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## *New Advancement in GRS Bridge Building*

Ionia County in Michigan was facing an all too common problem and one that counties all around the US are dealing with. The two-lane Keefer Highway Bridge that crossed Sebewa Creek was beyond repair and needed to be replaced. Obviously, budgets are tight and time is always short so they obtained assistance from engineers with Michigan DOT (MDOT) and the Federal Highway Administration (FHWA) and utilized a simpler and better bridge option.



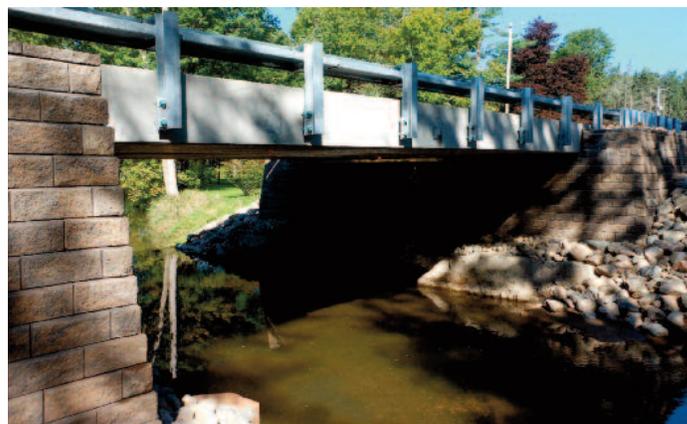
Traditional bridge construction can be slow, expensive and complex. The FHWA has been providing a better option since 2005 when they first designed the Bowman Road Bridge in Defiance County, Ohio and hundreds since. They have realized structures were built better, faster and for less money by using Geosynthetic Reinforced Soil (GRS) in an Integrated Bridge System (IBS) design. For all of these reasons, the local engineering firm of Williams & Works along with MDOT used the information from FHWA and incorporated this relatively new technology into the Keefer Road Bridge project. However, they wanted to take the abutment structure to the next level since the first generation GRS-IBS structures used standard split-face cinder blocks. Because of the northern climate and the durability that Allan Block provides, they incor-

porated the AB Classics SRW unit into the abutment structure instead. This provided better aesthetics and the tested durability they were looking for.

Milbocker & Sons was retained to build the bridge and they were new to working with the Allan Block product. The local manufacturer, Consumers Concrete, and Allan Block Corporation provided some on-site training and they were quickly building the abutments.

The bridge was completed and Ionia County and MDOT have one less problem to deal with. Michigan DOT were very pleased with the results and are looking for future potential applications for the GRS-IBS system. Incorporating this design and construction technology is just another example of how Allan Block can be the solutions to virtually any site condition there is.

The FHWA estimates that there are 600,000 bridges in the US needing replacement and that approximately 70% of them could utilize GRS-IBS technology. Most of these applications could be up to 50% less than that of a traditionally designed and constructed bridge.





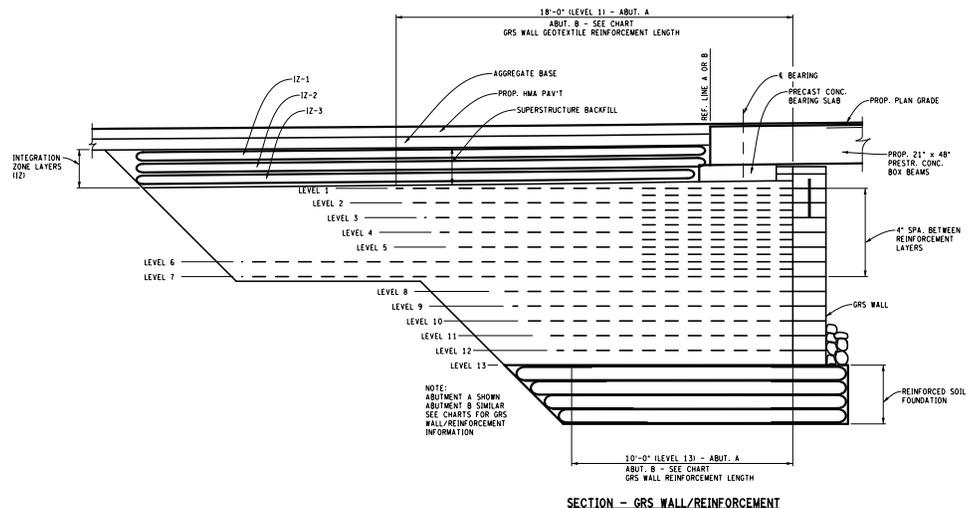
# Why is GRS-IBS Better?

We often experience a bump every time we travel across a bridge. That's because if you ask a bridge engineer they will tell you that roads settle and bridges do not. With a GRS-IBS bridge there is not a separate approach slab since the abutment and bridge girders are "Integrated" together meaning they function as one unit. This allows the bridge and road to settle together, which means a smooth ride for you and me.

