

**Project Number**

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Accelerated Slab Replacement Using Temporary Precast Panels and Self-Consolidating Concrete

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Slab replacement is the main activity in a concrete pavement rehabilitation project. Slabs are often replaced at night so that traffic lanes are not closed during the day. So the entire process of slab removal and replacement must be completed in one work period. The process begins when a damaged slab is removed, creating a pit. Then, the pit is prepared, and a new slab is poured. Finally, enough time – usually six hours – must be allowed for the slab to harden sufficiently to accommodate daytime traffic. No more slabs can be removed than can be recast in one work period. This severely limits the number of slabs replaced per work period, and contractor productivity on concrete pavement rehabilitation projects is low. The use of rapid setting concrete can reduce setting time and allow for more slab replacements per work period. Unfortunately, this faster setting concrete has a tendency to crack, leading to additional delays and maintenance issues.

Research Objectives

Researchers at Florida State University demonstrated the feasibility of using precast reinforced concrete panels to temporarily fill slab removal pits. The precast slabs can be driven on so traffic lanes can be open during the day, and new slab casting can be postponed, allowing for slabs to be removed during the entire work period. The researchers also developed a self-consolidating concrete (SCC) that speeds up slab replacement by eliminating the need for compaction of the concrete. Use of SCC reduces needs and costs of both labor and equipment.

Project Activities

In the first phase of the project, the precast reinforced concrete panels were designed, and their behavior was modeled using numerical simulations. Modeling was conducted to determine the behavior of slab designs under many loading conditions and especially to determine the potential for microcracking, which would reduce the number of times the slabs could be reused, a factor in their cost-saving potential.

The self-consolidating concrete (SCC) formula was developed and tested under a variety of conditions. The SCC was studied to determine how its formulation could be adjusted for the wide range of Florida temperatures. The SCC had higher than required strength at six hours, which may allow for casting of slabs an hour, or more, later in the work period.

In the second phase, the precast slabs were fabricated, and the placement process was tested in the field at a university test site and at a test track. A 60,000-lb truck was used to simulate traffic loads. Field tests demonstrated the feasibility and efficiency of the researchers' method. These trials also allowed the researchers to detail and troubleshoot the method.

Project Benefits

More efficient road repair methods reduce maintenance costs and lane closures and increase contractor productivity. Reducing repair times can also increase driver and worker safety.

For more information, please see dot.state.fl.us/research-center



Workers lower a temporary, precast concrete slab into place.