TECH-LINE

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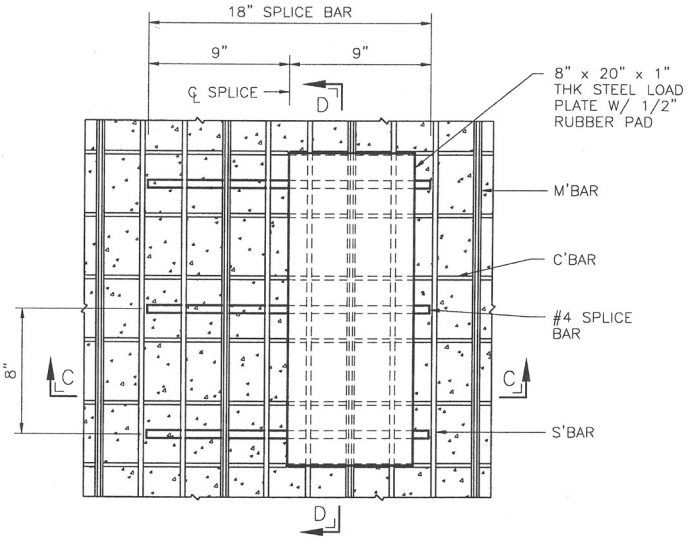
Splicing Grid Reinforced Concrete Bridge Deck Panels Without Welding Using Conventional Rebar Methods

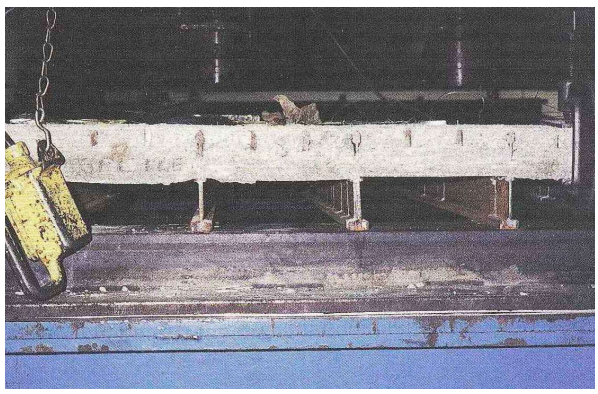
Abstract:

Two 5-3/16" deep steel grid panels, one 10' long (in the direction of the main grid I-beam) x 3'-8" wide, and one 10' long x 3' wide, were spliced together by using 18" long #4 rebars @ 8" c/c, resulting in a single panel 10' long x 6'-8" wide. The panel was then half-filled with concrete to the top of the steel grid section (flush-filled) and the splice constructed in the manner described was tested. The spliced panel was subjected to static and dynamic testing (over 1 million cycles). It was also tested for shear and ultimate loading. The completed panel contained 11 grid I-beams, and deflection indicators were placed under the seven middle I-beams to measure displacement under the load. Results of the test showed that the splice performed satisfactorily, which was predicted, based on theoretical analysis. No cracks were observed after one million cycles. Finally the panel was loaded to failure (ultimate loading test). During the ultimate loading test, at a test load of 79 kips, a longitudinal crack along the centerline of the splice developed. As a result of this crack, the differential displacement between the opposite sides of the splice detail was 2" to 3" under the load and decreased to 0" at the ends of the panels.

Grid with rebar splice prior to concrete

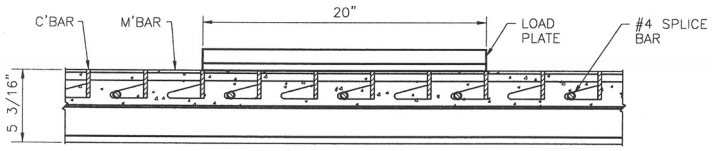


Plan view of load plate set-up on spliced panel

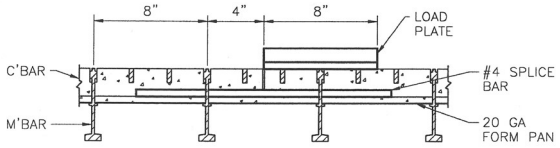


Panel being placed on supports

The load at failure exceeded the design capacity of the deck. Note that the concrete-filled steel grid decks have been shown to demonstrate, and are analyzed as orthotropic plates, distributing load in both directions. The test panel had a finite width of 6'-8". In actuality, panels on a bridge are much wider and the load is distributed over a much larger width. Test results show that grid I-beams farthest away from the load have a relatively large displacement, indicating that a wider panel would have distributed the load much farther.

