AIRFIELD PAVEMENT

INNOVATIVE CEMENT TECHNOLOGY

Fast Return to Service

Minimized Downtime

Low Carbon Footprint

Long Life

www.CTScement.com

Rapid Set®

BUSY AIRPORTS DEMAND CONCRETE INNOVATION

Rapid Set® Cement Technology offers rapid strength gain.

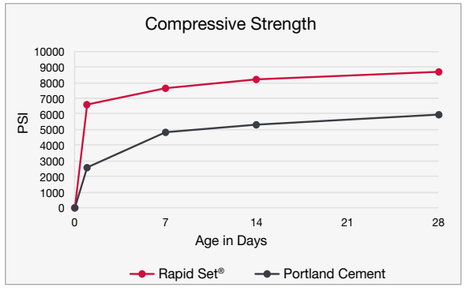
Minimize downtime and achieve a quick return to service with Rapid Set® Technology

AN INNOVATIVE SOLUTION RAPID SET® TECHNOLOGY

Demands on airfield concrete pavement continue to increase as airports are becoming busier than ever. Maximizing service life while minimizing disruption and associated costs of construction, maintenance, and repair is essential. Rapid Set® Cement is especially engineered to meet all of these demands.

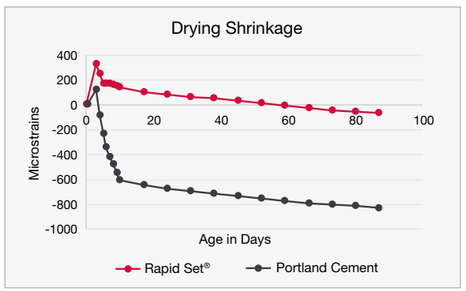
WHAT IS RAPID SET?

Rapid Set is not portland cement. It is an advanced Calcium Sulfoaluminate (CSA) cement designed for rapid strength gain and for durability. In portland cement, the early strength gain comes from the hydration of alite or tricalcium silicate, which usually takes place slowly. In Rapid Set, alite is replaced entirely with CSA which hydrates quickly and yields 28-day strength in one to two hours. This rapid strength allows pavement to be returned to service quickly, minimizing downtime of critical infrastructure.



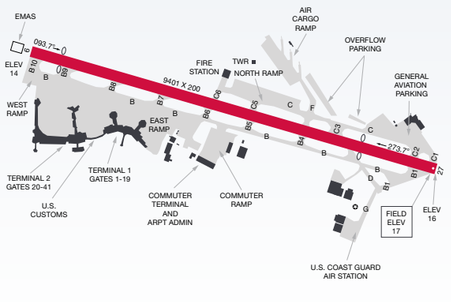
RAPID SET IS NOT A HIGH EARLY STRENGTH (HES) CONCRETE

High Early Strength Concrete has a reputation for short life. It is generally based on a finely ground portland cement prone to high shrinkage. Excess shrinkage is the primary culprit of premature cracking of HES concrete pavement. On the other hand, Rapid Set shrinks dramatically less. This drastic reduction in drying shrinkage contributes to making Rapid Set a long lasting solution for rapid repair and design of concrete pavement.

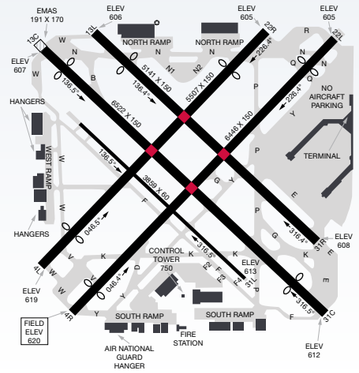


HIGH TRAFFIC AREAS
WHERE EXTENDED CLOSURE IS NOT AN OPTION

SINGLE RUNWAYS



INTERSECTING RUNWAYS



CRITICAL APRONS AND TAXIWAYS

Melbourne Airport

A PROVEN TRACK RECORD

Between 1994 to 2005, more than 30,000 cubic yards of Rapid Set Cement Concrete were used in the rehabilitation of Runway 16R at SEA-TAC Airport. Although the pavement was originally designed for 20 years, Rapid Set® provided additional strength that extended the fatigue life to 87 years. In 2012, the University of Oklahoma tested the runway pavement at 1160 PSI in flexural strength and measured the remaining fatigue life at 100 years after already being in service for 17 years.

