DENKA Σ2000

Additive for Super High-Strength Concrete

Description

DENKA Σ2000 is a revolutionary additive used in the production of super high-strength concrete products. Formation of ettringite and calcium silicate hydrate is enhanced when **DENKA Σ2000** is used, imparting super high-strength in concrete.

Features

- Enables manufacture of high-strength concrete with minimal usage of cement
- Suppresses heat of hydration as cement content is kept low
- Eliminates the need for conventional high-strength additives such as silica fume or silica fume-based cement

Applications

- High strength concrete (>80N/mm^2) for use in pillars, bridges etc.
- Chemically pre-stressed products (12~20N/mm^2) such as high pre-stressed piles, poles etc.

Packaging

- 15kg paper bags

Shelf Life

- 8 months from production date
- Determine the production date by reference to the lot number. A lot number of “1AXXX” corresponds to production in Jan 2001; “2BXXX” to Feb 2002 and so on.

Dosage / Standard Mix Proportions

- Dosage: Approximately 5~15% by cement weight, limiting maximum dosage to 100kg/m^3 of concrete.
- Determine the optimal dosage rate by considering target strength and cost performance.

Mix no.	Slump (cm)	Air volume (%)	W/C (%)	s/a (%)	Unit quantity (kg/m^3)					Compressive strength (MPa)			Curing
					Water	OPC[1]	Sand	Gravel	**Σ2000**	1d	7d	28d	
1	8	2.0	41.3	47	165	400	847	963	0	51.0	57.1	65.8	Steam
2			36.2		145	400	842	957	60	85.6	93.0	101	
3	12	2.0	35.1		158	450	837	951	0	57.2	67.4	74.9	
4			31.6		142	450	826	939	60	90.1	103	113	
5	65	2.0	30.9		150	486	807	917	50	38.9	86.7	128	Standard
6			19.2		150	783	691	786	50	49.4	118	154	

[1]Standard ordinary Portland cement

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http://www.denka.co.jp/eng/

Technical Information

- Physical properties

Specific Gravity (g/cm^3)	Chemical Composition (%)		
	SO_3	R_2O	Cl_2
2.45	11.4	1.00	0.04

Case 1: Using ∑2000 in Standard Civil / Architectural Engineering Works

Treat **∑2000** as per standard concrete. Although the recommended dosage is 5~15% by cement weight, the standard recommended dosage is 10% (50kg/m^3). Also, use a maximum of 100kg of **∑2000** per m^3 of concrete. The below graphs show data where **∑2000** has been applied to concrete.

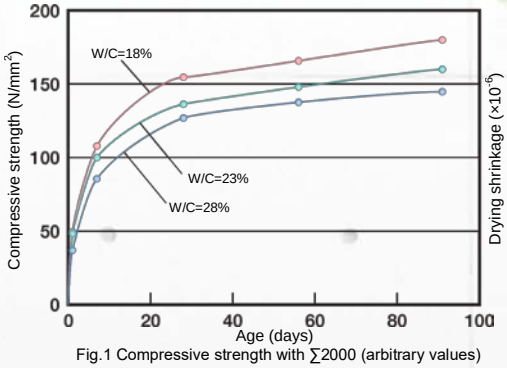

Fig.1 Compressive strength with ∑2000 (arbitrary values)

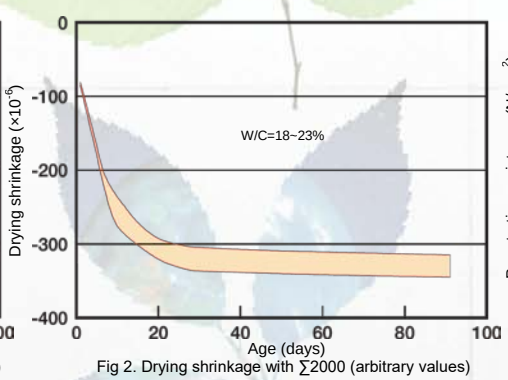

Fig 2. Drying shrinkage with ∑2000 (arbitrary values)

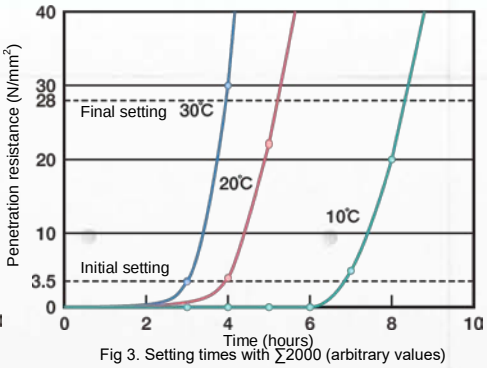

Fig 3. Setting times with ∑2000 (arbitrary values)

Case 2: Using ∑2000 in Steam Curing

The compressive strength will differ depending on the cement quantity, **∑2000** usage, and curing conditions.

