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Public Abstract

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Title:PERFORMANCE OBSERVATIONS OF GEOSYNTHETIC REINFORCED BRIDGE ABUTMENTS

Geosynthetic Reinforced Soil – Integrated Bridge System (GRS-IBS) is a technology which has been around for almost 40 years in the United States but is now being pushed by the FHWA due to improved performance and promised cost savings in the construction of small bridges. GRS-IBS is a mechanically stabilized earth (MSE) wall acting as the abutment with a bridge deck placed on top. The vertical spacing of the geosynthetic reinforcement in a MSE wall is much larger than in a GRS-IBS abutment. MSE walls have reinforcement vertical spacing of on average 24 inches compared to GRS-IBS bridge abutment vertical spacing of 8 inches.

The GRS-IBS process starts by removing material to a depth and area of the foundation for the abutment, then backfill is placed and compacted. Once the backfill is compacted, a layer of geosynthetic reinforcement is placed along with a row of precast concrete blocks to form the faces of the abutment. This process is continued until the abutment is at the level needed for the bridge girders. Bridge girders are then placed directly on the geosynthetically reinforced backfill abutment. Once the girders are in place, the abutments are then brought up to road level and pavement can be placed for the approach.

GRS-IBS bridges do not require driven piles or concrete for the bridge abutments and can be constructed with a working crew of five people. Due to the lack of need for heavy equipment for construction of standard bridge abutments and the availability of construction materials, GRS-IBS bridges can be constructed at a lower cost than conventional bridge construction. Also, because the bridge deck rests directly on the abutment, if the abutment settles, the bridge will settle to the same level, resulting in a smoother transition on and off the bridge.

This thesis focuses on the experiences the author has had with GRS-IBS bridges, and from the observations and data obtained from the Rustic Road project (Boone County, Missouri) – an instrumented GRS-IBS project. The thesis consists of a literature review of GRS-IBS applications in both Missouri and across the US, the bridge design and layout of the Rustic Road Bridge, instrumentation used in the Rustic Road Bridge, summary of the performance data to date, discussion of the applicability of GRS-IBS in Missouri, and conclusions.

Data collected thus far have shown satisfactory performance of the bridge. Movements have been minimal and all occurred in the first month after construction. The backfill drains quickly and is performing well based on piezometer data. GRS-IBS works well when the abutments are less than 20 feet high. The best application for GRS-IBS bridges is over small creeks and streams.