Pavement Design: 20 Year Design Life on 18 Inch Thick Pavement			
AGE	DESIGN STRENGTH	ACHIEVED STRENGTH	PERCENT INCREASE
4 Hours	500 PSI	755 PSI	51%
28 Days	715 PSI	920 PSI	29%

SEA-TAC 16R Runway Rehabilitation

ROCKFORD AIRPORT

In 1993, a 1,200 ft long by 75 ft wide continuous section of taxiway was constructed at Rockford Airport using Type K Cement manufactured by CTS Cement. The pavement design incorporated steel fibers and post-tensioning, but the entire pavement contained no longitudinal or transverse joints throughout the 1,200 ft section. 10 years later, the PCI was measured at 98. Over the same time period, the PCI of an adjacent portland cement concrete pavement section was tested at 67.

1,200 feet x 75 feet x 7 inches, no joint

FAST IS DURABLE

RAPID SET® CHANGES THE GAME

RAPID STRENGTH

Rapid Set® Cement gains strength rapidly, allowing return to service in two to three hours and significant savings in time and money.

DIMENSIONALLY STABLE

Traditional concrete repair materials shrink extensively, leading to cracking, curling, spalling, and ultimately, deterioration and failure. With Rapid Set Technology, drying shrinkage is reduced and durability is increased.

LOW CARBON FOOTPRINT, MAXIMIZED SUSTAINABILITY

Rapid Set Cement has several sustainability advantages: 32% reduced carbon emissions and two times the service life of traditional cement concrete.

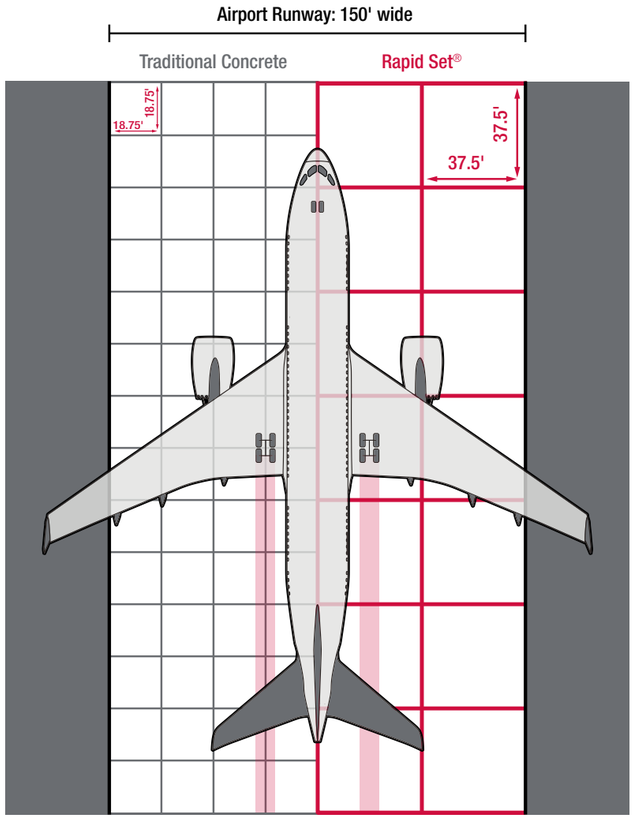
SHORT TERM REPAIR IS LONG TERM REPAIR

High Early Strength Concrete is often associated with a limited life span. With Rapid Set Cement technology, that is no longer the case. Independent testing proves that Rapid Set Cement concrete achieves a service life of up to 100 years. This extended life span maximizes asset life while minimizing life cycle costs and ensuring maximum return on the asset to service.

With Rapid Set Technology, construction speed does not come at the expense of durability. Decades of proven in-service performance, extensive independent testing, and collaborative industry/academic testing programs have demonstrated the exceptional performance of CSA cement-based Rapid Set technology.

