GRIDLINE

BGFMA
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Newsletter of The Bridge Grid Flooring Manufacturers Association

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As we wait on the next long-term transportation bill to fund our highway infrastructure projects, we continue to make-due with short extensions that have thwarted our industry for roughly 2-1/2 years. The inadequate amount of funding provided through past bill extensions falls short of what is needed to keep up with today's deteriorating bridges. In addition, these "band aids" tie the hands of state DOT's and their decision makers, since it's impossible to predict how much funding will be available for high profile and expensive multi-year projects that are becoming more and more urgent. With this in mind, we need to continue to push for extended service lives from our current structures, and design our new bridges to last longer.

An illustration poking fun at the poor condition of our nations bridge industry that can be attributed to our funding struggles

Thousands of older bridges have structurally deficient ratings, and oftentimes it's the poor condition of the bridge deck that paves the way (no pun intended) to classify these structures with unsatisfactory ratings. A large majority of our structures built in the last 50 years were constructed with conventional reinforced concrete decks that have already been replaced, or are in dire need of replacement. However, there are a significant number of 50+ year old bridges that were built with grid reinforced concrete decks that are still in service today!

National Steel Bridge Competition

The BGFMA was again a proud sponsor of the ***ASCE National Student Steel Bridge Competition***, hosted this year at Clemson University. Over 550 students representing more than 45 schools from the United States, Canada, Mexico and even China participated at this year's event. Teams placing at the top of each regional conference were invited to take part in the national competition, which was held on May 25th and 26th. Congratulations to all the teams who qualified.

ASCE/AISC National Student Steel Bridge Competition
(Photo Courtesy of Clemson University)

In Progress

The ***Arrigoni Bridge*** between Middletown and Portland Connecticut, carries nearly 35,000 vehicles per day on Route 66 & 17 over Route 9 and the Connecticut River. The bridge was originally opened in 1938 with a full depth grid reinforced concrete deck, which was in service until the middle of last year when the DOT began rehabilitating the 73 year-old structure. The rehabilitation work currently underway includes staged construction to replace the original deck with another grid reinforced concrete deck. Traffic will stay open on two of the four lanes throughout the duration of the project while the deck is replaced in three stages.

Arrigoni Bridge

Middlesex Corporation was awarded this $17 million rehabilitation project for which BGFMA member, ***Clearspan Construction Products***, has supplied the steel grid deck panels. The work is set to conclude later this year.

Overlay being scraped from existing 73 year old grid deck prior to replacing panels

Recently Completed

Boston Bridge

The two-lane ***Boston Bridge*** just south of Pittsburgh on PA Route 48 traversing the Youghiogheny River between Versailles and Elizabeth Township, was recently rehabilitated at a cost of roughly $17.5 million. Originally built in 1931, the 1,182 foot long cantilever through truss structure currently has an ADT of about 18,000. ***LB Foster*** supplied the general contractor, Trumbull Corporation nearly 37,000 square feet of new partial depth grid reinforced concrete bridge deck panels.

Half-width closures with single direction detours and occasional complete nighttime closures helped minimize traffic disruption. The project was completed on-time in late 2011. As is the case on most truss structures, the use of lightweight grid reinforced concrete deck systems is ideal for weight reduction, durability and ease of installation.

Contractor driving equipment on panels prior to pouring deck

Follow-up

Ben Sawyer Swing Bridge after Hurricane Hugo hit in late-September 1989

The ***Ben Sawyer Bridge*** became nationally recognized back in 1989 when Hurricane Hugo made its way across the southeastern coast, severely damaging the swing span and leaving one end of the structure dipping into the Intracoastal Waterway. At the time of occurrence, Hurricane Hugo was the most costly hurricane to ever hit the US, and photos of the damaged Ben Sawyer Bridge are some of the most identifiable photos from the devastating storm. The South Carolina Department of Transportation did an excellent job of moving quickly to get the bridge repaired and open to traffic, which was critical considering the structure is one of only two bridges carrying traffic to Sullivan's Island.

