

Concrete Technology in Focus

4x4[™] Concrete System Repair for Airport Pavement

Introduction

As transportation requirements in North America continue to grow, there is an ever-increasing demand placed on the highway and airport infrastructure systems. Concrete pavements, for example, carry larger volumes of automobile and aircraft traffic than originally intended and are wearing out. Many pavements have already outlived their useful service lives and are scheduled for repair or replacement.

Challenge

Fixing and returning these pavements to service quickly is a real challenge for engineers, producers, and contractors who are attempting to meet the demands of the public for minimal disruption to their traveling experience.

Solution

An innovative, patented, high-early strength concrete known as the 4x4 Concrete system has been developed for fast-track replacement of deteriorated pavement panels to permit early opening of highways and airport pavements. The 4x4 Concrete system achieves 400 psi (2.8MPa) flexural strength within 4 hours after placement and 600 psi (4.1MPa), the minimum ultimate flexural strength established by the FAA for airport pavements, shortly thereafter.

The 4x4 Concrete system is produced using locally available portland cement and aggregates and uses a unique combination of Master Builders Solutions brand MasterGlenium[®], MasterSet[®] DELVO and MasterSet admixtures, permitting workability, rheology control, and strength performance for economical repairs.



4x4 Concrete System for Repair of Airport Pavements Features

- Uses DOT approved admixtures and locally available cement and aggregates
- Mixed and delivered in ready-mix concrete trucks
- Meets FAA P-501 Specification requirements for airport concrete pavements
- Easy to place and finish
- Attains high-early strength quickly
- Resistant to aviation fuel and deicing fluids
- Resistant to abrasion and freezing and thawing cycles

Benefits

- Minimizes pavement repair logistics
- Alternative to fast-setting cement concrete
- Minimizes closure time and traffic disruption
- Lowers in-place cost
- Durable – increased service life
- Less expensive than proprietary fast-setting cement concrete

FAA Acceptance Criteria Item P-501 Portland Cement Concrete Pavement Description

Relevant Sections for the 4x4 Concrete System

Item	Criteria	4x4 Concrete Compliance
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Materials

Cement	ASTM C150 – Type I, II, or III	Meets
Fly Ash	ASTM C618 – Class C or F	Meets
Fine Aggregate	ASTM C33	Meets
Coarse Aggregate	ASTM C33	Meets
Water	Potable	Meets

Admixtures

Air-Entraining	ASTM C260/C494M	Meets
MasterGlenium or MasterPolyheed®	ASTM C494/C494M – Type A or F	Meets
MasterSet DELVO	ASTM C494/C494M – Type B	Meets
MasterSet AC 534 or MasterLife® CI 30	ASTM C494/C494M – Type C	Meets



Item	Criteria	4x4 Concrete Compliance
Concrete		
Cement Content	500 lb/yd ³ (297 kg/m ³) minimum	Meets 750 - 850 lb/yd ³ (445 - 505 kg/m ³)
w/cm	0.50 maximum	Meets < 0.36 required
Slump		
Side Form	ASTM C143: 1 - 2 in. (25 - 50 mm)	Requires specification modification to allow 8 in. (200 mm) slump or greater
Admixture Batching Sequence	Manufacturers recommendations	Meets
Mixing	ASTM C94	Meets
Flexural Strength	ASTM C78: <ul style="list-style-type: none"> • 550 psi (3.8 MPa) minimum to open pavement to traffic • 600 psi (4.1 MPa) minimum ultimate strength 	Meets
Compressive Strength (alternative)	ASTM C39: <ul style="list-style-type: none"> • 3,500 psi (24.1 MPa) minimum 	Meets
Side-Form Construction	Place concrete on moistened subgrade	Modify specification to allow slip sheet on subgrade

About Master Builders Solutions

Master Builders Solutions is a leading global manufacturer of concrete admixtures, as well as other sustainable solutions for the construction industry, focussed on delivering its vision: **Inspiring people to build better.** Master Builders Solutions provides value-added technology and market-leading R&D capabilities to improve the performance of construction materials and to enable the reduction of CO2 emissions in the production of concrete. Founded in 1909, Master Builders Solutions has ca. 1600 employees operating 35 production sites globally, supporting their customers in mastering their building challenges of today – for a decarbonised future.

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