

CMPA

Blast Management Plan Template in the Construction Materials Industry



Issue 3

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Acknowledgements

The CMPA would like to acknowledge those who contributed to the development of this Blast Management Plan Template from Issue 1 through to Issue 3.

Written by:

David McKelvie - Safe Mix

Contributions by:

Brian Calovic and David Kerr - Conundrum Holdings

David Ramage - Holcim Australia,

David Hamilton - Hamilton's Blasting Services

Graham Gordon - Orica

The review team has been established to cover the requirements of all stakeholders:

- Quarries - David Ramage (Holcim)
- Driller - David Hamilton [Hamilton's Blasting Services] and Paul Campion [Impact Drill & Blast]
- Suppliers - Graham Gordon (Orica Australia (Quarry Services)

Disclaimer

This Blast Management Plan Template has been prepared by the Construction Material Processors Association [CMPA]. The guidelines here may not apply in all circumstances and should not replace a quarry manager's considered assessment of a particular situation before them.

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[Company]

Blast Management Plan [BMP] Template

[Site]

Note for Template Version

Black text is proposed headings/text

Blue text is hints on what text should be included and must be removed before finalisation

Red text is sample texts that would require customisation before finalisation

The BMP should be an overarching document, not a working document. It is a risk based management plan that assembles and illustrates the overall approach to the management of blasting.

Nuts and bolts documents such as procedures, safe work methods statements, drill pattern plans and so forth underpin the BMP.

Authorisation

Version [insert] Released [date]

Managing Director / CEO/ Regional Manager _____

Quarry Manager: _____

Shot Firer: _____

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Preamble

The *Dangerous Goods (Explosives) Regulations 2011* under Regulation 130 requires operators to have a Blast Management Plan. This section of the Regulation also states that a Blast Management Plan must be prepared in accordance with the applicable requirements of AS 2187.2.

The *Australian Standard AS 2187.2 – 2006 Explosives - Storage and use Part 2: Use of explosives* stipulates the following obligations.

Both the Earth Resources Regulator and WorkSafe are responsible to ensure that Extractive Industry Operators will meet these obligations:

- The Earth Resources Regulator requires specific obligations to be managed when preparing a Blast Management Plan as part of the site's Work Plan, therefore Work Authority
- WorkSafe require specific obligations to be managed and implemented so as to be satisfied that the Extractive Industry Operator is meeting their workplace health and safety regulatory duties.

There is some overlap of both these regulatory body's requirements.

The table on the following page:

- Lists these obligations in the same order as the Australian Standard
- Highlights which regulator requires the operator to establish and or implement these obligations

This Blast Management Plan is inclusive of but not limited to the following and shall assist Extractive Industry Operators in meeting these obligatory requirements:

- The specific Blast Plan for the planned shot
- The Shot Firers Book
- Stock Control Records
- Inspection Checklists
- Safe Work Method Statements

A matrix has been established to cross reference the Australian Standard obligations to the particular section of this Blast Management Plan template.

Refer Attachments - Mapping AS 2187.2 Appendix A to the Blast Management Plan

[Insert Company Name] Blast Management Plan

Australian Standard AS 2187.2 Obligation	ERR	WS
Location of the proposed blasting	✓	
Description of the proposed blasting	✓	
Permits / licences required for the project		✓
Identification and position of the person responsible for the project including project safety and security		✓
Identification and position of person who has given approval to use explosives on the project		✓
Key appointments and responsibilities		✓
Shotfirer's details		✓
Details of the risk management assessment	✓	
Details of adjacent structures or services that influence the blast design	✓	
Details of reports drawings and records consulted	✓	
Layout plan of the blast including drilling pattern and hole depths	✓	
Detonation sequence/effective charge mass per delay (MIC) powder factor		✓
Type of explosive to be used and quantity required		✓
Method of initiation		✓
Type of firing equipment and procedures		✓
Drilling procedures		✓
Explosive loading and charging procedures		✓
Explosive storage and handling procedures		✓
Security procedures for the site and the blast, including explosives		✓
Environmental considerations for airblast overpressure, ground vibration	✓	
Details of communication systems		✓
Warning procedures		✓
Traffic management plan		✓
Proposed dates and times of blasting		✓
Details of the exclusion zone	✓	
Method of notification to owners and occupiers of structures and providers of services adjacent to the blast	✓	
Influence of weather		✓
Loading in poor light conditions or reduced visibility		✓
Cessation of explosive-related activities during electrical storms		✓
Misfire management system		✓
Post blast assessment and inspection procedures		✓
Provision for post-blast comments		✓
Signature spaces for the plan author shotfirer and person who approves the plan		✓

1. Introduction

Overview

[Include a concise overview of the site, when and why the BMP was first established [i.e. regulatory authorisation] and a short summary of the BMP generally]

Blasting has been identified as one of the key activities at hard rock quarry sites. It is an essential part of the quarrying process and must be undertaken in a way that does not endanger people or cause damage to property, equipment or the environment. Blasting is required to fragment the raw rock source material to a size that can be loaded and hauled into the crushing plant for processing.

The purpose of this Blast Management Plan [BMP] is to ensure safe blasting operations, ensure the protection of employees and surrounding community, all infrastructure, and assets both off and on site and minimise environmental impacts. The BMP also provides specific processes and parameters to ensure the most cost effective outcomes are achieved.