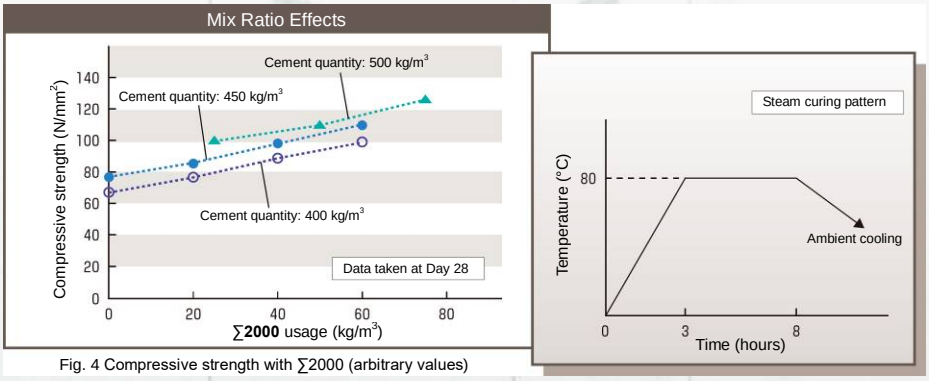

Fig. 4 Compressive strength with ∑2000 (arbitrary values)

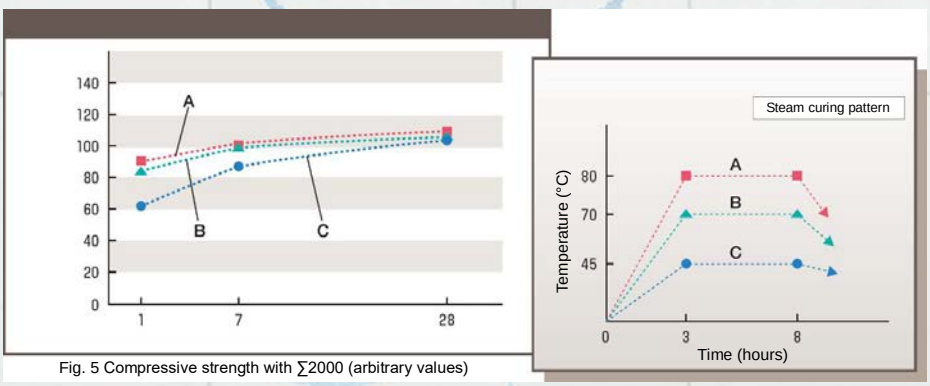

Fig. 5 Compressive strength with ∑2000 (arbitrary values)

Usage Precautions

- The quality of aggregates used will affect the high-strength concrete greatly. Conduct trial tests in advance.
- Compact concrete thoroughly to ensure proper development of strength.
- Carry out steam curing approximately after final setting has occurred. If steam curing is carried out too early, strength may be lowered due to heat expansion.
- After the test specimen for compressive strength tests is formed, protect the test piece surface from drying out to prevent reduction in compressive strength. Also, polish the loading face of the test specimen. (There are instances where the capping method does not accurately measure the compressive strength.

Handling Precautions

- Refer to Safety Data Sheet (SDS) before use.
- This product exhibits weak alkali nature when in contact with water. Immediately wash water thoroughly if contact with skin arises.
- If the product enters the eyes, flush with clean water for more than 30 minutes and seek medical attention.
- Wear protective gear (goggles, mask, gloves, and rubber boots) while handling the product.
- The product should be stored in a dry area, indoors, and out of direct sunlight.
- For further information, please contact DENKA.

Limitation of Liability

- The information contained in this brochure provides general advice for potential customers of DENKA about the basic properties and characteristics of various DENKA products (hereafter referred to as “the Product Information”). DENKA makes no warranty or representation as to the entire accuracy or completeness of the Product Information in this brochure.
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- DENKA reserves the right to change the Product Information from time to time at its discretion and without notice.

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