

New Jersey Department of Transportation
Bureau of Research

Technical Brief



Evaluation of Precast Concrete Pavement Systems and Cast-In-Place

Background

Concrete pavements play a crucial role in highway infrastructure, primarily in regions such as New Jersey (NJ) which has high traffic density. Due to trafficking over several years these pavements are deteriorating and in need of repair. Typical full-depth concrete pavement repairs result in long closure times due to concrete placement, texturing, and curing. These closures lead to high traffic congestion and driver discomfort, especially in high car density areas. In an effort to alleviate these issues, technologies have been developed for the purpose of rapid concrete pavement repair. These include Precast Concrete Pavement (PCP) systems and accelerated Cast-In-Place (aCIP) materials. These technologies have shown success in shortening roadway closure times, as well as, remaining structurally intact.

NJDOT has the ability to rehabilitate and open PCC pavements to traffic within a short period of time and minimize road closure effects using the rapid concrete pavement repair methods. This is the case because these rapid concrete pavement repair technologies can be completed overnight (8 to 10 hour window) depending on the amount of repair needed. Currently, the NJDOT has one approved PCP pavement system and a limited number of aCIP materials. Although the approved sets of materials have provided satisfactory performance for their intended uses, consideration of alternative materials would be beneficial. Additionally, more PCC rapid repair technologies could lead to even shorter repair times, greater cost-efficiency, and reduction in traffic congestion. Thus, it is crucial to identify and evaluate rapid PCC pavement rehabilitation technologies. This study aims to address these needs by identifying other PCP and aCIP rapid repair technologies that can potentially be employed in NJ.

Research Objectives and Approach

Therefore, the goal of this project was to evaluate current accelerated concrete pavement rehabilitation technologies for their feasibility and use in NJ. To achieve this goal, a thorough review of the available PCP and aCIP systems were conducted. Additionally, contact was made with other State Highway Agencies (SHAs) that have adopted or developed additional rapid concrete pavement repair systems. Finally, a set of specifications was developed for NJDOT PCP fabrication and installation based on the detailed review and past practices in order to further facilitate the use and expansion of PCP systems in NJ.

Conclusions

Based on review of available rapid concrete pavement repair systems and contact with other SHAs, the following conclusions were drawn:

- Several PCP systems were identified, however, only four PCP systems were considered available for use in NJ.
- The most critical component, based on the observations of SHAs that utilize PCP systems, is the installation of the PCP system.
- Most DOTs that use rapid PCP repairs allow for the acceptance of new PCP technologies through a trial installation procedure. In this, the contractor and system must demonstrate the ability to install precast concrete pavement panels according to the DOT's specification and obtain an adequate Load Transfer Efficiency (LTE).
- Modifications to aCIP materials are available to further improve and adapt for pavement repair.

Recommendations

The following are the recommendations from the study:

- Full-scale evaluation of PCP systems is recommended for validation of the attainable life span of using this rapid concrete pavement repair method.

- Evaluation of various PCP installation procedures (bedding grout material, dowel connections, dowel grout, etc.) to better understand the impact on PCP performance.
- Modification of quick setting patch materials with polyester-polymer and blending of Type I cement with calcium aluminate cement can be explored as a rapid concrete pavement repair material.

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