INNOVATIVE BRIDGE DESIGN/CONSTRUCTION TECHNIQUES TO EXPEDITE CONSTRUCTION

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Problem

The majority of bridge work done in Ohio consists of deck repair/resurfacing or replacement of existing bridges or bridge decks. Such work often requires lane restrictions or road closures with detours, both of which cause considerable difficulty and additional expense for the traveling public in terms of delays, increased milage and/or increased travel time. Local businesses can also be impacted by lane restrictions or closures which make it inconvenient or impossible for the public to get to the businesses.

Lane restrictions and detours often cost more than just time and money. Construction zones and changes in traffic patterns have always presented safety hazards even under the best conditions.

The danger and inconvenience to the public and businesses could be minimized by rapid repair and/or construction methods. These methods might include prefabricated bridges which the manufactures claim can be erected in a few days, prefabricated bridge decks, changes in concrete bridge sections to eliminate the need to place a separate wearing surface and the use of new materials which require less time for setting and curing than traditional concrete. Since these materials/method utilize newer or better technology, the resulting product might not only allow for faster construction, but might also result in a higher quality final product which would reduce the need for future repairs.

While many methods have been proposed for rapid repair/construction, the feasibility, costs and long term performance of these methods is uncertain. Before trying any means of rapid repair or construction, a survey should be conducted to see what methods are currently available and how they are being used by other states.

For copies of this final report go to http://www.dot.state.oh.us/divplan/research or call 614-644-8173.

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Objectives

The objective of this project would be to conduct a survey to:

1) Determine what methods of rapid repair/construction are currently available for bridges/decks;
2) Determine what materials are available which might allow for faster repair/construction of bridges and decks;
3) Find the extent to which these materials/methods are being used by other transportation agencies (state DOTs, county and city engineers);
4) Determine, to the extent possible, the feasibility, costs, success rates and problems with the identified methods/materials;
5) Issue a report with recommendations on which rapid construction/repair methods and materials would be most useful to ODOT and how these methods and materials could be implemented in the ODOT construction programs.

Description

The following tasks were completed:

1) A literature search and surveys of manufacturers, contractors and state DOTs were conducted to determine which rapid repair/construction methods are available, along with methods which have been successful.
2) An attempt was made to collect cost and feasibility information on each method. Cost information was found to be, generally, unavailable.
3) Sample projects with the most promising expeditious construction techniques and processes were identified.

Conclusions & Recommendations

1) The following methods have been identified as possible methods of reducing the time needed for bridge construction:
   i) Precast substructures.
   ii) Prefabricated composite bridge units.
   iii) Prefabricated superstructure units, such as adjacent boxes, which do not need a separate wearing surface.
   iv) Full depth precast concrete decks.
   v) Stay-in-place concrete or steel forms.
   vi) Completely prefabricated bridges.
   vii) Rapid curing concrete materials.
   Items i - vii have been tried in various states and the results of these trials can be found in an AASHTO Technology Implementation Group (TIG) report at www.ashtotig.org.

2) In order to find additional information on barriers to rapid construction, a survey of contractors was conducted. This survey showed that the main obstacle to fast bridge construction is the forming of the deck. The contractors also indicated that the best way to build bridges faster was to allow the entire bridge to be closed and the reconstruction to occur all at one time.

3) One possible solution to the deck forming problem is the use of stay-in-place steel deck forms. A survey of states showed that approximately 34 states use stay-in-place steel forms for decks. The main concerns about using these forms are the inability to inspect the underside of the deck, trapping moisture between the concrete and the form, deterioration of the form and additional weight due to the flutes in the forms. However, those states which use SIP steel forms contend that all of these concerns can be overcome.

4) An attempt was made to assess the cost of implementation, but as most of these techniques are still in a pilot phase, cost information was not available.

Implementation Potential

The findings of this study are being implemented in another study on rapid construction. A total of 7 pilot projects are part of the new study.