Department of Consumer and Employment Protection
Government of Western Australia

Resources Safety

Mines Safety Bulletin No. 78

Date: 2 March 2007

Subject: Use of explosive mortar devices for bringing down rockpass or drawpoint hang-ups

This bulletin is issued as a result of an investigation following a near-miss incident involving a mortar used to fire impact sensitive explosive charges at underground hang-ups. A previous incident resulting in a fatality occurred approximately a year ago involving a similar device.

The type of device involved is a mortar equipped with a base plate and stand which is used to fire a finned projectile containing a 2.2 kg impact sensitive booster charge at hang-ups. Further details regarding this type of device can be found in Mines Safety Bulletin No. 76, which should be read along with this bulletin.

Incident

During day shift, two operators were asked to set up and arm the mortar device in a draw point for firing at the end of the shift. The draw point had become blocked by large rocks that required an explosive charge to remove them.

Prior to the night shift entering the mine on the same day, an operator was instructed to carry out an inspection of the draw point prior to staff re-entering the area after blasting had occurred. On entering the draw point, the operator observed that the mortar hardware unit had been destroyed during the blast. He identified hardware components scattered around the area.

The stand legs and half of the mortar barrel were found on a pile of dirt inside the stope and were later recovered with a remotely-controlled loader. A visual inspection of the mortar hardware indicated that the 2.2 kg booster had detonated in the base of the barrel; the top half of the barrel was not damaged at all.

As a result of the preliminary assessment undertaken by the operator, it was apparent that the 2.2 kg explosive booster prematurely detonated inside the mortar barrel upon initiation of the propelling charge.

Causative factors

The likely cause of this particular incident was found to be a misaligned well in the centre of the plastic tailfin used to mount the impact fuse assembly and hold the booster charge. Misaligned wells appear more oval-shaped, rather than circular in cross-section, as they should be. The problem apparently results from a manufacturing error, not picked up by quality control processes.

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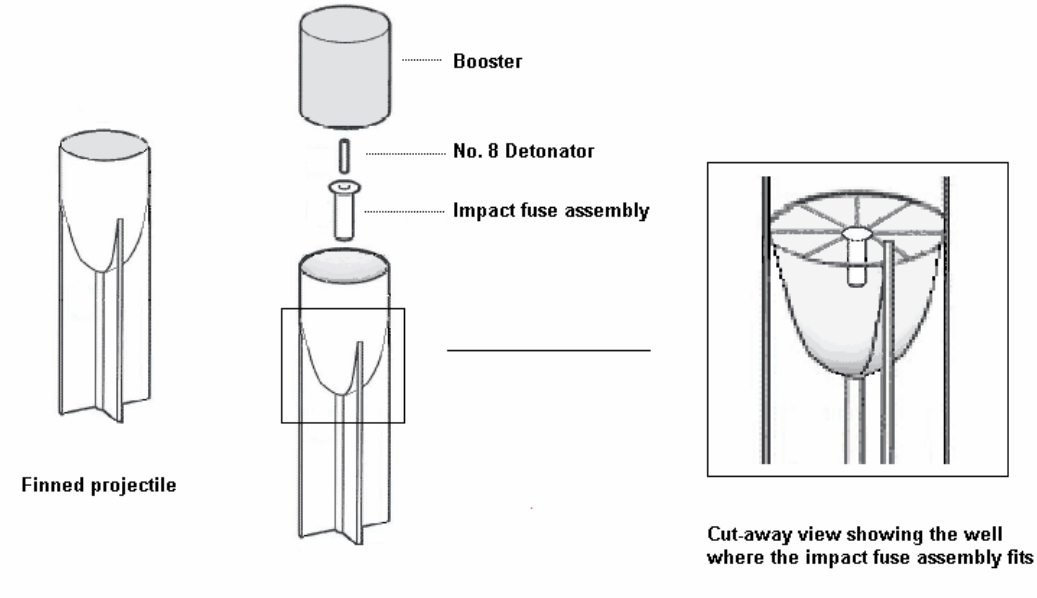

It would appear that this manufacturing error has occurred in a certain percentage of finned tubes (around 5-6% of those checked). The well in the centre of the finned tube is not formed properly in the manufacturing process and when the impact fuse assembly is inserted into the well, it sits at an angle, rather than in the correct position in-line with the long axis of the projectile. This may be compounded by another fault, where the well designed to receive the impact fuse assembly is tapered, rather than cylindrical, resulting in the impact fuse standing slightly proud of its seat, rather than fitting in the correct position within it. It is thus impossible for the operator to assemble the finned projectile properly. This results in the impact fuse assembly sitting too high in the well and when the finned projectile is assembled, the detonator is forced against the booster instead of fitting comfortably inside it as it is designed to do. Forcing the detonator against the booster in this manner is potentially extremely hazardous because the detonator may be prematurely initiated by crushing either during set-up or at launch.

If a 2.2 kg booster initiates prematurely inside the mortar, steel fragments travelling at supersonic speeds may fly in all directions. The consequences are, obviously, potentially catastrophic.

The investigation also revealed a second issue that can contribute to the problem. The 2.2 kg cast boosters can slip inside their cardboard casings, and if the casing is not completely filled to the top with cast explosive during pouring at manufacture then the problem potentially worsens. When the operator assembles the finned projectile this slippage, combined with the incomplete filling of the booster, has the potential to mask the fact that the impact fuse assembly is sitting too high in the well. The booster and the casing may appear to fit flush with each other and both may appear to be sitting at the correct height in the mortar, despite the fact that the detonator fuse assembly has forced the explosive charge higher within the booster cartridge. The operator may not notice that there is a problem despite the fact that the impact fuse assembly is being forced hard up against the booster.

The damage to the mortar sustained in this near-miss incident is similar to the damage in the previous incident, in that the mortar tube was blown apart near the base with a ‘petal-like’ or “banana-skin” opening of the barrel where the booster charge prematurely detonated.

Precautions

Mine managers are strongly advised to consider discontinuing the use of such explosive mortar devices for bringing down rockpass or drawpoint hang-ups on each site where they are employed until the supplier has confirmed by inspection of the products supplied to the site that the manufacturing problems noted above are not likely to constitute a hazard at that site.

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