

Granulated Blastfurnace Slag

Ground Granulated Blastfurnace Slag and the new European Chromium (VI) Directive for cement and cement-containing preparations



European Union Directive on chromium in cement

The Chromium (VI) Directive [1] was issued by the European Commission, with the aim of minimising the occurrence of chromate-related allergic dermatitis arising from the use of cement. It requires that:

"Cement and cement-containing preparations may not be used or placed on the market, if they contain, when hydrated, more than 0,0002 % (2 ppm) soluble chromium VI of the total dry weight of the cement."

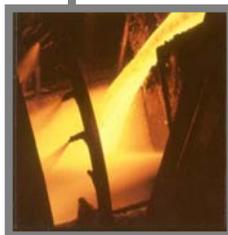
This Directive came into force on 17th January 2005 Europe-wide. Infringements against it will induce penal consequences. To meet its requirements, Cement Manufacturers will have to control the amount of soluble

chromium (VI) in all bulk and bagged cements by the addition, where necessary, of small amounts of a reducing agent (such as ferrous sulfate).

Chromium in ground granulated blastfurnace slag (GGBS)

Iron blastfurnaces operate with a 'reducing atmosphere' which is essential to reduce the iron-ore to iron. As a result of this reducing atmosphere, any chromium present in blastfurnace slag is in the insoluble trivalent oxidation state and not present as chromium (VI).

Granulated Blastfurnace Slag (GBS) is manufactured from molten blastfurnace slag, a co-product produced simultaneously with iron. Rapid chilling with water or air forms a glassy granular material with latent-



hydraulic properties. It is used for cement, concrete, mortar, grout and aggregates.

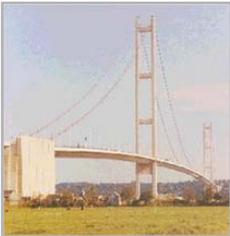
For more informations on GBS see EUROSLAG leaflet No. 1



TV Tower "Florian", D



Europe school, L



Humber bridge, UK



Church relief, D



Oosterschelde barrage, NL



Marina construction, UK



Road construction, F

Measurements on GGBS detect a very low (about a tenth of the limit in the Directive) or zero level of chromium (VI) [2]. This is acknowledged by the EC's Scientific Committee on Toxicity Ecotoxicity and the Environment, who concluded [3] that the use of GGBS to replace conventional cement, results in lower chromium (VI) contents, with evidence of resultant decreases in allergic contact dermatitis.

Implications of the Directive for ground granulated blastfurnace slag

Although GGBS is generally classified as a 'Type II addition' [4] rather than a 'cement', it normally counts as part of the 'cement content'.

With the Directive not defining what is meant by 'cement', there is some ambiguity in interpreting how its requirements apply to GGBS.

However because of the very low level of chromium (VI) in GGBS, incorporating GGBS in 'cement-containing preparations', as part of the cement content, will assist in meeting the Directive limit of "0.0002 % (2 ppm) soluble chromium (VI) of the total dry weight of the cement."

The efficiency of the chromium (VI) decrease depends on as well the chromium (VI) content of the cement (Portland cement clinker, sulfates and minor components) and concrete additions as the amount of GGBS used in cement or concrete. It might be possible that in some cases an addition of chromium reducing agents can be omitted.

Effect of the addition of ferrous sulfate to cement on properties of cement/GGBS combinations

Only a very small quantity of reducing agent is added to cement and no great changes in the performance of the cement with ggbs are expected. The only change that has been postulated [5] is an increase in setting time in combination with some additions.

Cement manufacturers should be able to provide further advice on the likelihood of this, related to their specific sources of Portland cement.

Secretary:

FEhS – Institut fuer Baustoff-Forschung e.V.
Bliersheimer Strasse 62, D-47229 Duisburg-Rheinhausen, Germany
Phone ++49/2065/9945-0 Fax ++49/2065/9945-10
E-Mail info@euroslag.org Internet: <http://www.euroslag.org>

Exposure controls/personal protection, when using GGBS

The precautions for the use of GGBS, which are set out in the Manufacturer's Product Health and Safety Information (Material Safety Data Sheet, MSDS), should always be followed. Europe-wide MSDS No. 401 (unground GBS) and No. 402 (GGBS) were developed.

References

- [1] Directive 2003/53/EC of the European Parliament and of the Council, amending Council Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations: nonylphenol, nonylphenol ethoxylate and cement (18 June 2003), Official Journal of the European Union pp. L178-24 - L178-27, 17 July 2003
- [2] Frías, M. et al.: Contribution of toxic elements. Hexavalent chromium in materials used in the manufacture of cement, Cement and Concrete Research 24 (1994) No. 3, pp. 533-541
- [3] Scientific committee on toxicity, ecotoxicity and the environment: C2/AST/csteeop/ChromiumVI 27062002/D(02) "Opinion on risks to health from chromium VI in cement", 32nd CSTEE plenary meeting Brussels, 27 June 2002
- [4] EC Mandate M/128: Products related to concrete, mortar and grout, April 1999
- [5] British Cement Association Information Sheet: The chromium (VI) directive for cement, sheet 3: Information for ready mixed concrete producers and concrete product manufacturers, January 2005

About EUROSLAG:

In 2000 slag producers and processors in Europe have come together to form EUROSLAG, the association of organisations and companies concerned with all aspects of the manufacture and utilisation of slag products. It seeks

- to promote and develop the utilisation of slag in all appropriate situations
- to ensure slag products are made by the best possible processes
- to provide and encourage communication between slag producers and processors
- to co-ordinate technical working parties and research and development
- to bring together people from both the supply and utilisation side of the industry
- to provide a co-ordinated approach to European Standardisation.