GRS-IBS NOTES

DESIGN

DESIGN LOADS AND SOIL PROPERTIES
Combined load: Superstructure (qLL + qB) 2 TSF maximum (service load, allowable stress design). Roadway live load surcharge: 250 psf uniform vertical

Plans prepared assuming a 28 inch block depth.

DESIGN SPECIFICATIONS

1. Geosynthetic Reinforced Soil Integrated Bridge System Interim Implementation Guide, FHWA-HRT-11-026, January 2011.
2. Design methods follow the ASD design methods presented in Chapter 4 of the reference Manual. No seismic design assumed.
3. Design factor of safety against sliding is > 1.5; Factor of safety against bearing failure is > 2.5.
4. A global stability analysis must be performed for each site. Factor of safety against global failure is to be > 1.5.
5. Performance criteria: tolerable vertical strain = 0.5% of wall height (H); tolerable lateral strain = 1.0% of b and a_b (bearing width and setback)

CONSTRUCTION SPECIFICATIONS

1. Site Layout/Survey: Construct the base of the GRS abutment and wingwalls within 1.0 inch of the staked elevations. Construct the external GRS abutment and wingwalls to within *0.5 inches of the surveyed stake dimensions.
2. Excavation: Comply with Occupational Safety and Health Administration (OSHA) for all excavations.
3. Compaction: Compact backfill to a minimum of 95 percent of the maximum dry density according to AASHTO-T-99 and * 2 percent optimum moisture content In the bearing reinforcement zone, compact to 100 percent of the maximum dry density according to AASHTO-T-99. Only hand-operated compaction equipment is allowed within 3-feet of the wall face. Reinforcement extends directly beneath each layer of modular blocks, covering > 85% of the full width of the block to the front face of the wall.
4. Geosynthetic Reinforcement Placement: Pull the geosynthetic taught to remove any wrinkles and lay flat prior to placing and compacting the backfill material. Splices should be staggered at least 24-inches apart and splices are not allowed in the bearing reinforcement zone. No equipment is allowed directly on the geosynthetic. Place a minimum 6-inch layer of granular fill prior to operating only rubber-tired equipment over the geosynthetic at speeds less than 5 miles per hour with no sudden braking or sharp turning.
5. RSF Construction: The RSF should be encapsulated in geotextile reinforcement on all sides with minimum overlaps of 3.0 feet. Wrapped corners need to be tight without exposed soil. Compact backfill material in lifts less than 6-inches in compacted height. Grade and level the top of the RSF prior to final encapsulation, as this will serve as the leveling pad for the modular blocks of the GRS abutment.
6. GRS Wall Face Alignment: Check for level alignment of the modular block row at least every other layer of the GRS abutment. Correct any alignment deviations greater than 0.25 inches.
7. Beam Seat Placement: Thickness of the beam seat is approximately 12 inches and consists of a minimum of three 4-inch lifts of wrapped-face GRS. Place precut 4-inch thick foam board on the top of the bearing bed reinforcement butt against the back face of the modular block. Set half-height or full height (depending on wall height and required clear space) CMU blocks on top of the foam board. Wrap 4-inch lifts across the beam seat. Before folding the final wrap, it may be necessary to grade the surface aggregate of the beam seat slightly high, to about 0.5 inches, to aid in seating the footing and to maximize contact with the bearing area.
8. Equipment can be positioned on the GRS abutment provided the outrigger pads are sized for less than 4,000 psf near the face of the abutment wall.
9. Integrated Approach Placement: Following the placement of the superstructure and cast-in-place abutment, geotextile reinforcement layers are placed along the back of the superstructure, built in maximum lift heights of 6-inches (maximum vertical spacing of reinforcement < 6-inches). The top of the final wrap should allow at least 2-inches of aggregate base cover over the geosynthetic to protect it from hot mix asphalt.
10. The GRS at the abutment, along with the adjacent backfill material and embankment shall be constructed up to the top level of the Beam Seat Zone, below the cast-in-place abutment spread footing, and then be allowed rest for a period as specified in the special provision Settlement Waiting Period. The bridge abutment cast-in-place spread footing and superstructure will be constructed after the waiting period. The Integrated Approach Zone is constructed after the superstructure and cast-in-place abutment wingwalls are constructed.
11. Geosynthetic reinforcement lengths for the abutments shall be as shown on the plan. Geosynthetic reinforcement lengths for the wingwalls shall be as shown in Table 3. Lengths of reinforcement may be varied by stepping vertically and horizontally. The Contractor shall determine RSF step locations and elevations. These elevations shall be used to determine the wingwall heights. Contractor shall prepare and submit shop drawings for approval showing the layout of all geosynthetic reinforcement for the abutments and wingwalls along with thickness and elevation of the RSF. This work shall be coordinated with the precast modular block supplier and the aggregate column contractor. Cost included with GRS-IBS.
12. The Contractor, the precast modular block supplier and the aggregate column contractor shall coordinate their submittals. This work shall be considered included in the cost of the contract. The Contractor shall cooperate with the FHWA and their representatives throughout construction of the GRS-IBS.