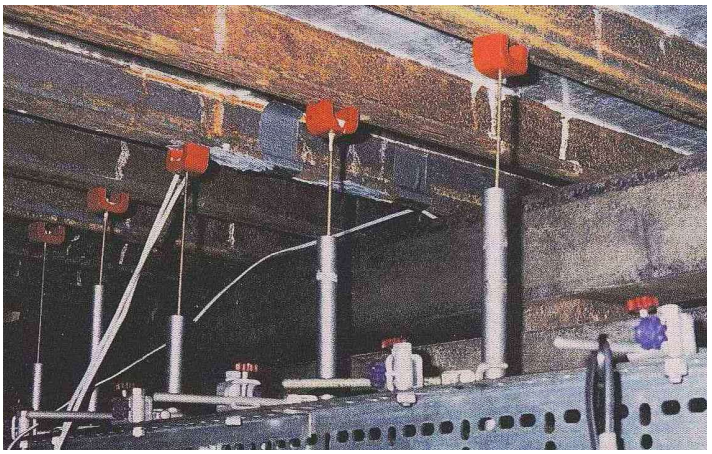


SECTION D-D

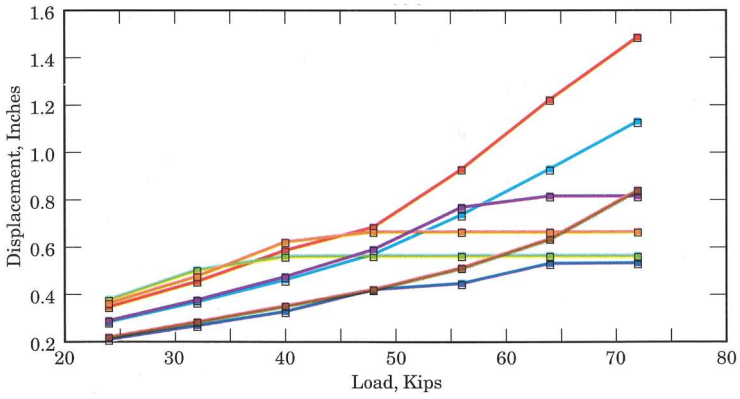


SECTION C-C

Section cuts from plan view on front

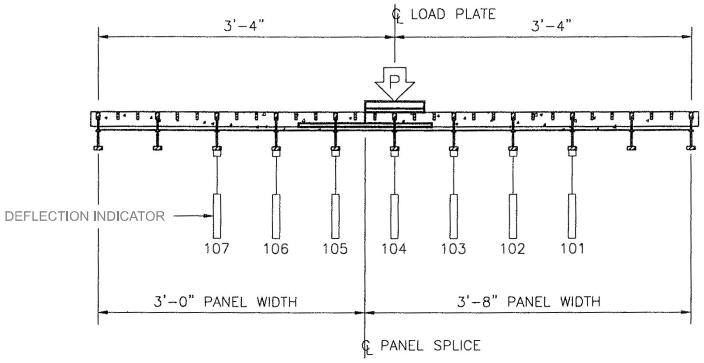


Deflection indicators under panel



Legend
- 101
- 102
- 103
- 104
- 105
- 106
- 107

Note: Gauges 103 and 104 show the same displacements after 56 and 48 kips respectively, indicating malfunctioning gauges. Actual displacements increased.



Detail of indicator locations

The complete test report with all text, graphics, pictures, and charts can be viewed at *http://www.bgfma.org/resources/pdf/reports/SplicRpt.pdf*

REFERENCES

Ahmadi, A. K. "Splicing Grid Reinforced Concrete Bridge Deck Panels Without Welding Using Conventional Rebar Methods," Bridge Grid Flooring Manufacturers Association Test Report, 1997

BGFMA
www.bgfma.org

Bridge Grid Flooring Manufacturers Association

(724) 355-1878

BGFMA@BGFMA.org