

CAUSAL INVESTIGATION REPORT

UNPLANNED INITIATION OF EXPLOSIVES AT PEAK GOLD MINE

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Executive summary

An incident occurred at Peak Gold Mine on 17 May 2022 in which there was an unexpected initiation of explosives. No-one was injured in the incident.

On the day of the incident, the original plan was to fire a development heading at the 16L along with a production stope at the 21L (referred to as the 25L nth stope).

The original firing was to be conducted using the I-Kon III electronic blasting system. To ensure that both locations would be fired together, the development heading was connected to the mains firing line via an I-Kon III starter detonator. The production stope was also primed with I-Kon III electronic detonators, and the joint firing was registered and logged via a I-Kon Logger II and wired into the mains firing line.

During the pre-firing set-up, the production shotfirer was unable to power up the blaster 3000 initiation device because it had a flat battery. The production shotfirer decided to remove the production stope from the planned firing and only fire the development heading.

To complete this, the I-Kon III starter detonator that had previously been installed would need to be removed, along with the firing line connection to the production stope. An electric detonator would be installed on the development heading. This would be fired using a 240v AC pulse delivered via the mains firing line at the mine portal entrance.

The development shot firer completed the change over of the detonator at the development heading and conducted the firing of the development heading with approval from the shift supervisor.

During the re-entry post-firing, it was identified that the 25L nth stope was disconnected from the mains firing line and there had been an unplanned partial initiation of electronic I-Kon III detonators in the stope. Note that an animation of this incident will be published by the Resources Regulator in the near future.

Investigation findings

The immediate cause of the incident was the application of a 240v AC pulse to the I-Kon III detonators resulting in detonating explosive product.

The investigation identified the following causal factors:

- Peak Gold Mines used a single main firing line system for the initiation of both electric and electronic blasting systems. Electric detonators were used for firing the development headings while electronic blasting systems were used for production stopes and where there were dual production/development firings to be conducted. The voltage used for firing an electric detonator was 240v AC. The mine did not identify all hazards associated with multiple firing systems operating on a single main firing line.
- Due to the change in firing processes on the day of the event, there was miscommunication regarding which shot firer had responsibility to remove the production stope from the mains firing line after the failure to power up the blaster 3000 device.

- The Orica production shot firer failed to ensure the blaster 3000 unit was fully charged before the task, which created additional pressure to complete the firing within the approved firing window.
- There was evidence that industry personnel considered the I-KON III detonator and firing system to resist stray voltage transients. There was limited communication from the original equipment manufacturer (OEM) on the potential for I-Kon III detonation if exposed to 240v AC mains power supply. As a result of this assumption, the mine procedures were developed that highlighted damage to the logger device was the only risk associated with exposure to an electrical charge. There was never a consideration at the mining operation regarding stray voltage mains voltage and detonation of electronic detonators.

Recommendations

Mine operators and persons conducting a business or undertaking (PCBUs) have a duty to identify hazards and manage risks to health and safety associated with the operation of plant and equipment in accordance with the *Work Health and Safety Act 2011* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulations.

It is recommended that mine operators, principal mining contractor and contract service providers implement the following:

- Mine operators should review their blasting risk assessments, management plans and operating procedures including the hazard of potential initiation of electronic detonators with 240v AC power and/or other non-approved initiation methods.
- In this case, the manufacturer prepared a product bulletin for distribution to customers using electronic blasting systems, warning that electronic detonators must not be connected to 240v AC power and/or other non-approved initiation equipment. It is recommended mine operators and principal contractors review this bulletin
- Mine operators of similar electronic blasting systems should be fully aware of the risks associated with the accidental connection of an electronic initiating system to 240v AC and/or other electrical power sources that could potentially initiate electronic detonators. Therefore, robust training and awareness procedures should be in place to ensure understanding all aspects of the system.
- All mines that use electronic blasting detonators and manufactures of this type of product should be aware of the requirements for electronic detonator systems as per Australian Standards AS2187.2 – 2006 Explosives – Storage and Use – Part 2 Use of explosives, section 8.2.2 Electronic detonator systems.
- Affected workers should be consulted in any change management process, including on the job changes. Mine operators should also ensure adequate communication of relevant information to all parties involved when changes are made that may affect workers.

- Mine operators should ensure adequate shift hand-over processes are in place, including documenting any changes to shot firing plans.
- Mine operators should have an adequate contractor management system in place to ensure that when multiple contractors are involved in a single process (such as shot firing), the process is conducted in a safety and efficient manner.

Mine operators should also read the post-incident actions section in this report as it provides additional detail about what the relevant parties have done and intend to do in response to this incident.

