

Foamed concrete explosion - HSE interim position 03 December 2009

This document has been produced to provide information on an explosion involving foamed concrete and provide interim advice whilst HSE continues its investigation.

There was an explosion which injured two people in August 2009. A contractor had filled a pit with about 6m depth of foamed concrete. Whilst the concrete was setting, workers started removing steelwork using angle grinders. There was an explosion underneath the steel walkway on which two contractors were standing and which blew the steel plates and the workers up into the roof.

HSE is investigating. The foaming agent in this concrete mix was air produced by the addition of surfactants and agitation. It appears that while the concrete was setting, the flammable gas hydrogen was produced. The particular location of the pour within a relatively confined area beneath a walkway appears to have allowed a flammable/explosive mixture to have developed.

HSE has been investigating the means by which hydrogen was generated. Aluminium is known to react with cement/concrete mixtures to form hydrogen. The particular concrete mix included incinerator bottom ash (IBA) which is suspected of being the source of aluminium. Tests on raw materials and the mixed concrete revealed the presence of aluminium. Tests to confirm the suspected mechanism have not yet been completed.

In the meantime the supplier of the IBA has been asked to advise customers of the following:

- foamed concrete mixes containing IBA or other recycled materials should be poured in the open air;

- if such mixes are to be poured within a building or confined area, adequate ventilation must be provided and the entire surface of the poured concrete should remain visible until it has set;

- sources of ignition such as naked flames or spark-generating tools (e.g. disc cutters, angle grinders) should be kept away from the concreted area during the pouring and setting process.

HSE has not taken any action requiring the removal of IBA from concrete products.

HSE is not investigating any other similar explosions.

HSE estimates that the scientific tests will be completed by the end of 2009 at which time we will consider what further action needs to be taken and will update this information note.