

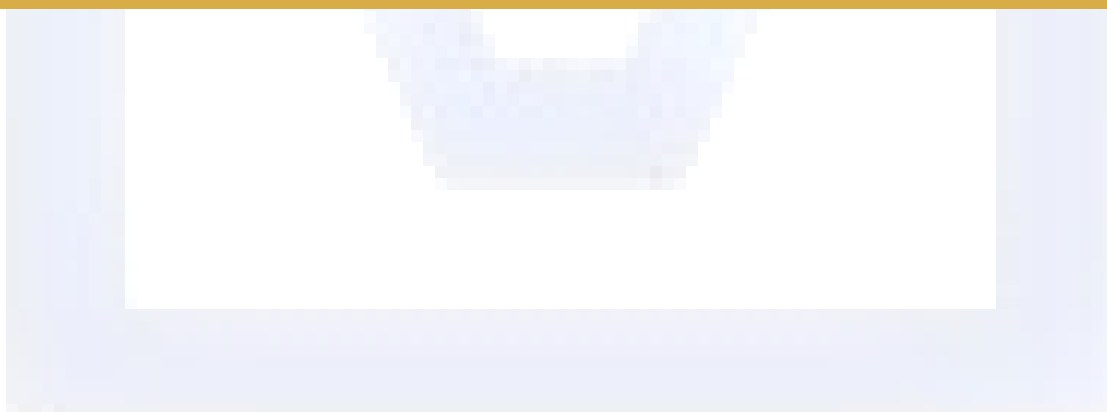


VULCAN MINE



Standard Operating Procedure

Charging and Firing Explosives





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1. PURPOSE

To achieve an acceptable level of risk associated with the use of explosives and Shot firing equipment at Vulcan Mine Operations

To detail the procedures associated with charging and firing explosives, including the prepping, loading, stemming, and firing of all blast holes.

2. SCOPE

This procedure applies to all Coal Mine Workers who are involved in the charging and firing of explosives at Vulcan Mine.

This procedure has been developed from VUL-RSK-116 WRAC Explosives Management and later reviewed & updated from VUL-RSK-116g-Review_update_0323.

Only workers who are competent and appointed by the Site Senior Executive (SSE) shall handle and use explosives at Vulcan Mine.

Prior to undertaking any surface blasting activities, operations will plan and implement effective blast design and management measures to account for all health, safety, environment, and community considerations, as well as the relevant statutory requirements.

3. DEFINITIONS

Authorised Person	A person who has the required competencies and who has been appointed by the Site Senior Executive, or their appointed representative to carry out a designated scope of duties.
CMSHA	Coal Mining Safety and Health Act 1999.
CMSHR	Coal Mining Safety and Health Regulation 2017.
CMW	Coal Mine Worker.
Competent Person	Competence for a task at a coal mine is the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons. The CMW must be assessed as competent and authorised by the SSE or SSE delegate to perform the task.
DNRME	Department of Natural Resources, Mines and Energy.
IMS	Integrated Management System.
JHA	Job Hazard Analysis.
SHMS	Safety and Health Management System.
SOP	Standard Operating Procedure.
Take 5	Personal Risk assessment.
FMZ	Fume Management Zone
MPU	Mobile Processing Unit



4. PREPPING, LOADING & STEMMING

4.1. Rules for Entry to Blast Area

Unauthorised entry to a blast area (shot) is not permitted. Permission to enter the blast area can only be given by the Shotfirer. In the case of an event or failure in the excavation the OCE may access the blast area to complete an inspection for the purpose of reducing an unacceptable level of risk.

Only (diesel) vehicles directly involved with loading and tying up activities unless directed by the Shotfirer are permitted on shot, for example, light truck and water cart.



Warning

*Petrol vehicles are **PROHIBITED** from entering or accessing a blast area*

4.2. General Rules

- Directions of the Shotfirer are to be followed at all times.
- Blast area shall be delineated.
- Entry to the blast area shall be strictly controlled by the Shotfirer.
- Consideration shall be given to the location/position of Blast Guards having regard for the potential of fume, face burst and fly-rock.
- Traffic management plan developed and signed on to by all persons entering the shot.
- Traffic management plan is to be reviewed prior to the commencement of loading each shift, taking into account the load plan for the day.
- Protocols for identifying and controlling hazards in the work area are to be done as per **VUL-SOP-094 Check, Examine and Restrict work areas**
- Access to explosives is restricted and controls outlined in **VUL-PLN-014 SSAN Explosives Security Plan**
- Action to be taken to specific trigger events concerning lightning in the area can be found in **VUL-TAR-005-Lightning**