The BMP provides a central reference point for all personnel associated with blasting activities on site. The BMP provides information to key stakeholders, engaging the community and addressing regulatory requirements. Only blasting methods identified in this document are to be used.

This BMP [which must be prepared by the Shot Firer prior to any use of explosives] together with the CMPA's *Shot Firer's Report Book* [CMPA 1340] aims to meet the requirements set out in Section 130 of the *Dangerous Goods [Explosives] Regulations 2011* and Appendix 2 of *AS 2187.2-2006 Explosives - Storage and Use - Use of Explosives*.

Objective of Blast Management Plan

The overall objective of the Blast Management Plan is to ensure there is no negative impact on the workplace, the environment or the surrounding community resulting from the blasting activity. Using this framework, the site will safely produce crushable raw feed that can be easily and safely dug with the calculated use of explosives; limiting fly rock and environmental impacts to the site and its surrounds.

To assist in meeting this objective the BMP outlines the following risk management processes and general commitments.

- Identify all hazards and associated risks arising from blasting activities;
- Eliminate or control risks as far as is reasonably practicable arising from blasting activities;
- Identify site specific requirements including selection of personnel, training programs and communication systems; and safe exclusion zone;
- Control the blast process from design to initiation, evaluation and where applicable misfire treatment;
- Monitor potential environmental impact of air blast overpressure and ground vibration;
- Implement blasting management processes to ensure compliance with regulatory requirements and Work Authority conditions;
- Assure compliance with supplier/provider contract specifications;
- Respond to complaints in a timely and professional manner;
- Provide the community with an understanding of our operations and commitments;
- Engage with the community so as to understand their expectations;
- Implement a review process to assess completion of objectives.

Where required, the plan shall be submitted to a regulatory authority for authorisation.

Relevant Documentation, Guidance and Legislation

All blasting procedures shall take into account as applicable the following documentation, guidance, and legislation:

- Site Specific Blast Management Plan;
- Work Authority licence conditions;
- Safe Work Method Statement for blasting;
- Company policies and procedures;
- Documentation provided by the manufacturer of any equipment or consumables used in the process of blasting;
- Ground Vibration and Air blast Limits for Blasting in Mines and Quarries;
- EPA - Recommended Separation Distances for Industrial Residual Air Emissions [Publication 1518];
- Work plan conditions;
- Preparation of Work Plans and Work Plan Variations – Guideline for extractive Industry projects December 2018;
- Mineral Resources [Sustainable Development] Act 1990;
- Mineral Resources [Sustainable Development] Extractive Industries] Regulations 2010;
- Dangerous Goods Act 1985;
- Dangerous Goods [Explosives] Regulations 2011;
- Dangerous Goods [Storage and Handling] Regulations 2012;
- Occupational Health and Safety Act 2004;
- Public Health and Wellbeing Act 2008;
- Public Health and Wellbeing Regulations 2009;
- AS 2187.1-1998 Explosives - Storage, transport and Use – Part 1 Storage;
- AS 2187.2-2006 Explosives - Storage and Use – Part 2 Use of Explosives;

General Safety

The safety of all personnel assisting with blasting activities on site will be managed following,

- Site safety standards and rules (such as clothing and PPE)
- Use of hierarchy of controls to reduce the risk of hazards that have been identified during the preparation of JSA's and risk assessments,
- Use of *Issue Resolution Form* [IRF - CMPA 1325] to report all incidents, including when reporting to regulatory authorities

During any emergency on site or that may impact the site or its operations, all personnel will be directed by the site manager or their representative to follow the companies Emergency Response Plan

Public Security

Public safety will be maintained within the Work Authority area at all times through the use of [\[Insert your site controls such as controlled site entry, fencing, bunding, gates, camera surveillance and signage as required\]](#)

Fire

Due to the considerable risk to fire fighters, fires in general proximity to loaded shots, external magazines or within magazines should not be fought.

All personnel should be removed to a safe location and access to the magazine or blast site secured.

Blasting activities must be reviewed on days of total fire bans depending on explosive selection and site conditions

Public Infrastructure Assets & Water Management

To ensure all public and private infrastructure assets are known and considered during blasting activities, all assets within [### metres] of the extraction boundary have been identified. Assets considered include:

- Water pipes – Potable, Class B or Class C;
- Significant water courses and water bodies;
- Power – Single phase, High voltage;
- Gas – Main supply lines;
- Communication – Copper, optic fibre; and
- Roads – Classified roads, proposed roads and easements.
- Proximity of rail corridor
- Proximity of airport / Quarry in flight path

[Insert a Local Services Infrastructure Map to identify the location, type of such assets, and distance from extraction boundary]

[Insert a Local Services Infrastructure Map]

Local Services Infrastructure Map

Record Keeping and Auditing

- Magazine Management and Safety Checklist [CMPA 1345];

On the day of loading and firing a shot, documents that must be completed by the Shot Firer prior to leaving the site include but are not limited to:

- Both pages of the *Shotfirers Book* [CMPA 1340];
- Pre and Post Blast Stability Checklist;
- Register for Community Feedback;
- Magazine Management and Safety Checklist [CMPA 1343];
- Driller's Log (detailed summary)
- Pre-Blast Checklist
- Post Blast Checklist
- Explosives Stock Sheet

Mandatory records must be completed within 48 hours of the blast and are held for 2 years.