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1. Causal investigation

A preliminary investigation and assessment of the incident was carried out by the NSW Resources Regulator. We did not identify any material breaches of the work health and safety laws. Following this assessment, we determined that an investigation under the *Causal investigation policy* would be appropriate.

A causal investigation is an investigation into a safety incident that has been notified to the Regulator under work health and safety laws. The purpose is not to obtain evidence for a prosecution, but to identify the causal factors of the safety incident, the effectiveness of the controls used and the factors that may have contributed to the failure of these controls. Timely communication helps to ensure that duty holders, under the work health and safety laws, can better understand the risks they must manage, and the necessary controls needed to prevent reoccurrences of similar incidents.

We invited relevant stakeholders to participate in the causal investigation process and an investigation team comprising representatives from Peak Gold Mine, PYBAR Mining Services Pty Ltd, Orica Technical Services and the Regulator was established.

1.1. Purpose

This report has been published under section 70(1)(b) of the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* to share safety lessons about the incident and prevent similar incidents from reoccurring.

1.2. The mine

Peak Gold Mines Pty Ltd operates Peak Gold Mines, which is 9 kilometres south east of Cobar, NSW. Peak Gold Mines consist of several underground gold and copper deposits - the Perseverance, Peak, New Occidental, Chesney and New Cobar. Four of these have active mines. There is also a copper and gold processing plant on site. PYBAR Mining Services is the principal contractor onsite and responsible for development activities at the mine.

Mining is typically via open stope underground methods with backfill. All production blasting is managed by Orica while development blasting is managed by PYBAR Mining Services.

1.3. Parties involved

1.3.1. Mine operator

Peak Gold Mines Pty Ltd is the mining lease holder and nominated operator of Peak Gold Mines. The ultimate holding company of Peak Gold Mines Pty Ltd is Aurelia Metals Ltd.

1.3.2. Explosives contractor

- Orica Blasting services for production blast in the use of Ikon blasting systems.
- PYBAR Mining services for development blasting only.

2. The incident

The mine planned to fire a development heading and the production stope simultaneously with the I-KON III electronic blasting system.

The Orica day shift production shot firer was tasked with the charge-up and firing of the New Cobar 25L north stope on 17 May 2022. This was a down-hole charge that was to be loaded from the 21 level.

The charge-up was completed around 5.30pm, and the shot firer contacted the New Cobar shift supervisor for permission to prepare for the hook-up and firing of the stope at the end of the shift.

The shift supervisor consulted with the Peak Gold Mine mine superintendent, who advised that the explosive product had not had sufficient time to gas, so the firing would be delayed until the following shift.

The production shot firer planned with the day shift supervisor to come in early the following shift to fire the stope as there was no night shift production shot firer due to illness.

During the night shift, the PYBAR mining development shot firer was tasked with charging the 16L development heading. This was completed and scheduled for firing at the end of the shift.

On the morning of 18 May 2022, the Orica production shot firer arrived at the New Cobar site office and then went to the 21L to finalise the stope for firing. As he was travelling down, the night shift supervisor informed him that there would also be a development heading to be fired at the end of the shift. Arrangements were made for an I-Kon III starter detonator to be picked up by the PYBAR Mining development shot firer from the UG magazine and taken to the 21 Level to be logged by the Orica production shot firer into the blast program.

The I-Kon starter was taken to the 16 level and installed on the development heading.

At this time, the Orica production shot firer was told there would need to be ventilation changes made before firing. This information was not communicated on the charge plan.

By the time the Orica production shot firer arrived at the New Cobar portal firing point at 6.53am, the approved firing window (6.30am – 7am) had nearly expired. The PYBAR mining development shot firer and offsider arrived at the portal shortly after.

2.1.1. There was a change to the blasting system due to a flat battery in the blaster 3000 initiation device

The PYBAR mining development shot firer completed the pre-firing checks. During this time, the production shot firer found the blaster 3000 had a flat battery and he was unable to find the power adaptor for the unit. He contacted the night shift supervisor to advise the firing would need to be cancelled.

The night shift supervisor asked if the development heading could still be fired, which the Orica production shot firer confirmed, but only if the I-Kon starter detonator was switched back to an electric detonator.

The night shift supervisor required approval to fire outside the window, so he instructed the PYBAR mining development shot firer to travel to the 16 level with an electric detonator but not to connect it until approval was given.

The Orica production shot firer packed up the blaster as the development shot firer and offsider went back to the 16 level. No discussion was held between the 2 on the removal of the production stope from the mains firing line.

The Orica production shot firer left the New Cobar Pit and travelled to the Peak Mine. The night shift supervisor contacted the development shot firer with approval to fire, so the I-Kon detonator was changed at the 16 level to an electric detonator.

