P197-4S

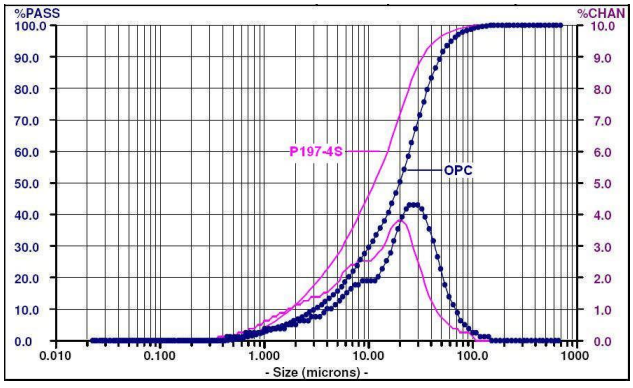
High Performance Eco-Friendly Cement – *Complying with SS EN 197-4 (CEM III/C): 2008*

As one of high slag bastfurnace cements (HSBFC) designed and developed by EnGro, P197-4S has become a successful CEM III/C cement product complying with SS EN 197-4: 2008 standard with the strength class of 32.5L. Containing high VCEM GGBS, P197-4S was developed with superior performance particularly for **Non-Structural** applications; such as soil stabilization – backfill and grout, etc.

Physical Properties		P197-4S	SS EN 197-4: 2008 (32.5L)
GGBS Content %		***83***	81 ~ 95
Consistency %		***31***	--
Penetration, mm		***5***	4 ~ 8
Initial setting time (m)		***180***	> 75
Final setting time (h:m)		***3:50***	--
Fineness, m^2/kg		***420***	--
Compressive Strength (MPa)	2-day	***14***	--
	7-day	***28***	> 12.0
	28-day	***40***	32.5 < σ < 52.5

Typical Technical Data

Particle size analysis shows P197-4S has finer particle size compared to OPC (CEM I), which contributes greatly to the enhancement of strength and workability in the application.



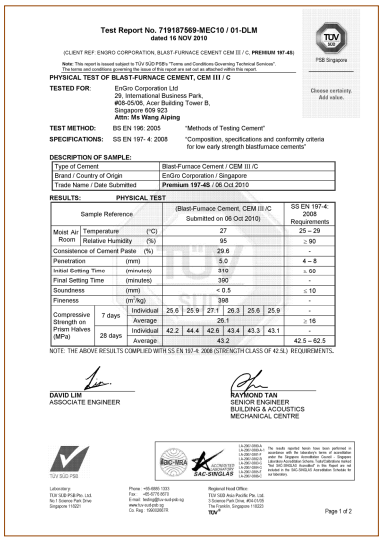
Chemical Property	P197-4S	SS EN 197-4: 2008
Loss on ignition, %	0.59	≤ 5.0
Insoluble residue, %	0.19	≤ 5.0
Sulfate, % (SO_3)	1.47	≤ 4.0
Chloride, % (Cl^-)	0.035	≤ 0.10

SS EN 197-4:2008 Standard

P197-4S is verified fully complying with CEM III/C requirements in SS EN 197-4:2008 Standard by TÜV SÜD PSB Singapore Pte. Ltd.

GGBS Contents Specified in SS EN 197-1: 2008

Blastfurnace Cement	Main Constituents (%)	
	Clinker (K)	Blastfurnace Slag (S)
CEM III/A	35-64	36-65
CEM III/B	20-34	66-80
CEM III/C	**5-19**	**81-95**



Test Report No. 719187569-MEC10 / 01-DLM
dated 16 NOV 2010

PHYSICAL TEST OF BLAST-FURNACE CEMENT, CEM III / C

TESTED FOR: EnGro Corporation Ltd
29, International Business Park,
#08-05/06, Acer Building Tower B,
Singapore 609 923
Attn: Ms Wang Aiping

TEST METHOD: BS EN 196: 2005 "Methods of Testing Cement"

SPECIFICATIONS: SS EN 197- 4: 2008 "Composition, specifications and conformity criteria for low early strength blastfurnace cements"

DESCRIPTION OF SAMPLE:

Type of Cement	Blast-Furnace Cement / CEM III /C
Brand / Country of Origin	EnGro Corporation / Singapore
Trade Name / Date Submitted	Premium 197-4S / 06 Oct 2010

RESULTS: PHYSICAL TEST

Sample Reference			(Blast-Furnace Cement, CEM III /C Submitted on 06 Oct 2010)						SS EN 197-4: 2008 Requirements
Mold Air Room	Temperature	(°C)	27						25 – 29
	Relative Humidity	(%)	95						≥ 90
Consistence of Cement Paste		(%)	29.6						-
Penetration		(mm)	5.0						4 – 8
Initial Setting Time		(minutes)	310						≥ 60
Final Setting Time		(minutes)	390						-
Soundness		(mm)	< 0.5						≤ 10
Fineness		(m^2/kg)	398						-
Compressive Strength on Prism Halves (MPa)	7 days	Individual	25.6	25.9	27.1	26.3	25.6	25.9	-
		Average	26.1						≥ 16
	28 days	Individual	42.2	44.4	42.6	43.4	43.3	43.1	-
		Average	43.2						42.5 – 62.5

NOTE: THE ABOVE RESULTS COMPLIED WITH SS EN 197-4: 2008 (STRENGTH CLASS OF 42.5L) REQUIREMENTS.

