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STATEMENT OF

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BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND COMMUNICATIONS

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ON

BRIDGE DECK DETERIORATION

Mr. Chairman and members of the Subcommittee:

We are pleased to be here today to discuss our report to the Congress on "Solving Corrosion Problems of Bridge Surfaces Could Save Billions" which was issued on January 19, 1979. (PSAD 79-10.) Our report discusses the magnitude of the bridge deck deterioration problem facing the Federal Government and the States. It also discusses ways of stopping premature deterioration of bridge decks.

In summary, our report says that:

--Bridge surface deterioration is a serious problem in 32 States, because of increased use of chlorides to melt ice and snow.

--Cost-effective systems are available to protect bridges where contamination has not yet reached the corrosion threshold; but, installation has been limited by lack of both Federal and State funds. There is a potential future savings of almost $3 for every $1 spent to protect these bridges before deterioration takes place.

--Proven systems are not available to protect already heavily contaminated decks. Increased or accelerated research efforts are needed to identify cost-effective systems for stopping further deterioration of these bridge decks.

I will discuss each of these items in more detail.

The Federal Highway Administration estimates that about $6.3 billion is needed to restore Federal-aid highway system bridge decks which are deteriorating prematurely. Instead of providing maintenance-free service for about 40 years as expected, many bridge decks require major repairs within 5 to 10 years, and often must be completely replaced after 15 years.

The major cause of this problem is the increasing use of chlorides to melt ice and snow--a procedure that was begun extensively in the mid-1950s. With repeated applications, the chemicals penetrate the concrete surfaces, eventually causing corrosion of the reinforcing steel and deterioration of the bridge deck.

The problem is naturally most prevalent in the States that get a lot of snow, such as Pennsylvania. We asked each State to complete a questionnaire on the magnitude of the deterioration problem and the protective systems that had been applied. Thirty-two States reported moderate to very major bridge deck problems. These States have about 163,000 of the approximately 236,000 Federal system bridges in the United States. Pennsylvania, for example, has about 22,000 Federal system bridges and reports a major deterioration problem.

Since 1976, the Federal Highway Administration has required States to install protective systems on all new or completely rebuilt bridges in areas where the likelihood of chloride use exists. The problem, therefore, relates to bridges constructed prior to 1976 which do not have protective systems. Many of these bridges can still be protected by use of protective systems now available.

The effectiveness of current protective systems, when installed on existing bridges, depends on how much chloride has already penetrated the concrete. Where the amount of chloride is still below the corrosion threshold (the level at which active corrosion of the reinforcing steel begins), currently available protective systems are effective. When corrosion is already above the threshold level, however, the effectiveness of treatment is questionable.

There are bridge decks that contain either no areas, or only small areas where chloride levels are high enough to cause deterioration. If these bridge decks were protected with one of the systems now used for new construction, significant savings could be realized by avoiding more expensive repairs later. The potential benefit/cost ratio of repairing and protecting an existing bridge deck needing only minor repair, versus completely replacing the deck at a later date, by our calculation, is about 3 to 1. Even so, progress has been slow.

Proven systems are not available to protect already heavily contaminated decks. Most of the existing unprotected bridge decks in the 32 States contain chloride levels above the corrosion threshold. These bridge decks will deteriorate and require premature replacement, unless a means is soon found to halt the deterioration.

The question of whether these physically sound, but chloride-contaminated, bridge decks can be protected to achieve their expected 40-year life, has not been resolved by the Federal Highway Administration. The repair procedure of completely replacing the contaminated portions of the deck is expensive and, as a result, is not being attempted by the States. Numerous techniques have been suggested as possibilities for protecting existing bridge decks from further deterioration. These techniques (which are in various stages of development) include asphalt membranes, concrete overlays, internally sealed concrete, deep polymer impregnation, cathodic protection, and electrochemical removal of chlorides. However, very limited data is available on the effectiveness of these potential protective systems.

We believe that it is time for the Federal Highway Administration to emphasize the development of tools and methods to rapidly and accurately determine the effectiveness of the various protective systems. Time is important. The sooner these issues can be resolved and applied to existing bridge decks, the fewer the decks that will require complete replacement. A program to protect existing contaminated bridge decks instead of completely replacing them could save billions of dollars.

Installation of protective systems on existing bridges has been slow. Replies to our questionnaire by a majority of the 32 States with a serious bridge deterioration problem indicate that lack of Federal and State funds is a major reason why bridge decks are not being protected. The States' bridge replacement funds were earmarked for those bridges that must be replaced. As a result, funds were generally not available to install protective systems on existing bridge decks.

As of 1977, our statistics show that less than 10 percent of existing bridges in 23 of the 32 States reporting serious deterioration problems had protective systems installed. For example, Pennsylvania had installed protective systems on only 46 of its 22,000 bridges during the 18-month period ending October 1977. The States expected little improvement in the near future.

The result of such slow progress will be greater cost in the future. Most States reported that, unless repairs are completed in the next 3 to 5 years, currently salvageable bridge decks will deteriorate to the point of requiring complete replacement at greatly increased costs. For example, a Federal Highway Administration study indicated that, if the 29,000 interstate bridge decks then requiring minor repair

were neglected to the extent that they require moderate repair, the current repair cost of about $600 million would increase by an additional $4.4 billion. These estimates are in 1975 dollars.

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By way of closing I would like to reemphasize the critical need to quickly find an effective protective system for heavily contaminated bridges and to resolve the funding problems at both the Federal and State level. Prompt resolution of these problems is essential so that existing bridge decks can be protected. The alternative--completely replacing the decks later at a cost of billions of dollars more--is not very attractive.

Mr. Chairman and members of the committee, this concludes my statement. We will be glad to respond to any questions you have.