

SURVEY OF PAVEMENT JOINT CONDITIONS



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**TESTING AND RESEARCH DIVISION  
RESEARCH LABORATORY SECTION**

SURVEY OF PAVEMENT JOINT CONDITIONS

L. T. Oehler

Research Laboratory Section  
Testing and Research Division  
Research Project 39 F-7(14)  
Research Report No. R 789

Michigan State Highway Commission  
Charles H. Hewitt, Chairman; Louis A. Fisher, Vice-Chairman  
Claude J. Tobin; E. V. Erickson; Henrik E. Stafseth, Director  
Lansing, October 1971

# OFFICE MEMORANDUM



MICHIGAN

DEPARTMENT OF STATE HIGHWAYS

October 8, 1971

To: Max N. Clyde  
Engineer of Testing and Research

From: L. T. Oehler

Subject: Survey of Pavement Joint Conditions.  
Research Project 39 F-7(14). Research Report No. R-789.

Four specific questions were raised under Item 3--"Expansion Joints and Joint Spacing"--at the September Pavement Selection Committee meeting. These four questions in total call for an objective re-examination of our present concrete pavement design practice, including performance of previously constructed pavements and the effect of more recent design changes on pavement performance. Unfortunately, when pavement performance problems become noticeable, particularly joint problems, the time for preventive maintenance has past. Most aspects of pavement performance require approximately 10 years of service in order to discriminate between good and poor performance. However, reacting to this information would ordinarily mean a 10 year delay in pavement design changes. In order to speed up the evaluation process on joint performance we have been taking pavement cores through the joint to determine the condition of the joint interface. Our current joint blow-up problems result from salt deterioration of the joint interface until there is only a small area just below the joint groove to resist compressive pressure and the pavement blow-up occurs.

Research Report No. R-582, June 1966, showed that the base plate was contributing to this decay of the joint interface by trapping the salty liquids which were penetrating the joint groove and deteriorating the concrete for approximately the width of the base plate.

Currently we have three relatively recent changes in design which require evaluation. These are:

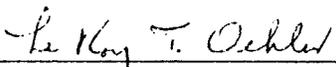
1. Change from hot-pour rubber-asphalt to neoprene seals. The first experimental neoprene seal was placed in 1962. However, it was not designed for the installation (seal was undersized and groove was formed for a hot-pour seal). The first neoprene seal which was engineered for the job was installed in 1964.
2. Improvement in joint groove construction with neoprene seal: sawing grooves rather than forming (1966).
3. The elimination of the base plates (1967).

The cores shown in the attached photographs were taken to evaluate the effect of these changes in design. Cracking of the cores does not indicate deterioration but was due to breakage which occurred in obtaining the cores. However, the missing concrete from the cores (shown below the black lines marking the full depth of the pavement) was caused by deterioration and this concrete could be removed from the core hole only in deteriorated pieces.

In summary, these conclusions can be drawn from the limited coring done to date:

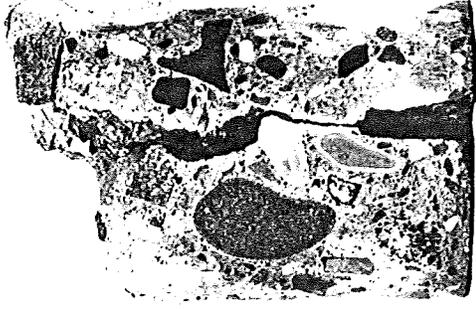
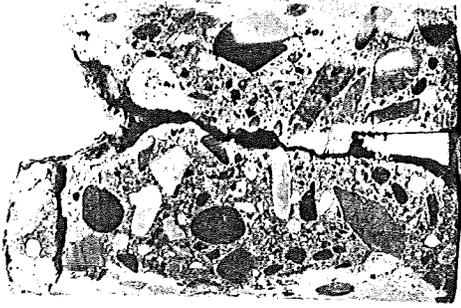
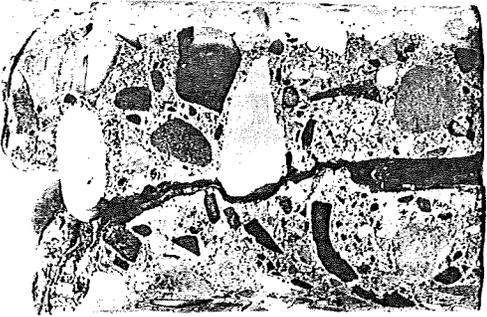
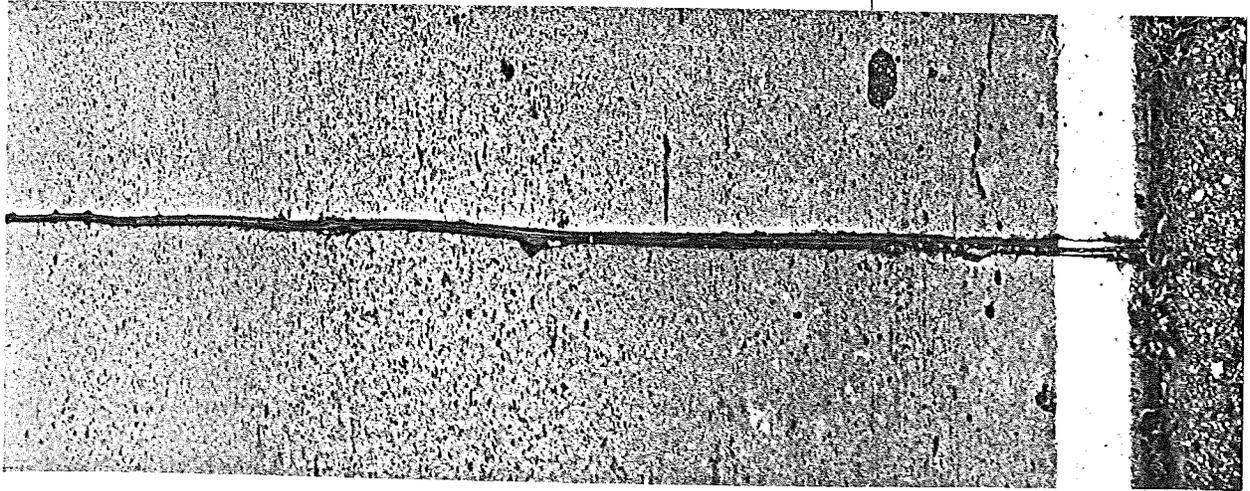
1. The oldest neoprene sealed joints (1962), even with an undersized neoprene seal, show a reduced rate of concrete deterioration at the interface as compared to hot-pour sealed joints of the same age. We may expect a few more years of service prior to serious joint problems but not an elimination of the problem.
2. The neoprene seals in formed joint grooves and with a base plate (seven years of service) have a limited amount of concrete deterioration.
3. The neoprene seals in sawed joint grooves and without a joint base plate, while only four years old, show no deterioration to date. While this is our current design, the time of four years is short for complete reassurance. One of the three cores, however, under the same conditions except that a base plate was used, shows a fair amount of deterioration at the end of four years.
4. The more recent design changes appear to be reducing the amount of concrete deterioration at the joint interface and thus should also reduce the future pavement joint blow-up problem. While each change made appears to improve the situation it will take additional service time for a more definite assessment of the magnitude of this improvement.