4.3. Requirements

- Operators shall have site authorisation to perform designated tasks.
- PPE shall be worn as per **VUL-SOP-065 PPE**, Dust controls as per **VUL-MOP-089-Dust** and controls relating to hazards of gas **VUL-SOP-142-Flammable and Toxic Gas in Work Environment**.
- Barricades and signs are in place per section 4.5 of this document.
- Maximum recommended sleep times advised by the explosive's suppliers are not to be exceeded. If exceeded OCE and Shotfirer are to develop a JHA after consultation with the explosive supplier,
- OCE is to be notified by the Shotfirer when loading of a shot commences and sleeping of shots.
- All relevant personnel are to be notified of location of sleeping shots in the OCE report.
- Controls for hazards associated with heat management are found in **VUL-MOP-143-Heat Stress**.
- Loading and Blast Notifications are to be communicated via email to all site supervisors and relevant personnel at least 1 shift before the activity commences



4.4. Shot loading area Demarcation

Shot loading and demarcation areas must be bunded with an earthen berm and/or Flagging and have Shotfirer's cones placed a maximum distance of fifty (50) metres apart. "No unauthorised entry contact Shotfirer" signage will be placed at any vehicle entry point or gaps made for drainage.

The minimum standoff between any loaded hole and barricading/cones will be ten (10) metres.

All corners of the shot must have a cone and flashing light.

Red flashing lights and red pyramid cones are to be placed along the perimeter when the shot sleeps (with lights to be no greater than fifty (50) metres apart).

There must only be one entry/exit point to the loading area unless approved by the Shotfirer and the Open Cut Examiner.

A stop sign facing into the shot to ensure a controlled intersection when leaving the shot and entering active haul roads.

Authorisation must be obtained from the Shotfirer before entry may be permitted.

4.5. Shot Preparation

All holes to be measured and recorded on individual blast pegs, data logger and /or data entry sheet, with exception of parting drill holes <8m in depth.

All holes are to be checked to ensure they have been drilled to design pattern (diameter, bearing, angle, burden, spacing & depth) with appropriate front row burden and suitable for loading. Record pattern variations on loading map sheet and notify Shotfirer and the Drill & Blast Engineer.

Data recorded to include water depth, muddy walls, and shallow holes (redrills), cavities or any other hazard that will impact the performance and safety of the blast.

Redrills shall be identified by flagging tape or paint, re-measured and recorded prior to loading.

Holes that need to be redrilled are to be stemmed prior to firing to reduce energy release from loaded holes.

No drilling is to be done inside blast demarcation area and ensure ten (10) meter stand-off from loaded hole. Caution to be given to the hole angle and direction of both loaded holes and redrills.

The charging instructions and load data sheets shall be issued by the Drill and Blast Engineer prior to the start of the job.

The Shotfirer, and MPU operator are to decide on the method of loading the shot. The following shall be considered:

- Weather
- Proximity to sensitive infrastructure (e.g. Saraji Road, fibre optic cable, powerlines or Aurizon Rail)
- Product sleep times (Coal present in shot)
- Dry/wet hole(s)
- Single or multi pass loading.
- Geology
- Bulk product availability
- A documented traffic management plan
- Hole stability
- Manufacturer specifications for sleep times for specific products.
- Dust levels, ensuring dust suppression is adequate when activities are happening on the bench.
- If holes need to be de-watered, decide on the sequence/timing so:



- Improved drainage so as not to interfere with loading operations.
- The recharge rate of water does not interfere with the efficiency or safety of the blast. Correct product shall be chosen.
- Sleep time for bulk products is not affected.

4.5.1. Backfilling

- Backfilling shall be completed in strict accordance with the backfill plan using suitable stemming material or drill cuttings.

Points to consider are:

- That the correct hole is being backfilled. If a hole is incorrectly backfilled. The hole number must be recorded and the Shotfirer notified.
- Conduct backfilling operations in blocks of predetermined size and at the time of measuring where possible.
- Backfilled holes to be highlighted on Drill Plan/Backfill Map.
- Any damaged or blocked holes shall be reported to the Shotfirer and are to be indicated by identifying the hole with flagging tape or paint. Any short or blocked hole can be re-drilled before loading commences.

4.5.2. Distribution of Charging Accessories

Explosive accessories should be distributed and placed at holes. Depending on loading sequence, this may not be possible; therefore, accessories shall not be placed in the path of any vehicles or in hole-cuttings.

Accessories are to be placed beside blast peg as per the pictures below;



When distributing charging accessories, any hole found to be missing an accessory shall be immediately reported to the Shotfirer. Work shall immediately cease with an 'on bench' stocktake undertaken. If explosive products remain unaccounted for the OCE, SSE and Explosives contractor shall be informed immediately, and the protocols contained within **VUL-PLN-0014 Explosives Security Management Plan** followed.

All explosives used must be recorded on a Daily Shotfirer's Report and Shotfirer's monthly stock usage spreadsheet. Information recorded shall include un-retrievable down-lines dropped down blast holes and damaged or destroyed explosives. Charge sheets detailing the charge mass and length, length of inert decks (gravel, air or water) and stem heights for each blasthole must be completed





4.5.3. Parking of Shotfirer's Light vehicles in blast pattern

All other non-essential equipment must be parked in designated park up areas as directed by the Shotfirer and appropriately signed. A Traffic Management plan is to be reviewed daily to indicate the direction of loading and the designated parking area.



