High Performance Rapid Setting Cement

Rev. 7/3/2018

DESCRIPTION

CMAX®Cement is proprietary hydraulic cement with a fibrous crystalline structure. It develops set times of 15 minutes and compressive strengths excess of 10,000 psi strength in 28 days.

WHERE TO USE THE PRODUCTS

- Highway pavement and repair.
- Airport taxiways and runways.
- Tilt-up panels and foundations.
- Precast concrete applications.
- Emergency repairs.

ADVANTAGES OF CMAX®

- Conventional concrete mixers may be utilized.
- Allows early removal of concrete forms.
- Very low shrinkage and permeability.
- High early strength and fast setting even with sea water.

PACKAGING

- 100 ton Railcars bulk or 25 ton pneumatic tanker.
- 40 bags per pallet or Super-Sack at 2000 lbs.
- 88 lb. (40 kg) sacks lined with one layer of polyurethane shrink wrap.

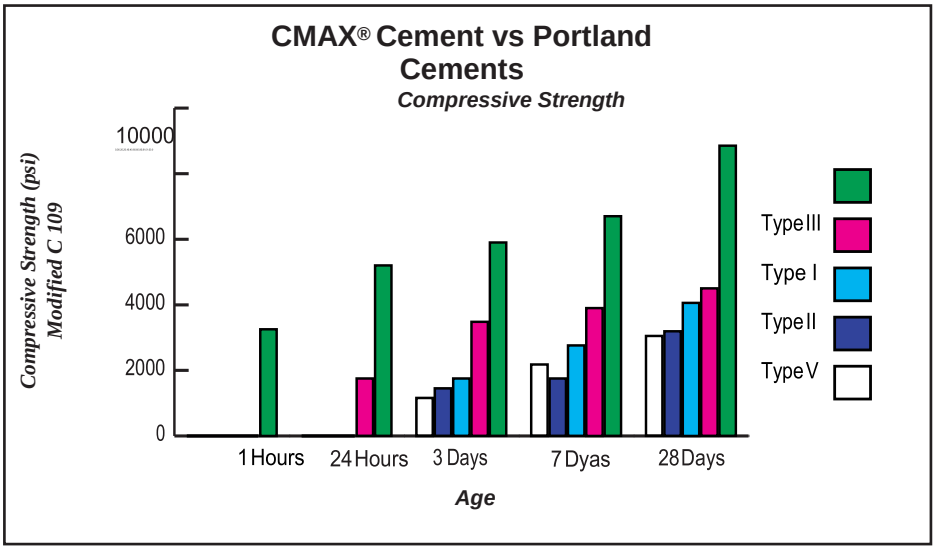
HOW TO USE

PREPARATION

Surfaces are prepared, when using CMAX® cement, the same way they are prepared for Portland cement.

FORMS

Construct forms to retain grout or concrete without leakage.



Forms should be as tight as possible.

MIXING CMAX®

Usage of concrete mixer per ACI specification 304.6R is recommended. CMAX® cement can be mixed manually and in regular concrete mixers. The typical working time for CMAX® is 15 minutes in normal weather conditions and maybe extended with retarded up to 90 minutes.

MIXING PROCEDURE

- Maintain the water/cement ratio at 0.35 all times (5" slump). **Excess water does not increase workability.**
- Add CMAX® to other materials in the mixer and mix for at least 5 minutes.
- CMAX® with superplasticizer is a self-leveling cement, which makes it easier to apply and handle.
- Start finishing immediately after applying the material. Do not delay finishing.

CURING & FINISHING

- Ranging temperatures, a set control or Hot water could be used to accelerate setting time in cold weather, or to retard setting time in hot weather.
- CMAX® cement, at normal conditions, does not require curing.
- An adequate number of finishers should be available during concrete placement.
- Setting time depends upon temperature.

LIMITATIONS

- Similar to Portland cement, increase in water/cement ratio relatively affects the strength.
- Apply to properly prepared areas.
- Material should be placed according to manufacturer specifications.