TESTING AND RESEARCH DIVISION

  
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Engineer of Research  
Research Laboratory Section

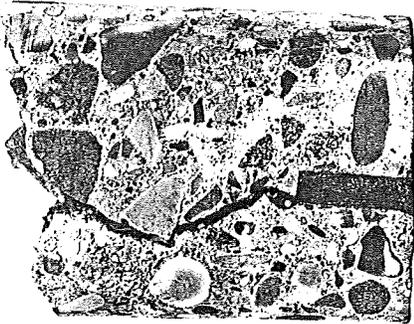
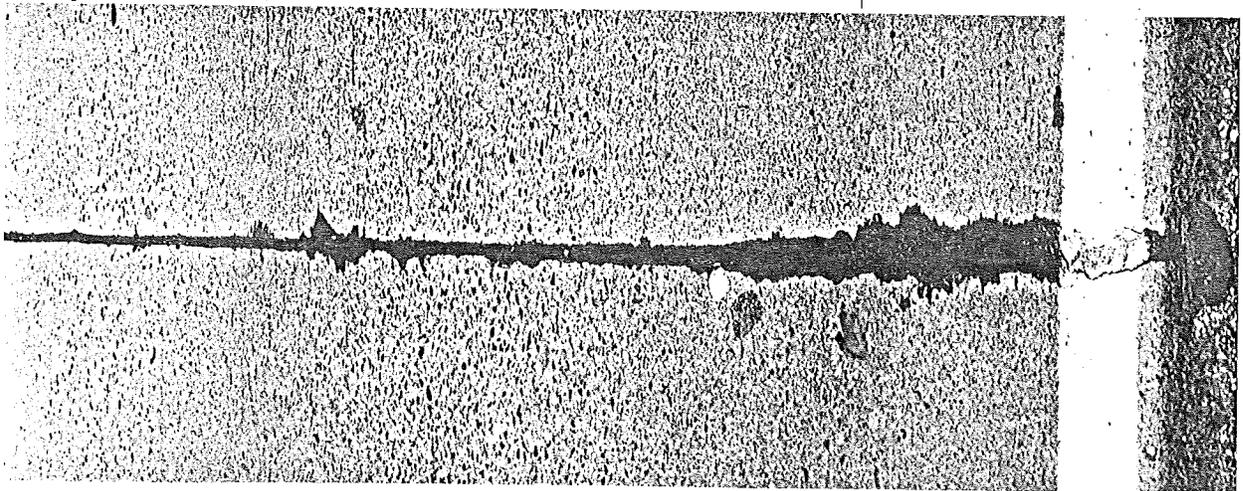
LTO:bf

PICTORIAL SURVEY OF PAVEMENT JOINT CONDITIONS



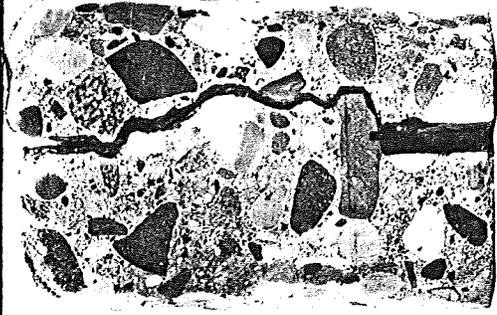
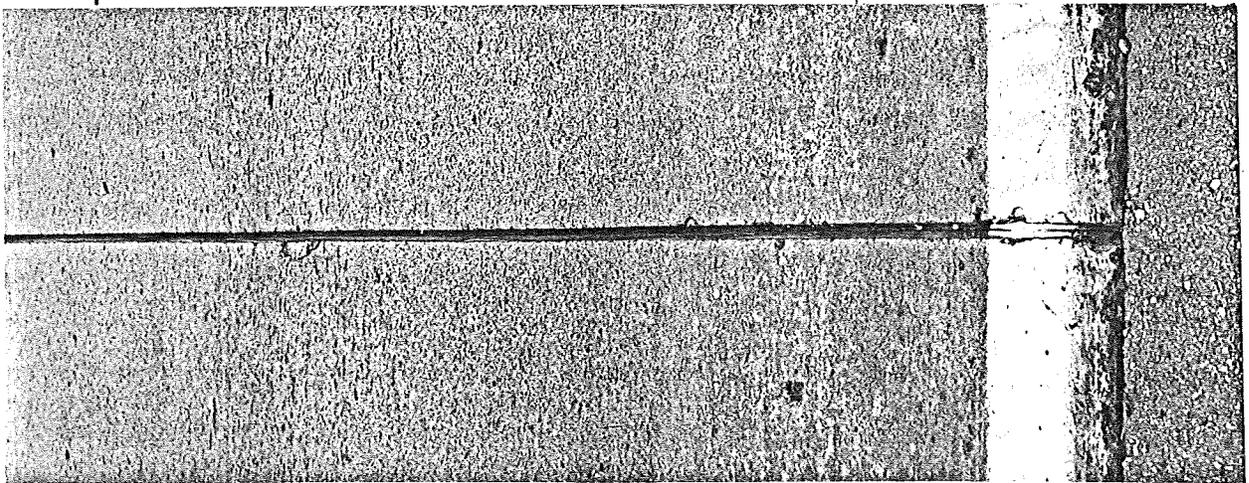
I96 LANSING  
9 YEAR OLD PAVEMENT  
BASEPLATE - FORMED GROOVE  
NEOPRENE SEAL (UNDERSIZE)

