

MICHIGAN  
STATE HIGHWAY DEPARTMENT  
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State Highway Commissioner

INSPECTION OF CONCRETE PAVEMENTS

IN THE

PROVINCE OF ONTARIO, CANADA

By

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## INSPECTION OF CONCRETE PAVEMENTS

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Several years ago the Ontario Highway Department adopted the policy of constructing concrete pavements with expansion joints spaced at 300 foot intervals. In this design intermediate plans of weakness joints and steel mesh reinforcement are not considered. In general, all of their pavements are poured one lane at a time because of the difficulty in providing reasonable detours for traffic.

In view of the fact that the Michigan State Highway Department is considering long slabs in their postwar construction program, it was believed worth while to observe the behavior of these 300 foot slabs in Canada. Consequently, on May 1 and 2 an inspection trip was made over several typical projects by Messrs. H. F. Eye, G. W. Tiedeman, Homer Cash and E. A. Finney. A resume of their observations follows.

### Pavement Design

On all of the concrete pavements inspected the pavement design followed this general pattern:

1. Single lane construction was used in all cases.
2. No special emphasis was placed on subgrade construction.

The pavements are laid on existing soil. Drainage conditions were questionable in many cases.

3. Pavement thickness is 9" - 7" - 9".
4. Expansion joints were placed at 300 foot intervals. Filler material consists of 3/4" wood boards with grain horizontal.

5. The slabs were not reinforced and load transfer devices at expansion joints were not employed.

6. Plans of weakness joints between expansion joints were omitted.

7. A keyway was provided at all longitudinal joints but no tie bars were inserted to hold the adjacent slabs together.

#### Observations

The first project to be observed was located on Route 40 in Ontario, south of Sarnia. This project was completed in the fall of 1943. Several interesting things were noted:

1. As illustrated in figure 1-B transverse cracking of the slabs was not the same in both lanes. The east lane was laid in August, 1943, the west lane in October 1943. In the west lane there were 2-3 cracks per 300 foot slab, while in the east lane the cracks averaged 5-6 for the same distance.

2. Typical condition of expansion joints may be observed in figure 2. This particular joint was 1-1/2 inches wide at surface. The 3/4 inch board filler was loose in the joint.

3. A construction joint approximately midway between expansion joints was observed to be open approximately 3/8 inch, see figure 3.

4. The width of crack opening varied with the number of cracks in each slab. The crack illustrated in figure 4 is approximately 1/8 inch wide which is typical of the crack opening in slabs containing several cracks per 300 feet. The crack openings were considerably wider in cases where only one or two cracks were observed per 300 foot slab length. See figure 5.

5. An interesting phenomenon was observed on this particular project. Vinyl resin cement was used throughout the project with the exception of a short section in the west lane, where due to lack of Vinyl resin cement at time of pouring, normal Portland Cement had to be used. The following winter, sand and chloride mixture was applied to both lanes in amounts of 100 pounds of calcium chloride per one yard of sand. As illustrated in figure 6 the lane without Vinyl resin cement (west lane) scaled completely, whereas the adjacent lane containing Vinyl resin cement was entirely free of scale.

6. No unusual blow-up experiences have been encountered with 300 foot expansion joint spacing.

7. The foundation for the pavement on route 40 consisted of sixed clay and gravel embankment. This was the limit of their work to afford a stabilized foundation.

Additional information was gathered from other projects visited. It was observed that the number of cracks per 300 foot slab increase with age. The pavement illustrated in figure 7 is ten years old and the number of cracks per 300 foot slab is approximately 8 to 10. This cracking has not apparently affected the riding qualities of the pavement which are satisfactory at the present time.

A concrete capping project was observed between Chatham and Hamilton. This construction consisted of approximately the same type of section that is used in Michigan with the exception of the fact that joints in the capping section were not placed opposite and over the same location as those of the old pavement. No serious failures were evident since the pavement was not over three years old. However, the surface was unusually rough which they attributed to poor form setting.

When soil type and drainage conditions are unfavorable bad surface failures have resulted. As witnessed on the Queens Highway just east of Hamilton, Ontario, see figure 8, the pavement in certain locations has broken into short slabs 7 to 10 feet in length and under heavy traffic each individual slab created by the cracks has faulted to the extent of 1/2 to 1 inch. This particular pavement is approximately ten years old and was constructed using the design features described at the beginning of the report.

#### Conclusions

The conditions witnessed on the survey are typical of those which may be encountered on highways in the United States when certain well established principles of highway design are violated.

In particular, the survey brought out the importance of giving careful consideration to such features as foundation construction, drainage facilities, weight of reinforcement, slab thickness and joint spacing and design, when long slabs are considered in concrete pavement construction.



