OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

August 8, 1962

To: E. A. Finney, Director
Research Laboratory Division

From: M. G. Brown, Chemical Engineer
Concrete Unit

Subject: Houghton-Hancock Lift Bridge Deck Leakage, B01 of 31012.
Research Project R-62 B-66. Report No. R-394.

The following is a summary of an inspection trip of the subject bridge project made July 26, 1962. This inspection was approved by W. W. McLaughlin in accordance with H. J. Rathfoot's request of July 13, 1962. The inspection was made by R. F. Rosatti, District Maintenance Engineer, J. Badaluco from the Office of Maintenance, and the writer.

The purpose of this inspection was to examine the left span section (Span No. 6) for leakage and to prepare recommendations for corrective measures. It was reported that leakage was occurring along the gutter line and median strip due to physical conditions built into the span structure.

Because of the lift span design a gap exists along the bottom of the 8-inch steel curb and the 4 1/4 inch thick, concrete filled, steel grid deck. Figure 1 shows that the steel curb of the median is welded to each transverse steel bar in the bridge deck with a gap for leakage between welds of from 1/8 to 1/4 inch high and about 5 inches long. Both outside curbs, however, are not welded to the transverse steel bars although it was called for on the plans (see Figure 2). The gap under the outside steel curbs varies up to as much as 3/8 inch.

Because of this leakage under the steel curbing a large amount of the deck drainage does not run to 12 small drain castings near each end, but filters down under the median strip and outside curbs onto the center stringers or onto steel members under the outside curbs. Figures 3 and 4 are typical of the corrosion along the center stringers, mainly along the top flange on the under side of the top deck. In places, the corrosion is extending transversely along the bottom of the I-beam sections of the 4 1/4 inch concrete filled steel deck. There also appears to be numerous areas where leakage is coming directly down through the filled deck and corroding the bottom of the transverse grid members.

Figure 5 was taken on the south end of the lift span where approximately the first 12 feet of both 26-foot roadways has scaled down to a depth of 1/8 inch or so. This appears to be an area of two complete pours.

Figure 6 is typical of transverse cracking in the 2 inch, concrete filled, steel T-grid sidewalk throughout the lift span. There is a considerable amount of this cracking in both the upper and lower deck sidewalks which are of the same type construction.

Several areas of scaled and abraded concrete exist in the approach pavement at both the north and south ends of the bridge spans. Figures 7 and 8 were taken of the worst area at each end of the bridge. These areas are mainly in turning lanes and at the edges or ends of pours. It is very probable that these pours were those done in October and November of 1960 using 7 sacks of cement per cubic yard of concrete and straw curing. Salt applications undoubtedly soon followed when the project was opened to traffic in December 1960.

Following is a listing of our recommended treatments and material estimates to correct the leakage and deterioration problems on the lift span and to restore the abraded areas in the approach pavement. They are listed in order of priority as evaluated by Messrs. Rosatti, Badaluco, and the writer.

1. Filling of Curb Joint, 1040 feet

The area along the base of steel curbs should be thoroughly cleaned and dried by sand blasting and blowing out. Outside curbs should be welded to every second or third transverse deck bar if there is no particular reason for leaving them unwelded. The joint should be primed 1 inch each side of the gap with Guardkote 140, brush applied. A fillet of Guardkote 140, Flow Resistant grade, or Guardkote 140 mortar, can then be applied with caulking gun or narrow trowel to a 3/4 inch wideth. This will require about 2 gallons of Guardkote 140 and 27 gallons of Guardkote 140 FR. If Guardkote 140 mortar is used it would require about 9 gal of the 140 filled with dry sand blast sand (30-100 mesh).

2. Sealing of Lift Deck Roadways, 1502 sq yds

After the curb joint is sealed the roadways can be cleaned with a dilute muriatic acid etch. Some light chipping may be necessary in the scaled south portion. The deck should be thoroughly flushed with water and dried. Guardkote 140 should then be applied, by a two component spray machine only, at a rate of 3 lbs per sq yd. The south portion of the deck, about 69 sq yds, will require at least twice this amount. A crushed quartz, 12-30 mesh, is then mechanically applied at 12 to 15 lbs per sq yd. This will require about 4720 pounds of Guardkote 140 and 22,500 pounds of 12-30 mesh quartz.

