GENERAL NOTES

PURPOSE: These example plan sheets A through D were prepared to illustrate the typical contents of a set of drawings necessary for a GRS-IBS project. Presented in these plans are the assumptions for the bridge and GRS-IBS systems with typical wall height (H) ranging from 10 to 24 feet. Two conditions were prepared for the quantity estimate Sheet B: "poor soil conditions" and "favorable soil conditions." These plans are not associated with a specific project. All dimensions and properties should be confirmed or revised by the Engineer of Record prior to use. Project specifications should be prepared to supplement this plan set.

DESIGN

DESIGN LOADS AND MATERIAL PROPERTIES


"Poor" Soil Conditions:

Reinforced fill: Unit weight = 125 psf, friction angle = 34°, cohesion = 0 psf, (cohesion ≥ 200 psf assumed for temporary back slope cut conditions during construction.)

Foundation soil: Unit weight = 125 psf, friction angle = 30°, cohesion = 0 psf

"Favorable" Soil Conditions:

Reinforced fill: Unit weight = 115 psf, friction angle = 38°, cohesion = 0 psf

Foundation soil: Unit weight = 120 psf, friction angle = 42°, cohesion = 0 psf

DESIGN SPECIFICATIONS


2. Design methods follow the ASD design methods presented in Chapter 4 of the reference Manual. No seismic design assumed.


4. Design factor of safety against sliding is 1.5. Factor of safety against bearing failure is not to be ≥ 1.5.

5. A global stability analysis must be performed for each site. Factor of safety against global failure is to be ≥ 1.5.

6. Performance criteria: tolerable vertical strain = 0.5% of wall height (H); tolerable lateral strain = 1.0% of b and a0 (bearing width and setback).

7. Settlement below the RSF is assumed to be negligible. No differential settlements based on the GRS abutment provided the outrigger pads are sized for less than 4,000 psf near the face of the abutment wall. Greater loads could be supported on the GRS abutment if checked by the Engineer of Record. An additional layout of geosynthetic reinforcement can be placed between the beam seat and the concrete or steel beams to provide additional protection of the beam seat. Set beams square and level without dropping across the beam seat surface.

8. Superstructure Placement: The crane used for the placement of the superstructure 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. Greater loads could be supported on the GRS abutment if checked by the Engineer of Record. An additional layout of geosynthetic reinforcement can be placed between the beam seat and the concrete or steel beams to provide additional protection of the beam seat. Set beams square and level without dropping across the beam seat surface.

9. Integrated Approach Placement: Following the placement of the superstructure, geotextile reinforcement layers are placed along the back of the superstructure, built in maximum lift heights of 6-inches (maximum vertical spacing of reinforcement ≤ 2.5). The top of the final wrap should be approximately 2-inches below the top of the superstructure to allow at least 2-inches of aggregate base cover over the geosynthetic to protect it from hot mix asphalt.

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 stage dimensions.

2. Excavation: Comply with Occupational Safety and Health Administration (OSHA) standards.

3. Compaction: Compact backfill within 3-feet of the wall face. Reinforced embankments directly beneath each layer of CMU blocks, covering 85% of the full width of the block to the front face of the wall.

4. Geosynthetic Reinforcement Placement: Pull the geosynthetic to remove any wrinkles and fold back 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 layers along the length of the superstructure. Pads are sized for less than 4,000 psf near the face of the abutment wall. Greater loads could be supported with increasing distance from the abutment face to ≥ 2.5. Note: In many construction applications CMU blocks are placed with a 3/8" mortar joint to create an in place nominal dimension of 8" × 8" × 16".

REINFORCED BACKFILL GRADATION

Reinforced Backfill Gradation: See Geosynthetic Reinforced Soil Integrated Bridge System Interim Implementation Guide, Table 1 or Table 2. Consider GRU CMU minimal dimensions to be the same.

GEOSYNTHETIC REINFORCEMENT TENSILE PROPERTIES

Required ultimate tensile strength = 4,800 lbf/ft (by ASTM D 4595 (pebbles))

Tensile strength @ 2% strain = 1,370 lbf/ft

POLYSTYRENE FOAM BOARD

Provide polystyrene foam board conforming to AASHO M 230, type VI.
**GRS-IBS Poor Soil Condition DESIGN DIMENSIONS**

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**GRS-IBS Favorable Soil Condition QUANTITIES**

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**PRELIMINARY NOT FOR CONSTRUCTION**

**FOOTNOTES:**

1. The estimated materials quantities correspond to the dimensions on the accompanying plan sheets. Deviation from the dimensions on the plan sheets will void the quantities.
2. No overlaps in geosynthetics measured for quantities.
3. Design clear space (d_s) rounded to the nearest 1.0 inch.
1. Insert #4 rebars into the top 3 rows of CMU's and corner CMU's and fill with concrete.

2. Adjust length and angle of wingwalls for site specific conditions and quantities in Sheet B accordingly.

3. If RSF is not used beneath the wingwalls then additional independent retaining wall calculations should be performed to determine the stability of the wingwalls.

4. Elevation of the roadway is assumed to have a crest at the centerline of the roadway, shown as a 1 percent slope towards each edge of bridge.

5. No skew angle of the bridge to the stream channel is assumed.

6. No angular distortion between abutments is assumed.

7. Solid core CMU's placed up to the riprap height (5 feet typ.).

8. CMU blocks are staggered, including corners, so there are no vertical joints greater than 1 CMU block height.

9. Guardrail type and location to be designed by others in accordance with required safety standards.
NOTE:
1. Insert #4 rebars in to the top 3 rows of CMU's and corner CMU's and fill with concrete.
2. Strike CMU concrete fill flush with top of CMU's under bridge girders slope to drain.
3. On the top row of CMU's create a mortar capping approx. 3/8-inch thick.
4. Typical sections represent a wall height (H) equal to 18.21-feet.

FOOTNOTE:
1. Vertical wall face batter = 0°.
2. Solid CMU's behind riprap.
3. Minimum of 5 layers of bearing bed reinforcement.
4. Primary wrap reinforcement vertical spacing for the integrated approach is a maximum of 12-inches.
5. Full height block in typical in front of bearing seat but a half height block and a special foam board thickness may be required in some applications.
6. Short term back slope ratio per OSHA Safety Regulations (29 CFR, Part 1926, Subpart P, excavation). Shoring may be required if the short term back slope will be open more than 30 days or if the required short term back slope ratio specified cannot be obtained.
7. Extend integration zone layers past cut slope.
8. Insure that high quality fill is placed in this area.
9. The first beam seat reinforcement layer length is a maximum of 6-feet with a conventional 4-foot tail.