PRECAST MODULAR BLOCK

See Special Provisions.

GEOSYNTHETIC REINFORCEMENT TENSILE PROPERTIES

Required ultimate tensile strength = 4,800 lb/ft by (ASTM D 4595 (geotextiles) or ASTM D 6637 (geogrids))
Tensile strength at 2% strain = 1,370 lb/ft

POLYSTYRENE FOAM BOARD

Provide polystyrene foam board conforming to AASHTO M230, type VI.

AGGREGATE COLUMN GROUND IMPROVEMENT

See Special Provisions.

BACKFILL MATERIAL

Backfill material, defined as the material placed in the geosynthetic reinforced volume, shall be according to Section 1004 of the Standard Specifications and the following:

GRS Backfill Material
Coarse aggregate gradations CA 12 thru CA 16 may be used.

RSF Backfill Material
Coarse aggregate gradations CA 4, CA 6, CA 9 or CA 10 may be used.

Backfill Material Quality. The coarse aggregate shall be Class B quality or better.

GRS-IBS QUANTITIES

See individual abutment wall sheets for quantities.

GRS-IBS PAY ITEMS

Geosynthetic Reinforced Soil (GRS):
Method of Measurement. Geosynthetic Reinforced Soil will be measured for payment in square feet. The GRS will be measured from the top of the precast modular cap line to the theoretical top of RSF line for the length of the wall as shown on the contract plans and includes all GRS material from the bottom of roadway sub-base to the top of the RSF. Foam Board and solid CMU's are inlcuded in the cost of Geosynthetic Reinforced Soil.

Basis of Payment. This work, as shown on the contract plans, including placement of the GRS backfill material and RFS backfill material within the geosynthetic reinforcement wall volume shown on the approved shop drawings, geosynthetic reinforcement and accessories will be paid for at the contract unit price per square foot for Geosynthetic Reinforced Soil. This includes all labor, material, equipment for constructing the GRS. Foam board and solid CMU's are included in the cost of Geosynthetic Reinforced Soil.

Precast modular blocks and RSF will be paid for separately. Excavation necessary to place the GRS will be paid for as Structure Excavation. Reinforced backfill material placed between the ends of the geosynthetic reinforcement and the embankment will be paid for separately.

Reinforced Soil Foundation (RSF):
Method of Measurement. Reinforced Soil Foundation will be measured for payment in feet, along the inside face of blocks as shown in the plan view.

Basis of Payment. This work, as shown on the contract plans, including placement of the RFS backfill material within the geosynthetic reinforcement foundation volume shown on the approved shop drawings, geosynthetic reinforcement, backfill material and accessories will be paid for at the contract unit price per foot for Reinforced Soil Foundation.This includes all labor, material, equipment for constructing the RSF.

Excavation necessary to place the RSF will be paid for as Structure Excavation, lateral limits shall be as shown on the contract plans.

GRS Backfill Material:
Method of Measurement. Reinforced Backfill Material will be measured for payment in cubic yards, compacted in place and the volume computed by the method of average end areas. Only reinforced backfill material placed between the ends of the geosynthetic reinforcement and the embankment will be measured for payment. GRS backfill material placed within the geosynthetic reinforcement is included for payment with the Geosynthetic Reinforced Soil item.

Basis of Payment. This work, as shown on the contract plans, will be paid for at the contract unit price per cubic yard for GRS Backfill Material.

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