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Report on Accelerated Techniques for Concrete Paving

Reported by ACI Committee 325

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American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331
Phone: +1.248.848.3700
Fax: +1.248.848.3701

www.concrete.org

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Kurt D. Smith,* Chair

David J. Akers
Richard O. Albright
Jamshid M. Armaghani
Bob J. Banka
Neeraj J. Buch
Tim Cost*
Juan Pablo Covarrubias
Mohamed Nasser Darwish
Norbert J. Delatte*
W. Charles Greer
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Anthony M. Sorcic†
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Peter C. Taylor
Samuel S. Tyson
Thomas J. Van Dam
Don J. Wade
W. James Wilde
Gergis W. William
James M. Willson
Dan G. Zollinger

*Task Force members who authored this Report.
†Task Group Chair.

Consulting Members

Michael I. Darter
John L. Rice
Raymond S. Rollings

This report covers state-of-the-art of accelerated concrete paving techniques. Accelerated concrete paving techniques are appropriate for roadways, airfields, streets and intersections, and other paved surfaces where early opening to traffic and quick access are required. Considerations include planning, concrete materials and properties, jointing and joint sealing, curing and temperature control, concrete strength testing, and opening-to-traffic criteria. Applications and uses of accelerated concrete paving are discussed.

Keywords: accelerated paving; admixtures; aggregates; airports; concrete pavement; curing; fast-track paving; gradation; highways; intersections; joint sealing compound; jointing; specifications; streets.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

Airport authorities and road agencies face major challenges in repairing and maintaining their pavement infrastructure under ever-increasing traffic volumes while maintaining traffic on these structures. The duration that is involved with traditional concrete pavement construction can have significant consequences to users of the facilities and, as a result, transportation agencies seek alternative methods for accelerating this process when closure times become an issue. This can be especially demanding in urban areas where congestion is severe. Accelerated construction techniques for portland-cement concrete (PCC) pavement can address these problems by providing reduced construction closure for new construction, reconstruction, or resurfacing projects.

Accelerated paving encompasses various activities, including technological methods to accelerate concrete construction (using rapid-setting materials or innovative construction approaches) and contractual methods to minimize the construction time (such as time incentives and disincentives).

Traditional agencies have been using these time-of-completion incentives for many years, and contractors will often meet these requirements by lengthening the work day or increasing the size of construction crews. Using accelerated paving techniques, a contractor often can complete a project without increasing crew size or changing normal labor schedules.

If any accelerated paving project is to be successful, there should be buy-in from all parties involved on the project. There needs to be a partnership and effective communication between the transportation agency representatives, contractors, suppliers, and engineer consultants.

1.1.1 *Changes to construction specifications and processes*—To build an accelerated paving project, both the contractor and the agency will make some changes to traditional construction specifications and processes. Often, these involve high-early-strength concrete, but they

Table 1.1.1—Changes to project components useful to shorten concrete pavement construction time

Project component	Possible changes
Planning	a) Implement partnering-based project management. b) Implement lane rental charges, which is an innovative contracting practice that encourages contractors to lessen the construction impact on road users. c) Allow night construction. d) Allow contractor to use innovative equipment or procedures to expedite construction (for example, minimum-clearance machines, dowel inserters, and ultra-light saws). e) Specify more than one concrete mixture for varied strength development. f) Provide options to contractors, not step-by-step procedures to allow the contractor to provide options based on their experiences in paving, instead of prescribing how to perform the work. g) Use time-of-completion incentives and disincentives.
Concrete materials	a) Try different cement types (particularly Type III). b) Use accelerating and water-reducing admixtures. c) Use a well-graded aggregate that has a uniform distribution of aggregates on each sieve. d) Keep water-cementitious materials ratio (*w*/*cm*) below 0.45 for durability and strength. e) Use a prewetted lightweight aggregate sand to cause a higher-early-age and long-term strength.
Jointing and sealing	a) Allow early-age sawing, which is done during the initial concrete. set stage after compressive strengths reach about 150 psi (1.0 MPa) b) Use dry-sawing blades. c) Use step-cut blades for single-pass joint sawing. d) Use a sealant that is unaffected by moisture or reservoir cleanliness.
Concrete curing and temperature	a) Suggest blanket curing to aid strength gain when beneficial. b) Monitor concrete temperature and understand relationship of ambient, subgrade, and mixture temperature on strength gain. c) Improve characteristics caused by less than optimum temperature through internal curing by use of prewetted lightweight aggregate sand to improve early age and longer results.
Strength testing	a) Use nondestructive methods to replace or supplement cylinders and beams for strength testing. b) Use concrete maturity or pulse velocity testing to predict strength.
Traffic opening criterion	a) Revise from a time criterion to a strength criterion; channel early loads away from slab edges. b) Restrict truck traffic.