

EVALUATION OF PRECAST BOX CULVERT SYSTEMS

PROBLEM STATEMENT

Frequently, alternatives to the traditional cast-in-place box culvert system are presented to the Department of Transportation for review. Currently, there is no clear-cut procedure for evaluating these systems. The purpose of this research was to investigate the systems being used in Florida and in other states, and to provide recommendations regarding the evaluation and use of precast box culvert systems.

OBJECTIVES

The overall objective of this research was to identify the types and overall performance of precast box culvert systems by surveying the FDOT Districts and other states. The project included a literature review, site and plant inspections, a survey of FDOT Districts, and a survey of the other state DOTs.

FINDINGS AND CONCLUSIONS

Precast box culverts have been around for the last 25 years, but usage has really only picked up in the last 10 years. The use of precast box culverts was prompted by their quick installation time and increased concrete quality when compared to their cast-in-place counterpart. However, as with any new product, problems were encountered during the design, construction, and installation processes. Due to transportation, weight, and lifting requirements, precast sections are limited to 6-8' lengths, requiring numerous joints in every precast box culvert installation. Therefore, most of the installation and performance problems involve the joints. However, most states that reported joint fit-up problems with precast box culverts seem to have resolved their issues and are satisfied with the current construction and installation of their precast box culvert systems.

The knowledge and experience with precast box culverts seems to vary among the states that responded to the survey. A few states, with a high percentage of precast box culverts being installed, maintain design, construction, and installation specifications and standardized details, while others, that can only recall the installation of one precast box culvert in their entire state, have no specifications or details. Because box culverts are not considered bridges, they are not periodically inspected, accurately inventoried, or intensely studied to determine their actual field performance. Furthermore, most states do not have standardized details for precast box culverts. Due to the lack of standardization and limited knowledge of the long-term field performance of precast box culverts, some states may be uncertain and weary of their widespread use. Overall, the states using precast box culverts report no major failures and

believe their precast box culverts to be a good product. Although many believe that the possibility of failure exists, with the proper site investigation, design, construction, installation, and inspection of these precast box culverts, the probability of failure should remain very low.

The results of this study suggest that Florida should continue to construct and install four-sided single and multiple cell precast box culverts; review the plant inspection process; research and approve a joint filler material; continue to completely wrap the top and sides of each joint with filter fabric; develop an inventory tracking database; develop a guideline requiring all final inspections to be visually documented; revise the FDOT Specifications Section 410 (suggested revisions are contained in the project report); and consider the possibility of implementing a set of standard details for single and multiple cell precast box culvert installations. Each of these items is discussed in detail in the project report.

BENEFITS

The results of this project provide recommendations for the evaluation and use of precast box culvert systems. These results will assist project engineers in the review of these systems with the end result being improved long-term performance of the systems.

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