

MICHIGAN
STATE HIGHWAY DEPARTMENT
G. Donald Kennedy
State Highway Commissioner

COMMENTS ON CONCRETE SCALING STUDIES

By

J.W. Kushing

Research Laboratory
Testing and Research Division
Report No. 24
December 10, 1941

12-10-11 295

LANSING, Dec. -- Eventual elimination of virtually all scaling, the "scourge" of highway builders, from Michigan highways was predicted today by State Highway Commissioner, G. Donald Kennedy.

Kennedy's assertion came following completion of the first year's tests on Michigan's experimental highway, an 18-mile section of M-115 built last year between US-10 and M-66, in Clare and Osceola Counties.

The Michigan test road is divided into two projects, one for the study of principles of concrete pavement design, and the other for the study of factors pertaining to durability of concrete pavements, particularly in regard to scaling.

"While several years must elapse before definite findings can be determined relative to design features," Kennedy explained, "we have already obtained encouraging results from tests conducted on the durability section."

Prior to building the "test" road, Kennedy explained that a preliminary survey of all concrete pavements in Michigan revealed approximately 10 percent of the surface scaled in varying degrees.

Said Kennedy:

"In addition to its unsightliness, the necessary subsequent maintenance and the added possibility of further deterioration of the highway as the result of scaling is of immediate concern to the state highway department. If we can eliminate scaling from concrete highways, we will save the state huge sums in future maintenance costs of our highways."

Since action of "salts" on concrete pavement was found to be one of the major contributing factors to scaling, highway engineers debated

as to whether ice control and methods now used should direct the basis of the investigation, or whether new methods of ice control should be developed. "It was decided," said Kennedy, "that the most logical attitude to take is that the use of 'salts' for ice removal is the cheapest and most efficient method we know and that the problem should be one concerned with what to do about the concrete to prevent scaling."

As increased traffic in recent years demanded Michigan's highways be kept open 365 days a year, the state highway department pioneered in the development of ice removal methods. Abrasives, chloride salts, serrated blades and other methods have been used to control slippery conditions of pavements with satisfactory results.

"However," said Kennedy, "as an effect of the use of a considerable amount of salts in the control program an increased amount of scaling was noticed on the concrete slabs."

Consequently, a study of scaling, its causes and methods for prevention was incorporated into the plans of the research division of the state highway department.

As a part of this study, a portion of the test road project was built to assist in the further study of factors contributing to scaling as well as to study preventative measures.

Working toward the perfect concrete mix, various materials and methods of construction, such as proportioning and grading of aggregate, physical and chemical additives, cement blends, cements produced with grinding aids, curing methods and final finishing methods were all incorporated in various sections of the "test" road.

And as a result of accelerated tests conducted during the first year, Kennedy declared certain sections to date had remained entirely free from scaling. "This is most encouraging," Kennedy said, "as ordinarily a considerable amount of scaling appears while the pavement is comparatively new."

The Commissioner was reluctant to reveal any details of construction or ingredients used on the scale-free sections, pending further tests this winter. "The results of the first year's tests," he added, "although very encouraging, have not warranted the acceptance of such materials on a general specification basis.

"In some cases, laboratory findings in freezing and thawing tests are not in agreement with findings in the field, and further, studies on the chemical action of 'salts' on the constituents of concrete create certain reservations in the mind of the investigator as regards such findings."

Kennedy did admit, however, that in reference to the various organic admixtures which showed satisfactory resistance, it could be pointed out that in construction operations those admixtures which could be added right at the mixer rather than ground in the cement had been found to be more desirable.

"It is proposed to carry on these tests for several years," Kennedy said, "to determine what effect age has on the ability of concrete to resist freezing, thawing and ice removal treatments."

Kennedy explained that while results obtained from the test road so far were only part of the solution to the problem and subject to change by future findings they represented the first step in a scientific program designed to save Michigan millions of dollars in its future road-building programs.