

**TEMPORARY GEOSYNTHETIC REINFORCED SOIL WALLS.**  
**(REV 10-22-14)**

The following new Section is added after Section 548.

**SECTION 549TW**  
**TEMPORARY GEOSYNTHETIC REINFORCED SOIL WALLS**

**549-1 Description.**

Construct temporary geosynthetic reinforced soil walls (GRS) in accordance with this Section and in conformance with the lines, grades, design, and dimensions shown in the Contract Documents or established by the Engineer.

Ensure that each shipment of products to the job site includes a signed or stamped delivery ticket in accordance with the Materials Manual, Section 8.2 Volume II, and the required written certification statement for each product shipped. Provide these tickets and certifications to the Engineer.

Store geosynthetics in conditions above 20°F and not greater than 140°F. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement.

Carefully inspect all reinforcement geosynthetics to ensure they are the proper size and free from defects that may impair their strength and durability.

**549-2 Materials.**

**549-2.1 Temporary Masonry Facing Blocks:** Provide and install medium or normal weight concrete masonry units (CMU) of the size, textures and colors as shown in the Plans. Install textured facing blocks with textured face exposed. Install textured corner blocks in wall corners adjacent to textured blocks. When scour protection is shown in the Plans, install only solid masonry blocks below the top of scour protection elevation as shown in the Plans. Ensure all CMUs are manufactured in accordance with ASTM C90 with a minimum 28-day compressive strength of 1900 psi.

**549-2.2 Reinforced Soil Foundation (RSF):**

**549-2.2.1 RSF Geosynthetic:** Provide an R-1 woven, geotextile reinforcement meeting the requirements in Section 985 and the Plans.

**549-2.2.2 RSF Backfill:** Provide select sand backfill material meeting the requirements of 548-2.6 or an aggregate approved by the Engineer.

**549-2.3 GRS Backfill Reinforcement:** Provide an R-1 biaxial geogrid or woven geotextile reinforcement meeting the requirements in Section 985 and the Plans. Ensure all GRS backfill reinforcement materials are manufactured using the same material.

**549-2.4 GRS Backfill Material.**

**549-2.4.1 General:** Provide compacted select backfill within the GRS backfill volume shown in the Plans.

**549-2.4.2 Compacted Select Backfill:** Provide select sand backfill material meeting the requirements of 548-2.6, graded aggregate (GAB) meeting the requirements of Section 204 or coarse aggregate comprised of natural stones meeting the requirements of Section 901 with a size distribution of Size No. 57 or 67, except as noted in the Plans. Ensure the

pH, as determined by FM 5-550, is not lower than 3.0 or higher than 10.0. When uncoated polyester geosynthetics will be used, ensure the pH is not higher than 9.0. Test the backfill material for pH by a Department approved independent testing laboratory prior to placement. Provide certification to the Engineer that the results have met the requirements of this Section and are signed and sealed by a Professional Engineer, registered in the State of Florida.

**549-2.5 Reinforcing Steel:** Use Grade 60 rebar meeting the requirements of Section 931.

**549-2.6 Concrete for Filling Facing Blocks:** Use Class NS concrete meeting the requirements of Section 347.

**549-2.7 Polystyrene Foam Board:** Provide polystyrene foam board conforming to AASHTO M230, Type VI.

### **549-3 Repairs or Rejection of Masonry Facing Blocks.**

The Department will reject all facing blocks not meeting the quality standard of this Section and referenced Specifications. In addition, any of the following defects will be sufficient cause for rejection by the Department:

1. Defects that indicate unsatisfactory molding.
2. Defects indicating honeycombed or open texture concrete.
3. Defects in the physical characteristics such as:
  - Signs of aggregate segregation;
  - Broken or cracked corners;
  - Insufficient concrete compressive strength;
  - Exceeding thickness tolerance of plus or minus 3/16 inch;
  - Stained front face, due to excess form oil or other reasons.

Remove any stains or discolorations or apply a Department approved concrete stain to attain a uniform appearance of the portions of the structure remaining visible after construction to the satisfaction of the Engineer.

Correct cracks or spalls occurring after installation in accordance with 400-21.