2.1.2. I-KON III detonators in the production stope inadvertently received a 240v AC pulse from a conventional 240v AC electric firing system

The Orica production shot firer left the New Cobar Pit and travelled to the Peak Mine.

The night shift supervisor contacted the PYBAR mining development shot firer with approval to fire, so the I-Kon starter detonator was changed at the 16 level to an electric detonator.

The development heading was fired via the 240v AC mains firing system at 7.14am. There was no indication at the time of the firing that there had been any additional detonations outside of the development heading.

About 8.10am, the re-entry crew started the re-entry to the areas. During the checks, the re-entry operator went down to the 21 level to restart the fan and to see if any residual fume was present from the 16 level firing. As he entered the 21 level cross-cut, he saw the production stope was still attached

to the mains firing line. On closer inspection he saw sections of the charged shot in the stope had heaved, indicating detonation had occurred.

Figure 1: Post incident – charge plan showing location of the fired holes resulting from the unplanned initiation

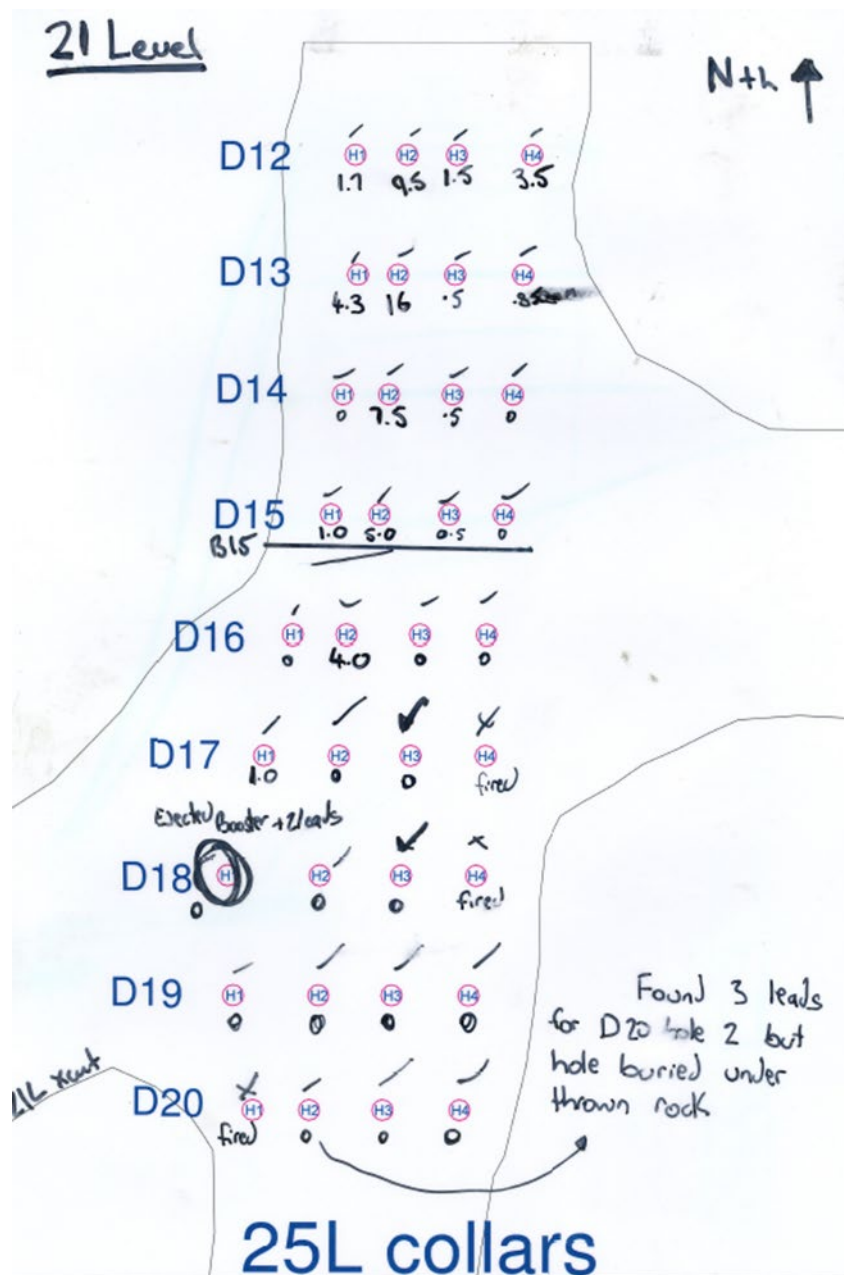
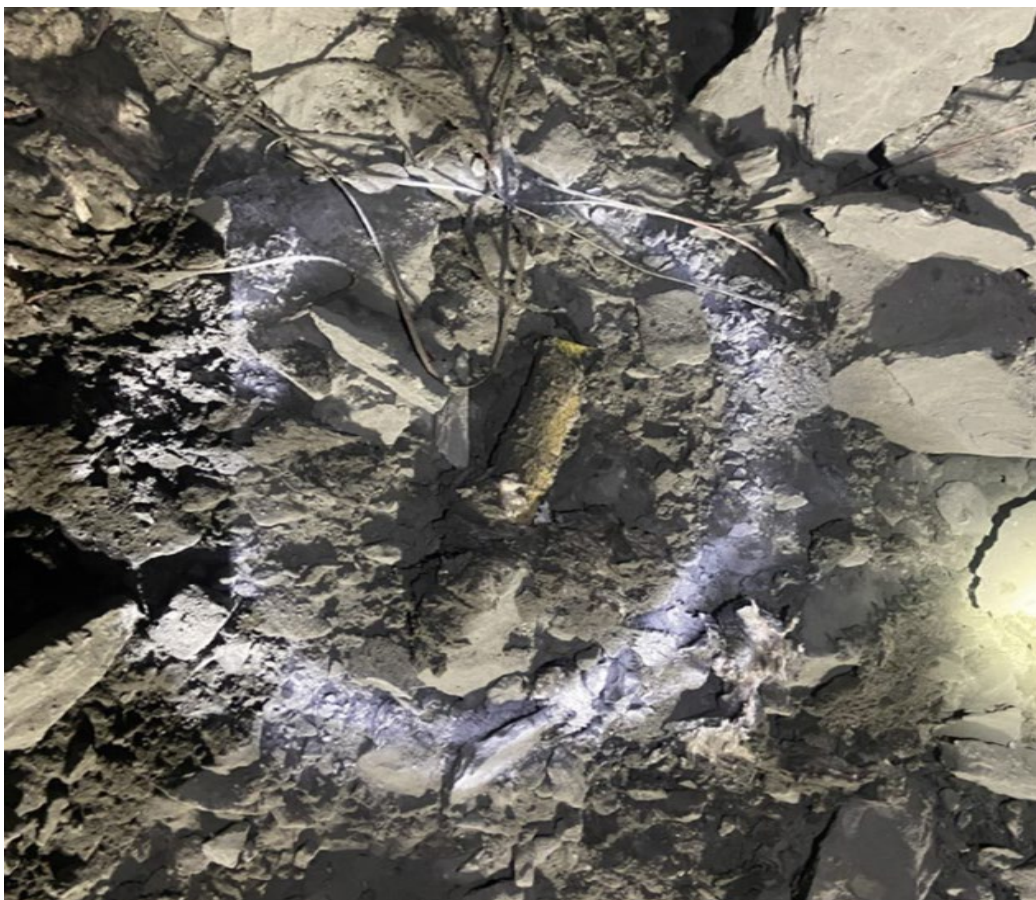