4.5.4. Dewatering Blast Holes

- All dewatering to be carried out under the Shotfirer's instructions.
- Attempt to drain water away from work area.
- At the end of daily dewatering activities, the dewatering unit should be flushed out in clean water.
- Manual handling of Hose Reeler to be minimised to avoid over exertion. Shotfirer to remove or reduce collar cuttings where practicable if the cantilever is unable to extend over the collar.

4.5.5. Priming of Blast Holes

Only sufficient holes that can be loaded that day are to be primed.

All holes shall be double primed if:

- The explosives column is greater than ten (10) metres.
- There is known faulting in the area.
- Poor quality collars
- As directed by the Shotfirer in consultation with the Drill and Blat Engineer

The following general precautions shall be taken:

- Check that none of the accessories are damaged.
- Damaged downlines or boosters are to be reported immediately to the Shotfirer and kept for investigation.
- If using nonel dets, Check that the downhole delays are in the correct sequence. In most cases the bottom delay should be the shorter timed delay than the top delay.
- If the rate of water inflow is excessive, a wet-hole-product is required to be used.
- Detonators and boosters to be assembled as per manufacturer's specifications. Once assembled the primer is to be lowered into the blast hole in a controlled manner. Primed detonators and boosters are not to be left on the bench unattended whilst intact. Do not place detonator in booster without the intent to prime the hole as soon as possible.
- The bottom primer is to be raised from the bottom of the hole, above sub-drill to confirm that the bulk explosive product can adequately surround the booster Refer to the Drill Plan for the sub-drill parameters.
- Tie off the downline to the peg in a secure manner. Check peg is secure in the drill cuttings.



- Tails to be left in a tidy state, away from the traffic area and not able to fall down the hole.
- Allow enough downline free (lead slack) at peg height in case of slumping.
- Do not use downlines that are shorter than the length of the blast hole unless it is the top primer
- Placement of pegs is to be an adequate distance from blast hole to prevent the peg falling in the hole due to lose collars (if necessary, pegs are to be hammered into the ground to prevent falling over).

4.5.6. Loading Holes

Loading shall not commence without authorised Load Plans and exclusion zones issued to blast crew and OCE.

Shot shall be demarcated prior to any loading activities beginning.

A traffic management plan must be filled out showing flow of MPU traffic whilst loading pattern, this is to be updated whenever traffic flow changes, this plan is to be kept in the blast pack during and upon completion of loading pattern.

All persons entering the shot shall have read and understood the load and traffic management plan and sign onto the bench toolbox form. Load map will clearly map the progress of the shot.

The shot shall be loaded such that the holes furthestmost from the access point are loaded first unless otherwise directed by the Shotfirer, and in a manner that allows the shot to be squared up for urgent firing. (i.e., Severe Weather Event).

Consideration shall be given to requirements outlined in AEISG Elevated temperature and reactive ground.

Holes shall be bobbed during the loading process to the extent that the Shotfirer is sure that:

- The correct stem height is achieved.
- Stem height to be adjusted to allow gassing of product (if used).
- Maximum Instantaneous Charge (MIC) parameters have not been exceeded. Where shots are governed by the Asset Protection Plan a third-party review is required.

If the upper primer is still not covered, it shall be lowered down to the top of the explosive's column and cover with a small amount of explosives product. Consideration should be given to placing an air bag/air deck and a satellite charge above to ensure quality fragmentation of ground. Consult with the Drill and Blast Engineer.

The use of a spotter shall be required when in tight working conditions and when MPU, stemming truck or dewater unit is required to reverse on the pattern.

Each hole shall be charged as per the charge sheets:

- The MPU operator shall record the actual quantities placed in the hole on the load sheet.
- The actual charge sheet shall be kept in the blast pack upon completion of loading shot.

Additional charge may be added to achieve stem height, unless in a MIC sensitive area (do not load past MIC). Any variance greater than ten (10) percent from design shall be discussed with the Drill and Blast Engineer prior to continuation of loading. Variation shall be recorded on load sheet.

If other mining activities are in close proximity to the loaded holes e.g. An Excavator mining waste, the following protocols shall apply:

- OCE/Supervisor to consult with the Drill and Blast engineer to obtain an accurate map of the ten (10) metre stand-off area taking into consideration angle of holes.
- OCE/Supervisor to clearly communicate with equipment operators' location of loaded holes, if necessary, mark out the ten (10) metre stand-off zone with pegs or bunding
- Equipment operators and Supervisors to ensure designs are followed correctly and not breach the 10m stand-off zone

If the MPU empties during the charging of a particular hole, the hole shall be marked by placing a witch's hat on this hole, and remaining charge to go in the hole shall be written on blast peg.

