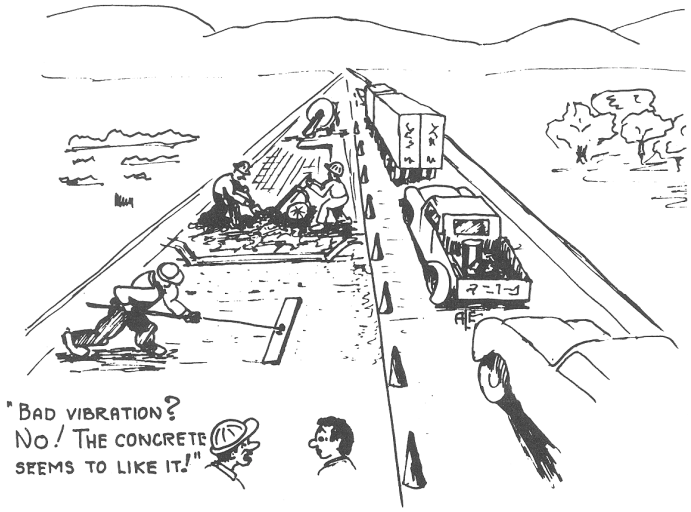
RESEARCH PAYS OFF

Avoiding the Costs of Closures and Detours During Bridge Deck Rehabilitation

Investment in research often pays off by providing a practical solution to a costly problem. The payoff is better yet when research findings indicate that the problem itself either does not exist or is not as severe as anticipated.

Prudence sometimes dictates that engineers take costly steps to deal with potential problems that could be disregarded if better information were available. It now appears that bridge engineers may have one less problem concerning the maintenance of traffic on bridges while concrete is placed in adjacent lanes during deck repairs, overlays, widenings, or replacements. The findings of a recently completed study under the AASHTO-sponsored National Cooperative Highway Research Program (NCHRP) are being used in support of bridge deck repair and rehabilitation procedures that avoid costly bridge closings and detours.

Problem More than 160,000 bridge decks in the United States are seriously deteriorated because of reinforcing steel corrosion that results from penetration of concrete by chlorides from deicing chemicals or a marine environment. Although many decks are repaired and replaced each year, the problem is growing. Because of the uncertainty over the possible detrimental effects on fresh concrete from vibrations caused by traffic in adjacent lanes, bridge deck repair projects frequently involve rerouting traffic.



Roadway closures and off-site detours often result in not only excessive delays to motorists but also strong opposition from local residents, especially when freeway traffic is diverted onto local roads and streets. Temporary median crossovers can sometimes be used to detour traffic within the right-of-way during repair of parallel bridges; but safety considerations require more stringent traffic-control procedures for lane reversals, with the result that traffic-control costs can range between 10 and 20 percent of the total cost of a deck rehabilitation project. Substantial savings, therefore, can be realized when detours and crossovers are avoided and deck repair is carried out while maintaining traffic in adjacent lanes.

Solution In 1980 an NCHRP project panel considered using $250,000 allocated by the AASHTO Select Committee on Research for a study with the following objectives: (a) to determine the effects of traffic-induced vibrations on concrete used in various bridge deck repair and widening procedures, and (b) to identify criteria for materials, design, construction, and traffic control procedures to alleviate any negative effects. After thoroughly evaluating the problem and the small amount of information that was currently available, the panel concluded that it could not be sure that there really was a problem.

In view of the relevant research in progress at the time, including studies by the Georgia and New York State Departments of Transportation and by the Texas Transportation Institute, a decision was made to postpone action on a full-scale NCHRP research project. Instead, the panel decided to spend $25,000 for a study under NCHRP Project 20-5, "Synthesis of Information Related to Highway Problems." The investigator for this study, David G. Manning of the Ministry of Transportation and Communications, Ontario, reviewed research findings, current practices, and experiences relevant to the maintenance of traffic during bridge deck rehabilitation. He contacted a number of highway agencies to gather more detailed information on the field performance of bridge decks that have been restored, patched, or widened in the presence of traffic-induced vibrations.

The conclusion of the final report of this research, *NCHRP Synthesis of Highway Practice 86: Effects of Traffic-Induced Vibrations on Bridge-Deck Repairs*, is that no convincing evidence exists to indicate that the performance of a concrete deck is degraded by traffic-induced vibrations during placement or curing. Accordingly, the practice (now used under certain circumstances by many highway agencies) of allowing traffic in adjacent lanes during bridge repairs can be continued and expanded without unnecessary concern for its effect on the long-term durability of the new concrete.

Manning recommended that no further research be carried out on this question, and the unused portion ($225,000) of the allocated funds was returned to be used for other NCHRP projects.

Applications and Benefits The Minnesota Department of Transportation reported that more than $104,000 was saved in a typical deck-repair project by the elimination of temporary median crossovers on two sets of bridges over minor crossings on Interstate and divided highways. Engineers in the New York State Department of Transportation estimate that by adopting the practices supported by this research, the state will save approximately $3 million each year. Similar savings are projected by the Texas Department of Highways and Public Transportation.

On the basis of present levels of deterioration, the Federal Highway Administration estimates that the cost of needed bridge deck repairs over the next decade might be more than $25 billion. Thus, as these research findings are used to avoid the cost of closures and detours on many of these deck-rehabilitation projects, enormous savings will be realized nationwide.

For further information, contact Dr. David G. Manning, Ontario Ministry of Transportation and Communications, 1201 Wilson Avenue, Downsview, Ontario M3M 1J8 Canada.