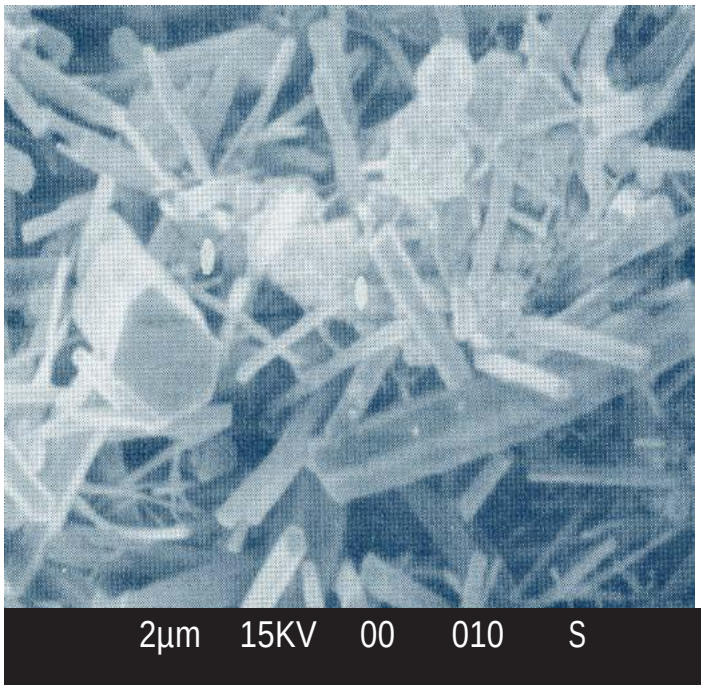
TYPICAL DATA FOR CMAX® CEMENT

(Curing conditions @ 70° F and 50% R.H.)

COLOR	Gray	
SHELF LIFE	One year in original, unopened packaging	
STORAGE CONDITIONS	Store dry	
SETTING TIME (ASTM C-191) AT 23° C	Initial 10 - 15 minutes Final 20 - 25 minutes	
FLEXURAL STRENGTH (CalTrans test 551)		
24 Hours	900 psi	
BOND STRENGTH (CalTrans test 551)		
24 Hours	600 psi	
COMPRESSIVE STRENGTH	***Mod. ASTM C-109***	***ASTM C-1157 Limits***
1 Hour	3350 psi (22 MPa)	———
24 Hours	5200 psi (35 MPa)	1750 psi (12 MPa)
7 Days	6100 psi (40 MPa)	2900 psi (20 MPa)
28 Days	8850 psi (60 MPa	4100 psi (27 MPa)
CHLORINE RESIDUE (Caltrans test 422)	0.007% Limits 0.05% Max	
SULFATE RESIDUE (Caltrans test 417)	0.068% Limits 0.25% Max	
SETTING TIME CONTROL	100 grams of set control (Citric Acid) in each 40 kg bag increase setting time by 15 minutes at normal temperature.	

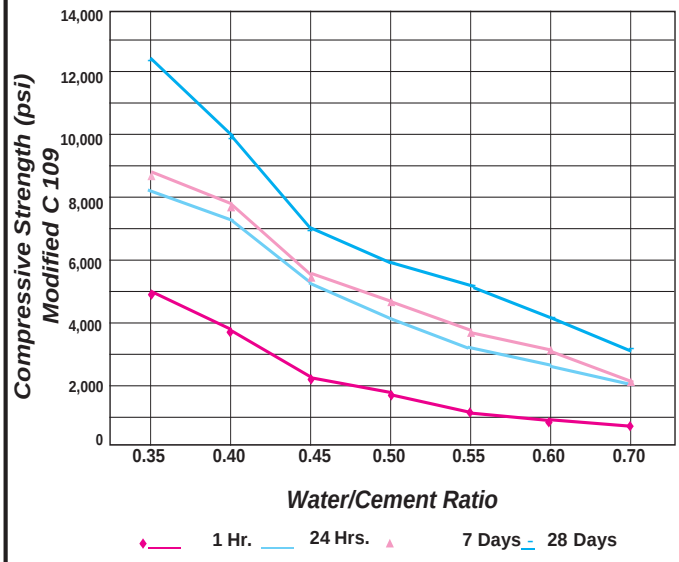
TYPICAL CHEMICAL ANALYSIS

Silica	SiO_2	1 2-1 5%
Aluminum Oxide	Al_2O_3	18 - 20%
Iron Oxide	Fe_2O_3	4 - 7%
Calcium Oxide	CaO	48 - 52%
Magnesium Oxide	MgO	1 - 1.5%
Sodium Oxide	Na_2O	0.2 - 0.4%
Potassium Oxide	K_2O	0.3 - 0.5%
Sulfate	SO_3	12 - 15%
Loss of Ignition	LOI	0.5 - 1 %

