

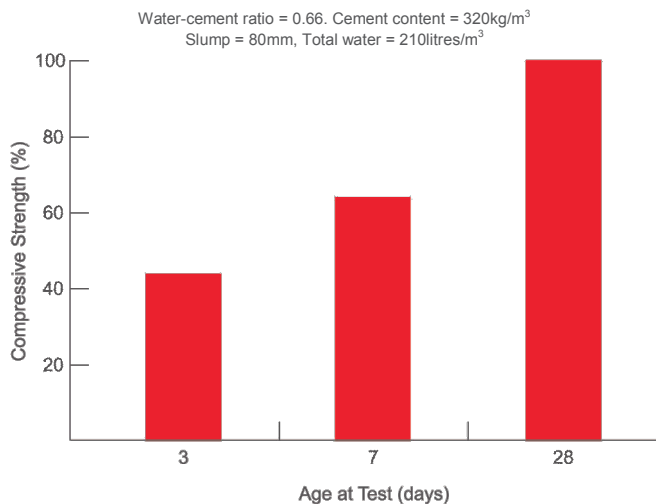
GB Slag is a general purpose blended cement containing a nominal 30% ground blast furnace slag complying with AS 3972 Type GB.

Sunstate Cement Ltd. manufactures GB Slag Blend by grinding portland cement clinker with granulated iron blast furnace slag selected for its particular mineral and chemical qualities.

GB Slag is a versatile alternative to GP Cement in most applications. The 28 day compressive strength performance is similar to GP Cement, however it provides advantages in higher later age strength. Some adjustment to concrete mix design may be necessary. Less water will be required to achieve the same consistency as concrete using GP Cement. Where early strengths are required concrete mixes should be modified to give the desired result.

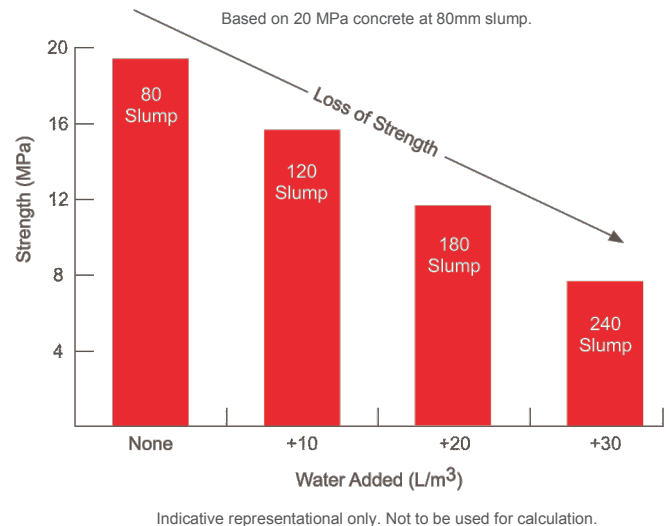
Concrete Properties

Strength development. The strength development of GB Slag is primarily dependant on water-cement ratio. Graph One gives indicative data on the strength development of concrete produced with GB Slag.



GRAPH ONE. Compressive Strength of GB Slag

Effect of excess water. Use only the minimum amount of water to mix and place concrete. Graph Two shows the reduction in compressive strength of concrete with increased water addition.



GRAPH TWO. Effect of Water Addition on Concrete Strength and Slump

The porosity of concrete made with excess water is also increased resulting in a structure with less resistance to chemical attack.

Other factors which affect the strength and durability of concrete containing GB Slag manufactured by Sunstate Cement Ltd. are:

- Concrete mix design including admixtures
- Temperature (ambient and materials)
- Entrained air content
- Compaction of concrete
- Curing

Concrete Mix Design

The cement content for each grade of concrete will be dependent on the nominated target strengths. AS 3600 Concrete Structures recommends minimum strengths to achieve adequate concrete durability for various exposure conditions.

AS 1379 The Specification and Manufacture of Concrete is the relevant standard for the production and ordering of concrete.

For site mixed concrete the following mix proportions are suggested.

Mix Proportions by Volume

Application	GP Cement	Stone or Gravel	Sand
High Strength & Watertight	1	3	1.5
General Use: Paths, Floors, etc.	1	4	2.5
Foundations & Large Masses	1	5	3

Mixing. AS 1379 outlines requirements for material quality and mixing procedures for pre-mix concrete. Recycled water may only be used where testing can demonstrate compliance with the relevant section of AS 1379. Dissolved salts and organic matter may adversely affect the strength, durability, set time and appearance of the concrete.

Sand contaminated by the above will have a similar effect.

Placing. AS 3600 outlines requirements for handling, placing and finishing concrete. Minimum cover to reinforcement is 20 mm for lowest exposure classification. The cover will need to be increased where concrete is cast against the ground, for fire resistance and for exposure classification other than A1.

Curing. A minimum curing period of seven days is recommended for all exposure classifications. Concrete should be maintained in a moist condition where practicable. Water sprays, wet sand or moisture-retaining techniques; such as polyethylene sheets or curing compounds, have been used successfully. Curing should begin as soon as the selected technique allows.

In hot conditions aliphatic alcohol is recommended as a technique to mitigate plastic shrinkage cracking, however it is not a substitute for a proper curing regime. For normal concrete curing will result in a significantly higher compressive strength than concrete not subject to curing.

Curing can also affect other concrete properties including:

- Reduction in the potential for plastic shrinkage cracking
- Improvements in surface quality, durability, and performance
- An improvement in abrasion resistance
- Reduction in the carbonation rate

Variations in the duration of curing or uses of different curing methods may effect the initial colour of concrete.

Cement Properties

The following table provides an example of some typical cement properties of GB Slag manufactured by Sunstate Cement Ltd.

Property	GP Cement	AS3972	
Setting Time	Initial	2.15 hrs	≥ 45 mins
	Final	3.15 hrs	≤ 10 hrs
Constancy of Volume (soundness test)	0 mm	≤ 5 mm	
Fineness Index	420 m ² /kg		
Compressive Strength (Mortar)	3 day	33.0 MPa	
	7 day	45.0 MPa	≥ 20.0 MPa
	28 day	64.0 MPa	≥ 35.0 MPa

Compatibility

GB Slag may be blended with other cements complying with AS 3972 and with flyash complying with AS 3582.1. It is also compatible with admixtures complying with AS 1478.

Working Instructions

Storage. Contact with air and moisture will cause hydration of the cement and alter the cement properties. The 'shelf life' of GB Slag is therefore dependent on the storage conditions. It is recommended that cement be retested prior to use if its age exceeds three months.

Handling. A Material Safety Data Sheet can be downloaded from www.sunstatecement.com.au or by contacting Sunstate Cement Ltd. on Tel 07 3895 9890.

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