◀ Typical condition of joint prior to coring.



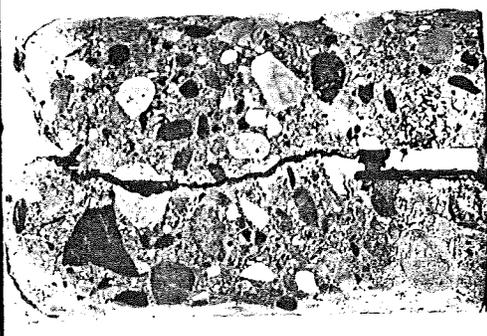
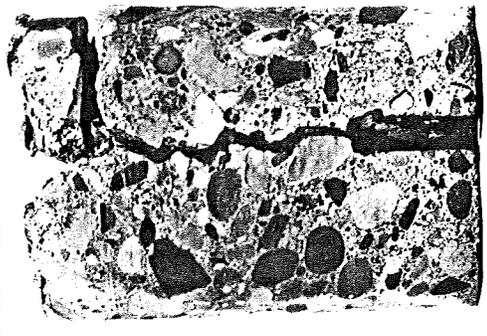
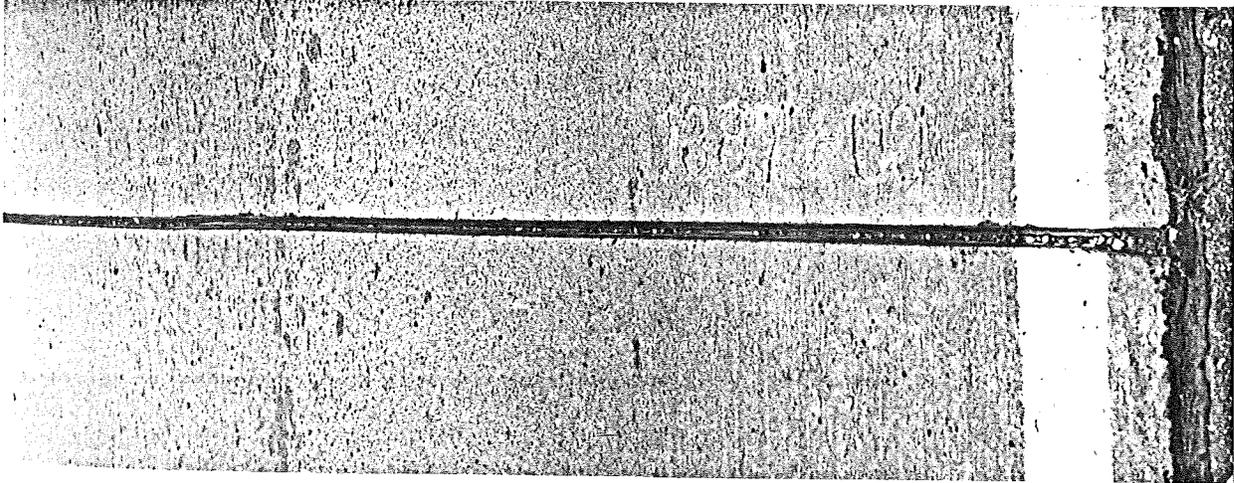
I96 LANSING  
9 YEAR OLD PAVEMENT  
BASEPLATE - FORMED GROOVE  
HOT-POURED RUBBER ASPHALT SEAL