As with the Keefer Road Bridge project it is always about time and money. There are many factors that contribute to the time reduction when using a GRS-IBS design. Typically, there are no piles required for the abutment foundations; there is also no need to pour concrete such as footings, pile caps, abutments or wing walls, which all can add a tremendous amount of time to any project. Even after the forms are set and rebar is placed the concrete still has to be poured and allowed to cure. Instead of driving piles and pouring all the typical concrete elements, the bridge structure is built directly on a heavily geosynthetic reinforced subsoil mass. If the construction is rehabilitating an existing structure, the existing foundation can remain for additional stability or even scour protection for the abutments. The abutments are then constructed on top of the subsoil mass by compacting select granular backfill and geosynthetic reinforcements in a series of thin alternating layers. The geosynthetic reinforcement are usually spaced at 8-inch (200 mm) or less, which means that the facing elements of the modular blocks are not required to hold back a significant mass of soil. Therefore, the FHWA has proven that connecting the modular block face to the reinforcement by friction is all that is needed. Consequently, pinned connections are not necessary for the facing blocks, which is in contrast to typical mechanically stabilized earth structures using metal tieback strips.



The benefits of tightly spaced grids to create a composite structure is not new to the industry. Allan Block has seen similar results and findings when conducting our full-scale seismic testing in 2000. When the geogrid reinforcement was spaced closer together we saw a significant improvement in the structure handling the applied dynamic loads. Professor Hoe Ling of Columbia University concluded, "When properly designed and con-



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structed, these systems seem well suited for handling seismic conditions. The wall facing, soil mass and geosynthetic reinforcement all moved in phase with the induced forces. Structures that are both flexible and coherent are ideal for these conditions.”

When preparing to place the bridge girders, further geosynthetic reinforcement may be required at intermediate coursing to provide additional soil reinforcement. This brings the reinforcement spacing down to every 4 inches (100 mm) where a precast concrete bearing slab can be placed directly on top of the reinforced soil mass, which the girders are set on top of. Again, reinforced soil is then placed behind the girders up to the pavement structure elevation. When the pavement is placed, there is no need for a traditional expansion joint because the abutments and girders are integrated together. The history of all the projects, as reported by the FHWA, has shown virtually zero cracks at the girder interface and no traditional bump the drivers experience at each abutment when crossing. Lastly, when the GRS-IBS passes over a waterway, scour protection is placed in front of the wall facing blocks at the base of the abutment to prevent soil erosion and undermining of the bridge structure. Scour protection is very similar to a typical bridge project. Riprap is often used and in the cover story of Keefer Road Bridge a series of Articulating Concrete Block mats were used.



Constructing a GRS-IBS over conventional bridge systems is much simpler since basic earthwork activities are used for fill and compaction. However, the methods might be simple, but they need to be done properly to ensure a successful project.

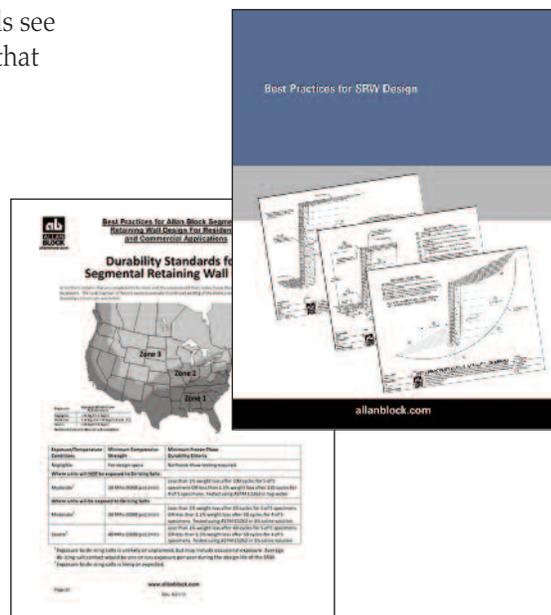
## Best Practice for SRW Design

For in depth information on building and designing segmental retaining walls see **Best Practices for SRW Design**. Written with 12 main topics of discussion that include but are not limited to:

- Pre-designed and Pre-construction Considerations
- Soil Requirements
- Tall Wall Information
- Global Stability Considerations
- Freeze Thaw Durability Considerations
- References to Other Industry Related Standards
- More...

The Best Practices document was created to be used as a guide and an industry standard for any equivalent segmental retaining wall (SRW) product and not just exclusively for Allan Block products. The goal with this publication is to help drive the industry towards zero wall failures. By creating a quality set of standards it lays out a good practice for how to plan, design and build SRW walls properly.

Using this document along with the other Allan Block materials like the AB Walls Design Software and/or the AB Engineering Manual will give any engineer or design professional everything they need to properly engineer an Allan Block retaining wall. Download your copy today from [allanblock.com](http://allanblock.com).



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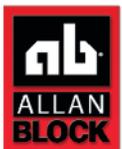
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