A. General view looking north showing general condition of pavement.



B. Same project looking south showing relative cracks in east and west lane.  
West lane 2 to 3 cracks per 300 foot slab  
East lane 5 to 6 cracks per 300 foot slab

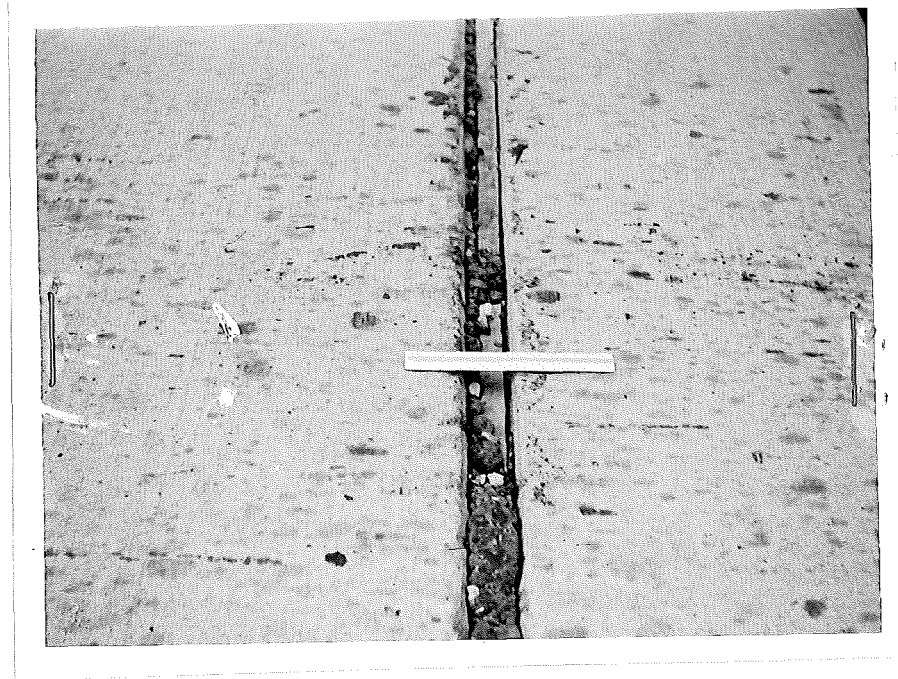


Figure 2. View showing typical condition of Expansion joints.  
3/4" wood board filler, width of joint at top  
1-1/2". Board filler was loose in joint.

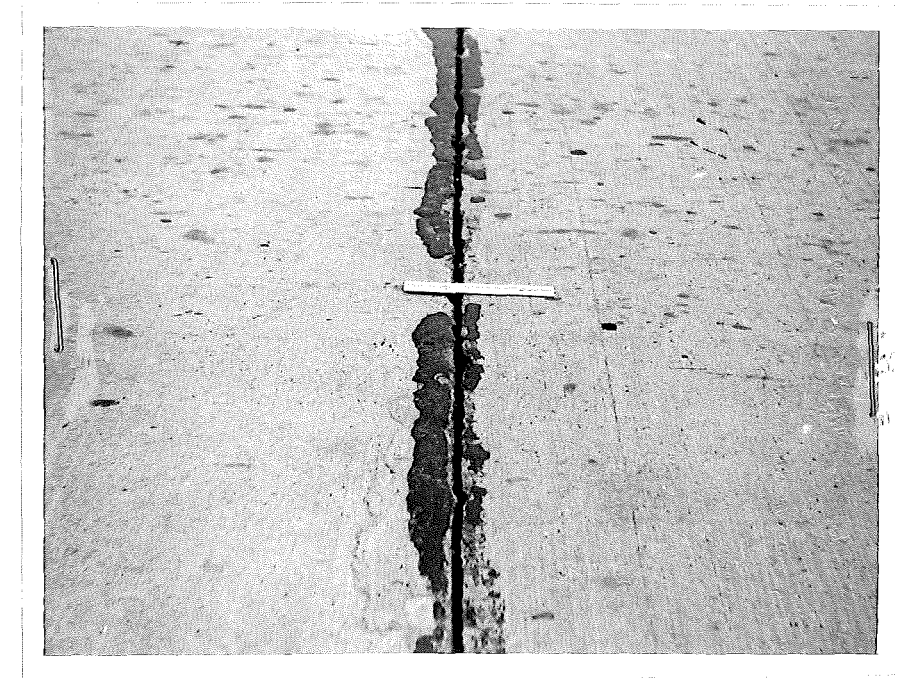


Figure 3. View showing opening of construction joint.  
Width of opening 3/8 inch.



Figure 4. Typical condition of cracks in most slab lengths of 300 feet. Approximate width 1/8 inch.



Figure 5. Typical condition of cracks when only one or two appear per 300 foot slab, approximately 1/8 inch opening.





A. General view looking south showing scaling of the west lane constructed with normal Portland Cement. East lane was constructed with Vinsol resin cement.



B. Close view showing general condition of adjacent sealed and unsealed surfaces.



Figure 7. Typical condition of pavement ten years old with 8 to 10 cracks per 300 foot slab length. Cracks have not been filled which would have made them quite discernable in photograph.



Figure 8. Badly cracked and faulted area on Queens Highway, East of Hamilton, Ontario, looking east. This pavement carries west bound traffic to Hamilton. Faulting as much as 1" was observed in some instances.