Insurance Requirements

To ensure all public and private infrastructure assets are known and considered during blasting activities, all assets within 500m of the extraction boundary have been identified.

Reviewing insurance policies ensures blasting operations are adequately covered noting any changes.

Auditing

All auditing tasks applicable to the BMP are to be completed and organised by the Shotfirer or Quarry Manager with documented evidence. Blast Folios of shots fired are reviewed by the Shot Firer and Quarry Manager reporting any issues as required through an *Issue Resolution Form* [IRF - CMPA 1325].

Risk Management

A Risk Assessment has been completed, *Attachment 3.2*, outlining the key hazards and their control measures as outlined within this BMP.

Other risks will be assessed and controlled through the company's risk management procedures, including:

- Completion of the *Shot Firer's Report Book* [CMPA 1340] or equivalent for every shot;
- Company policies covering safe work practices;
- Job Description documents identifying individual's responsibilities;
- SWMS for high risk work including blasting;
- JSA's and Risk Assessments for any tasks outside SWMS;
- Reporting books and forms to record relevant information such as incidents;
- Daily checklists to record condition of plant and drill rigs;
- Driller's logs to report actual drill data;
- Inductions to highlight safe work procedures and conditions of employment;
- Ongoing training and information is provided to employees and documented in their *Personal Work Record Book* [CMPA 0945] [with the aim of leading to certificate level qualifications]; and
- *Issue Resolution Forms* for operator level input, etc.

BMP Periodic Review

The BMP and all other related company documentation will be periodically reviewed to ensure that all requirements of AS 2187.2 Appendix A are being complied to.

This includes

- Blast Management Plan Risk Assessment
- Site Security Plan
- Emergency Response Plan

Performance monitoring reviews will also be conducted periodically to ensure best practice is being utilised and that blasting practises on site are as efficient as possible. Where changes are identified as necessary, the findings will be documented and presented and if accepted by all parties involved in the blast management team, the BMP can be presented for update.

External Consultation System

[Identify how neighbouring residents/businesses are notified and who is responsible for doing this. A map may assist in disseminating this. Also identify how complaints are managed, e.g. complaints register]

The quarry manager maintains a register of property owners.

2. Site Overview

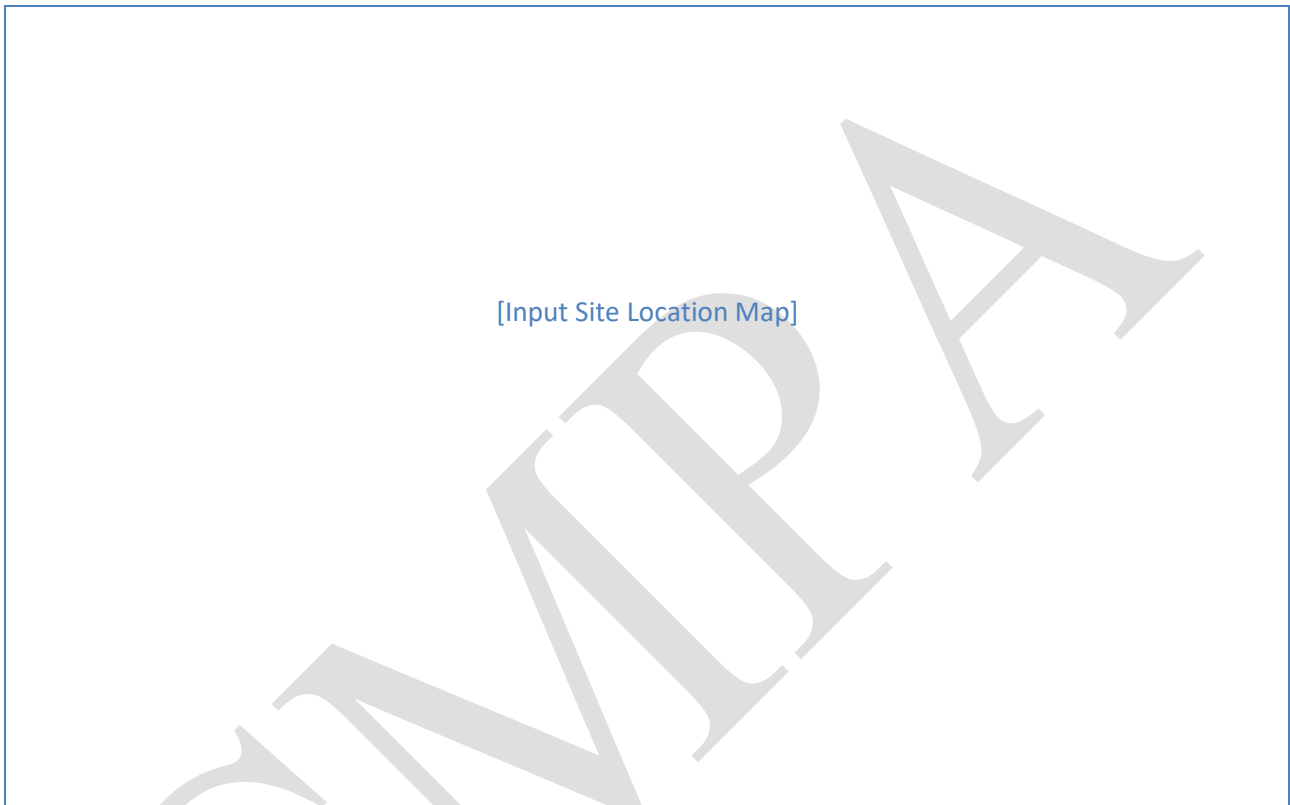
Site Details

Site Name:

Work Authority No:

Address:

Site Location Map:



Site Location Map

This map must include WA boundary and Extraction limits.