◀ Typical condition of joint prior to coring.



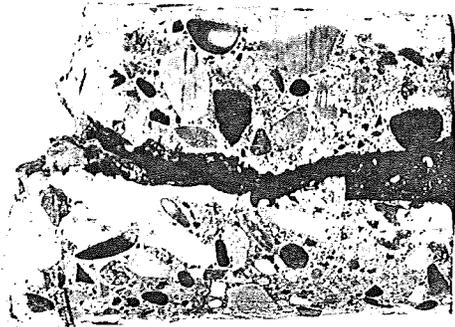
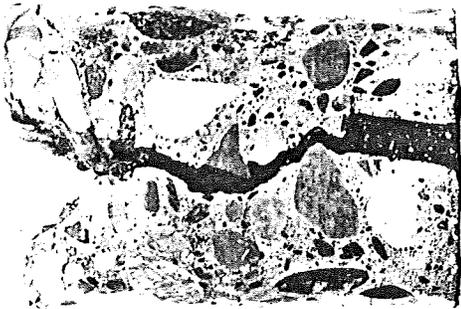
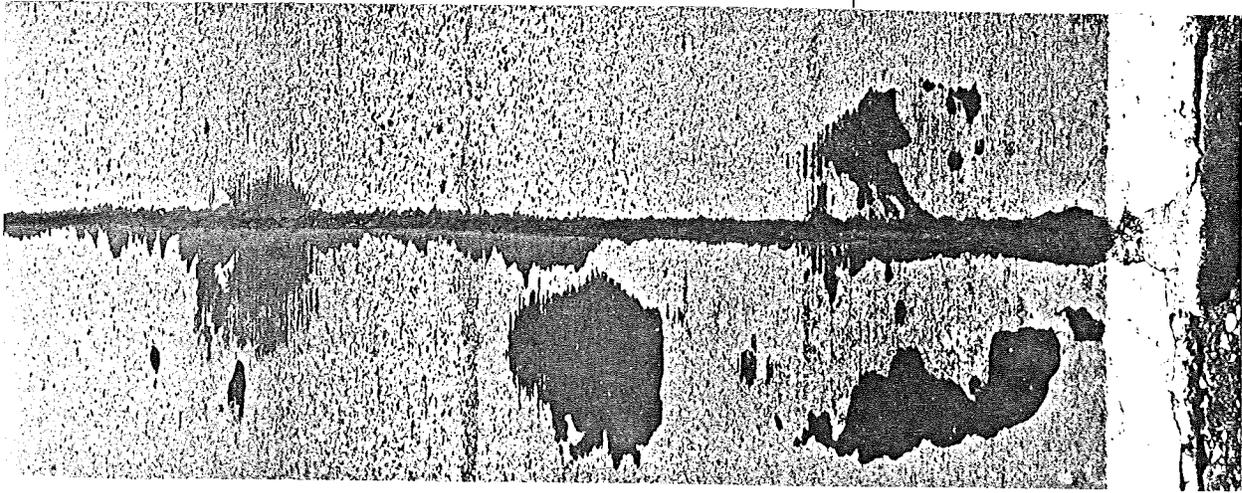
I69 COLDWATER  
4 YEAR OLD PAVEMENT  
NO BASEPLATE - SAWED GROOVE  
NEOPRENE SEAL

◀ Typical condition of joint prior to coring.



