ISSUE: Effectiveness of Waterproofing Systems for Bituminous Overlays on Bridge Decks

SUMMARY OF PROBLEM: New bituminous overlays on bridge decks are no longer common in Illinois. Most new overlays are now rigid concrete overlays. 2,568 bridges in Illinois are currently reported to have bituminous overlays with some kind of waterproofing system. Concerns about long-term waterproofing, durability of the bituminous surface, and difficulty in performing visual inspection of an overlayed deck are reasons that concrete overlays are chosen more often today. Illinois has used sand-coal tar systems, sheet membrane systems, spray-applied waterproofing systems, and a few other experimental and proprietary systems throughout the years. Feedback from bridge maintainers indicates that those systems are not durable enough. No studies currently exist on the useful life of bituminous overlays and waterproofing systems on bridge decks in Illinois. Comprehensive bridge management systems require information on life-cycle performance of bituminous overlays. The concept of "replacement at the right time" is very important to ensure long-term performance of the original deck.

The Illinois Department of Transportation (IDOT) Standard Specifications for waterproofing systems has not been changed or updated in more than 30 years. It may be time to update the specification with acceptable waterproofing alternatives. However, a significant problem is lack of a good method to evaluate waterproofing systems in the field as well as to evaluate proposed waterproofing systems that are coming into the market. An accelerated testing procedure is necessary for evaluating new and existing bituminous overlay systems. Additionally, a decision tool is necessary to help determine when an overlay with or without waterproofing membranes should be replaced.

Some states now use "flame applied" waterproofing systems and claim successful performance. To date, Illinois has not tried this as an alternative. Other alternatives exist as well. Because there is no quick method of assessing performance, the only way to classify success is through long-term monitoring. IDOT cannot afford to wait many years to determine whether it should use a particular product. Therefore, a method to evaluate various waterproofing membrane systems is desired.

Additionally, asphalt technology has changed significantly in the past 30 years. Perhaps there are mix designs that can be easily and economically placed on bridges, properly compacted without damaging bridge elements, and may not even need waterproofing membranes. This technology should be tested and evaluated and possibly incorporated into IDOT's list of approved waterproofing alternatives.
DESIRED RESULTS/OUTCOMES: This research should result in an acceptable method for assessing the current condition of bituminous overlays with and without waterproofing membranes. A simple non-destructive field test method should be developed so that bridge maintenance staff can quickly determine whether the useful life of the system has expired. Additionally, the research should develop accelerated testing procedures that can test new and innovative waterproofing systems so that implementation decisions can be made much quicker than in the past. Using this test procedure, the researchers should evaluate the feasibility for use in Illinois of flame-applied membranes and any other new waterproofing technology. If feasible, adequate generic specifications should be developed for use. The research should also include the development of a repair/replacement matrix to guide decision makers in the proper timing of rehabilitation/replacement of overlay systems. Finally, the research should provide a recommendation on the feasibility of an asphalt mix design that can be used on bridge decks without waterproofing membrane systems. This feasibility should be assessed through the accelerated testing program mentioned above.

ISSUE: Load Rating of Bridges in Illinois

SUMMARY OF PROBLEM: The current American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation, which includes load and resistance factor rating (LRFR) procedures, is based on national data and trends on truck sizes and weights. However, the load factors prescribed by AASHTO may be conservative or may not be representative of the actual trucks (sizes and weights) that typically traverse Illinois highways. Refining the load factors from those prescribed by AASHTO for Illinois bridges through the use of weigh-in-motion data and sophisticated reliability analyses would provide the Illinois Department of Transportation (IDOT) with more accurate and realistic load ratings for its population of about 25,000 state and local bridges.

DESIRED RESULTS/OUTCOMES: Revised load factors for rating of Illinois bridges through use of existing and newly collected weigh-in motion data and reliability analyses.

ISSUE: Determining Whether a Deck with a Microsilica or Latex Concrete Overlay in Place Can Be Overlaid Again

SUMMARY OF PROBLEM: Since the mid 1990s, the Illinois Department of Transportation’s (IDOT) policy has been to place either microsilica or latex concrete overlays on bridge decks. These overlays are starting to fail. Often, the decks are still good condition but the overlay is cracked and delaminated. The decks were milled and scarified (either mechanically or using hydro demolition), so the cover over the reinforcement bars has been reduced. To hydro scarify the deck for a new overlay, all the existing concrete overlay must be removed. Otherwise, the hydro for the new overlay will not remove the bad portion of the deck because the existing overlay acts as a shield, preventing the hydro machine from penetrating the deck. The deck is milled first to remove the concrete overlay before the hydro scarification. The challenge is determining whether enough deck structure remains for a new overlay. If the reinforcement does not have enough cover, the milling machine will hit the top mat of the reinforcement and damage the bars.
DESIRED RESULTS/OUTCOMES: A non-destructive test to evaluate a deck with overlay to determine the thickness of both the concrete overlay and the deck structure and how much cover remains on the bars in the original deck. The research should also develop a set of guidelines to determine when a deck can be overlayed a second time.