Where practical, the same MPU shall be used when loading toe charges. If two (2) MPUs are required, clear communication of start and finish locations is essential.



Extra care should be taken when loading in wet conditions.

MPU operator to conduct at least one (1) on bench density checks for each load if pumping gassed emulsion blends.

4.6. Decking/Thru-Seam Blasting

Decking is normally carried out where it is required to have explosives located in certain parts (position) of the hole to make sure that hard bands of material are broken, or as a means of reducing the powder factor. This is achieved by placing 'air decks' or stemming decks in the explosive's column. The loading sequence is as follows:

- Determine lead lengths to be used in each deck
- Load lower portion of hole.
- Establish 'deck or decks' using gasbags or stemming.
- Check that each deck is adequately primed.
- Any backfilling should be done first, prior to the predicted shifts loading.

4.7. Stemming

Prior to stemming, a check shall be made to ensure that the hole is loaded with explosive product and the planned collar height has been achieved as per the load sheet. Manufacturer's specifications shall be followed with regards to recommended gassing time of product prior to stemming holes.

4.7.1. Stemming Method

It is important that the stemming method used does not damage the downline.

The Shotfirer and or the Assistant Shotfirer shall check the stemming material is of a suitable quality and does not contain large fragments of rock that may bridge across the hole or damage the downlines. The Shotfirer shall be advised if any holes are blocked or if the operator is unsure of the quality of the stemming material.

Any excess explosives product, lying around the hole, shall be placed down the hole. Excessive explosives product can be mixed with the stemming.

Where practical all loaded holes shall be stemmed prior to the end of shift (i.e., prior to persons ceasing operations for the day). A risk assessment is to be conducted in the event that holes are required to remain opened to ensure the security of the explosives.

Issues to consider if holes are being stemmed mechanically, include:

- A 'fit for purpose' machine is to be used for stemming.
- The stemming vehicle operator shall visually check the downlines are secure and the stemming vehicle's bucket/discharge chute does not encounter the downlines.
- The stemming operator shall check that the stemming is either pushed or tipped in at a rate that allows it to be free flowing into the hole. Do not force stemming into a blast hole as this can lead to the stemming becoming blocked halfway down.
- Any hang-ups or blockages are to be dislodged with a wooden peg if possible.
- The operator is to check that the chute on the stemming truck approaches the hole from the side opposite to the peg securing the downline.

If slumping occurs, the Shotfirer/Assistant Shotfirer shall check the tension of the downlines, slacken if necessary, and retie the downlines to the peg. The shotfirer is to be notified of any slumping

The Shotfirer, in conjunction with the Drill and Blast Engineer, shall determine whether stemming material requires topping up.

4.8. Pre & Mid Split Blast

As a guide, if the powder factor shall be between 0.6- 1.0.

Consideration must be given to rifling fly rock when developing load plan. Consideration should also be given to the use of survey controlled or GPS aided drilling to improve the accuracy of the final wall.



4.9. Sleeping of Shots

Sleeping of Shots refers to a loaded blast pattern that is unattended by the Blast Crew for a time, usually overnight. A loaded blast hole may be required to sleep over several days due to the size of the shot, mechanical delays, planning issues, lightning event, or type of shot.

Note



If in extenuating circumstances shots are unable to be fired at least 1 day prior to sleep time expiring, the SSE shall be notified immediately.

In each case, loaded blast holes may be left unattended overnight without a Shotfirer, if demarcation and flashing lights are in place and the Access is closed off.

Where sleep times have potential to exceed the supplier recommended standard time, the Shotfirer shall seek recommendation for extending the time from the explosive's supplier and authorisation from the Explosives contractor and SSE

Type	Additional Checks
Pre-split	- No hole is left with just the primer. - Pre-split holes that may be slept shall be loaded to prevent the primer being removed. - The cord tied off to the peg in a secure manner and all holes counted and documented. On return, the Shotfirer shall recount loaded pre-split holes for potential tampering. - Pre-split holes do not need to be stemmed to sleep overnight. - Avoid excess cord at the top of the pre-split down-line, and if needed, cut shorter. Excess tails can be disposed of when firing.
Standard Blast Pattern	- The night shift OCE is informed and regularly inspects the area during the shift (if applicable). - The shot firer in conjunction with the OCE, check that NO vehicle or person breaches the demarcation of the loaded shot. - Identify the Lightning Exclusion Zone in the case of electrical storms and confirm the night shift OCE and supervisor are familiar with the details. - All loaded holes are stemmed off and when possible, primed holes that are not loaded, are de-primed with all loose explosives returned to the magazine in their original packaging or otherwise secured to prevent theft.
Coal Shots	- All holes to be stemmed prior to a shot being left unattended. - Downline tails shall remain attached to a secure object so that in the event of subsidence, the downline is not drawn down the hole. - Inspected on an hourly basis if hot holes are detected, eg venting.