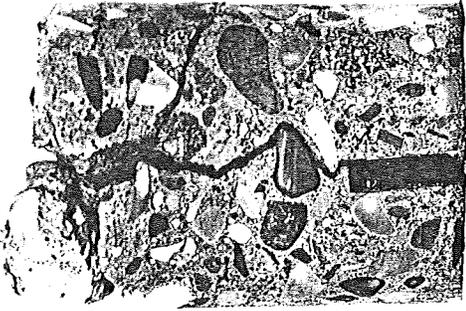
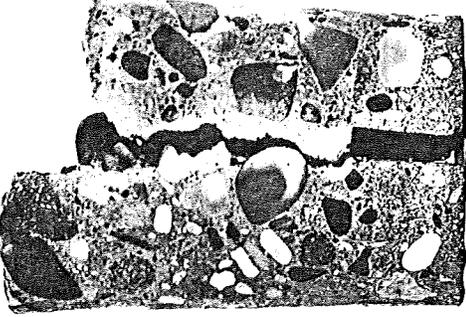
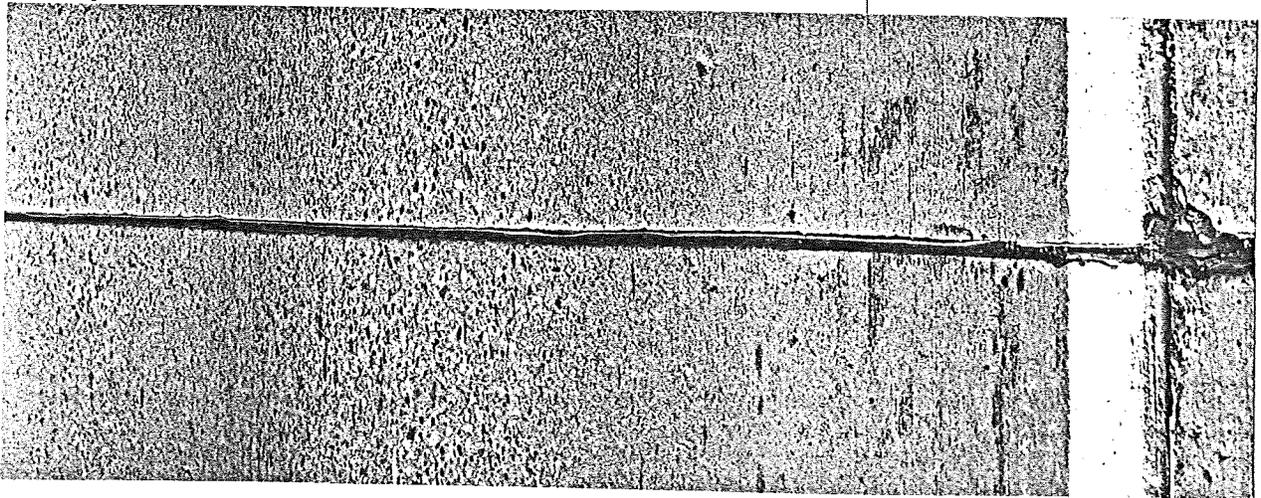
I69 COLDWATER  
4 YEAR OLD PAVEMENT  
BASEPLATE - SAWED GROOVE  
NEOPRENE SEAL

◀ Typical condition of joint prior to coring.



I 196 GRAND RAPIDS  
7 YEAR OLD PAVEMENT  
BASEPLATE - FORMED GROOVE  
HOT-POURED RUBBER ASPHALT SEAL

Typical condition of joint prior to coring.



I 196 GRAND RAPIDS  
7 YEAR OLD PAVEMENT  
BASEPLATE - FORMED GROOVE  
NEOPRENE SEAL

◀ Typical condition of joint prior to coring.