3. Sealing of Top Deck Walks, 437 sq yds

The walks should be lightly sand blasted, flushed with water, and dried. Guardkote 140 should then be applied at 2 lbs per sq yd by hand spray and 12-30 mesh quartz

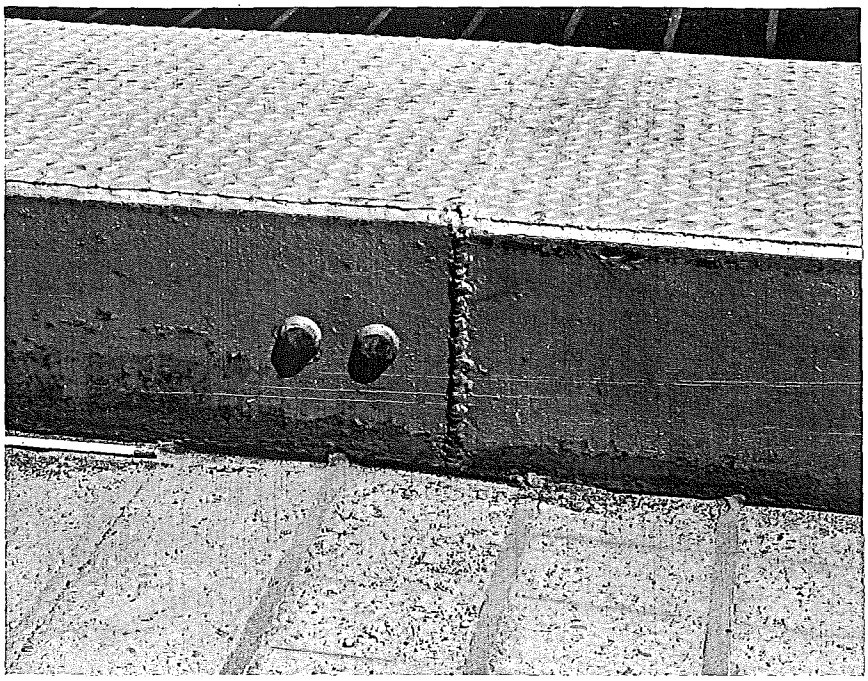


Figure 1. Median curb showing welds on transverse steel and gap along bottom between curb and deck.

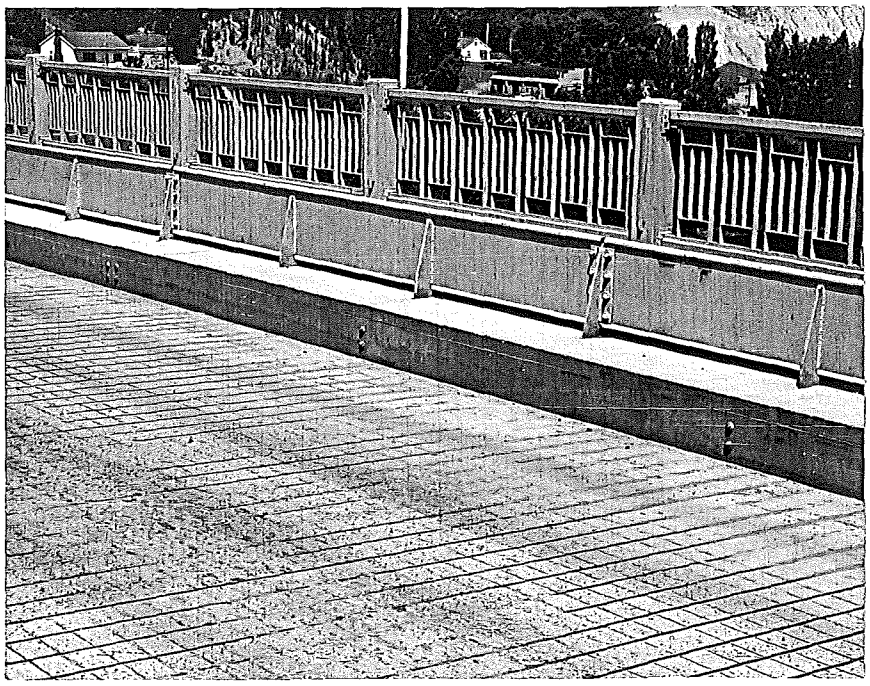
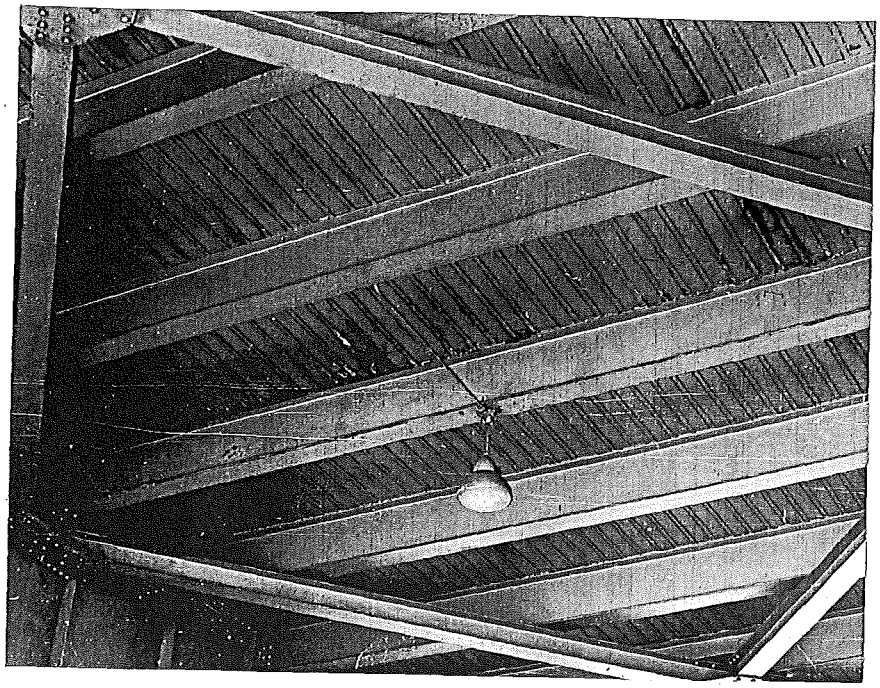