### **549-4 Construction Requirements.**

**549-4.1 General:** Verify all pertinent information (e.g. soil parameters, dimensions, facing alignment, utility locations, conflicting structures) prior to beginning construction. Bring any conflicts not shown in the Contract Documents to the Engineer's attention. After constructing the RSF, construct the facing blocks, compacted backfill and reinforcement in layers to produce a tight fitting and secure GRS wall. Perform all compaction operations using a vibratory compactor (roller or plate compactor) with an operating weight of at least 600 lbs and which produces a centrifugal force on not less than 7,500 lbs.

**549-4.2 Excavation:** Excavate to the limits shown in the Contract Documents and in conformance with Section 125.

**549-4.3 Reinforced Soil Foundation (RSF) Subsoil Preparation:** Grade and compact the RSF subsoil in accordance with Section 125 for a width equal to or exceeding the limits of the RSF as shown in the Contract Documents. Remove and replace recycled asphalt pavement and any other soft or loose material from the RSF subsoil incapable of sustaining the required compaction to the Engineer's satisfaction.

In lieu of the compaction requirements of Section 125, dewater and compact the RSF subsoil with a vibratory compactor for at least 5 passes or as directed by the Engineer.

**549-4.4 Reinforced Soil Foundation (RSF) Construction:** Construct the RSF within the dewatered excavation as soon as possible in order to avoid the weakening effects of weather

or seepage. Encapsulate the RSF in woven geotextile reinforcement to protect it from possible erosion. Measure and size the reinforcement sheets to fully enclose the RSF. Overlap the reinforcement sheets a minimum of 3 feet, starting with the first (outermost) layer on the upstream side of the RSF. Orient all overlapped sections of reinforcement in the area of the RSF to prevent running water from flowing between the layers of reinforcement and prevent water from eroding backfill material from within the RSF.

Place and compact RSF backfill material in layers of not more than 6 inches compacted thickness. Compact RSF backfill with a minimum of five passes of a vibratory compactor. Continue compaction until there is no additional movement. Place intermediate layers of reinforcement at a vertical spacing not exceeding that shown in the Plans. Ensure each intermediate layer of reinforcement provides complete horizontal coverage of the RSF backfill material with overlaps of adjacent sheets of at least 1 foot. After all RSF backfill material is placed, compacted and leveled, tightly wrap the corners of the RSF geotextile and completely encapsulate the RSF backfill.

Ensure the position of the facing blocks on top of the RSF is firm, level and smooth with no more than 1/2 inch of GRS backfill between the RSF and the bottom layer of facing blocks.

**549-4.5 GRS Wall Facing:** Carefully place and level GRS facing blocks tightly together along the wall alignment, one course at a time in running bond pattern unless otherwise noted in Plans. Do not place the next course of blocks until the backfill behind the previous course is placed, compacted and covered with backfill reinforcement. As each layer of GRS backfill material is placed behind the GRS facing, maintain the facing blocks in the vertical position to provide a final horizontal and vertical alignment. Ensure facing blocks are separated vertically only by the reinforcement layers; sweep all soil and other materials from between the facing blocks. When reinforcement layers must be overlapped, do not overlap reinforcement on top of the facing blocks. Except for blocks in the top three courses, fill all hollow core facing blocks with backfill material.

**549-4.5.1 Tolerances for GRS Facing Blocks:** Ensure the horizontal alignment tolerances do not exceed 1 inch when measured with a 10 foot straight edge. The maximum allowable offset in the joint between facing blocks is 1/4 inch. The final overall vertical tolerance of the completed wall (plumbness or deviation from top to bottom batter shown in the Plans) shall not exceed 2 inches per 10 feet of wall height. GRS facing which does not meet these tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.

**549-4.6 GRS Backfill Placement:** Perform work in accordance with an approved Quality Control Plan (QCP) meeting the requirements of 105-3. A LOT is defined as a single lift of finished embankment not to exceed 500 feet in length. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT will not extend beyond the limits of the phase.

