TECH-LINE

BGFMA
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Technical Update of the Bridge Grid Flooring Manufacturers Association

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Overfills and Overlays

Departments of transportation are perpetually shackled by insufficient funds and must wrestle with the options to maintain existing structures and building replacement structures. Fortunately, the decision was made to invest in a grid reinforced concrete deck, which has been shown to have superior life cycle costs when compared to standard full depth reinforced concrete decks. But frugal owners are always looking to extend the service life of the bridge deck as cost effectively as possible.

Overfills and Concrete Cover

Overfill is a term that is unique to partial depth and full depth grid decks where the concrete fills the "cells" created by the intersecting main bars and cross bars. Any concrete cover over the top of the bars is considered overfill. Because the concrete portion of an Exodermic™ deck is virtually identical to the top half of a standard reinforced concrete deck, overfill is analogous to clear cover over rebar for Exodermic™ decks.

AASHTO LRFD Bridge Design Specifications, Article 5.12.3 provides concrete cover requirements for reinforcing steel which may be superseded by state specifications. In general, 2" cover over the top rebar is considered an accepted minimum even when the reinforcing steel is protected from chloride-induced corrosion by means of galvanization or epoxy coating. Article 9.8.2.3 suggests that a minimum 1.75" thick structural overfill should be provided where possible. For consistency, the BGFMA recommends a minimum 2" cover or overfill for all grid reinforced concrete decks. See *Figure 1*.

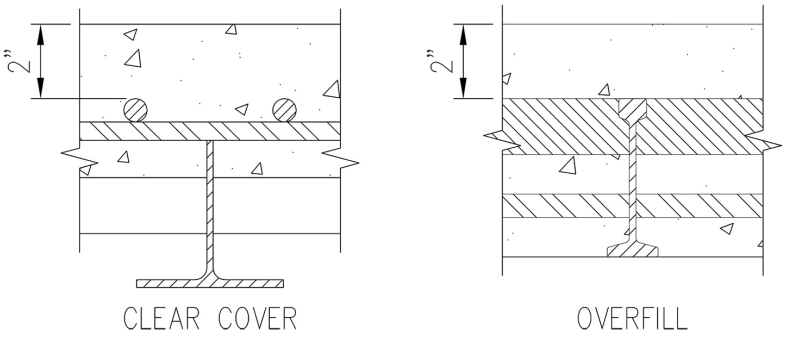

Figure 1

Any increase of integral overfill or cover provides additional stiffness as calculated using the transformed area method. Overfill permits the contractor to use conventional finishing methods to handle cross slopes, super elevations, etc. Overfill also provides protection for the steel grid and a sacrificial element for a future overlay.

Overlays

In **NCHRP Project 20-07, Task 234, "Guidelines for Selection of Bridge Deck Overlays, Sealers and Treatments,"** the authors state that older decks with previous repairs will require more aggressive maintenance and rehabilitation, such as overlays or partial depth replacement than newer decks. But based on exposure conditions, even new decks may be good candidates for overlays, since the use of an overlay may result in the longest service life for the least cost. Decks can be overlaid several times if the base deck remains in generally good condition and there is sufficient concrete cover to avoid damaging the top of steel during removal of the overlay by milling of the deck surface.

One of the oldest case studies of this "overlay for life" is the **Mackinac Bridge** which was opened for traffic in 1957. The outer lanes were constructed with flush-filled full depth lightweight concrete grid and immediately overlaid with asphalt concrete with waterproofing in mind. The deck overlay has only been replaced twice since the bridge has been in service. (continued, other side)

In the NCHRP report, asphalt concrete overlays (1-1/2" minimum thickness) with a waterproofing membrane are cited as the most commonly specified overlay system used and one of the most economical choices. Other options which have a steady use include high-performance concrete, and "modified" concretes. One system that is increasingly being specified is polymer concrete overlay.

Grid reinforced concrete decks are commonly specified for weight savings. A polymer concrete overlay can be installed as thin as 3/4" which is attractive for weight control and high performance. *Figure 2* shows the northbound **South Grand Island Bridge** being overlaid with a polymer concrete system. Each polymer concrete system consists of a particular type of resin and a particular type of primer which need to be compatible with the specified aggregate blend so that when mixed and applied, the system functions as intended. Critical to the performance of the system is the preparation of the surface prior to application of the primer. Some systems may require the surface to be milled, while others may only require a blasted profile. In either case, a clean surface is mandatory.

Figure 2 - South Grand Island Bridge

Figure 3 - Robert C. Beach Memorial Bridge

For even greater weight savings, a thin (1/4" to 3/8") hybrid polymer system with a special blend of extremely hard aggregate can be applied which will serve as a waterproofing system and provide a non-skid surface. As shown in *Figure 3*, the system used on the **Robert C. Beach Memorial Bridge** is holding up well to heavy traffic and weather extremes in northern West Virginia after seven years in service.

Any precast grid reinforced concrete deck should receive an overlay of some type to seal the inherent cold joints. Should milling be required, the precast concrete thickness must account for this sacrificial element.

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