If entire worksite is not held as the blast exclusion zone, a detailed map will be required for each blast defining the blast exclusion zone, sentry positioning and road closures.

Surroundings: [Include reference to nearest neighbours, major infrastructure assets, roads and townships]

Monitoring: [Highlight position, or direction and distance to monitoring instruments, e.g. Air Blast Overpressure, Ground Vibration and Video]

Sensitive Receptors: [Highlight location, or direction and distance to Sensitive Receptors]

Communication

[Add details of site phone numbers, radio communication channels and contact numbers]

Traffic Management and Signage

[Outline how traffic is managed on the day of a shot, what and where signage is placed, and how vehicles carrying explosives are identified]

[Insert Company Name] Blast Management Plan

On the morning of a blast, signage must be placed at the site entrance and all entry points to the blast area. Signage must be in accordance with explosives regulations. The purpose of this signage is to notify all people on site of blasting operations as well as clearly identifying the blast exclusion zone.

The weighbridge is the control point for all persons entering the site. The Weighbridge Officer or Nominated Personnel will notify appropriate persons of blasting operations and restricted access areas. Entry to the blast exclusion zone will be monitored by the Shot Firer or other responsible person with unauthorised persons to be removed from the area, reported to Quarry Manager and an Issue Resolution Form [CMPA 1325] or company specific document raised.

Vehicles moving explosives around the site are to be signed and must have an appropriate placard indicating the type of explosives being carried. All signage and vehicle requirements must comply with explosives regulations.

Rock Formation:

[Insert details of rock type, period formed and any features such as fractures, faults, clay seams, geotechnical anomalies, etc]

Permits and Licences

The following approvals, licences and permits form the permission to blast on this site:

Licence Number	Date of Issue	Any Specific Conditions	Copy Attached?
Work Authority			
Planning Permit			
Work Plan			
Magazine			

The following personnel on this site hold a current Licence to use Blasting Explosives:

Name	Position	Licence Number	Date issued

The following personnel on this site hold a current Permit to Have Unsupervised Access to High Consequence Dangerous Goods [HCDG]:

Name	Position	Licence Number	Date issued

3. People and Responsibility

The Quarry Operator is responsible for establishing, approving and implementing this BMP.

[Customise job titles as used on-site. It may be that more roles are necessary, i.e. sentry. Add contractors, being blast contractors, surveyors, drillers, suppliers and technical services as required to suit your operations]

Quarry Manager

The Quarry Manager, as nominated on the cover page of this BMP, is responsible for site operations including authorisation of the Shot Firer to commence with blasting operations. The Shot Firer is responsible for all aspects of the blast.

As the Quarry Manager gives final authorisation to fire the shot, he/she must be responsible for guaranteeing that the site is prepared for blasting.

[List or nominate where responsibilities can be found]

Shot Firer

The Shot Firer must prepare the Blast Management Plan prior to using explosives on site. The Shot Firer is responsible for the use of explosives during blasting operations as well as the concept of designing, loading and firing the shot. The Shot Firer is also responsible for the shot in the event of a misfire. The name of the Shot Firer must be nominated for each blast in the *Shot Firer's Report Book* [CMPA 1340] and the *Magazine Management Safety Checklist* [CMPA 1343] or equivalent documents when explosives are stored on site.

The Shot Firer, as nominated on the cover page of this BMP, has the final authority on who can access a shot, what can and cannot be done on a shot and what items can and cannot be brought onto a shot.

Where the nominated Shot Firer is to change throughout the Blasting process, a handover must take place to ensure all abnormalities are noted and the current progress stage is clearly identified.

[List or nominate where responsibilities can be found]

Assistant Shot Firer/Trainee Shot Firer

Assistant Shot Firers/Trainee Shot Firers are to assist the Shot Firer as directed. The details of all personnel assisting on the shot must be recorded for each shot in the *Shot Firer's Report Book* [CMPA 1340] or equivalent

[List or nominate where responsibilities can be found]

Contractor Obligations

Works undertaken by contractors are:

- Surveying, laser profiling and bore tracking holes to ensure BMP parameters are complied with;
- Drilling;
- Loading of bulk explosives.

Upon arrival, contractors must proceed directly to the Weighbridge Office to sign in. The Weighbridge Officer must ensure:

- [Nominate site specific procedures]

The Quarry Manager must be satisfied that the person undertaking the task is competent and has proof of competency from their employer that is equal to the company's requirements.