4.10. Tying & Firing

4.10.1. Tying a Nonel Shot

The Shotfirer and the Drill and Blast Engineer are to agree on designed tie up plan. Shots are governed by the Asset Protection Plan and a third-party review if necessary. Strict design parameters concerning ground vibration limits are contained within the asset protection plan and shall be adhered to.

Completed tie up plan to be inspected by Shotfirer and include summary of required delays before the day of the shot.

Tying of shots should be done on dayshift only. If Blast PED (Remote initiation system used to initiate blast) is to be used, it is the Shotfirer's responsibility to check it remains secure.

Coal shots shall be de-pegged to avoid product contamination where possible.



Distribute all accessories as per tie-up plan (check and challenge the plan).

Any change to the tie-up should be discussed with the Drill and Blast Engineer prior to firing the shot to ensure compliance to exclusion zones and MIC. These changes, if agreed, shall be identified on the plan

Remove all equipment (lighting plants, blast trailer, etc.) from any section of the blast that is to be tied in, with a minimum ten (10) metre separation, before commencing tie-up.

Commence tie-up working from back row towards the control row.

The designated Shotfirer or an assistant shotfirer under the Shotfirer's direction shall tie in the control row.

If an interruption occurs, current echelons shall be completed prior to suspending tie up.

All connector detonators shall be tied in a standard format, as per the tie up plan:

- Connector det beaks shall be facing upwards.
- Lines to be clipped in one at a time, surface lines are to be connected into the Connector det beak first, followed by downlines last
- Slide beak along lines after clipped in to confirm no crossovers and lines are placed in the back of beak. CLIP AND SLIDE
- Surface lines are not to be taut or coiled and shall not cross directly in front of the detonator block.
- TIDY TAILS. All tails to be as neat as possible and, where possible, to one side, to aid the walking process. Tails are not to cross over main leads
- Appropriate security and safety controls such as barriers, signage, demarcation and supervision must remain in place to prevent unauthorised access to the blast area until effective blast clearance has taken place ready for firing. Once surface connection has been completed a nominated member of the blast crew must stay in attendance until the shotfirer returns to connect the lead-in line.
- Do not clip in a hole unless all the leads designed for the hole are present (e.g., slumped hole, inform Shotfirer)
- When all connections are made, an inspection shall be made by the Shotfirer and at least (1) one other competent person to check all connections are correct.
- Lead in Line (LIL) bunch block is to be connected to initiation point Connector det and then reel is to be run out to area adjacent to Firing Point.
- In no circumstances is the LIL to be reeled out unless the initiation point Connector det is connected to the LIL bunch block.
- Blast controller must give approval before any LIL is run out.
- Blast Controller must be informed before any LIL is run out across any road.
- For detonating cord, check correct knots are used for trunkline and cord to cord connections.
- Detonating cord is to be used as a redundant system (safety backup) as per manufacturer's instructions.

4.10.2. Postponing a Tied in Nonel Shot

Where there is a valid reason to postpone firing a shot, the Shotfirer shall advise the OCE and then SSE.

The SSE or delegate shall assess the risks for the proposed postponement. Based on the risk assessment results, the shot shall be prepared for postponement by:

- Positioning of Blast Guard(s) to prevent access to the shot.
- The guards shall be designated by the Shotfirer, Blast controller/OCE.
- At night, lighting plants are to be put in place to be able to see the whole shot (may need more than one guard depending on the size of the shot).
- Shot shall be walked prior to firing.
- Consider unclipping the control row.



- LIL is to be wound up back on reel and placed back in explosives magazine, under no circumstances is the LIL to be left connected or left on shot.
- Untying the shot is to be a last resort. In this case all firing accessories shall be unclipped, returned, and booked back into the magazine before the shift ends.

Prior to reuse, untied leads shall be inspected to ensure leads have not been damaged during the unclipping process. Damaged leads shall be treated as deteriorated explosives.

The Shotfirer and OCE shall:

- Consult the SSE and confirm the reasons for postponement are valid.
- Assess related-postponement hazards and required controls.
- Consult with the Drill and Blast Engineer to determine when the shot can be fired.
- Notify Supervisors, of postponement and tied-in shot.

4.10.3. Inspecting the Tie in Before Firing (Walking the Shot)

The entire shot MUST be walked by the Shotfirer and all blast crew members prior to firing. (Nonel)

A visual inspection is to be made of every connection. Check that the preceding holes are all connected correctly and in sequence.

The control row is checked last by the designated Shotfirer or a nominated assistant shot firer under the Shotfirer's direction.

The walk process requires the highest level of attention.

If an interruption occurs, the interruption point shall be marked. When the process is resumed, it shall start from the marked point.

If time becomes an issue, the Shotfirer may delay the blast time by giving adequate notice to be able to perform the walkthrough as per the procedure.

Any timing discrepancies found are to be addressed by the Shotfirer immediately. They are not to be adjusted by any other crew member unless instructed by the Shotfirer. All alterations to the tie in shall be recorded onto the tie in plan.

