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Exodermic Bridge Decks

Tabliers de pont exodermiques

Brückendeck aus Betonplatte auf Stahlrost

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This method of utilizing composite steel-concrete elements best fits Theme 1 of the Symposium.

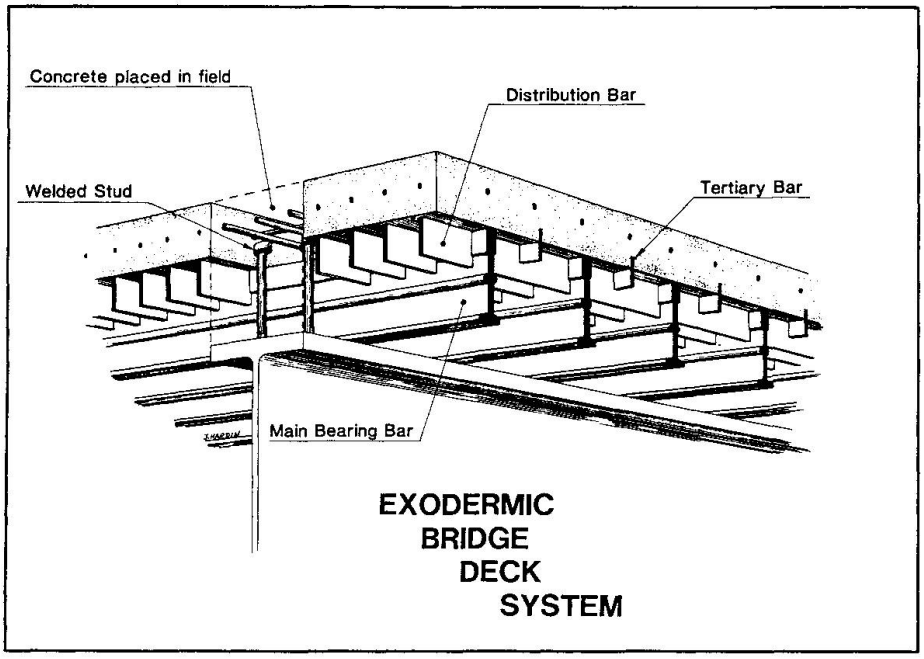
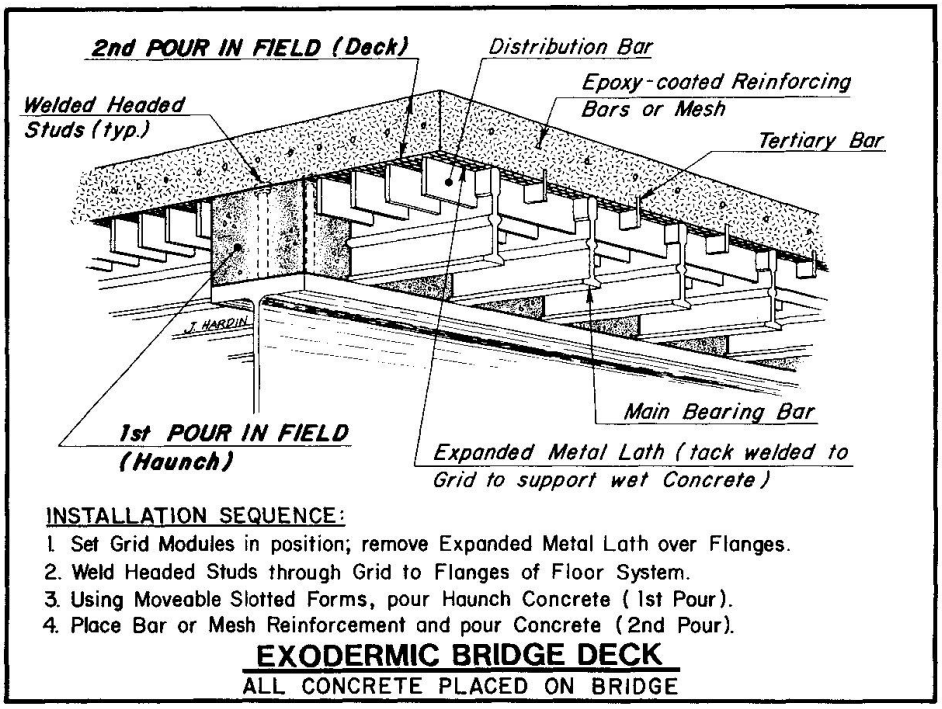
Historically, welded steel grid, both with and without concrete filling, has been used over the past 60 years to provide the roadway surface for many fixed and movable highway bridges.

During the past seven years, an innovative method of achieving an internally and externally composite bridge deck, utilizing a layer of reinforced concrete bonded to a substrate of an unfilled steel grid, has been successfully tested in the laboratory and installed in the field on five bridges.

Published literature describes the developmental work, the confirmation of anticipated structural behavior in the laboratory, and the actual construction of the first three exodermic bridge decks. Two of the decks were installed on existing bridge framing, and made composite with that framing (hence an internally and externally composite bridge deck). The third bridge, utilizing exodermic bridge deck units, was an entirely new structure, and the description includes the evolution of field adjustment of the prefabricated deck modules, and joint details.

Approximately 18 years ago severe problems developed with many concrete filled grid deck installations. The author believes that these problems have been solved by the introduction of exodermic bridge deck, which is a composite unfilled steel grid bridge deck. In this method of construction an aggressive method for the development of resistance to horizontal shear forces between the upper deck component of reinforced concrete, and the lower component of unfilled welded steel grid, has produced a bridge deck which enables the designer to take full advantage of the respective properties and performance of steel and concrete.

Very low levels of stress in each material in the exodermic deck, in use on a typical bridge, indicate a strong expectation for enhanced durability and serviceability of this method of bridge deck construction. This expectation is based on the established inverse linkage between level of stress and durability, and the present need to replace existing reinforced concrete decks while retaining existing floorsystem members in service.

Exodermic deck has been prefabricated by a precast concrete manufacturer and by a contractor working out of doors in his yard.

In 1989, exodermic deck was installed on a bridge using cast-in-place concrete. The project was to provide permanent large area patches in a reinforced concrete viaduct deck. The drawings below illustrate the precast and cast-in-place options.