All contractors must provide work procedure documents:

[Enter detail of procedures of contractors working on site under BMP including]:

- Who will escort contractors to the area prior to surveying, drilling or loading?
- Personnel and equipment movement around blast site;
- Drill Rig Compliance;
- Drill Rig loading/unloading;
- Blast Hole Parameters;
- Communication of safety issues/rules;
- Safe access to the blast site for all mobile plant and equipment including the drill rig to enter and leave the area during the drilling and surveying activities;
- Agreed communication process is in place.

Surveyor Obligations

[Enter detail of surveyor's procedure for working on site under BMP]

- Conduct a joint meeting before commencing survey work with the Quarry Manager, Shot Firer and Survey contractor;
- Discuss shot design complying with BMP, parameters;
- Profiling techniques;
- Prior to concluding their work, all contractors must present the relevant documented evidence of the tasks they have undertaken;
- Provide a Shot Plan, Drillers Log, Load Chart and Bore Track Results report including side profile scale of the individual blast holes.

The surveyor must provide evidence of equipment calibration currency.

Driller Obligations

[Detail of procedure of drillers working on site under BMP]

Before commencing drilling, a joint meeting must be held between the driller, Quarry Manager and Shot Firer.

All contractors undertaking drilling must provide a SWMS on:

- Loading and unloading the drill rig on site;
- Filling fuel and water tanks;
- Entering and exiting the drill rig;
- Handling drill rods; and
- Drilling holes.

The Driller's Log must include driller's name, date, time and blast site location as well as individual hole number and report on ground conditions.

Drill Rig Compliance

[Enter requirements of a drill rig used on your site]

The drill rig will hold current mechanical certification and must be able to maintain a noise level of less than 80db [A] at 75m while drilling.

Modern fuel efficient, low emission drill rigs are to be available for drilling. Maintenance programs must be in place with scheduled maintenance performed before arriving on site to ensure drill rig reliability.

Dust suppression and collection systems must be functioning and used at all times.

Bulk Explosives/Mobile Manufacturing Unit [MMU] Operator Obligations

[Detail of procedure of MMU Operators working on site under BMP]

All contractors undertaking supply of explosives to site and loading must provide a SWMS.

All contractors loading bulk explosives on site must provide risk assessments on,

- Positioning vehicles on the blast site and loading blast holes;
- Electrical earthing during the conveying of explosive product.

4. Training

General Requirements

Shot Firers must have a current *Licence to Use Blasting Explosives* issued by WorkSafe, under the *Dangerous Goods [Explosives] Regulations 2011*, which is endorsed for use of the explosives and must be able to provide documentation to support this on the day of a shot. For quarries, the applicant must:

- Have completed an approved WorkSafe training course or passed an approved test within the previous six months of making the application and provide a *Certificate of Competency, Statement of Attainment* or other written evidence;
- Provide a portfolio demonstrating practical experience with explosives and documenting at a minimum;
 - 12 production shots at quarries, or
 - Six months of continuous involvement in blasting operations at an underground mine;
- Pass WorkSafe's written examination [only applicable for licence renewals]; and
- Pass the oral and practical examinations conducted by an assessor authorised by WorkSafe.

The Shot Crew shall work under direct supervision of the Shot Firer and shall have acknowledged their understanding and application of the blasting SWMS.

Explosives Licence Disqualifications

Any suspension or cancellation of the Shotfirers license must be immediately reported to the Quarry Manager. No person who has ever had an application for blasting explosives refused by the authority, or had an explosives licence revoked, will be permitted to work with or around explosives on site unless they reapply to the authority and have their application approved.

Fitness for Work

For the purposes of this section, "working on a shot" is considered to include all tasks involved in the preparation of a blast, including but not limited to accepting deliveries of and transport of explosives, stemming, charging, firing and inspecting.

[Insert relevant company policies concerning alcohol, drug and fitness for work, highlighting any particular conditions applicable to working on a shot]

5. Explosives Storage and Control

Magazine Security



Example of well-maintained Explosives Magazine and Compound

[Identify who has access to magazines and insert your entry and security procedures]

- Entry into a site explosives magazine is documented and recorded on the *Magazine Management Safety Checklist and Explosive Stock Record* [CMPA];
- Assistants may be allowed to enter if under constant supervision of the Quarry Manager/Shot Firer
- Quarry Managers and Shot Firers must ensure that the magazines are maintained to standards and that magazine licenses are renewed every five years;
- A copy of the magazine license is attached to the magazine;
- Magazine keys are locked securely away when not in use;
- No explosives are held on site during extended periods of shut down periods of two weeks or more;
- Site surveillance systems are maintained and in serviceable order at all times;
- Employees and contractors are utilised for additional security surveillance during periods of extended shutdown;
- Any evidence of attempted forced entry to or theft of explosives from a magazine or unaccountable stock discrepancy is immediately reported to the police. In addition, such thefts are reported to WorkSafe on 13 23 60.

[Insert Company Name] Blast Management Plan

Explosives magazines and compounds are to be inspected daily while any explosives are held on site, ensuring that:

- Bund walls around magazines, the area within the bunded area and the 15-metre surrounds are maintained clear of any flammable materials with safe access in all weather conditions;
- Perimeter fences and magazine doors are intact and have not been tampered with;
- Earth straps and signage are in place and in good order;
- Fire extinguisher is accessible and serviceable;
- Drainage inside and outside of compound is adequate and serviceable.

