

# Pavement Pumping Correlated with Traffic Loads

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## SYNOPSIS\*

This paper reports one of the researches conducted by the Highway Research Laboratories of Purdue University and the State Highway Commission of Indiana. The report supplements previous studies on pavement pumping in Indiana, and the indicated correlation is developed between the increase in the amount of pavement pumping with the number and magnitude of truck loads. The report is divided into two parts: (1) the presentation of data covering the extent and increase of pavement pumping for the period 1940-1947, and (2) an analysis of truck-weight data obtained by the Indiana State Highway Planning Survey for the period 1936-1946. The performance-survey data indicated that the pumping problem was almost nonexistent in Indiana before 1940 and that since this date the amount of pumping has accelerated and that more and more rigid pavements have been and are affected. Approximately 6.0 percent of the rigid pavements were affected by pumping action in 1943; in 1947 the percentage had risen to about 12.0. Even though most of the rigid pavements in Indiana are still in excellent condition structurally, this situation cannot prevail indefinitely when, on the average for the past four years, 60 new miles of pavement pumping per year have developed and only 30 miles per year of pumping pavements were either reconstructed or repaired. The Indiana truck-weight data indicate, for the period 1936 to 1946, that the number of violations of the 18,000-pound-axle-load-law has increased greatly and that the number of trucks with gross loads exceeding 40,000 pounds likewise has increased. It was concluded that much of the pavement pumping has been caused by overloads for the pavement designs employed, which represent a relatively small percentage of the total number of loads, and that strict

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\* Reprints of the complete paper, which appeared in the *Highway Research Board Proceedings*, 1947, may be secured from the Joint Highway Research Project, Purdue University. Since it has been printed already, we are omitting it here in the interest of economy.

enforcement of the present Indiana axle-load and gross-load laws should do much to reduce the number of future rigid pavement failures; also, that research should be initiated immediately to determine the destructive characteristics of repetitive 18,000-pound axle loads as well as different spacing of axles carrying 18,000-pound loads and pavement designs to withstand heavier loads. It should be noted that damage caused by excessive loads to non-rigid pavements and to structures is not included in this report since the failures take a form different from those caused by pumping action. The performance survey data indicate that the increase in the amount and the severity of pavement pumping is becoming increasingly more serious and that drastic measures will need to be taken immediately in order to protect a large portion of the present state highway system which is still in excellent condition.