

# MATERIAL SAFETY DATA SHEET

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## SECTION I: MATERIAL IDENTIFICATION

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**Material Name:** Ground Granulated Blast Furnace Slag (GGBS/GGBFS, or Slag Powder)

**Trade Name:** VCEM

**Description:** A ground powder made with an appropriate mill from a glassy granular material formed when molten iron blast-furnace slag is rapidly chilled as by immersion in water.

**CAS Reg. No.:** NA (Mixture)

**Supplier:** EnGro Corporation Limited  
[Former SsangYong Cement (Singapore) Limited]

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## SECTION II: INGREDIENTS IDENTITY

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**Ingredient:** Iron Blast-Furnace Slag

**Ingredient Sequence Number:** 01

<u>Components</u>	<u>CAS Number</u>	<u>Percentage (Approx.)</u>
Calcium oxide (CaO)	1305-78-8	30-50
Silicon dioxide (SiO <sub>2</sub> )	7631-86-9	30-40
Magnesium oxide (MgO)	1309-48-4	2-14
Alumina (Al <sub>2</sub> O <sub>3</sub> )	1344-28-1	7-18
Iron oxide (Fe <sub>2</sub> O <sub>3</sub> )	1309-37-1	0.1-1.8
Manganese oxide (MnO)	7439-96-5	0-1.0
Sulfur (S)	7704-34-9	0-2.0

**Ingredient:** Gypsum

**Ingredient Sequence Number:** 02

**Ingredient Percentage:** 0-5

**CAS Number:** 13397-24-5

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**SECTION III: PHYSICAL / CHEMICAL CHARACTERISTICS**

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<b>Boiling Point:</b>	N/A
<b>Specific Gravity (H<sub>2</sub>O=1):</b>	2.80-2.95
<b>Vapor Pressure (mm Hg):</b>	N/A
<b>Melting Point:</b>	N/A
<b>Vapor Density (AIR-1):</b>	N/A
<b>Evaporation Rate:</b>	N/A
<b>Solubility in Water:</b>	0.1-0.5%
<b>Appearance &amp; Odor:</b>	Beige to white powder with traces of sulfur odor

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**SECTION IV: FIRE AND EXPLOSION HAZARD DATA**

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<b>Flash Point:</b>	N/A.
<b>Extinguishing Media:</b>	Media suitable for surrounding fire.
<b>Special Fire Fighting Procedures:</b>	None.
<b>Unusual Fire &amp; Explosion Hazards:</b>	None Reported.
<b>Flammable Limits:</b>	N/A.
<b>Lower Explosive Limit:</b>	N/A.
<b>Upper Explosive Limits:</b>	N/A.

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**SECTION V: REACTIVITY DATA**

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<b>Stability:</b>	Stable
<b>Conditions to Avoid (Stability):</b>	Avoid moisture. Keep dry until used.
<b>Incompatibility:</b>	None known.
<b>Hazardous Decomposition/Byproducts:</b>	Respirable dust particles may be generated when the product is handled.
<b>Hazardous Polymerization:</b>	Will not occur. No conditions to avoid.

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**SECTION VI: HEALTH HAZARD DATA AND FIRST AID**

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**EXPOSURE LIMITS:**

Unless specified otherwise, limits are expressed as a time-weighted average (TWA) concentration for an 8-hour work shift of a 40-hour workweek. Limits for cristobalite and tridymite (other forms of crystalline silica) are equal to one-half the limits for quartz.

## Abbreviations:

- ACGIH TLV:** Threshold limit value of the American Conference of Governmental Industrial Hygienists (ACGIH). The Federal Mine Safety and Health Administration (MSHA) has adopted the TLVs established by ACGIH, as set forth in the 1973 edition of "TLVs Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1973".
- m.p.p.c.f.:** Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.
- mg/m<sup>3</sup>:** Milligrams of substance per cubic meter of air.
- NIOSH REL:** Recommended exposure limit of the National Institute for Occupational Safety and Health (NIOSH), expressed as a TWA concentration for up to a 10-hour workday during a 40-hour workweek.
- NIOSH STEL:** NIOSH Short Term Exposure Limit. This is a 15-minute TWA exposure that should not be exceeded at any time during a workday.
- OSHA ACC:** Acceptable Ceiling Concentration set by the federal Occupational Safety and Health Administration (OSHA). Under OSHA regulations, an employee's exposure to an acceptable ceiling concentration shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed as specified under the subheading "acceptable maximum peak above ACC for an 8-hour shift". If no such subheading appears, then employee exposure shall never exceed the acceptable ceiling concentration limit.
- OSHA PEL:** Permissible exposure limit of OSHA.

**Calcium Oxide CaO:** OSHA PEL: 5 mg/m<sup>3</sup>; ACGIH TLV: 5 mg/m<sup>3</sup>; NIOSH REL: 2 mg/m<sup>3</sup>.

**Silicon Dioxide SiO<sub>2</sub>:** OSHA PEL: (respirable) 80 mg/m<sup>3</sup> ÷ (% SiO<sub>2</sub>); ACGIH TLV: 20 m.p.p.c.f.; NIOSH REL: 6 mg/m<sup>3</sup>.

**Magnesium Oxide MgO:** OSHA PEL: (total particulate) 15 mg/m<sup>3</sup>; ACGIH TLV 10 mg/m<sup>3</sup>.

**Alumina Al<sub>2</sub>O<sub>3</sub>:** OSHA PEL: (respirable) 5 mg/m<sup>3</sup>, (total dust) 15 mg/m<sup>3</sup>; ACGIH TLV: 10 mg/m<sup>3</sup>.

