

Strength-on-Demand Concrete

Philadelphia International Airport Taxiway



Photo courtesy of Richard McMullin, Philadelphia Airport System

The Philadelphia International Airport, like many airports in the United States, had concrete aprons and taxiways in need of repair. In the fall of 2002, the decision was made to repair the damaged concrete areas. The project took approximately two months to complete.

Project:

Philadelphia International Airport

Location:

Philadelphia, PA

Owner/s:

City of Philadelphia

Concrete Producer:

SJA Paving

Concrete Contractor:

SJA Construction, Inc.

Requirements:

High early strength, durable concrete

550 psi (3.8 MPa) flexural strength

Air-entrained concrete

Products Used:

4x4 Concrete System

MasterAir[®] AE 90

air-entraining admixture

MasterGlenium[®] 3030

high-range water-reducing admixture

MasterSet[®] AC 534

accelerating admixture

Market Sector:

Paving



The Challenge

The repairs consisted of replacing different concrete pavement sections. The construction took place in the evening to minimize disruption to the airport operations and the traveling public.

The Solution

To meet the challenges of repairing the apron and taxiway sections at the airport, a field trial evaluation was conducted to choose a concrete mixture that suited the needs of the contractor. Three different sets of mix proportions utilizing MasterGlenium 3030 high-range water-reducing admixture and MasterSet AC 534 accelerating admixture were evaluated to determine the best performing and most economical design. To facilitate rapid repair, a concrete mixture utilizing the 4x4 Concrete system was developed. The mixture, capable of achieving 3,500 psi (24 MPa) in eight hours, was selected and further developed by SJA Paving.

High-Early Strength Concrete Mixture Proportions

Cement Type III	800 lb/yd ³ (475 kg/m ³)
Water	275 lb/yd ³ (163 kg/m ³)
w/cm	0.34
s/a	0.35
Ambient Temperature	80 °F (26.7 °C)

Plastic Properties

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

Project Facts and Benefits

- The concrete was mixed in a central mixer and placed at night to minimize inconvenience to airport operations
- 20 minute haul time
- Consolidation of the concrete was achieved using an internal vibrator
- Finishing was accomplished by using a truss screed

Compressive Strength

@ 7 h: 3,140 psi (21.7 MPa)

@ 28 days: 6,820 psi (47.0 MPa)

Flexural Strength

@ 7 h: 545 psi (3.8 MPa)

@ 28 days: 850 psi (5.9 MPa)

- The airport was opened to traffic shortly after concrete was placed
- Airport operations were minimally affected using the 4x4 Concrete System
- 500 yd³ (382 m³) of 4x4 Concrete was placed

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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