Tracking and Storage of Explosive Products Stock

[Insert your procedures on explosives tracking]

An audit of stock records is undertaken on receipt, use and returns of explosive products using the Magazine Management Safety Checklist and Explosive Stock Record [CMPA];

Only approved explosives types/classes are stored within a magazine;

Ensure that no explosives or explosives packaging are ever left unattended;

Ensure that no explosives are stored beyond their use by date;

Ensure that explosives stock is rotated to ensure older stock is used first;

Stored quantities of explosives do not exceed the license agreement.

Delivery of Explosives

[Identify and document your site specific procedure detailing the ordering and accepting of explosives onto site and the storing and handling of explosives on site]

It is this site's policy that, where possible, explosives will only be delivered to site as required on the day of blasting.

However, due to the expense and logistical difficulties involved in ordering bulk explosives at remote sites, some explosives are stored in on-site licenced explosive magazines.

Ordering Explosives

Changes to explosives type selection methods or method of use is not permitted without the Quarry Manager and Shot Firers Authority for use of new products.

[Insert your policy on explosives ordering]

Before confirming explosives orders the Shot Firer will:

- Inspect site and driller's records;
- Re-measure drilled holes and check for presence and depth of water;
- Take note of any holes that need to be treated differently when reviewing bore track results.

Explosive Selection

[Explain types of products used with explanation. Use sites prior history and your supplier to confirm/consult]

Review explosives types and methods used as new technology is developed in an effort to always use best industry practices;

Approved explosives products>

Wet Holes: []

Dry Holes: []

Initiation: []

Firing Method: []

Site Movement of Explosive Products

The Shot Firer is responsible for vehicles moving explosives around the site ensuring they are signed, have an appropriate placard indicating the type of explosives being carried, and are escorted to and from the shot. All signage and vehicle requirements must comply with explosives regulations as defined in the AS 2187.2 – 2006 *Explosives – Storage, Transport and Use – Part 2: Use of Explosives*

[Insert details of sites explosives transport vehicle if applicable]

The preparation of detonators for firing must only take place on the Blast Site after the Blast Charging Zone has been implemented and following [Insert your company procedure for Loading and Firing a Shot].

Disposal of Explosives

Explosives that are not required may be disposed of by:

- [Detail your site's disposal procedures]

Theft of Explosives

Any evidence of attempted/actual theft of explosive products must be immediately reported to the Police and WorkSafe Victoria.

6. Blasting Arrangements, Frequency and Timing

Third Parties

All third parties involved in blasting must adhere to company policies and minimum regulatory requirements.

[Identify any arrangements with third parties in terms of blasting. I.e. Rock on ground, drill only, load only, etc]

Extraction Boundaries

[Refer to Work Authority Number]

The Extractive Boundary Limits are surveyed and identified with Yellow posts positioned to ensure that the boundaries of the area to which the licence applies are readily ascertainable by a person in the area.

Hours of Work

Blasting on this site is licenced to occur between [Insert time/days permitted]

Activity	Blasting	Drilling	Other
Monday to Friday			
Saturday			

Note - No drilling or blasting activities shall be undertaken on public holidays or outside the nominated hours.

Firing Time

Aim is to undertake firing at [insert time] but must take into account:

- Minimum sleep time of explosives in water effected holes to ensure effectiveness in maximising blast outcomes;
- Adjusted to best suit predicted or actual weather conditions;
- Brought forward to address material shortages at quarry face;
- Changed due to delivery time of explosives products;
- Availability of personnel to manage firing of the shot safely;
- Number of persons on the site [plant construction, significant sales activity]; and
- Impact on persons adjoining neighboring boundaries.

Sleeping Loaded Blast Sites

During loading practises, there may come an unforeseen circumstance that requires the blast site to be loaded but unable to be fired.

In this case, WorkSafe Victoria must be contacted and sentries positioned to ensure no unauthorised access.

7. Environmental Conditions

Weather

The Shot Firer monitors and reviews weather forecast leading up to the proposed day of blasting by reviewing long range forecasts during the planning stages of the shot.

In the case of unexpected poor weather on the day of a blast, all persons must comply with directions communicated by either the Quarry Manager or Shot Firer.

As per the *Dangerous Goods [Explosives] Regulations 2011*, if an electrical storm, thunderstorm or dust storm approaches a site where blasting operations are being conducted:

- All persons must withdraw to a safe distance from any explosives, including those explosives contained in a magazine, blasthole or in the course of transport on site and must not return until the storm has passed; and
- The Shot Firer, or in the Shot Firer's absence, a person authorised by the Shot Firer must keep the blasting site under observation from a safe distance.

All emergency procedures should follow Section 5 of *AS 2187.1-1998 Explosives - Storage, Transport and Use – Storage*.

Fire

In case of a bushfire, all persons are to follow the site's Bushfire Management Plan.

Due to the considerable risk to fire-fighters, fires in general proximity to loaded shots, external magazines or within magazines should not be fought, all personnel should be removed to a safe location and access to the magazine secured.

If a fire threatens a loaded shot, the Quarry Manager will declare an emergency situation and all personnel will be evacuated to a safe location outside the exclusion zone.

