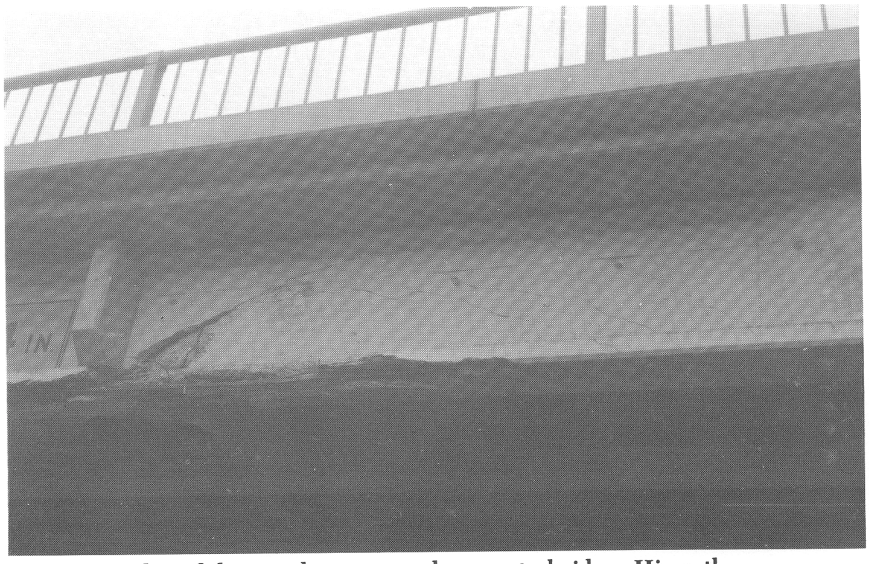
RESEARCH PAYS OFF

NCHRP Study—Methods for In-Place Repair of Damaged Prestressed Concrete Bridges



Exterior girder of damaged prestressed concrete bridge, Hiawatha Valley, Washington.

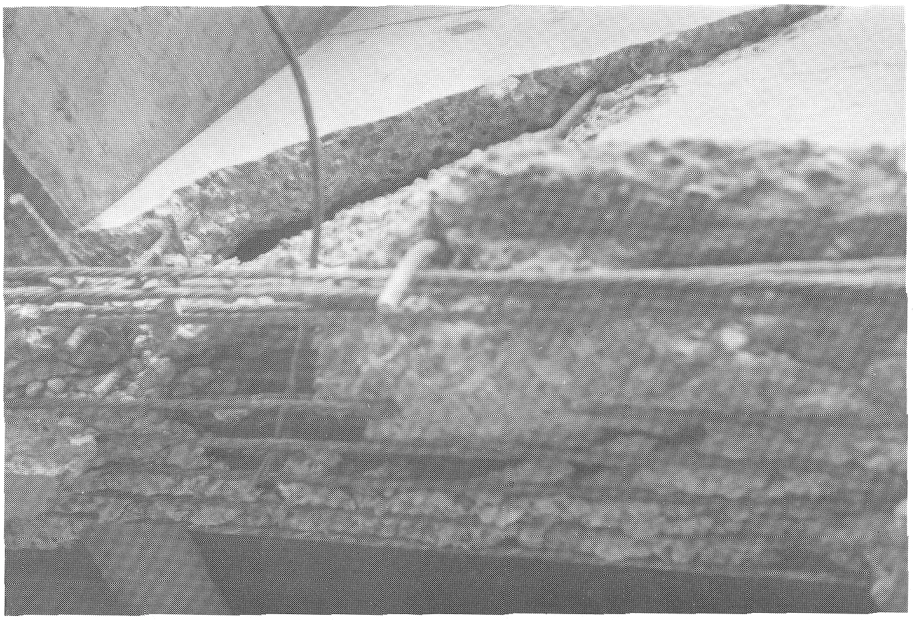
When bridges are damaged by overheight vehicles, highway agencies must quickly repair the damage and the public usually pays for the repairs. A research study recently completed by NCHRP has provided engineers responsible for repairing damaged bridges with some practical guidance.