Figure 2: Post incident - Photo of 21L showing floor heave in line with mark-up of the charge holes (painted on wall)



Figure 3: Post incident – Detonator ejected from D18H1 during event (in-situ)



3. Investigation

3.1. ICAM recommendations

1. Physical removal the 240v AC mains firing system from all firing points.
2. Remove all electric detonators from service.
3. Replace electric detonator use across site with I-Kon electronic blasting system for all blasting activities (development and production).
4. Finalise sign-off for the management of change for the removal of the 240v ac mains firing system, electric detonators.
5. Develop and implement safe work instructions (SWI) for using electronic initiation for development blasting activities.
6. Conduct GAP analysis on PGM, PYBAR and ORICA blasting procedures and SWI.
7. Conduct review of PGM explosives management plans, procedures and training to ensure that references to electric mains firing are removed and the hazard associated with I-Kon III detonators initiating if exposed to 240v AC charge is identified.
8. Update the daily shift plan to indicate only one designated shot firer for the shift for each mine, with the responsibility for all shot firing activities assigned to that person.
9. Ensure there is a fully charged replacement blaster 3000 unit available in the event of future equipment failure.
10. Communication of the investigation findings with other Aurelia Metals Operations.
11. OEM to communicate a product bulletin to advise customers of potential for unplanned initiation of I-Kon III detonators if connected to other firing methods.
12. Complete I-Kon blasting systems training for all current PYBAR and PGM approved shot firers.

4. Post incident actions

- The re-entry operator disconnected the production firing line and contacted the D/S supervisor.
- An authorised entry only sign was installed across the level access.
- The mine superintendent notified
- The mine manager was informed, who then reported the event to the Regulator.
- All explosives activities were ceased pending the investigation of the incident.