

OFFICE MEMORANDUM



MICHIGAN
STATE HIGHWAY DEPARTMENT

October 18, 1965

To: W. W. McLaughlin
Testing & Research Engineer

From: E. A. Finney

Subject: Grade Separation Carrying Eight Mile Road over the Couzens Expressway (I 696). Research Project 62 G-122. Research Report No. R-557.

In accordance with your request of September 3, 1965, W. L. Frederick and A. J. Permoda inspected reappearing staining on grade separation piers on September 14, with C. E. Christensen of the Metropolitan District Office. Reappearance of this staining was the subject of a letter of complaint from the Bureau of Public Roads to H. E. Hill, dated August 23, 1965. The Laboratory's inspection showed development of the following condition, since the original cleaning on force account completed on July 5, 1965:

1. Lower level bridge piers show almost no staining, although retaining walls supporting the upper level bridge show some staining.
2. Upper level bridge piers show staining, generally a little worse under the fascia beams. South and north fascia areas show about equal staining. Varying staining appears on piers under interior beams. Since deck joints are not over piers, leakage from that source did not cause the existing staining, which must be due to a bleed-back from pores in the concrete since the original cleaning.
3. The inspectors report that current staining was "short of presenting a shoddy appearance." Several slides taken during the inspection are being processed as color prints and will soon be available.

After the inspection, W. L. Frederick conducted a study of chemical iron stain removers, including the following:

1. A solution of 1 part Erustosol in 2 parts water was applied and scrubbed in with a medium-stiff-bristle brush, allowed to stand for 1 minute, and then rinsed and scrubbed off with water. A second application before final rinsing was most effective.
 - a. 1 part of sodium citrate was dissolved in 6 parts and 12 parts of this Erustosol solution before application, but was of doubtful value.

W. W. McLaughlin

- 2 -

October 18, 1965

b. Scrubbing the concrete with a 10-percent sodium citrate solution after the Erustosol treatment did not improve results.

2. A 10-percent solution of sodium citrate in 10-percent hydrochloric acid was found to be very slow-acting.

3. After cleaning with Erustosol, a slight amount of staining recurred from iron salts left in pores of the concrete. This was treated with a solution of 1 part of sodium citrate in 6 parts of water, mixed with an equal volume of glycerine. This liquid was mixed with whiting to form a stiff paste that was troweled onto the concrete. After 2-1/2 days the paste was scrubbed off with water. The stain was reduced to a barely detectable level.

Affirming previous Detroit tests, the following cleaning procedure is most effective in removing the stain, although a very light tan color may recur:

Apply a solution of 1 part Erustosol in 2 parts of water and scrub the concrete with a medium stiff brush. Equal volumes of Erustosol and water may be used for serious stains or to increase the speed of action. The bristles of the brush should be flexible enough to reach into irregularities in the concrete surface. Allow the solution to act for 1 minute after scrubbing it on; then scrub the surface while flushing with water. All water used must be non-staining. Repeat the treatment and thoroughly scrub and flush the surface with water again. Workmen must wear protective gear to prevent skin contact with the Erustosol solution.

If any minor recurrence that is noted is objectionable, the paste containing sodium citrate as described in Item 3 should be applied by trowel or brushed on as a heavy coat of whitewash. After this has dried (within a few days) it can easily be scrubbed off with water. The concrete should then be thoroughly flushed with water. This can be repeated until the desired result is obtained.

Comments on Future Bridges of This Type

Several staining preventives might be considered:

1. Covering entire pier caps with temporary plastic sheeting.
2. Applying yellow paint to pier caps after decking.
3. Adding yellow colorant to pier cap concrete.
4. Applying colorless sealer before setting beams, permitting easy removal of staining.

W. W. McLaughlin

- 3 -

October 18, 1965

5. Pre-weathering steel at the fabricators before setting on piers, and/or decking shortly after steel is set on piers.

OFFICE OF TESTING AND RESEARCH


E. A. Finney, Director
Research Laboratory Division

EAF:AJP:WLF:nw

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MICHIGAN

STATE HIGHWAY DEPARTMENT

October 26, 1965

To: W. W. McLaughlin
Testing & Research Engineer

From: E. A. Finney

Subject: Grade Separation Carrying Eight Mile Road over Couzens Expressway. Research Project 62 G-122. Supplement to Research Report No. R-557.

Transmitted herewith are color photographs showing the current appearance (September 14, 1965) of grade separation piers, as discussed in Research Report No. R-557, dated October 18, 1965.

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director
Research Laboratory Division

EAF:ADE:nw



South view of east piers (Eight Mile Road grade separation over I 696).



South view of east retaining wall piers (I 696 under Eight Mile Road).



Central pier of lower level grade separation, with almost no staining (Eight Mile Road over I 696).