70\%$

C. FACING

1. Welded Wire Form

Provide and install welded wire forms and wire struts as shown on the plans, and conforming to the material requirements of Subsection 709-02 *Wire Fabric for Concrete Reinforcement*.

2. Geotextile

Provide geotextile material as shown on the plans and conforming to Item 207.12 *Geotextile Drainage*.

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3. Non-Degradable Erosion Control Mat

Provide non-degradable erosion control mat meeting the following material properties:

<b>Property</b>	<b>Test Method</b>	<b>Requirement</b>
Color	N/A	Green
Minimum Tensile Strength (Machine / cross-machine direction)	ASTM D 1682	1575 N/m / 525 N/m
Maximum Elongation (Machine / cross-machine direction)	ASTM D 1682	150% / 100%
Ultraviolet Stability	ASTM D 4355	80%

**CONSTRUCTION DETAILS**

A. GENERAL

1. ON-SITE REPRESENTATION - For installation assistance and guidance at the start of construction, provide on-site representatives from the geosynthetic and non-degradable erosion control mat suppliers for a minimum of three days.
2. STORAGE OF GEOSYNTHETIC AND NON-DEGRADABLE EROSION CONTROL MAT - Store and protect prior to installation, in accordance with the manufacturer's recommendations.

B. SITE PREPARATION

Prepare and compact the surface immediately beneath the bottom layer of primary geosynthetic reinforcement as shown on the plans or as directed by the Engineer.

C. GEOSYNTHETIC PLACEMENT

Place and secure the primary and secondary reinforcement in accordance with the manufacturer's recommendations, in continuous strips without joints, seams or connections, to the line, grade and orientation shown on the plans.

Place welded wire forms where required, as shown on the plans. Position and connect the welded wire forms to overlap 50 mm with adjacent forms and connect with wire ties. Place and wrap secondary reinforcement and geotextile facing to conform to the welded wire forms as shown on the plans. Where required, install wire struts as shown on the plans.

Place non-degradable erosion control mat where required, as shown on the plans and secure according to manufacturer's recommendations.

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**D. BACKFILL PLACEMENT OVER GEOSYNTHETIC REINFORCEMENT**

Replace any damaged geosynthetic prior to placement of any overlying material at no cost to the State. Place the backfill onto the geosynthetic reinforcement in such a manner that no damage occurs. The thickness of a compacted lift of backfill is not to exceed 0.3 m or the measured vertical distance between geosynthetic layers, whichever is less. Compact the backfill to a minimum of 95% of Standard Proctor Maximum Density in accordance with the requirements contained in Subsection 203-3.12, *Compaction*.

**METHOD OF MEASUREMENT:**

The quantity to be paid for under this item is calculated by the number of vertical square meters of face area computed between the payment lines shown on the plans or from payment lines established, in writing, by the Engineer prior to performing the work.

**BASIS OF PAYMENT**

The unit price bid for this item, includes the cost of furnishing all labor, equipment and materials including site preparation, backfill, geosynthetic reinforcement, geotextile, on-site supplier representation, welded wire forms, non-degradable erosion control mat and incidentals necessary to satisfactorily complete the work as shown on the plans.