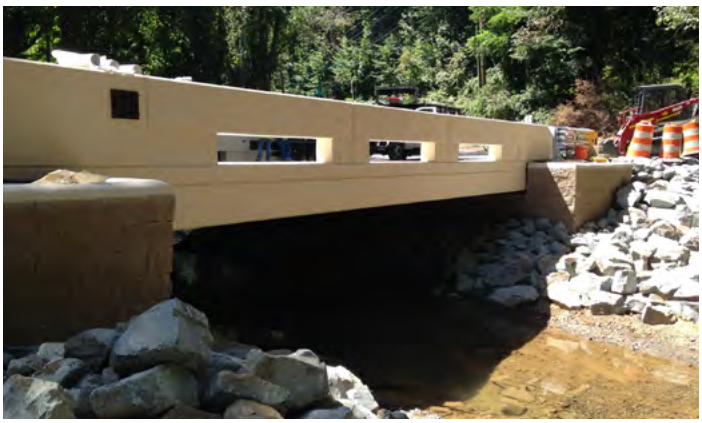
Geosynthetic Reinforced Soil–Integrated Bridge System (GRS–IBS)

The Geosynthetic Reinforced Soil–Integrated Bridge System (GRS–IBS) is an innovation for helping reduce bridge construction time and cost. Due to the ease of construction and the use of common, readily available equipment and materials, GRS-IBS projects can be built in weeks instead of months, which translates into less congestion around work zones.



Originally developed by the Federal Highway Administration (FHWA) under the Bridge of the Future Initiative, GRS-IBS can help states and local public agencies meet the country's demand for small, single-span bridges by delivering low-cost, strong and durable structures in less construction time.

The technology consists of three main components: the reinforced soil foundation, the abutment, and the integrated approach. Alternating layers of compacted granular fill and geosynthetic reinforcement provide support for the bridge. The closely spaced reinforcement and granular soil create an efficient composite material that is internally stable and capable of carrying significantly higher than design bridge loads with predictable and reliable performance.

The designer places the bridge directly on the GRS–IBS substructure, creating a seamless and smooth transition between the bridge and approach roadway without using joints, deep foundations, approach slabs, or cast-in-place concrete. The smooth transition from the roadway to the bridge helps alleviate the "bump at the end of the bridge" problem caused by differential settlement between the bridge abutment and the approaching roadway.

Since GRS-IBS construction involves basic earthwork methods and practice, without requiring highly skilled labor, and employs commonly available equipment and materials, projects can be completed faster and at lower cost. Constructing a GRS-IBS bridge can cost 25 to 60 percent less than one built with conventional methods, depending on the standard of construction and the method of contracting.

BENEFITS OF ELIMINATING THE BUMP AT THE BRIDGE

- Decreases the impact loads the bump normally causes, reducing structure and vehicle maintenance
- Improves safety for the traveling public by minimizing the potential for vehicles to lose control
- Reduces the cost of re-leveling the transition from the bridge to the roadway
- Eliminates the need for additional lane closures to repair the bump, decreasing exposure of workers to traffic

Geosynthetic Reinforced Soil–Integrated Bridge System (GRS–IBS)

Once built, GRS-IBS bridges are also durable and easy to maintain. This, combined with fewer components compared to traditional construction, also provides the potential for lower life-cycle costs.

GRS-IBS provides environmental advantages, since construction of the abutment is contained within its footprint and a deep foundation is not needed. Environmental impacts are also minimized through shortened construction time and the reduced amount of steel and concrete required.

Other features of GRS-IBS are convenience and flexibility. The technique can be used in less-than ideal weather conditions and can accommodate on-site modifications in the case of unforeseen site conditions. GRS-IBS bridges also perform well and can be designed for a wide range of loading conditions, such as in seismic areas and rapidly changing water elevations.

BENEFITS

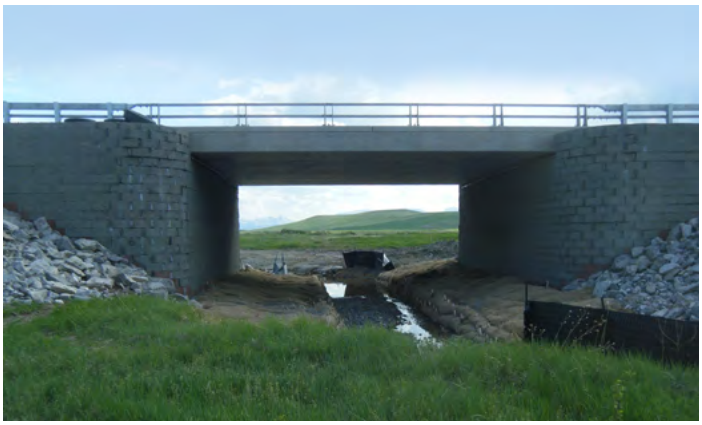
- **Accelerated Construction.** GRS-IBS bridges are easily built with common equipment and materials, resulting in projects that are completed faster.
- **Reduced Cost.** GRS-IBS may save up to 60 percent in cost compared to a standard DOT bridge, and the system potentially requires less or simpler life-cycle maintenance.
- **Flexible Design.** GRS-IBS bridges employ a simple design that can be adapted to suit environmental or other needs, and the design can be easily modified in the field to adjust to unexpected site conditions.

CURRENT STATE OF THE PRACTICE

GRS-IBS was included in both EDC-1 and EDC-2 as an Accelerated Bridge Construction technology. Nearly 200 bridges in 44 states, Puerto Rico and the District of Columbia have been selected for construction using GRS-IBS since the innovation was first championed under the initiative in 2010.

SUPPORT AND AVAILABLE TOOLS

- FHWA GRS-IBS Interim Implementation Guide *http://www.fhwa.dot.gov/publications/research/infrastructure/structures/11026/11026.pdf*
- Every Day Counts GRS-IBS website *https://www.fhwa.dot.gov/innovation/everydaycounts/edc-3/grs-ibs.cfm*
- FHWA demonstration video on GRS-IBS technology *https://youtu.be/w_5WFoAdoUw*



For additional information, please contact:

Daniel Alzamora, P.E.
FHWA Resource Center Geotechnical Team
720-963-3214
Daniel.Alzamora@dot.gov

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery

FHWA-14-CAI-040