ASH GROVE CEMENT COMPANY
LOUISVILLE, NEBRASKA

DURACEM® F
Duracem® F is a blended hydraulic portland cement that is inter-ground with 25% Class F fly ash for *High Performance Concrete*. The product is designed to mitigate alkali silica reactivity and provide exceptional sulfate resistance and reduced chloride permeability while attaining improved ultimate flexural and compressive strengths.

INTER-GRINDING
Inter-grinding is the key to the performance of Duracem® F. The largest coarse particles of the fly ash are fractured to a smaller size, increasing the surface area of these large particles. This increases the early reactivity of Duracem® F, improving early strength gain and set time.

OPTIMIZED SULFATE CONTENT
Sulfates (SO3) in cement controls setting time, workability, and how the cement interacts with admixtures. Fly ash and other mineral admixtures contain alumina and other minerals that have an affinity for sulfates. If the sulfates are not optimized in a concrete mixture, there can be problems with false set, slump loss and admixture incompatibility. The sulfate content of Duracem® F is optimized to meet the needs of the cement and the inter-ground Class F fly ash.

SPECIFICATIONS
ASTM C 595 Type IP and IP (MS)
ASTM C 1157 Type GU, (HS) & (Option R)
AASHTO M 240 Type IP and IP (MS)

Duracem® F contains 25% inter-ground ASTM C 618 Class F fly ash pozzolan, meeting the requirements of Table 3 and Section 8.2 of ASTM C 595.

STATE APPROVED
Duracem® F from the Louisville plant is approved for use in state concrete in Nebraska, Iowa, Kansas, and Colorado.

WATER REQUIREMENT
Duracem® F does have a lower water requirement to achieve the same slump. This is to be expected since it is finer, occupies more volume than Type I, and the Class F fly ash provides small spheres for improved mobility. Its water requirement is about 5% less than Type I or about 1 to 2 gallons per cubic yard depending on the cement content and mix design. The use of a water reducer is recommended.

SULFATE RESISTANCE
Duracem® F meets the high sulfate resistance criteria of ASTM C1157 and can be used as an alternative to Type V portland cement.

COMPRESSIVE STRENGTH
The one through 28 day strengths are comparable to Type I. However, Duracem® F provides increased strength at ages later than 28 days. The water-to-cement ratio law applies to Duracem® F the same as to all portland cements.

SETTING TIME
The time of set of Duracem® F concrete is approximately 20 minutes longer for initial set than portland cement only concrete. Particularly in hot weather conditions, this is an advantage--allowing a little more time for placing and finishing.

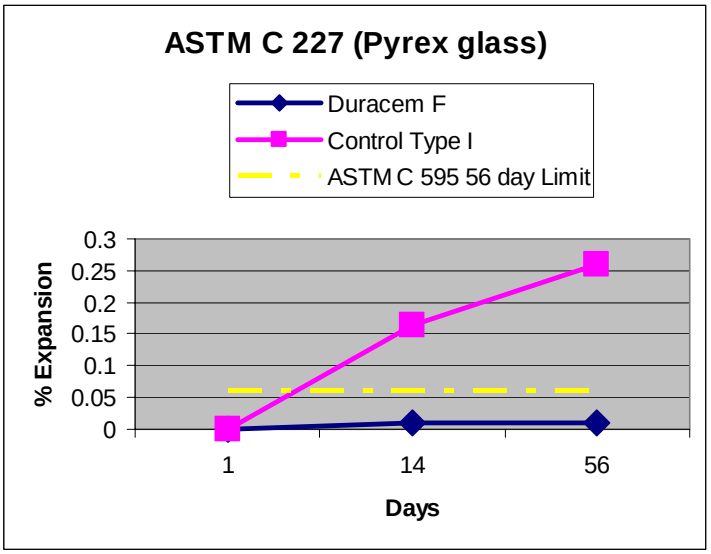
AIR ENTRAINMENT
Due to the Class F fly ash, the increased paste volume, and particle fineness, Duracem®F typically requires an increased quantity of AEA to attain the same air content in the concrete. However, the increased AEA quantity provides improved air void spacing factors and increased specific surface area. As with all concrete, proper air content and air void parameters must be maintained for freeze and thaw durability.

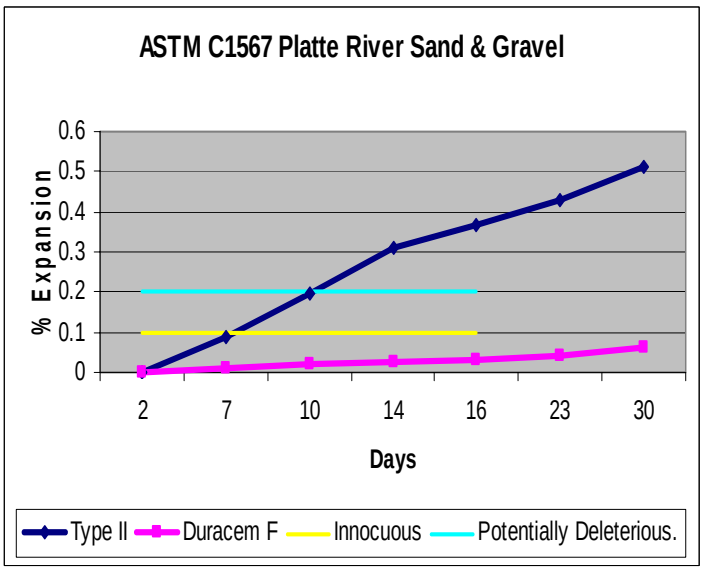
WORKABILITY
Because of the increased paste volume and particle fineness of Duracem® F, the workability of concrete is greatly enhanced at the same slump.

DURACEM® F

TYPICAL DATA

Parameter	ASTM Specs.	Reported
Chemical Properties		
MgO, %	6.0 max.	2.45
Sulfur as SO_3, %	4.0 max.	3.10
Loss on Ignition, %	5.0 max. 1.00	
Pozzolan Content, %	15-40	25
Physical Properties		
Specific gravity	----	2.95
Heat of hydration		
7 Days, cal./g	70 max.	60
28 Days, cal./g	80 max.	66
Fineness:		
Blaine, cm^2/g	report	4400
325 sieve, % passing	report	94.0
Autoclave		
Expansion, %	0.80 max.	0.02
Contraction, %	0.20 max.	------
Time of Set, Vicat		
Initial set, min.	45 min.	90
Final set, hrs	7 max.	3.4
Air Content, %	12 max.	5
Compressive Strength, psi		
1 Day	----	1900
3 Days	1800 min.	3300
7 Days	2800 min.	4000
28 Days	3500 min.	6000
Mortar Expansion (ASR Mitigation), ASTM C 595:		
14 Days, %	0.020 max.	0.009
8 Weeks, %	0.060 max.	0.010
Sulfate Resistance: ASTM C 1157 (HS)		
6 months, %	0.05 max.	0.04
1 year, %	0.10 max.	0.05





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For Further Information:

Ash Grove Cement Company
11011 Cody Street, Suite 300
Overland Park, KS 66210
(800) 545 -1882
www.ashgrove.com

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