4.11. Preparation to Fire a Shot

Shotfirer shall:

- Review all relevant information prior to firing.
- Undertake a inversion layer and weather assessment to confirm conditions are appropriate for blasting e.g wind direction, wind speed, location of personnel, near neighbours.
- Review blast pack, especially the loading plan map to check no holes have been over/under loaded. If any holes are not loaded to design, a risk assessment is to be carried out and exclusion zones may be increased.
- A Blast Exclusion Zone (BEZ) of at least 600m shall be used for personnel and 300m for equipment. The Shotfirer/Blast controller may increase this if deemed necessary. If the Blast Exclusion Zone must be reduced a JHA prior to loading activities must be completed and signed off by the SSE
- When using the electronic initiation system, a full system check must be conducted prior to firing to ensure full communication to all detonators established (Detonators reporting a high leakage and or non-responsive is to be reported immediately).
- Review Shotfirer's diary, Shotfirers Daily Report and Shotfirer's monthly spreadsheet for any relevant notes pertaining to shot (Shotfirer may have to fire a shot that they have not loaded).
- Obtain and review the Blast Clearance Map and check the guard positions. Shotfirer to discuss Blast Guard positions with Blast Controller Place Blast Guard cones at locations of Blast Guards



- Consideration shall be taken for the location/position of equipment & Blast Guards when the blast patterns have a free face, in case of face burst and fly-rock.
- Check all blast equipment is removed from exclusion zone.
- Check all mining equipment is outside the 300m exclusion zones, if equipment cannot achieve the 300m a risk assessment must be completed and approved by the SSE
- Film all the blasts, with consideration of the firing point and preferably film from back of blast. Drones are the preferred choice of camera, video camera on a tripod is second option.
 - If shot has a free face drone/camera needs to be able to see movement of free face.
 - Check whole blast is in the frame of the drone/camera.
 - Pan cameras zoom out after the blast to monitor the fume and/or dust content.
 - Follow the fume/dust path with drone/camera if possible.
 - Additional cameras may be used from different positions to get numerous angles whenever possible.

Blast Guards shall:

- Participate in the discussion at the Blast Guard Meeting and read, understand, and sign onto the Blast Controller document.
- Confirm you understand your role as a Blast Guard and your assigned guard number. If unsure of your position, YOU MUST ASK the Blast Controller for confirmation.
- Stop vehicles and unauthorised people from entering shot area during the firing/postponement period.
- Guards shall be appropriately trained and authorised using VUL-ATN-13_Blast Guard Authorisation
- Refer to the Radio protocols within this procedure.

Blast Sweeper shall:

- Participate in the discussion at the Blast Guard Meeting and read, understand, and sign onto the Blast Controller document.
- Confirm you understand your role as a Blast Sweeper and your assigned area to sweep. If unsure of your responsibilities, YOU MUST ASK the Blast Controller for confirmation.
- Refer to the Radio protocols within this procedure.
- Sweepers shall be appropriately trained and authorised using VUL-ATN-27- Blast Sweeper Authorisation

Blast Controller shall:

- Ensure Technical Services department has sent out notification of blast via Blast Notification Distribution List with a minimum of 24 hours' notice.
- Facilitate a meeting with the Blast Crew to discuss planned tasks for the day.
 - Request Blast Guards and Sweepers from other Departments and communicate locations of Blast Guard meeting. Prepare documentation required for the Blast Guards
 - Discuss locations of mining equipment for blast, clearance of personnel and any other relevant information.
- Obtain a blast clearance map with designated Fume management Zone (FMZ) clearly marked (predicted wind direction).
- Use gas monitors to monitor in front of possible travel path of the fume cloud.

Blast Controller needs to take into consideration the possible dust path from the blast being fired if it may travel towards near neighbours and sensitive receptors. Blast shall be postponed in the event fume cloud is expected to travel towards sensitive receptors. Also, consideration will include wind speed, expiry of bulk



product sleep times, if it is a blast that contains coal, any areas of heating etc. Blast controller will discuss any safety and health concerns with the OCE and assist to implement appropriate controls

Attend Blast Guard Meeting and discuss:

- Mining equipment locations
- Infrastructure in the BEZ/FMZ
- Plan pit clearance sweep with allocated sweepers ensuring effected areas are understood.
- Blast Guard locations
- Wind direction (use helium ballons to provide wind direction)
- Confirm JHAs are read, understood, and signed.
- Any concerns raised by the Shotfirer.
- Sufficient notification shall be given to all relevant departments if any major changes are made to the blast schedule/ exclusion zones.
- Ensure communication to all effected area Supervisors to ensure their personal is out of the blast exclusion zone

4.12. Radio Protocol

4.12.1. Radio Channels & Phrases

- Main Ops Channel: Channel 1, 2, 3, 4, 5 and 6
- All-Clear Phrase: All clear is given, thank you
- Timeline & Call Scripts
- The morning of the blast at 0600 the blast controller to notify the following
- Aurizon electrical-07 49320213
- Aurizon control-07 49320926

4.12.2. T-2:00 Hours — Two-Hour Site Call (Across all channels)

“Attention all mine site personnel: there will be blast fired at Pit Location and Strip Number in approximately two hours at [HH:MM] repeat again confirm with Open Cut Examiner that the broadcast got across channels.

