TB-0801 — Cold Temperature Performance of POLARSET® Non-Chloride Accelerator Technical Bulletin

/ concrete / mix design

Introduction

POLARSET®is an ASTM C494, Type C, non-chloride, noncorrosive accelerator specifically formulated to work in concrete over a wide variety of temperature conditions. This technical bulletin summarizes the laboratory performance of POLARSET®over a range of different mix designs, cement compositions and temperature exposure conditions.

Use of POLARSET® in General Concreting Applications

The data below show that dramatic reductions in set time and significant increases in early strength can be achieved in cold-weather concreting through the use of POLARSET®without compromising the 28-day compressive strengths. This type of performance is extremely important since it will enable contractors to speed up production and reduce costs.

Test Series 1: Normal Concrete at Low Temperature (W/C = 0.47)

POLARSET® DOSAGE RATE ML/100 KG (OZ/100 LBS_)	TIME OF INITIAL SETTING % OF CONTROL	COMPRESSIVE STRENGTH	
		3 DAY % OF CONTROL	28 DAY % OF CONTROL
0 (0)	100	100	100
525 (8)	81	112	98
1045 (16)	64	113	98
1565 (24)	56	119	106
2350 (36)	45	120	108

Mix Temperature: 10°C (50°F)

Cure Temperature: 10°C (50°F) through 28 days of age

Test Series 2: Normal Concrete at Low Temperature (W/C = 0.58)

POLARSET® DOSAGE RATE ML/100 KG (OZ/100 LBS)	TIME OF INITIAL SETTING % OF CONTROL	COMPRESSIVE STRENGTH	
		3 DAY % OF CONTROL	7 DAY % OF CONTROL
0 (0)	100	100	100
2935 (45)	53	140	127
3915 (60)	45	164	118

Mix Temperature: 16°C (60°F)

Cure Temperature: 4.5°C (40°F) through 7 days of age

Use of POLARSET® in Concrete Containing Fly Ash

Although fly ash is an excellent quality enhancer for concrete, its use in cold weather can lead to significant retardation in terms of setting and strength development. With the use of POLARSET®, these drawbacks can be overcome. The following data shows how POLARSET®can be used to make fly ash concrete at 16°C (60°F) set faster and gain strength faster than the same mix at 22°C (72°F); or how it can enable the use of fly ash concrete at temperatures as low as 4.5°C (40°F) with almost the same set and strength performance as at 22°C (72°F).

Test Series 3: Fly Ash Concrete at Low Temperature (W/C = 0.58)

CURING TEMPERATURE °C (°F)	POLARSET® DOSAGE RATE ML/100 KG (OZ/100 LBS)	TIME OF INITIAL SETTING % OF CONTROL	COMPRESSIVE STRENGTH		
			3 DAY % OF CONTROL	7 DAY % OF CONTROL	28 DAY % OF CONTROL
22 (72)	0 (0)	100	100	100	100
16 (60)	1960 (30)	87	103	103	92
4.5 (40)	3915 (60)	120	63	76	91

Note: These results represent an average of 4 mixes – 2 different cements with Class C and Class F fly ashes.

Mix Temperature: 22°C (75°F).

Specimen cured at specified temperature through 28 days of age.

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