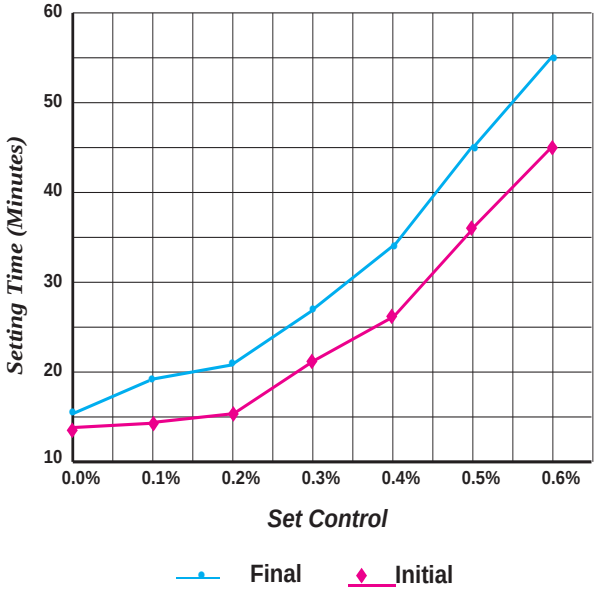


CMax® Cement Crystals

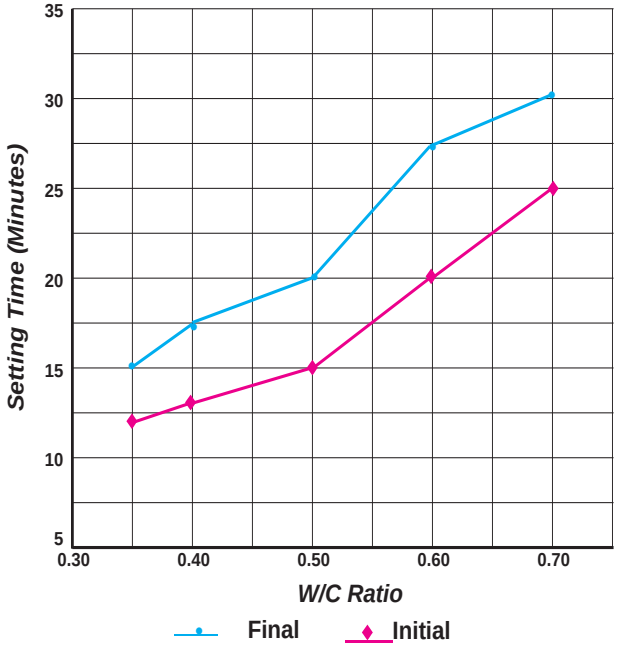
Effect of Water/Cement Ratio on Compressive Strength



Setting Time vs Setting Control (Citric Acid) W/C Ratio = 0.35



Setting Time vs Water/Cement Ratio



Note: Segregation of aggregates can possibly occur at w/c ratio of 0.50

High Performance Rapid Setting Cement

DESCRIPTION

CMAX® develops its sulfate resistance properties through its unique crystalline structure. CMAX® is superior to ASTM type V Portland cement in sulfate.

WHERE TO USE THE PRODUCTS

- Pavements and floor slabs.
- Salty & Alkaline ground environment.
- Coastal structures & applications.

ADVANTAGES OF CMAX®

- Mixing CMAX® with sea water does not affect its durability.
- Very low shrinkage and permeability.
- High early strength and fast setting cement.

PACKAGING

88 lb. (40 kg) sacks lined with one layer of polyurethane.

HOW TO USE

PREPARATION

Surfaces and areas are prepared, when using CMAX® cement, the same way they are prepared for ASTM type V cement.

MIXING CMAX® Cement

Using concrete mixer per ACI specification 304.6R is recommended. CMAX® cement can be mixed manually and in regular concrete mixers. The typical working time for CMAX® is 20 minutes in normal weather conditions.

