

Position Paper

The Chromium VI Directive and Pulverised Fuel Ash (PFA)

The Chromium VI Directive

The European Union Directive¹ limiting the Chromium VI content of cements becomes effective from 17 January 2005. This directive has 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% (2ppm) soluble chromium VI of the total dry weight of the cement."

The COSHH and CHIP Regulations under the responsibility of the Health & Safety Executive (HSE) have been amended accordingly. As a result of these changes 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 or stannous sulfate.

Chromium VI in Pulverised Fuel Ash (PFA)

PFA is produced by the burning of coal in a power station. Power stations have been subject to environmental legislation requiring a reduction in Nitrous Oxides emissions (NO_x). This has been achieved by burning the pulverised coal in a reducing atmosphere. As a result chromium in the resulting ash should contain very low levels of Chromium VI. Tests of PFA from all the UK power stations indicate typical levels of Chromium VI below the maximum levels specified in the directive of 2ppm, normally ranging between 0 and 0.5 ppm. Specific values can be obtained from your supplier of PFA.

How this Directive affects PFA

PFA is classified as a Type II addition within BS EN206-1. It is not treated as cement within this standard. The complementary standard to BS EN206-1, BS8500, uses the phraseology of the 'combination'. However, combinations are effectively treated as being cementitious in many ways in both standards.

The Directive does not clarify what it means by cement or cement containing preparation. It implies that the Chromium VI should be calculated by dividing the Chromium VI content by the cement content. This suggests that Chromium VI from aggregates, additions like PFA, admixtures, etc should all be taken into account in a cement containing preparation. Concrete, mortar, grouts, bagged products; etc could all be considered 'cement containing preparations'. As the limiting Chromium VI level of 0.0002% is expressed by weight of the cement, mixes with lower cement contents are at greater risk of failing the criteria than cement rich mixes. We consider the wording of the directive to be rather poor in this respect and subject to misinterpretation.

Testing for Chromium VI

The test being used for the Chromium VI content of PFA is the draft method being proposed and subject to public enquiry prEN196-10². This method has been developed by CEN in a relatively short timescale and has only been tested

using cement. PFA is NOT cement but added to cement and to concrete. PFA behaves differently to cement when subject to this test regime.

The reported repeatability and reproducibility of the test method is 0.000015% and 0.000040% respectively for results between 0.0001% and 0.0005%. This means that for PFA the results could be expected in the range of ± 0.15 ppm from a single laboratory and ± 0.2 ppm for differing laboratories for 95% of the time. There is limited evidence that these values are too conservative for PFA, based on duplicate samples tested to date. As a result of these findings it is intended to carry out a more precise and detailed test programme with commercial laboratories to ascertain the realistic repeatability and reproducibility values for PFA.

Effect of the reducing agents in cement on the properties of PFA combinations

As only small amounts of reducing agents are being added to cements, there is likely to be no noticeable difference in the properties in concrete, mortar and grouts containing blends of cement and PFA. Setting times may alter slightly by being reduced or extended, but there should not be significant differences from past performance.

COSHH and Personal Protection Equipment (PPE)

The Chromium VI limits imposed and the use of reducing agents in cement does not make cement containing preparations significantly any different. When cement is mixed with water, a strong alkaline solution is produced that may cause serious burns when in prolonged contact with skin, together with possible irritant and allergic dermatitis. The reducing agents added to cement will minimise the risk of allergic dermatitis, but proper PPE is still required to protect against irritant dermatitis and alkali burns.

Further information

The British Cement Association has a series of Information Leaflets relating to Chromium VI on the following link: <http://www.cementindustry.co.uk/main.asp?page=265>

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¹ DIRECTIVE 2003/53/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2003 amending for the 26th time Council Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations (nonylphenol, nonylphenol ethoxylate and cement)

² prEN196-10: 2004 Methods of testing cement — Part 10: Determination of the water soluble chromium (VI) content of cement, prepared by CEN TC51