



The Chemical Company

Product Information

4x4™ Concrete System

Early Strength High Load Concrete

Features

- Easy and economical to place and finish
- Attains very high-early and ultimate strengths
- Resistant to aviation fuel and deicing fluids
- Has high abrasion resistance
- Uses DOT-approved admixtures and locally available cement and aggregates
- Mixed and delivered in ready-mixed concrete trucks
- Meets FAA P-501 Specification requirements for airport concrete pavements

The infrastructure challenge

As air travel worldwide continues to grow, there is an ever-increasing demand placed on airport infrastructure systems. Concrete pavements, for example, carry both larger volumes of aircraft traffic as well as higher loads than originally intended. This has resulted in the need for many pavements to be repaired or replaced. Repairing and returning these pavements to service quickly with only minimal disruption of their use are an economic imperative.

The BASF 4x4 Concrete System

An innovative, patented, high-early strength concrete known as the 4x4 Concrete System has been developed for fast-track replacement of deteriorated pavements to permit early

opening to traffic. The 4x4 Concrete System achieves 400 psi (2.8 MPa) flexural strength within 4 hours after placement. It can be modified to achieve a flexural strength of 550 psi (3.8 MPa), the minimum opening flexural strength established by the FAA for airport pavements, and is an economical alternative to proprietary fast-setting cement concrete. The 4x4 Concrete is produced using locally available portland cement and aggregates and uses a unique combination of BASF's Glenium® high-range water reducers, Delvo® hydration-control admixtures or RheoTEC™ Z-60 workability-retaining admixture and Pozzolith® NC 534 accelerating admixture or Rheocrete® CNI corrosion-inhibiting admixture. Air-entraining admixtures such as BASF's Micro Air® or MB-AE™ 90 admixtures can be used where the concrete has to be air-entrained.

4X4 Concrete System use in aerospace applications

The 4x4 Concrete System is ideally suited for use in the fast repair and replacement of deteriorated airport pavements – runways, taxiways, aprons, etc. The 4x4 Concrete System provides the following benefits:

Benefits

- Minimizes closure time and traffic disruption and permits early opening of airport pavements
- Less expensive alternative to proprietary fast-setting cement concrete
- Minimizes closure time and traffic disruption and permits early opening to traffic
- Lower in-place cost
- Durable, increased service life
- Minimizes pavement repair logistics

Portland cement based systems usually require a minimum of 24 hours to develop sufficient strength and up to 14 days to return to service. 4X4 is ready for loads in 4 hours and back in service within one day.

Project profile airport aprons and taxiway replacement — Philadelphia International Airport, Pennsylvania



4x4 Concrete mixture proportions

- Cement Type III: 800 lb/yd³ (475 kg/m³)
- Water: 275 lb/yd³ (163 kg/m³)
- w/cm: 0.34
- s/a: 0.35

Admixtures

- MB-AE 90 air-entraining admixture
- Glenium 3030 NS high-range water-reducing admixture
- Pozzolith NC 534 accelerating admixture

Ambient Temperature: 80°F (27°C)

Plastic properties

- Slump: 7–8 in. (180–200 mm)
- Air Content: 6–9%

Hardened properties

- Compressive Strength
 - At 7 hours: 3,140 psi (21.7 MPa)
 - At 28 days: 6,820 psi (47.0 MPa)
- Flexural Strength
 - At 7 hours: 545 psi (3.8 MPa)
 - At 28 days: 850 psi (5.9 MPa)

Project facts and benefits

- 500 yd³ (382 m³) of 4x4 Concrete was placed
- The concrete was mixed in a central mixer and placed at night to minimize inconvenience to airport operations
- Consolidation of the concrete was achieved using an internal vibrator
- Finishing was accomplished by using a truss screed
- The airport was opened to traffic shortly after concrete was placed
- Airport operations were minimally affected using the 4x4 Concrete System

For more information on BASF Aerospace Materials:
aerospace.materials@basf.com
www.aerospace.basf.com



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

Relevant Sections for the 4x4 Concrete System		
Materials	Criteria	4x4 Concrete Compliance
Cement	ASTM C150 — Type I, II, or III	Meets
Fly Ash	ASTM C 618 — Class C or F	Meets
Fine Aggregate	ASTM C33	Meets
Coarse Aggregate	ASTM C33	Meets
Water	Potable	Meets
Admixtures		
Air-Entraining	ASTM C 260/C 494M	Meets
Glenium or PolyHeed	ASTM C 494M — Type A or F	Meets
Delvo	ASTM C 494M — Type B	Meets
Pozzolith NC 534 or Rheocrete CNI	ASTM C 494M — Type C	Meets
Concrete		
Cement Content, lb/yd ³ (kg/m ³)	500 lb/yd ³ (297 kg/m ³) minimum	Meets-750–850 (445–505)
w/cm	0.50 maximum	Meets -/ < 0.36 required
Slump		
Side Form, in. (mm)	ASTM C 143:1–2 (25-50)	Requires specification modification to allow 8 (200) slump or greater
Admixture Batching Sequence	Manufacturers	Meets
Mixing	ASTM C 94	Meets
Flexural Strength, psi (MPa)	ASTM C 78: <ul style="list-style-type: none"> ▪ 550 (3.8) minimum to open pavement to traffic ▪ 600 (4.1) minimum ultimate strength 	Meets
Compressive Strength (alternative), psi (MPa)	ASTM C 39: <ul style="list-style-type: none"> ▪ 3,500 (24.1) minimum 	Meets
Side-Form Construction	Place concrete on moistened subgrade	Modify specification to allow slip sheets on subgrade

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More information

If you are designing, producing, or placing concrete for airport pavement repair applications and want to learn more about how the 4x4 Concrete system can make your repair project easier and more economical, contact us or visit our website.

The Admixture Systems business of BASF's Construction Chemicals Division is a leading provider of innovative admixtures for specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets throughout the North American region. The Company's respected Master Builders brand products are used to improve the placing, pumping, finishing, appearance and performance characteristics of concrete.

BASF Corporation

Admixture Systems

www.masterbuilders.com

United States Sales Office

23700 Chagrin Boulevard
Cleveland, Ohio 44122-5544
Tel: 800 628-9990
Fax: 216 839-8821

Canada Sales Office

1800 Clark Boulevard
Brampton, Ontario L6T 4M7
Tel: 800 387-5862
Fax: 905 792-0651

Master Builders

Patent Information: Product and/or use covered by: US6858074

BASF Corporation

Aerospace Team
100 Campus Drive
Florham Park, NJ 07932
E-mail: aerospace.materials@basf.com

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