TYPICAL DATA FOR CMAX® CEMENT
(Curing conditions @ 70° F and 50% R.H.)

COLOR	Gray		
SHELF LIFE	One year in original, unopened packaging		
STORAGE CONDITIONS	Store dry		
SETTING TIME (ASTM C-191) ***AT (23° C)***	Initial 10 - 15 minutes Final 20 - 25 minutes		
COMPRESSIVE STRENGTH (Mod. C-109)	**Sea Water**	**Fresh water**	
1 Hour	2900 psi (19 MPa)	3350 psi (22 MPa)	
24 Hours	4400 psi (31 MPa)	5200 psi (35 MPa)	
7 Days	5800 psi (39 MPa)	6100 psi (40 MPa)	
28 Days	7200 psi (49 MPa)	8850 psi (60 MPa)	
DRYING SHRINKAGE (ASTM C-596) ***28 days***	0.03%	Portland cement 0.15%	
SULFATE EXPANSION (ASTM C-1012) ***Six Months***	**CMAX™** 0.01	**TYPE V** 0.04 (Two Weeks)	**ASTM C-1157** 0.05 Max

MIXING PROCEDURE

- Maintain the water/cement ratio at 0.35 at all times (3" slump). **Excess water does not increase workability. Add superplasticizer for higher slump.**
- Add CMAX® to other materials in mixer and mix for at least 5 minutes.
- CMAX® with plasticizer is a self-leveling cement, which makes it easier to apply and handle.
- Start finishing immediately after applying the material. Do not delay finishing.

LIMITATIONS

- Similar to portland cement, increase in water/cement ratio relatively affects the strength.
- Apply to properly prepared areas.
- Material should be placed according to manufacturer specification.

Typical Data Sheet

COLOR	Gray	
SHELF LIFE	One year in original unopened bags	
STORAGE CONDITIONS	Store dry	
SETTING TIME	***ASTM C-191 (At 23° C)***	
	Initial	10 - 15 Minutes
	Final	20 - 25 Minutes

COMPRESSIVE STRENGTH	***Mod. ASTM C-109***	***ASTM C-1157 MIN. LIMIT***
1 Hour	3350 psi (22 MPa)	————————
24 Hours	5200 psi (35 MPa)	1750 psi (12 MPa)
7 Days	6100 psi (40 MPa)	2900 psi (20 MPa)
28 Days	8850 psi (60 MPa)	4100 psi (27 MPa)

DRYING SHRINKAGE	**ASTM C-596**	
28 Days	0.03%	(Portland cement 0.15%)
EXPANSION IN WATER	**ASTM C-1038**	
14 Days	0.006%	(ASTM C-1157 max. Limit 0.02%)
PERMEABILITY	**DIN 1048: Part 5:1991**	
	1mm	(Portland cement 15mm)
SULFATE EXPANSION	**ASTM C-1012**	
6 Months	0.01%	(ASTM C-1157 max. Limit 0.05%) (ASTM C-150 max. Limit Type V 0.04%)
ABRASION AT @ 24 Hours	24%	(Caltrans Max. Limit 25%)

MIXING WITH SEA WATER

ASTM C-687

CMAX® Cement mixed with sea water meets the criteria for questionable water supplies set in ASTM C-685 for strength and setting time.

7 Days Strength

Fresh Water

6100 psi (40 MPa)

Sea Water

5800 psi (39 MPa)

TYPICAL CHEMICAL ANALYSIS

Silica	SiO_2	12 - 15%
Aluminum Oxide	Al_2O_3	16 - 20%
Iron Oxide	Fe_2O_3	4 - 7%
Calcium Oxide	CaO	48 - 52%
Magnesium Oxide	MgO	1 - 1.5%
Sodium Oxide	Na_2O	0.2 - 0.4%
Potassium Oxide	K_2O	0.3 - 0.5%
Sulfate	SO_3	12 - 15%
Loss of Ignition	LOI	0.5 - 1%

HEAT OF HYDRATION

The Heat of Hydration for CMAX® Cement is similar to that of Type IV (low heat of hydration cement)

Calories /Grams

	3 hrs.	**24 hrs.**	**7 days**	**28 days**
CMAX®	46	57	58	70
Type IV	-----	------	60	70