INNOVATIVE PAVEMENT DESIGN

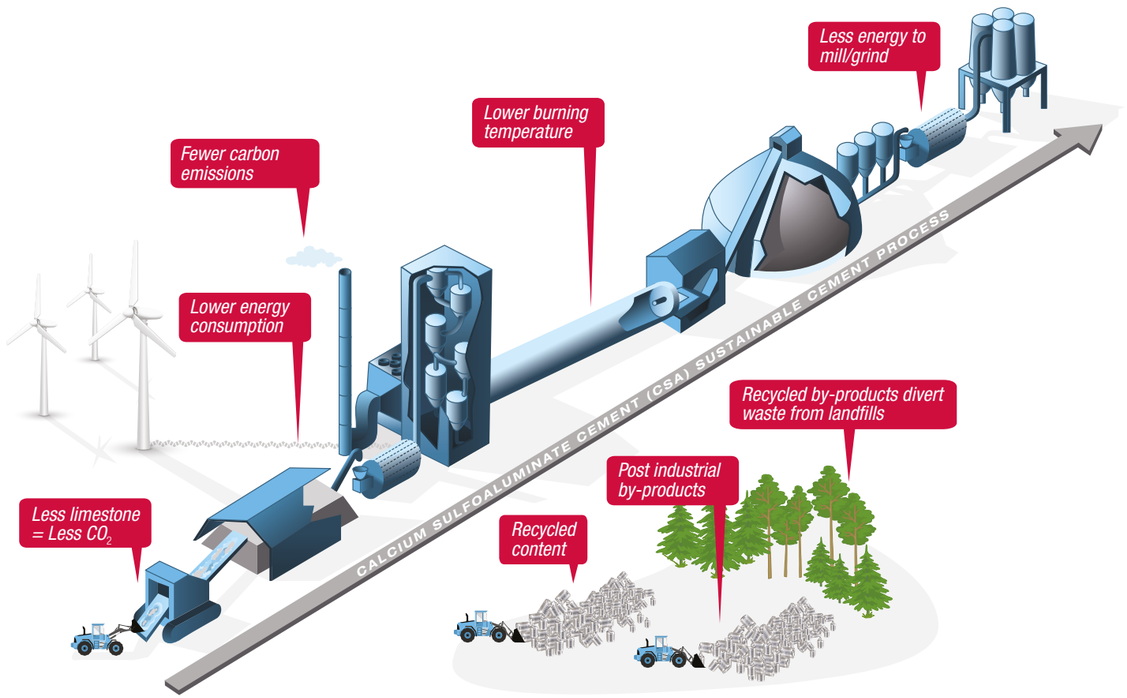
Rapid Set® allows improvements in pavement design. Combining low shrinkage, with early and high late strength, it allows modifications of slab size, thickness or geometry. Joint spacing can be increased to 37.5 ft, which would allow a runway to be constructed just 4 slab-wide. In a joint effort between the University of California, Los Angeles and the University of Oklahoma, a research slab was successfully placed with 37.5 ft joint spacing in 2015.



Most wide-bodied aircraft like the Boeing 787 Dreamliner have the outside tires within two feet of a longitudinal joint in a traditional pavement design. Since most concrete damage occurs on or near the joints, the current pavement design may not be conducive to long life. Using a larger slab made of Rapid Set Cement Concrete may alleviate this problem.

SUSTAINABILITY

Calcium sulfoaluminate cement is a greener alternative to traditional portland cements. It is manufactured at lower temperatures and requires less energy in the grinding process. Additionally, CSA cement uses less limestone, the primary source of carbon dioxide released in the manufacturing process. These differences in the manufacturing process reduce the energy consumption, the carbon footprint, and the use of natural resources.



32% Reduced carbon emissions during production vs. portland cement.

2X the service life of portland cement concrete.

TIME & COST SAVINGS

Rapid Set® is slightly more expensive than portland cement. However, this minimal increase in material cost is offset by the significant reduction in costs associated with extended closures.