Use only one type of backfill in each layer. Use only coarse aggregate backfill below the 100 year flood elevation, unless shown otherwise in the Plans. Prior to placing each backfill layer, smooth all wrinkles and loose zones from the backfill reinforcement. Place backfill from the facing backward to prevent formation of wrinkles in reinforcement. Compact immediately behind the facing blocks then proceed backward to completely compact the layer. Allow only hand operated compaction equipment within 3 feet of the wall face. At the end of each day's operation, shape the last level of backfill to permit runoff of rainwater away from the

wall face or provide a positive means of controlling run off away from the wall such as temporary pipe, etc.

**549-4.6.1 Graded Aggregate (GAB) Backfill:** Perform work in accordance with 204-2, 204-4, 204-5 and 204- 6, except that the minimum density requirement is reduced to 95% of the maximum density.

**549-4.6.2 Coarse Aggregate Backfill:** Place and compact the coarse aggregate such that it will be stable, firm and unyielding. Compact coarse aggregate backfill with a minimum of four passes of a vibratory compactor. Continue compaction until there is no additional movement.

**549-4.6.3 Select Sand Backfill:** Meet the requirements of 120-10 except delete the requirement of 120-10.1.4.3 and 120-10.1.6 does not apply.

**549-4.7 GRS Backfill Reinforcement:** When backfill is level with the top of each course of facing blocks, sweep all soil and other materials from the top of the facing blocks. Place the layer of reinforcement to cover the top of the blocks and the compacted backfill in one piece from the blocks to the back of the compacted backfill. In GRS abutments, position the edge of the mid-layer “bearing bed” reinforcement within the bearing bed zone against the back of the facing blocks without attaching to the blocks. Place all backfill reinforcement so that all joints are normal to the face of the wall or abutment and at least 8 feet from the wing wall, unless otherwise shown in the Contract Documents or as directed by the Engineer. Overlapping of GRS back fill reinforcement is not necessary. Do not overlap reinforcement between facing blocks. Offset joints in adjacent layers of GRS back fill reinforcement at least 10 feet. Prior to placement of the reinforcement, compact the backfill in accordance with 549-4.6. Do not place any equipment directly on the geosynthetic reinforcement. Place a minimum 6 inch thick layer of backfill prior to operating only compaction equipment or rubber tired equipment over the geosynthetic. Operate such equipment at speeds of less than five mph with no sudden breaking or turning.

**549-4.8 Beam Seat Construction:** Not applicable.

**549-4.9 Superstructure Placement:** Not applicable.

**549-4.10 Integrated Roadbed Construction:** Beginning at a depth from finish grade as required to meet the roadway pavement design for base course thickness, construct successive GRS layers of 6 inch maximum thickness with GAB as the select backfill material until the top of the final wrap is 2 to 3 inches below the bottom of the proposed asphalt pavement. Perform work in accordance with 204-2, 204-4, 204-5 and 204- 6. Compact GAB in the integrated roadbed to 100% of the maximum density. Cover the top layer of reinforcement with GAB to pavement grade and compact to no additional movement.

**549-4.11 Guardrail Posts:** Install only steel guardrail posts through the GRS backfill reinforcement material. Do not attempt to pre-drill holes in the reinforcement; drive steel guardrail posts through the buried reinforcement.

## **549-5 Method of Measurement.**

The quantity to be paid for GRS abutments and walls will be the plan quantity, in square feet, completed and accepted, of the area bounded by the top of the coping, the top of the reinforced soil footing and the begin and end wall limits as shown in the Plans. Plan quantity for GRS bridge abutments includes wing walls.

**549-6 Basis of Payment.**

Price and payment for GRS abutments and walls will be full compensation for all work specified in this Section, including the excavation required specifically for wall construction, backfill reinforcement, RSF, copings, fabric material, repairs, labor, equipment, and other materials necessary to complete the wall in an acceptable manner as shown on the Contract drawings. The cost of select backfill material as described and required in this section will be paid as gravel fill.

Payment will be made under:

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| Item No. 549-1 | GRS Retaining Wall - per square foot.  |
| Item No. 549-2 | GRS Bridge Abutment - per square foot. |
| Item No. 549-3 | Gravel Fill - per cubic yard.          |

Do Not Use Without  
CO Specs Authorization