Figure 2. Outside curb showing no welds to roadway bars and variable gap between curb and deck.



Figures 3 and 4. Two adjacent bays showing deck leakage, dark areas, causing corrosion along top of center stringer (supporting light fixture).

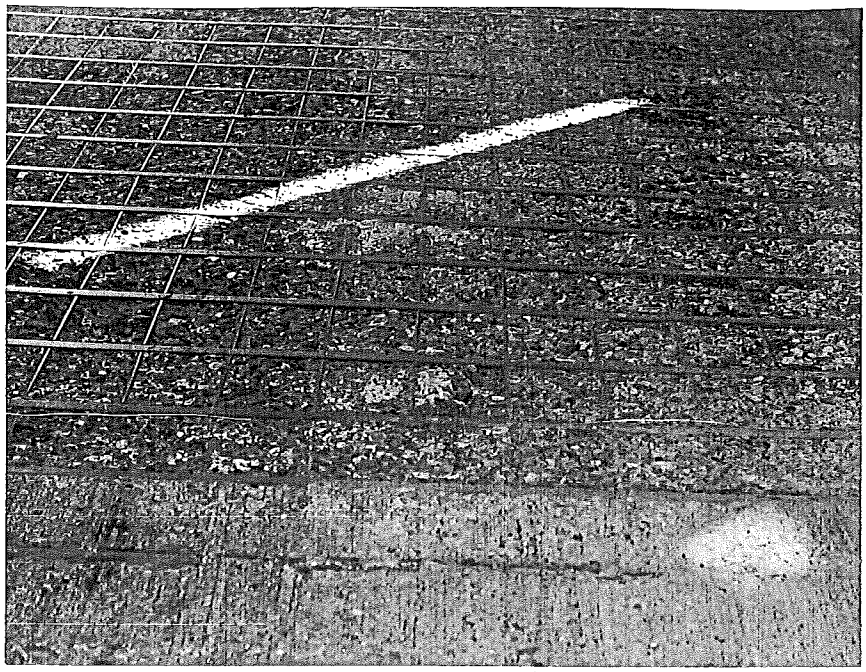


Figure 5. Scaled and abraded area at south end of lift span.

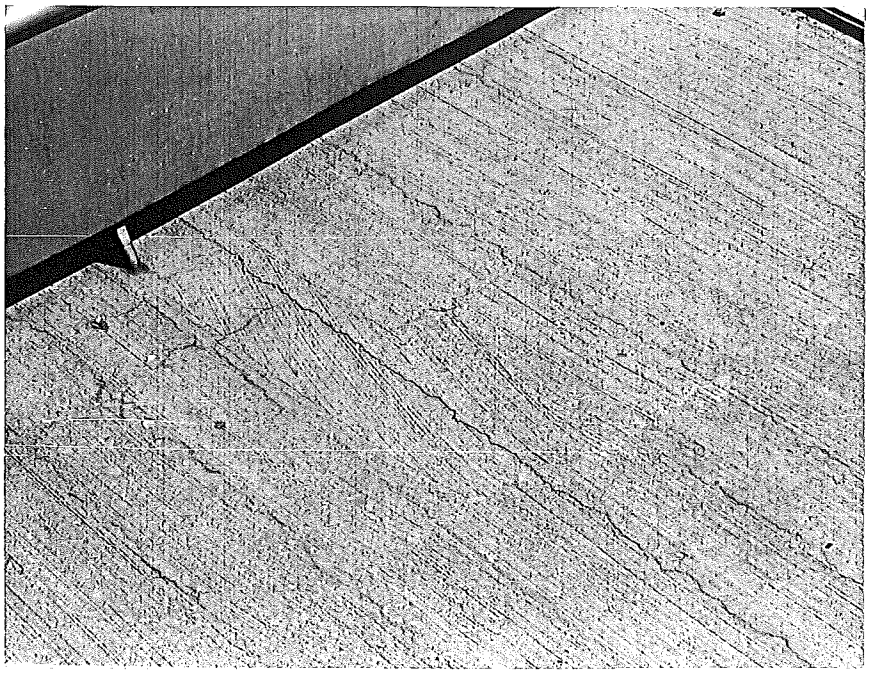


Figure 6. Concrete filled, steel T-grid walk showing typical crack pattern.