If a bushfire threatens an area containing an external magazine then, if it is safe to do so:

- Promptly place any explosives or detonators inside the magazine or, if safe, remove them from site;
- Ensure the magazine is closed and locked;
- Ensure every person has withdrawn to a designated safe area prior to the arrival of the bushfire;
- Ensure the person in charge of the magazine shall be available to advise and assist local firefighting authorities; and
- Ensure no person is permitted to return to the magazine until a competent person determines that it is safe to do so.

[Add any company policy requirements in regards to Total Fire Ban days taking into account the *Dangerous Goods [Explosives] Regulations 2011 Part 8—Use of Blasting Explosives, 131 – Total Fire Ban days*]

[Insert or refer to Bushfire Management Plan]

8. Monitoring Obligations

The nature of blasting creates noise, vibration and dust. There may also be a risk of fly rock that could result from loading procedures, blast design or rock conditions, all of which need to be monitored and recorded.

[Identify all monitoring protocols and requirements. Additional sections may be necessary depending on the site]

Air Blast and Ground Vibration

The ground vibration and air blast limits from blasting operations are measured in accordance with AS2187.2:2006 Explosives - Storage and Use - Use of Explosives - Appendix J Table J4.5 [A] Ground Vibration Limits and Table J5.4 [A] Air Blast Limits.

Air blast and ground vibration limits tabled are the guideline limits of Earth Resources Regulation (ERR) as applied to new quarry applications and existing quarry extensions.

The site's allowable limits are:

Issue	Level	Allowable Exceedance
Air Blast	dB [Lin Peak]	
Ground Vibration	mm/s	

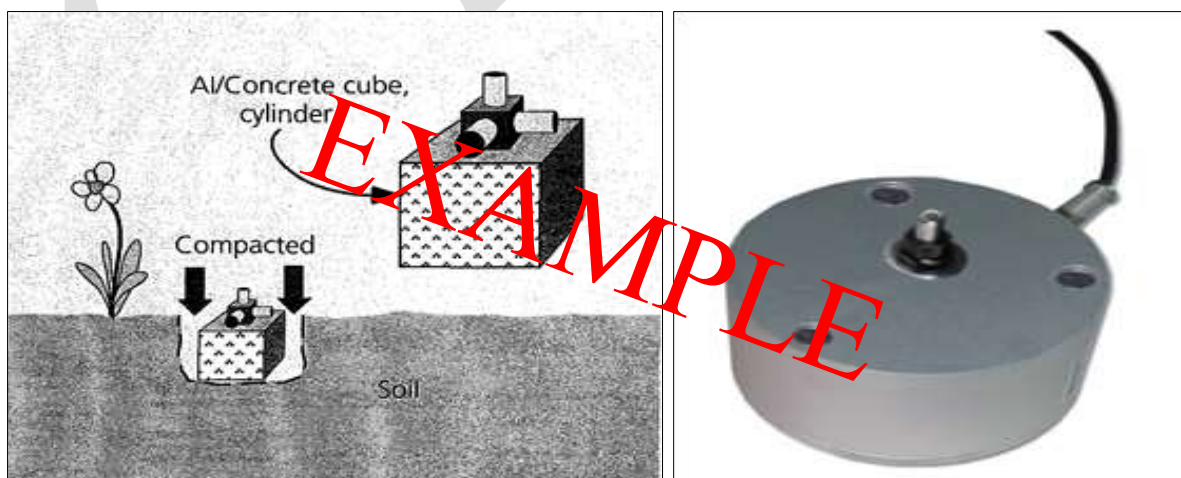
Non-compliance to these limits is a reportable incident to WorkSafe Victoria or/and ERR under the Work Plan.

Blast Monitor Units

[Insert details of blast monitor units used, calibration requirements and record keeping]

Mounting the Transducer [geophone] to Measure Ground Vibration

[Insert method of setting up monitors, geophones and microphones]



(Example of Mounting the Transducer [geophone])

Video Recording

Video recording should be completed with every shot fired for gathering data and evidence of blasting performance.

[Insert Site details of video recording process, camera set up, position, drones]

[Sites may elect to document what monitoring equipment such as securing the site on the day of the shot. Two videos / monitors, calibration certificates]

[Having two videos and monitors should be an individual quarries decision if they want to double up on equipment. A check on the day will confirm if a video works]

[Where videos are used a copy of the video should be maintained for an agreed period of time]

Dust

Consideration to dust movement/carriage arising from a blast shall be undertaken when planning a blast through the assessment of forecasted wind speeds and directions.

Reactive Ground

Reactive ground is ground that reacts after it comes into contact with nitrates. This involves chemical oxidation of sulphides, e.g. iron or copper, presence of pyrite and or acidic soils and can result in premature initiation of explosives or evolution of toxic NO_x and SO_x fumes.

[Insert any site specific details]

Fly rock

All shots will be observed as the blast is initiated or following the blast for evidence of fly rock going outside of the nominated Blast Exclusion Zone. This may be clarified by reviewing the video recording of the blast to establish where the fly rock originated within the blast.

Any fly rock moving outside the WA boundary is a reportable incident under the Work Plan conditions.

[Insert any fly rock response procedures]

Blast Fume

All blasts shall be visually monitored for blast fume.

