



S A F E T Y B U L L E T I N

FORMATION OF HYDROGEN GAS FROM SILICON METAL

Amorphous silica fume is a by product of ferrosilicon and silicon metal production. It is often used as a hydraulic binder with cement in concrete or shotcrete to improve the plastic properties, strength and durability.

There have been three reports from overseas of explosions of hydrogen gas which formed where amorphous silica fume was being used. These explosions were at:

the Nevada test site tunnels,

a Hollowcore plank manufacturing operation in Sweden, and

a site in France

Apparently in all cases the problem was traced back to the fact that the silica fume contained up to 2.1 per cent of silicon metal. The presence of silicon metal leads to the formation of hydrogen gas when the metal comes in contact with an alkaline environment. To prevent such occurrences the quantity of silicon metal contained in the silica fume should never exceed 0.2 per cent.

Silicon metal cannot contaminate the silica fume during the manufacturing operation, however, it is possible for contamination to occur during the collection and storage of silica fume where housekeeping is poor. Therefore it is of utmost importance that producers of silicon metal and silica fume keep the products entirely separate during collection and storage, and maintain a high standard of housekeeping.

In the Western Australian mining industry concrete and shotcrete are commonly used as materials in foundations, flooring, bulkheads and ground support. Where amorphous silica fume has been used in any of these areas a potential hazard exists.

It is recommended that operators using silica fume in concrete or shotcrete ensure there has been no contamination of the product with silicon metal, or ensure that safe working procedures are established which will eliminate the risk of an explosion should hydrogen gas be formed.