



PRODUCT DATA SHEET

Ground Slag

Ground Slag is a supplementary cementitious material manufactured by intergrinding selected granulated iron blast furnace slag with optimised quantities of gypsum to a controlled particle size distribution. Ground Slag is designed to enhance properties of concrete and will also assist in enabling concrete producers to meet the growing needs of sustainable construction. Ground Slag complies with Australian Standard AS 3582.2-2001 Supplementary cementitious materials for use with portland cement. Part 2: Slag – ground granulated iron blast furnace. The product was developed by Cement Australia Pty Ltd and is manufactured by Cement Australia at their Bulwer Island grinding facility.

Benefits

Ground Slag is a versatile supplementary cementitious material that can replace significant proportions of Portland cement in most concrete applications.

Availability

Product available in Bulk

Setting Times

Concrete produced with Ground Slag may have set times extended by up to 40 minutes when compared to concrete produced with Type GP cement only.

Why use Ground Slag?

- Due to the general tendency for ground granulated blast furnace slag (GGBFS) to impart a less porous matrix in hardened paste, resistance to waterborne aggressive liquids is enhanced. Thus GGBFS cements are ideal in high durability concrete applications.
- Including GGBFS in the cementitious component of concrete significantly decreases water permeability. It is generally recognised that the durability of concrete is primarily related to permeability and thus its ability to reduce the movement of waterborne ions such as sulfates and chlorides.
- Ground Slag blends (≥45% GGBFS) reduce heat of hydration in concrete mixes and are suitable for most low heat applications.
- The carbon footprint of concrete can be reduced (in direct proportion to reduced clinker content) by partial replacement of Portland cement with Ground Slag.

Ground Slag Properties

Specified Properties		AS 3582.2		Typical	Physical Properties	
		Max	≤			
Loss on Ignition	Max	3.0%	≤	0.5%	Specific Density	2.80-2.85
Sulfide Sulphur	Max	1.5%	≤	1.3%	Bulk Density (loose)	0.99-1.10 approx.
Magnesia	Max	15.0%	≤	6.0%	Bulk Density (packed)	1.16-1.20 approx.
Alumina	Max	18.0%	≤	15.0%	>45µm Fraction	3-4%
Total Iron	Max	1.5%	≤	1.0%		

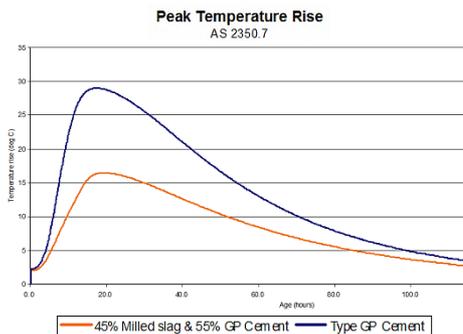
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Temperature Profile

The following graph compares the temperature profiles of concrete containing a blend of Ground Slag (45%) and Type GP (55%) and a concrete containing Type GP only. Peak temperature rise is expected to be up to 5 hours later and up to 15°C lower for concrete containing at least 45% Ground Slag. Therefore Ground Slag blends are especially suited for low heat applications



Further Important Information

Ground Slag may also be known as Ground Granulated Blast Furnace Slag (GGBFS), Slag, or Milled Slag. A Ground Slag product known as Ecocem is marketed by Cement Australia in NSW and Victoria.

Please review the Safety Data Sheet No. CA 068 for specific hazard identification and safe use of Ground Slag

Chloride Ion Penetration & Sulfate Damage

Published research indicates that higher strength concrete containing $\geq 45\%$ Ground Slag has negligible chloride ion penetration at a depth of 40mm. This increase in resistance to chloride penetration improves as the slag replacement ratio increases up to approximately 80%. Effective curing of the concrete ensures that moisture is available for the slag reaction.

It is generally recognised that the durability of concrete is primarily related to permeability and its ability to reduce the movement of water borne sulfates, chlorides and other aggressive liquids.

Resistance to sulfate attack is attributed to the following 3 parameters:

1. Reduced aluminate (C3A) content: As Ground Slag replaces the amount of OPC in concrete, the net aluminate in the cement system goes down.
2. Reduction in Ca(OH)_2 through pozzolanic reactions.
3. Reduction in pore size and the subsequent reduction in permeability and the movement of water.

Sorptivity

The rate of water absorption by capillary action in concrete is significantly decreased when Ground Slag blends are used. In low slag blend applications such as a 32MPa concrete using 35% Ground Slag, similar Sorptivity values are achieved to an approximately 65MPa concrete using Type GP cement only.

Mix Designs

For optimum concrete performance, Cement Australia recommends a minimum of 30% Ground Slag cementitious replacement in concrete. Ground Slag performs exceptionally well in ternary blends with fly ash and or silica fume or other pozzolanic ultrafines. A typical ternary blend contains 30% Ground Slag, 15% fly ash and 55% Type GP cement. Extensive testing has shown that the considerable benefits of Ground Slag become less obvious at replacement rates greater than 65%.

Appearance

Concrete containing Ground Slag is usually significantly lighter in colour than concrete containing only ordinary Portland cement or Portland cement with other cementitious materials. Cement Australia recommends caution in the use of Ground Slag in specific stencilled concrete applications due to the tendency to some initial blue green colouration that may be evident in fresh moist concrete containing Ground Slag. However the discolouration will dissipate within several days as sulfides in the Ground Slag oxidise and the concrete cures.

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Recommendations regarding the use of this product are to be taken as a guide only. If in doubt contact Cement Australia Pty Limited ("Cement Australia") or seek professional advice. To the extent permitted by law, Cement Australia excludes all implied warranties, conditions and guarantees imposed by legislation. Cement Australia excludes all liability for loss, damage or injury arising from use of the product (i) otherwise than in accordance with the recommendations or (ii) for purposes other than those for which it is ordinarily acquired. For all other loss, damage or injury arising from the use of this product, to the extent permitted by law Cement Australia's liability is limited, at its discretion, to refunding the cost of the product or resupplying the product or equivalent product.

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