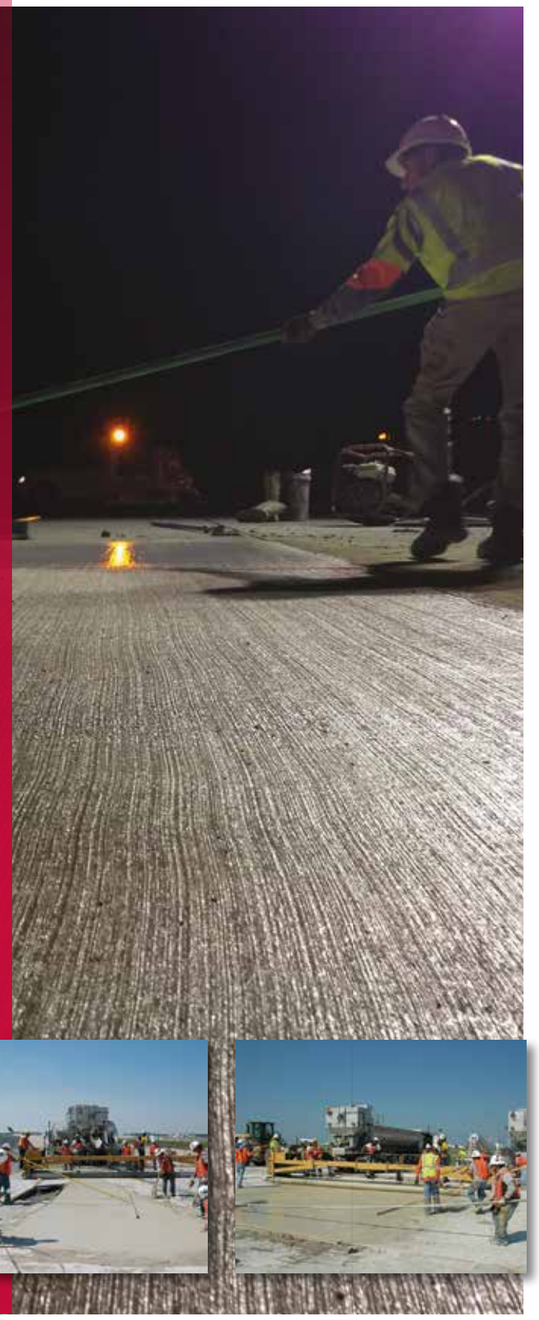
	RAPID SET®	TRADITIONAL METHOD	
Closure Time	7 Nights	12 Days and 12 Nights	**70% Savings**
Traffic Control Direct Cost	$92,000	$422,000	
Construction Direct Cost	$489,000	$230,000	
Total Direct Cost	$581,000	$652,000	
Indirect Cost	$0	Congestions Cost: $96,000 per Day **$864,000**	
PROJECT COST	**$581,000**	**$1,516,000**	**62% Savings**

*Estimating road network congestion and associated costs, M1 Trial Concrete Slab Replacements, Suman Joshi, 2013

COST SAVINGS

Labor • Gate Closure • Operations • Traffic Control

AIRPORTS USING RAPID SET®



SYD – Sydney Int'l Airport, Australia
MEL – Melbourne Int'l Airport, Australia
SEA – Seattle-Tacoma Int'l Airport
JFK – John F. Kennedy Int'l Airport
SAV – Savannah / Hilton Head Int'l
MDW – Chicago Midway Int'l Airport
SFO – San Francisco International Airport
RDU – Raleigh Durham International Airport
SAN – San Diego International Airport
RDW – Rockford Int'l Airport
SNA – John Wayne Int'l Airport
BOS – Boston/Logon Int'l Airport
ICT – Wichita Dwight D Eisenhower Airport
KCI – Kansas City Int'l Airport
ATL – Atlanta/Hartsfield Int'l Airport
EWR – Newark Liberty Int'l Airport
LGA – LaGuardia Int'l Airport
TSA – Taipei Songshan Int'l Airport
CAE – Columbia Metropolitan Airport
MEM – Memphis Int'l Airport
SDF – Louisville Int'l Airport
STL – Lambert–St. Louis Int'l Airport
LAX – Los Angeles Int'l Airport
PHL – Philadelphia Int'l Airport
PHX – Phoenix Sky Harbor Int'l Airport
DXB – Dubai Int'l Airport
SPN – Saipan Int'l Airport
PDX – Portland Int'l Airport

AVAILABILITY & SUPPORT

CTS Cement's Engineering Service provides full support to engineering and construction teams. It can participate in pre-construction meetings and assist in specifications and mix design requirements.

Rapid Set® Cement products are available in bulk transport as well as bagged products for smaller projects. Materials are distributed in the United States and worldwide.

CONTACT US

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