



Material Datasheet

GGBS

BS 6699 Ground granulated blastfurnace slag

CEMEX GGBS is a latent hydraulic binder that can be used in conjunction with Portland cement (CEM I) to produce Portland-slag or Blastfurnace cements. The cementitious properties of CEMEX GGBS are activated in an alkaline environment. Such conditions are generated when free lime is released from hydration of Portland cement. The two materials are, thus, complementary.

When combined at the concrete mixer, blends of ggbs and CEM I cement may comply with the designated combinations given in BS 8500 (UK complementary standard to BS EN 206-1 Concrete - Part 1). Typically, over 50% of CEM I cement may be replaced by CEMEX GGBS, whilst still achieving 28 day strengths consistent with class 42,5 performance. Higher replacement levels may be utilised for specific durability / low heat applications.

Concretes containing CEMEX GGBS are economical and also provide enhanced durability / chemical resistance, compared to those made with CEM I cements alone. Although early age strengths are reduced (for 28 day

equivalence) relative to CEM I cement performance, strength development beyond 28 days is considerably improved.

Blastfurnace slag is a by-product of iron manufacture and is chemically very consistent. For reactivity in concrete, molten slag from the blastfurnace is rapidly cooled by quenching with water to produce a glassy granulate that is then dried and ground to a fine off-white powder. The material consists principally, of calcium alumino-silicates together with some magnesium, sulfur compounds and a small amount of alkalis. Expressed as major oxides, it is approximately 41% Calcium oxide, 36% silica and 11.5% alumina.

CEMEX GGBS is consistent in both composition and fineness. Ground to a specific surface in excess of 400 m²/kg by high efficiency milling processes, the powder has a bulk density normally in the range 1000-1200 kg/m³.

Features/benefits/applications

- For use in both general and specialised concretes
- Economical
- Longer-term strength development
- Reduced early age temperature rise
- Enhanced sulfate-resistance
- Reduced chloride diffusion rates
- Effective in minimising risk of damaging alkali-silica reaction
- Lighter colour for attractive appearance
- Consistent in characteristics and performance
- Compatible with admixtures

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Delivery, storage and handling

Delivered in pressurised bulk powder tankers by road, the standard load size is 28 - 30 tonnes. Silo identity disks can be provided for individual products by calling Customer Services on 0800 353433. Make sure you're ready to receive and store your bulk material by viewing the checklist shown on www.cemex.co.uk. All CEMEX drivers are fully trained and experienced in the discharging of our vehicles, please do all you can to ensure your site is accessible with no obstructions. If you are in any doubt, we can send an engineer to advise you - just ask.

Health and safety

Contact with wet concrete or mortar may cause irritation, dermatitis or severe alkali burns. Contact between ggbs powder and body fluids (e.g. sweat and eye fluids) may also cause irritation. There is risk of damage to the eyes. Wear suitable waterproof protective clothing, gloves and eye / face protection. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice. After contact with skin, wash immediately with plenty of clean water. Keep out of reach of children. Contains chromium (VI), may cause allergic reaction.

Product applications – concrete

General

CEMEX GGBS may be combined with CEMEX Portland or other CEM I cements for general concreting operations. When selecting aggregates, separate (sharp) sand and coarse aggregate is preferable to all-in aggregate (ballast). Use the minimum mixing water consistent with placement and full compaction of the concrete; excess water reduces both strength and durability. A plasticising admixture from the CEMEX range may be beneficial in this respect. CEMEX GGBS is compatible with the full range of CEMEX admixtures. Note that a somewhat longer setting time may be experienced with concrete containing CEMEX GGBS.

Once placed, concrete requires moisture to develop its full strength and premature drying out must be avoided. In normal conditions

and at temperatures in excess of 10°C, concrete should be cured under damp conditions for 1 to 3 days (cover with curing membrane, plastic sheeting or wet hessian); at temperatures below 10°C, this curing time should be doubled. Protection of fresh concrete against freezing is essential and placement under such conditions should be avoided if possible. Curing of concrete containing ggbs is particularly important due to the lower early age strength development. Striking of formwork may need to be delayed relative to CEM I cement concrete with equivalent 28 day strength.

Colour

Concrete made with at least 50% replacement of CEM I cement by CEMEX GGBS, will be significantly lighter in colour than CEM I cement concrete and may be used to provide pleasing architectural finishes.

It should be noted that fresh surfaces of blastfurnace cement concrete may transiently exhibit a bluish-green tinge which fades on exposure to the atmosphere and does not recur.

Strength development / heat release

Concrete containing ggbs gains greater strength beyond 28 days than equivalent CEM I concrete. With high replacement levels of ggbs, desired ultimate concrete strengths can, thus, be achieved without excessive early age heat release and temperature rise. Use of CEMEX GGBS is, therefore, beneficial in reducing risk of thermal cracking in thick section or mass concrete construction.

Chemical resistance

Chlorides

Chlorides penetrate concrete by a process of diffusion and can cause localised pitting and corrosion of steel reinforcement. Incorporation of CEMEX GGBS in concrete may reduce chloride diffusion rates by an order of magnitude compared to CEM I cement. CEMEX GGBS is particularly effective in this respect, as it can not only reduce concrete permeability but also chemically bind chlorides. This property is particularly beneficial in concretes exposed to de-icing salts or tidal marine environments.

Sulfate-resistance

Binders containing ggbs are more chemically resistant than CEM I cements and those containing between 70% and 85% ggbs are defined as group 2 combinations in BRE Special Digest No. 1 (Concrete in aggressive ground conditions) Group 2 materials may be used in more aggressive ground conditions than Group 1 (includes CEM I cements) – up to Design Chemical class 4 (see BRE SD1 and BS 8500). Use of CEMEX GGBS, therefore, represents a cost effective alternative to sulfate-resisting Portland cement in all but the most severe ground conditions.

Alkali silica reaction (ASR)

Incorporation of ggbs in concrete, is generally acknowledged as an effective means of reducing the risk of expansive damage arising from ASR where aggregates are known to contain reactive silica. The contribution of alkalis from the ggbs does not need to be taken into account in the overall concrete alkali content, provided that the binder contains at least 40% ggbs. Higher binder contents may, thus, be achieved relative to CEM I cements for equivalent sodium oxide limits in concrete.

Product certification

CEMEX GGBS complies fully with the requirements of BS 6699 and carries third party product certification to that standard under the BSI Kitemark Scheme: "Additions for use with Portland cement". The Scheme requires independent assessment of both Factory Production Control and test data, coupled with independent audit sampling and testing.

BS 6699 test reports and certificates of CEM I / CEMEX GGBS combinations to BS 8500 are available on request.

For further information please contact
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