



Ground Granulated Blast Furnace Slag (GGBS)

Technical Data Sheet

SECTION 1 – PRODUCT IDENTIFICATION

Product Name: Ground Granulated Blast Furnace Slag (GGBS)

Manufacturer: Gulf Cement Company P.S.C

Manufacturing Location: Ras Al Khaimah, United Arab Emirates

Product Description:

Ground granulated blast furnace slag is a finely ground powder produced by quenching molten blast furnace slag and grinding it into a fine powder. It is used as a partial replacement of cement to improve the performance and durability of concrete.

SECTION 2 – INTENDED USES

GGBS is intended for use as a cementitious material in concrete and mortar applications as a partial replacement of Ordinary Portland Cement (OPC).

Typical replacement levels:

- Commonly used at 50% replacement in normal applications
- Can be used up to 70% replacement in aggressive environments (e.g., chloride and alkali exposure)

GGBS does not hydrate and harden on its own and requires OPC for activation.

Product Name:
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Revision Date:
01/12/2025



SECTION 3 – PRODUCT COMPOSITION (GENERAL)

GGBS is produced as a by-product from the iron manufacturing industry in a blast furnace. The slag is quenched and then ground into a fine powder.

It has a similar chemical composition to cement, but with differing proportions. When used as a partial replacement of cement, it contributes to improved strength and durability performance.

SECTION 4 – PRODUCT CHARACTERISTICS & PERFORMANCE

Key characteristics and benefits of GGBS:

- Improves strength development in concrete
- Enhances resistance to sulphate and chloride attacks
- Improves performance in aggressive environments such as chloride and alkali exposure

Cementitious reaction (summary):

- Pure GGBS does not hydrate and harden on its own and needs OPC for activation
- GGBS reacts with calcium hydroxide (CH) produced during OPC hydration to form additional C-S-H gel, improving durability and strength
- Pure GGBS does not hydrate and harden on its own and needs OPC for activation



SECTION 5 – APPLICATIONS

GGBS is suitable for use in:

- Ready-mix concrete
- Precast concrete
- Mass concrete pours
- Marine structures and coastal applications
- Foundations and substructures exposed to aggressive ground conditions
- Concrete exposed to sulphate and chloride environments

SECTION 6 – QUALITY MANAGEMENT & ASSURANCE

GGBS is produced in compliance with relevant standards and is supplied with test certification demonstrating compliance with required chemical and physical properties.

Quality control includes routine testing of:

- Chemical composition
- Physical properties
- Fineness and strength activity



SECTION 7 – TESTING & LABORATORY FACILITIES

Testing is carried out to confirm product conformity with applicable standards including:

- ASTM C989/C989M
- BS EN 15167-1

Typical testing includes:

- Chemical composition analysis (oxides, chlorides, sulphides, etc.)
- Fineness and specific surface
- Soundness and setting time
- Strength activity / activity index

SECTION 8 – PACKAGING & SUPPLY

GGBS can be supplied in bulk or packaged form depending on project requirements.

SECTION 9 – PROJECT REFERENCES

GGBS is widely used in concrete applications requiring improved durability, reduced heat of hydration, and improved resistance to sulphate/chloride exposure, including infrastructure and marine projects.



TEST CERTIFICATE

ASTM C989/C989M-14

CHEMICAL COMPOSITION

Parameter	Unit	Requirements	Typical Results
Loss of Ignition	%	—	0.97
Insoluble Residue	%	—	0.42
Silicon Dioxide (SiO ₂)	%	—	33.70
Aluminium Oxide (Al ₂ O ₃)	%	—	12.86
Ferric Oxide (Fe ₂ O ₃)	%	—	0.94
Calcium Oxide (CaO)	%	—	42.47
Magnesium Oxide (MgO)	%	Max. 5.0	6.68
Manganese (Mn ₂ O ₃)	%	—	0.25
Sulphur Trioxide (SO ₃)	%	—	1.78
Sulphide (S ²⁻)	%	Max. 2.0	0.16
Alkalies (Na ₂ O + 0.658K ₂ O)	%	—	0.395
Chlorides (Cl)	%	—	0.018



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PHYSICAL PROPERTIES

Parameter	Unit	Requirements	Typical Results
Moisture	%	—	3240
Density (50/50)	—	—	3.00
Specified Surface (Air Permeability Test)	m ² /kg	—	437
Fineness by sieve 45 μ (No. 325)	%	Max. 20.0	5.6
Soundness: Le Chatelier Expansion	mm	—	0.01
Air content of Slag mortar	Vol(%)	Max 12.0	7.30
Time of Setting: Vicat test – Initial	Minutes	—	205
Time of Setting: Vicat test – Final	Minutes	—	255
Normal Consistency	%	—	26.6
Heat of Hydration at 7 Days	kJ/kg	—	215
Slag Activity Index – 7 Days (50% GGBS + 50% GCC OPC)	%	Min. 95	99.85
Slag Activity Index – 28 Days (50% GGBS + 50% GCC OPC)	%	Min.95	136.44



TEST CERTIFICATE

BS EN 15167-1:2006

CHEMICAL COMPOSITION

Parameter	Unit	Requirements	Typical Results
Loss on Ignition	%	Max. 3.0	0.97
Insoluble Residue	%	Max. 1.5	0.42
Silicon Dioxide (SiO ₂)	%	—	21.25
Aluminium Oxide (Al ₂ O ₃)	%	—	3.75
Ferric Oxide (Fe ₂ O ₃)	%	—	5.37
Calcium Oxide (CaO)	%	—	64.09
Magnesium Oxide (MgO)	%	Max. 6.0	1.29
Manganese (Mn ₂ O ₃)	%	—	0.25
Sulphur Trioxide (SO ₃)	%	Max. 2.5	1.78
Sulphide (S ²⁻)	%	Max. 2.0	0.16
Titanium Oxide (TiO ₂)	%	Max. 5.0	0.9
Alkalies (Na ₂ O + 0.658K ₂ O)	%	—	0.590
Chlorides (Cl)	%	—	0.021
Glass Content	%	—	99.0



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PHYSICAL PROPERTIES

Parameter	Unit	Requirements	Typical Results
Moisture	%	Max. 1.0	0.29
Density (50/50)	gm/cm ³	—	2.995
Specific Surface (Air Permeability test)	m ² /kg	Min. 45	437
Soundness: Le Chatelier Expansion	mm	—	0.05
Fineness (Sieve 45 μ)	%	—	5.2
Time of Setting: Vicat test – Initial	Minutes	—	200 / 180
Time of Setting: Vicat test – Final	Minutes	—	255 / 230
Compressive Strength – 7 Days	N/mm ²	—	36.6 / 38.1
Compressive Strength – 28 Days	N/mm ²	—	63.8 / 50.3
Activity Index – 7 Days	%	Min. 45	96.1
Activity Index – 28 Days	%	Min. 70	126.8