Problem

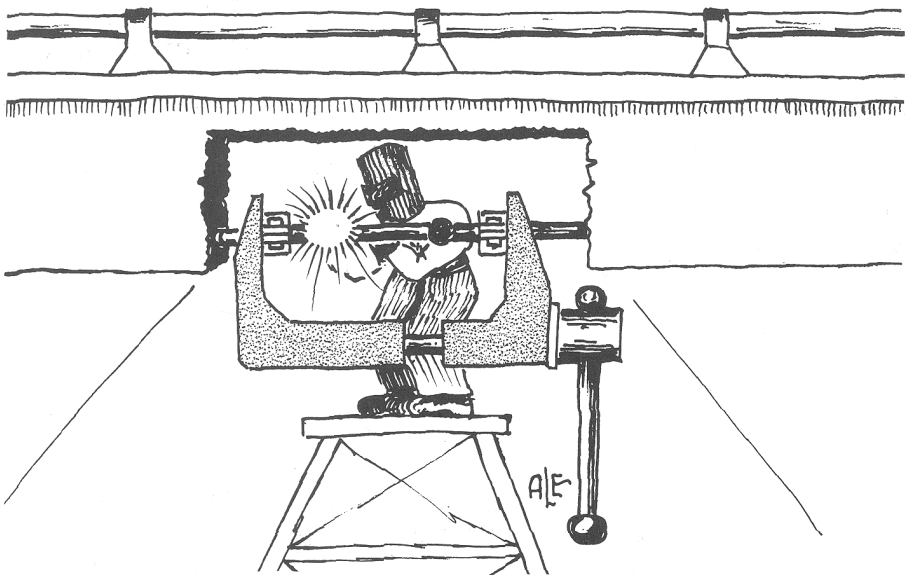
Each year, more than 150 prestressed concrete girders nationwide are damaged by overheight vehicles. Concrete is crushed and reinforcement is sometimes severed. The damage may be highly visible, the bridge could be unsafe, and the need to repair is usually urgent. In the past 25 years, thousands of bridges have been built with prestressed superstructures. Because most of these structures are in good condition and are performing well, many bridge engineers have little experience in repairing prestressed concrete. As a result, damaged girders that could, in many instances, be repaired in place have been removed and replaced with new members at considerable cost.

Solution

In a study recently completed under the AASHTO-sponsored National Cooperative Highway Research Program (NCHRP), consulting engineers George Shanafelt and Willis Horn of Olympia, Washington, evaluated several repair-in-place methods that have been used by individual highway agencies with varying degrees of success. They developed modifications of these procedures, and recommended several methods appropriate for immediate use, which were published in *NCHRP Report 226: Damage Evaluation and Repair Methods for Prestressed Concrete Bridge Members.* In this report, guidance is given on the use of various techniques such as splicing severed cables, internal prestressing, steel-sleeve splicing, patching under preload, and external post-tensioning. In a recently completed second phase of research, the efficacy of the recommended techniques was demonstrated in full-scale laboratory tests. A manual of recommended practice will be published at the end of 1985 as *NCHRP Report 280: Guidelines for Evaluation and Repair of Damaged Prestressed Concrete Bridge Members.* This report will include guidelines for (a) inspection of damage, (b) assessment of damage, (c) selection of repair method, and (d) application of techniques for in-place repair.



Close-up of damaged area.



Splicing and tensioning broken prestressed tendons.

Application and Benefit

Repair methods recommended by the researchers have been used by the Washington, Iowa, and North Carolina departments of transportation, as well as by several other highway agencies, with satisfactory results and substantial cost savings. Moreover, since the publication of *NCHRP Report 226*, interest in repair-in-place has spread to other states. The cost of complete replacement of a damaged girder averages about $50,000, and the cost of repair-in-place is estimated to be about $15,000; thus, the savings realized by applying the results of this research to only 20 percent of the approximately 150 girders damaged each year will amount to more than $1 million.

This NCHRP research study provides an excellent example of the benefits that can be derived by pooling funds for research. Although the problem of accidentally damaged prestressed concrete bridge members most likely is not sufficiently urgent for any one highway agency to justify a separate study, the NCHRP study and its results demonstrate what can be accomplished when 52 highway agencies join in a cooperative research effort. In this case, a relatively small investment was transformed into nationwide annual savings of millions of dollars.

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