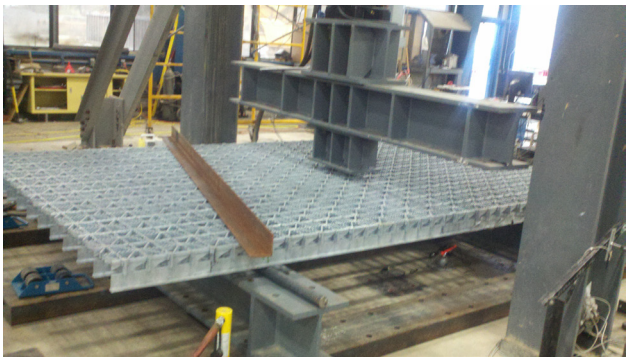
Major rehabilitation of the Ben Sawyer Bridge began in January of 2009 and included replacement of the aging swing span structure. This project was mentioned in Gridline #2 in August of 2009 and briefly discussed how accelerated construction techniques would be utilized to fabricate the swing span offsite and barge it into place. An Exodermic™ deck system, fabricated by ***Bailey Bridges, Inc.*** out of Fort Payne, AL was used on the swing span for its weight savings and added rigidity to the structure. The project went as planned for the most part, with the exception of some additional substructure damage repair work identified after removing the existing structure from the center pier that was thought to be caused by Hurricane Hugo.

Photo of the Exodermic™ Bridge Deck System installed on the new Ben Sawyer Swing Bridge prior to the concrete pour

The project was completed in early 2011 by the design-build team of PCL Constructors, Inc. and Hardesty & Hanover, LLC, much to the satisfaction of Sullivan's Island residents.

Research Update

It has been roughly a year since the BGFMA introduced our initiative to fund the ***Oregon Transportation Research and Education Consortium (OTREC) project entitled "Data and Performance Measures for LRFD Design of Open Grid Bridge Decks."*** There has been a great deal of interest from engineers in this study and the following is a brief review of the project status.



At this time, most of the analytical work has been completed, and Dr. Christopher Higgins at Oregon State University is currently conducting tests on the sample panels. Three different panel configurations will be tested in order to quantify the fatigue performance of various weld details and cross bar sizes. These results will be used to produce a reliable LRFD based design specification for open grid deck systems. Also being studied are alternate methods of connecting the grid to the superstructure and how various details influence the system durability and performance. One of the connection methods being evaluated uses headed shear studs attached to the top of beam flanges, and a narrow concrete fill over these supports.

It is believed that this detail will improve the stiffness of the system and reduce fatigue in the internal panel connections, as well as the obvious - it eliminates the fatigue prone welds historically used to connect open grid panels to the supporting steel.

More information, including an in-depth progress update on this project will be presented at the AASHTO T-8 Movable Bridge Subcommittee meeting on July 9, 2012 in Austin, TX. For more information on this presentation please contact the BGFMA.

Grid Facts

Q: What is the preferred method to attach an open grid deck to the supporting structure?

A: The three attachment methods - bolting, welding, and a concrete closure pour - each have their own advantages that should be considered. See publication BGFMA TS-02: "Installation Tolerances and Guidelines for Open Grid Decks," for more information and details.

The bolting method requires base plates be shop welded to the bottom of the grid, which will then be bolted to the supporting elements. The holes in the base plate could be predrilled, then requiring field drilling the supporting elements. Gaps between the base plate and the supporting steel are filled by 16 gage shims with predrilled oversized holes. This method is slower but does not require fatigue sensitive field welds to the steel girders.

The welding method requires that the contractor perform a field weld between each main bearing bar and supporting element. A 1-1/2", 1/4" fillet weld is made on each side of the main bar providing the root opening is no greater than 1/16". Root openings greater than 1/16" are permitted but require an increase in the weld size and may require a backing weld or suitable backing.

The final attachment method includes pouring concrete full depth in the portion of the open grid over the top flange of the supporting girders that include shear studs. While this method adds dead load to the structure it is the most simple connection method that also protects the top flange of the supporting girders from accumulated debris and corrosion. As mentioned earlier, it is believed that this connection detail could provide additional stiffness and is a part of current research being sponsored by the BGFMA.

More Information

If you would like to receive more information about the features and benefits of grid deck systems, please contact us at **1-877-257-5499** or **bgfma@bgfma.org**. We are also available to make presentations at your office and can offer continuing education credits for professional engineers as a registered provider in New York and Florida.

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