DAVID LIM
ASSOCIATE ENGINEER

RAYMOND TAN
SENIOR ENGINEER
BUILDING & ACOUSTICS
MECHANICAL CENTRE

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Note: Test report was issued by TÜV SÜD PSB Singapore Pte. Ltd.

EnGro Corporation Limited
29 International Business Park
#08-05/06 Acer Building Tower B
Singapore 609923

Tel : +65 6561 7978
Fax: +65 6561 9770
www.engro-global.com

Blended Cement

P197-4S

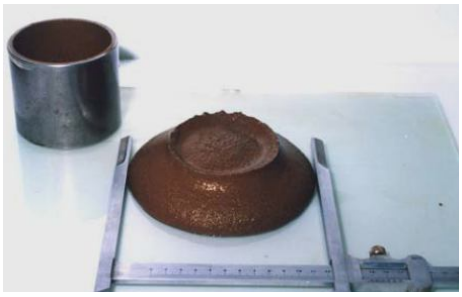
High Performance Eco-Friendly Cement – *Complying with SS EN 197-4 (CEM III/C): 2008*

Typical Application

Liquefied Soil Stabilization (LSS)

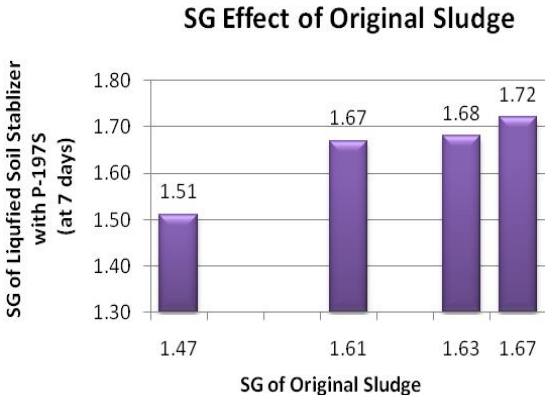
P197-4S can be used, for example, in liquefied soil stabilization, like backfilling and grouting.

The typical flow of P197-4S mix (stabilizer) ranges from 100 ~ 150mm depending on the specific gravity (SG) of original sludge and dispersant used.



The flowability of sludge and/or stabilizer is measured using a flow ring with a dimension of ϕ77

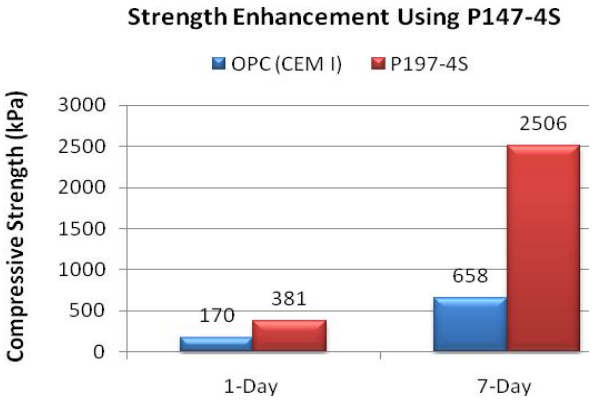
The specification of SG of original sludge above 1.65 is required before blending with P197-4S to ensure 7-day SG and strength of the stabilizer. The desired SG of stabilizer could be adjusted using fine sand.



In the compressive strength test, P197-4S mix exhibits significant enhancement in the strength development.

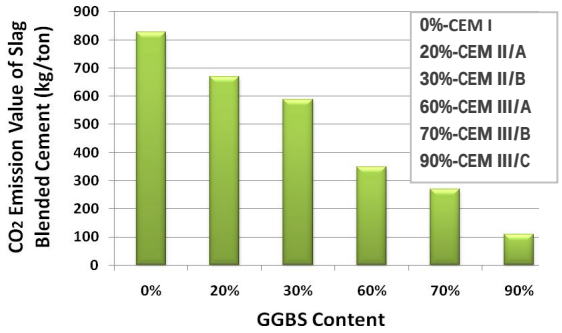
A 7-day cured P197-4S sample with a ϕ50×100mm cylinder mould for compressive strength test.

Compared to conventional LSS mix using OPC (CEM I), the 1-day strength of P197-4S enhanced mix increased by about 85%, and the 7-day strength increased by more than 200%.



Sustainability

Due to high replacement with GGBS, CEM III/C cement shows the lowest embodied CO_2 emission.



Noted: A typical demonstration of GGBS content effect on embodied CO_2 emission of slag blended cement.

EnGro Corporation Limited
29 International Business Park
#08-05/06 Acer Building Tower B
Singapore 609923

Tel : +65 6561 7978
Fax: +65 6561 9770
www.engro-global.com