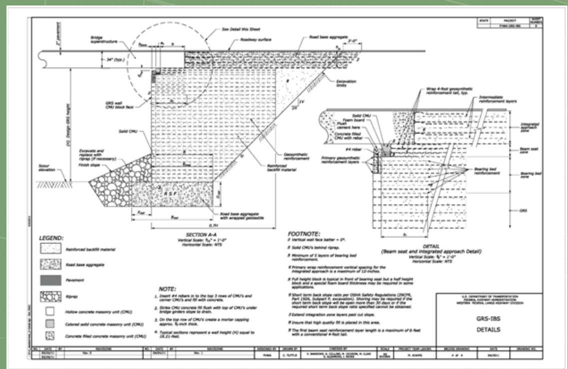
Looking for tools to implement GRS?



Several valuable tools are available to help you implement GRS for your agency. Leveraging innovation in training and reference materials, FHWA offers webinars, training videos, design guides, and standard plans . These will allow you to concentrate on implementation instead of starting from scratch.

Standard plans include notes and engineering drawings that can be used for GRS-IBS construction. The design guide includes methods and procedures for inspection, quality assurance/quality control, performance monitoring, maintenance, and repair.
The construction training video illustrates how to build the GRS-IBS and includes narrated video footage explaining the three main components: reinforced soil foundation, abutment, and the integrated approach.

Contact Information

For training or more information on this Every Day Counts Initiative, please contact your local FHWA Divisions Office.

To learn more about EDC, visit:
http://www.fhwa.dot.gov/everydaycounts

About Every Day Counts

Every Day Counts is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadway, and protecting the environment.

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

U.S. Department of Transportation
Federal Highway Administration

What is GRS-IBS?

An innovative alternative to conventional bridge support technology, Geosynthetic Reinforced Soil (GRS) Integrated Bridge System (IBS) technology uses alternating layers of compacted granular fill material and fabric sheets of geo-textile reinforcement to provide support for the bridge. The GRS technique can be applied to many facets of earthwork, such as walls, abutments, culverts, slope stability, rock fall barriers, roadway support, and integrated bridge systems.

IBS is a fast, cost-effective method of bridge support that uses GRS technology to blend the roadway into the superstructure. This creates a simple, joint-less interface between the bridge and the roadway alleviating the "bump at the bridge" problem caused by uneven settlement between the bridge and approaching roadway.

What are the major advantages of GRS IBS?

GRS IBS offers unique advantages, particularly in the construction of small bridges. Construction costs are typically 25 to 60 percent lower than conventional construction methods. GRS IBS bridges are easy to build with common equipment and materials, so projects can be completed more quickly. They are also easy to maintain because they contain fewer parts: IBS is typically built without many of the elements common to a conventional bridge abutment, such as a bridge seat, bridge bearings, deck joints, approach slab, end wall, and sleeper slab. Its flexible design can be easily modified in the field for unforeseen site conditions, including unfavorable weather conditions.

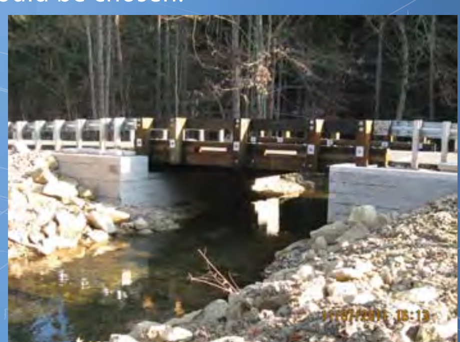
How can GRS-IBS address the problem of scour?

Scour has been and still is one of the primary barriers to the implementation of GRS-IBS over waterways in many States. Over the past year, The Federal Highway Administration (FHWA) has found that although the concern for scour is real, the IBS structure can be designed using current Federal and American Association of State Highway and Transporation Officials (AASHTO) guidelines for an appropriate countermeasure, under the appropriate conditions.

Can the GRS-IBS prevent scour?

No, but it can be designed to accommodate and resist a small amount of scour through embedment and scour countermeasures. Design scour countermeasures include riprap aprons, gabion mattresses, and articulating concrete blocks.

Installing a designed scour countermeasure can prevent loss of soil from underneath a GRS abutment from scour that occurs at or near the abutment. If a large amount of scour is estimated, however, the GRS-IBS may not be feasible for the project and an alternative should be chosen.



Huston Township, PA GRS Bridge

Can the GRS-IBS be deployed over waterways?

Yes: the majority of bridges being constructed with the GRS-IBS technology are over water. However, as with any bridge technology over a waterway, a thorough hydraulic analysis must be conducted to estimate scour and freeboard height. In addition, a scour countermeasure must be designed for the GRS-IBS abutments according to the FHWAs HEC-23 guidance. If properly designed, and under the right circumstances, a GRS-IBS can be a successful alternative to deep foundations for bridges over waterways.

Does the bridge need to be placed on a deep foundation?

No. The GRS abutments are capable of supporting high loads from the superstructure without piles or other deep foundation systems.

Which projects are best suited to GRS-IBS? GRS–IBS has been successfully used to build abutments near rivers and streams. However, assessing the potential impact of stream instability, scour, and adverse flow conditions is a vital consideration in the decision to use this technology. The potential for issues with stream instability, scour, and adverse flow conditions can lead to deep foundation bottom elevations or expensive countermeasures that could reduce the cost–effectiveness of GRS–IBS abutments. Deployment of the GRS-IBS will not be feasible on all bridges, but it should always be considered as an alternative to contentional bridge-building techniques and materials.

Case Study: Stever Road Bridge over the Tiffin River, Defiance County, OH

This project involved the replacement of a steel truss bridge supported on stone wall abutments that was functionally obsolete and structurally deficient. The new Stever Road Bridge has a 130-foot opening with 6-foot deep steel girders supported on GRS abutments about 25-feet high. The new bridge was built in 2009 with grant help through the Innovative Bridge Research and Deployment Program.

The innovative portion of the project involved the deployment of the GRS-IBS. It involved the installation of a reinforced soil foundation, a GRS abutment, and a GRS integrated approach to create a joint-less bridge system. Alternating layers of compacted fill and sheets of geosynthetic reinforcement provide support for the bridge and alleviate the "bump at the end of the bridge" problem frequently caused by differential settlement between the abutment and approaching roadway.

Using the GRS-IBS instead of a pile cap abutment on a 2:1 slope, which was conventional practice for the county prior to discovering the GRS-IBS, the county was able to shorten the span by approximately 40 feet, eliminating the need for piers in the river while maintaining low costs.

Using the GRS-IBS, the county was able to economically build vertical abutments close to the river, avoiding the need for a three-span replacement bridge and associated complications that could have resulted from having piers in the river. This project was the fifteenth GRS-IBS in the county. Since completing this bridge, the county has built an additional seven GRS-IBSs and more are planned. The savings the county achieves using the GRS-IBS helps stretch the limited local bridge program budget.

Estimated Schedule and Cost Savings:

- Start Date: April 2009
- Completion Date: September 2009
- Estimated Reduced Schedule: 60 days
- Actual Cost with Innovation Applied: $620,000
- Estimated Cost without Innovation: $800,000
- Cost Avoidance Due to Innovation: $180,000