**Iron Oxide Fe<sub>2</sub>O<sub>3</sub>:** OSHA PEL: 10 mg/m<sup>3</sup>; ACGIH TLV: 10 mg/m<sup>3</sup>; NIOSH REL: 5 mg/m<sup>3</sup>.

**Manganese Oxide MnO:** OSHA ACC: 5 mg/m<sup>3</sup>; ACGIH TLV: 5 mg/m<sup>3</sup>; NIOSH STEL: 3 mg/m<sup>3</sup>; NIOSH REL: 1 mg/m<sup>3</sup>.

**Sulfur S:** OSHA PEL: Not listed; ACGIH TLV: Not listed; NIOSH STEL: Not listed.

**Other Particulates:** OSHA PEL: (total particulate, not otherwise regulated) 15 mg/m<sup>3</sup>, (respirable particulate, not otherwise regulated) 5 mg/m<sup>3</sup>; ACGIH TLV: (nuisance particulates) 10 mg/m<sup>3</sup>.

## HEALTH HAZARDS:

### Primary Route(s) of Entry:

**Inhalation:** Yes

**Skin:** Yes

**Ingestion:** No or unlikely.

### Acute:

**Eye Contact:** Minor irritation to the eyes. Direct contact by larger amounts of material or splashes of wet material may cause effects ranging from moderate eye irritation to chemical burns and blindness.

**Inhalation:** Dusts may irritate the nose, throat, and respiratory tract. Coughing, sneezing, and shortness of breath may occur following exposures in excess of appropriate exposure limits.

**Skin Contact:** Exposure to dry material may cause drying of the skin with consequent mild irritation. Dry material contacting wet skin or exposure to moist or wet material may cause more severe skin effects including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

**Ingestion:** Ingestion of large amounts may cause gastrointestinal irritation and blockage.

**Chronic:**

**Inhalation:** Inhalation of slag dust can cause inflammation of the lining of the nose.

**Eye Contact:** Exposure to slag dust may cause inflammation of the cornea.

**Skin Contact:** Hypersensitive individuals may develop allergic dermatitis.

**Signs & Symptoms of Exposure:** Irritation of eyes, skin and/or respiratory system.

**Medical Conditions Generally Aggravated by Exposure:** Inhaling respirable dust may aggravate existing respiratory system disease(s) and/or dysfunctions such as emphysema or asthma. Exposure may aggravate existing skin and/or eye conditions.

**EMERGENCY & FIRST AID PROCEDURES:**

**Eyes:** Immediately flush eye(s) with plenty of clean water for at least 15 minutes, while holding the eyelid(s) open. Beyond flushing, do not attempt to remove material from the eye(s). Contact a physician if irritation persists or later develops.

**Inhalation:** Remove to fresh air. Dust in throat and nasal passages should clear spontaneously. Contact a physician if irritation persists or later develops.

**Skin:** Wash with cool water and a pH-neutral soap or mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged direct exposure to wet product or prolonged wet skin exposure to dry product.

**Ingestion:** Do not induce vomiting. If person is conscious, give large quantity of water. Get immediate medical attention.

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## SECTION VII: PERSONAL PROTECTION AND CONTROL MEASURES

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<b>Ventilation:</b>	Local exhaust or general ventilation adequate to maintain exposures below appropriate exposure limits.
<b>Other:</b>	Exposure levels should be monitored regularly. Exposure levels in excess of appropriate exposure limits should be reduced by all feasible engineering controls, including (but not limited to) ventilation, process enclosure, and enclosed employee workstations.
<b>Respiratory Protection:</b>	When exposure levels exceed or are likely to exceed appropriate exposure limits, follow MSHA or OSHA regulations, as appropriate, for use of NIOSH-approved respiratory protection equipment.
<b>Skin Protection:</b>	Protective gloves, shoes and protective clothing that are impervious to water should be worn to avoid contact with skin.
<b>Eye Protection:</b>	Safety glasses with side shields should be worn as minimum protection. Dust goggles should be worn when excessive (visible) dust conditions are present or anticipated. Contact lenses should not be worn when working with this product.
<b>Hygiene:</b>	Periodically wash exposed skin with a pH-neutral soap. Wash again before eating, drinking, smoking, and using toilet facilities. Wash work clothes after each use. If clothing becomes saturated with wet material, it should be removed and replaced with clean, dry clothing.

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## SECTION VIII: STORAGE AND HANDLING PRECAUTIONS

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**Respirable dust** may be generated during processing, handling, and storage. The personal protection and controls identified in Section VII of the MSDS should be applied as appropriate.

**Keep** product dry until used.

**Do not** store or handle near food and beverages or smoking materials.

**The personal protection and controls** identified in Section VII of the MSDS should be applied as appropriate.

**Steps to be taken if material is released or spilled:** Use dry clean-up methods that do not disperse dust into the air. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment. Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal.

**Waste Disposal Method:** Do not attempt to wash material down drains. Dispose of waste materials only in accordance with applicable federal, state, and local laws and regulations.

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## **SECTION IX: SOURCE DATA / OTHER COMMENTS**

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### **Reference Sources:**

- (1) CSR Rinker Materials, *MSDS for: Ground Slag Material*, Effective Date: October 1, 1996; Revision: 0; (Address: 1501 Belvedere Road, West Palm Beach, FL 33406).
- (2) TARMAC AMERICA, INC. *Material Safety Data Sheet for Iron Blast Furnace Slag, Ground*, Revised: 3/25/98; (Address: 1151 Azalea Garden Road, Norfolk, VA 23502)
- (3) Test Certificate of GGBS issued by the Original Manufacturer (dated 27<sup>th</sup> February 2004)

### **Supplier's Address:**

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**NOTICE:** Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references, however EnGro Corporation does not certify the data on the MSDS. The certified values for this material are given only based on the EnGro Corporation Certificate of Analysis.