4.12.3. T-1:00 Hour — One-Hour Site Call (Across all channels)

“Attention all mine site personnel: there will be blast fired at Pit Location and Strip Number in approximately 1 hours’ time [HH:MM]. repeat again confirm with Open Cut Examiner that the broadcast got across channels. Once confirmed Call: Everyone associated with the blast please attend the blast guard meeting held at (area designated by Blast Controller). All equipment must be parked safely outside the equipment exclusion zone and all personnel not associated with the blast remove yourself from the exclusion zone.

BLAST Meeting (Immediately after one-hour call)

- Confirm shot plan & planned fire time
- Confirm guard posts & identifiers
- Confirm who will send the two-minute voice recording
- Confirm Horizon Electrical & Control will be notified at 10 minutes prior to blasting
- Confirm weather/fume plan



- Confirm post-blast all-clear process

- Dispatch Blast Guards
- Send BLAST guards to their posts. Set lockdown time at 30 minutes for in-pit Blast Guards and fifteen minutes for Highway Blast Guards
- Guard Lockdown Confirmations
- Blast guard calls in: “Blast Guard (ID) to blast controller
- Controller must call back each guard: blast controller to blast guard <ID>
- Blast Guard calls back: Blast guard (ID) is in position and lockdown
- Blast Controller to confirm

4.12.1. T-30 Minutes — Internal Notification

Once all blast guards are in place Blast Controller to call all blast sweepers appointed for the blast to start there sweep in their designated area. The Blast Controller shall announce thirty (30) minute notification: a blast will be fired at Pit Location and Strip Number at approximately [HH:MM].

Once the exclusion zone is Swept and clear of personnel, Sweepers & Blast Controller are to head to the firing point and the Blast Controller shall contact the shotfirer to arm the boxes.

4.12.2. T-10 Minutes — External Notification

Notify Horizon Electrical & Control and all mine site personnel and BMA Peak Downs Mine Blast Controller:

“This is the Blast Controller. Ten-minute notification: a blast will be fired at Pit Location and Strip Number at approximately [HH:MM]. Please action your controls as required.”

4.12.3. T-2 Minutes — Two Minute Site Call and Guard Rollcall

The Blast Controller to initiate the blast tones.

The Blast Controller shall then call: “Copy all mine site personnel: a blast will be fired Pit Location and Strip Number in two minutes’ time. Please maintain radio silence for the duration of the blast unless in the case of an emergency.”

Then sequentially confirm each guard:

- Blast Controller: “Blast Guard (1), are you in position and is your area secure?”
- Blast Guard: “Blast Guard (1) I am in position and area secure

4.12.4. T-1 Minute — Final Call

“Firing in one minute”

Liaise with shotfirer:

- Blast Controller: “Shotfirer, confirm ready to fire.”
- Shotfirer: “Ready.”

Countdown:

- Firing in thirty (30) seconds
- Firing in ten (10) seconds

4.12.5. FIRE

Controller: “Calls Fire ON “

Shotfirer initiates as per procedure.



4.12.6. During Blast

As soon as blast is fired Call on Channel 1: shot fired please maintain radio silence until the level of fume is determined. If fume is present wait until it has dispersed and call: ***“Copy all mine site personnel the fume associated with the blast has now dispersed and clear, there for radio silence can be lifted Blast Guards please still maintain your position until all clear is given”.***

Turn off blast tone.

If no fume is present, after firing repeat above (4.12.6) call to release radio silence and wait for dust to settle then wait for shot firer to inspect the shot for visible misfires. The Shotfirer notify the Blast Controller that the area has been inspected and clear confirming no visible signs of misfires. The Blast Controller shall release only the highway Blast Guards, to avoid traffic congestion.

4.12.7. Post-Blast

- All-clear site call: “Attention all mine site personnel: the blast at Pit Location and Strip Number has no visible signs of misfires there for all clear is given I repeat all clear is given Blast Guards please stand down in numerical order. Once all Blast Guards have released their position call on Channel 1: thanks Blast Crew and Blast Guards, please pick up blast cones and return to the crib hut. The Blast Controller announces to the OCE and Supervisors, the pit is yours again.
- Inform OCE/Supervisor of any open faces and or geotechnical hazards.
- Notify Aurizon control/electrical along with BMA Peak Downs Mine that the Blast is now complete.

4.13. Incident Reporting if blast fume is present after firing shot

There are obligations regarding reporting incidents under the applicable legislation.

If Blast Fume rating is within the range of 3 to 5 and is not controlled by the Fume management zone, an incident must be entered and the SSE or delegate must report this to the Explosives Inspectorate, Mines Inspectorate & ISHR by phone. The information to be provided for reporting a fume event is:

- Time of event
- Fume strength rating 0-5. A NO_x rating scale can be found at Appendix [A1](#).
- Fume strength rating when the cloud is at its highest concentration (on the shot)
- Fume strength rating when the cloud concentration leaves the Mining Lease.
- Percentage of blast area emitting fume (0% - 100% in 10% increments) or use A to C rating from AEISG.
- Size of NO_x cloud in metres referring to width, length and height
- Wind speed and direction
- Stability class of atmosphere
- Temperature
- Cloud cover
- Persons exposed.
- Treatment provided (if any)
- Pre firing review summary – add to incident report.
- Post firing review summary – add to incident report.
- Times, dates, names, and email addresses of people spoken to will need to be recorded at the time of contact and this information entered into RSHQ Portal that will be submitted. As soon as practical

5. SECONDARY BLASTING

There are several blasting methods for breaking-up oversize rock and/or toe.

Unless authorised by the SSE, the process of popping, which involves drilling a hole and charging the hole shall be the only method used.

Hazards

Fly-rock and air overpressures caused by overloading rocks	Access to hoppers
Uncontrolled stored energies when blasting in plant	Confined spaces



5.1. Requirements

- Drilled holes shall be 12% to 25% larger than the stick of explosives used.
- Shotfirer to check that charge weights are within 50gm to 100gms per cubic metre of rock mass measured at the location of the charge.
- Calculate charge weights by identifying the location of the charge and the thinnest point of the rock where the charge is located. The thinnest point is used for your rock mass (e.g. if the rock was 2 metres long but only 0.8 metres thick then the rock mass would be $0.8 \times 0.8 \times 0.8 = 0.52\text{m}^3$).

Note



All secondary blasting is to have a separate JHA completed before the activity.

6. COMMUNICATION AND TRAINING

All personnel affected by the content of this document shall receive instruction or explanation on the relevant parts of the document.

Communication of procedures shall involve crew pre-starts, toolbox talks, risk assessment participation, safety meetings, availability on the site Intranet as a minimum.

All personnel shall receive required site-specific skill and knowledge training during mandatory inductions training, refresher training and ongoing job safety training as per VUL-PLN-082 Training Plan. Additional communication and training shall be conducted whenever significant changes are made to this Procedure.

7. ROLES & RESPONSIBILITIES

SSE	Shall review and approve this procedure.
HST Manager	Shall ensure that all provisions of this procedure are implemented, and that compliance is achieved.
Managers/Superintendents	Shall be responsible for their area of operations and the implementation and application of this procedure. Provide adequate training, information, structure and supervision to ensure that this procedure is implemented. Carry-out a periodic review of activities to ensure the appropriate application and understanding of this procedure; and Ensure immediate and appropriate steps are taken to investigate and rectify any risks to health and safety arising from these activities.
Supervisors	Ensure all CMWs are familiar with, have access to and comply with the requirements set out in this procedure.
All CMWs (including visitors and contactor)	Shall comply with the requirements of this procedure.



8. REFERENCES

- Coal Mining Safety and Health Act 1999 (Qld)
- Coal Mining Safety and Health Regulation 2017 (Qld)
- Explosives Act 1999
- Explosives Regulation 2017
- AS 2187 Safe Use & Storage of Explosives
- Australian Explosive Code (AEC)
- Australian Code for the Transport of Explosives by Road and Rail.
- Australian Dangerous Goods (ADG) Code
- Information Bulletin 53

9. REVIEW

This document shall be reviewed bi-annually, or as follows:

- When there is a change of method and/or technology and/or legal or other requirement that may affect the accuracy of this document.
- When operational changes occur that effect the currency of the document.
- When there has been a significant event to which this document was relevant; and
- as a result of relevant audit findings.

10. DOCUMENT CONTROL

Version	Date	Description	Document Controller
01		Development	Rachael Decker
02	31/03/2021	WRAC & review	Nicole Davey
03	20/03/2023	SOP review and update	Allira Spencer
04	22/04/2025	Review & Formatting	Kelly Jensen
05	23/10/2025	Review and Update	Kelly Jensen
06	08/12/2025	Review & Formatting	Kelly Jensen

11. APPENDIX A – NOX RATING SCALE

The following table together with the Field Colour Chart in Appendix 4 in the VUL-PLN-116-Blast Fume Management Plan details how NOx fumes from a surface blast can be assessed (provided by AEISG).

LEVEL	TYPICAL APPEARANCE
Level Zero No fume	



Level One Fume	
Level Two Minor yellow/orange fume	
Level 3 Moderate orange fume	
Level 4 Significant orange fume	
Level 5 Major red/purple fume	