In general, it can be stated that post blast fume [nitrogen dioxide] is caused by the non-ideal detonation of an ammonium nitrate-based explosive, or the partial reaction of explosive constituents in an oxygen positive environment. The causes of post blast fume are many and varied [ref; *AEISG Code of Practice – Prevention and Management of Blast Generated NO_x Gases in Surface Blasting. Edition 2. August 2011*]

Detonating explosives produces a range of gaseous products. These gases are sometimes found as by-products in the post blast gases of ammonium nitrate-based explosives.

Fume levels are monitored post blast by Shotfirer observation as well as review of video evidence of the shot.

Fumes are rated based on appearance and colour from minor yellow to red using a level rating being A. Local, B. Medium or C. Extensive.

Before proceeding to the blast site to carry out the post blast inspection, the Shot Firer or other competent person shall make an assessment to ascertain whether fume dispersal has occurred.

Blast Fume Personal Exposure Response

Any worker or other persons exposed to blast fume and or is experiencing respiratory symptoms shall be provided with immediate medical attention. The treating medical practitioner will be informed of possible nitrogen dioxide [NO₂] exposure.

Symptoms of overexposure include:

- Eye irritation and coughing
- Initial dizziness and/or headache [may subside]
- Shortness of breath
- Cyanosis [blue lips, fingertips] 5–8 hours later

Immediate first aid treatment will involve thoroughly washing eyes and clearing nose and throat.

Where a medical practitioner examines and releases a patient that develops symptoms later, urgent medical attention shall be sought.

All workers will be made aware of blast fume, its symptoms and management.

Australian Exposure Standards

NO₂: 3ppm TWA, 5ppm [9.4mg/m³] STEL

NO: 25ppm TWA, 35ppm STEL

TWA: Time Weighted Average over 8 hour day

STEL: Short Term Exposure Limit over 15 minutes

NB: the average odour threshold is 0.12ppm

[The following risk controls are in place to manage the potential hazard posed by exposure to NO_x gases]:

Record of Blast

The *Shot Firer's Report Book* [CMPA 1340] [or other document equivalent to the Victorian Work Safe's BMP Template] must be completed and approved by the Quarry Manager and Shot Firer for every shot. This document will cover all shot specific requirements of the shot which are not covered within this BMP. This includes specifying:

- Blast design e.g. faces height, number of holes, burden, spacing, stemming height, number of explosives;
- Drillers Log;
- Bore tracking/laser profiling results;
- The personnel involved in the blast and their roles;
- Environmental conditions;
- Exclusion zones for that particular shot;
- Environmental monitoring results;
- A summary of the success/failure of the blast and the reference number of any further investigation.

9. Blast Site Preparation

Access to Blast Site and Face, Bench Stability

An inspection of the access to the blast site itself, the faces below and above and the working bench shall be undertaken. Housekeeping will continually be monitored to ensure that a safe worksite is maintained throughout the preparation of the Blast Site.

Refer to the CMPA's *Working Safely with Geotechnical Risk in Quarries, Attachment B - Pre and Post Blast Checklists*.



Example of crevice in rock face

The face of the shot shall be assessed for faults, loose rock or crevices that may identify lesser burden, e.g. blasthole coverage, resulting in release of explosive energy causing fly rock.

[Insert your methods of face inspection, laser profile and bore tracking processes]

Stripping and Site Preparation

The blast site shall be prepared to ensure the safety of surveyors, drill rig operators, explosive workers and suppliers.

[List controls in place required before surveying or drilling can commence, stripping and backfill, levelling, drainage, compaction, nominated parking areas, buffer zones, signage, edge protection berms, rock trap berms, barriers, trip points removed, access and traffic management]

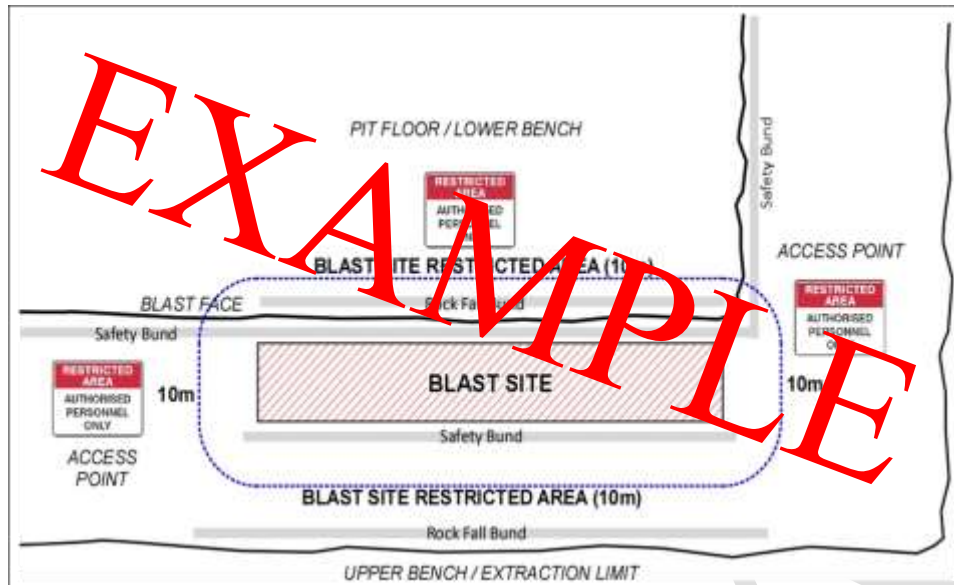
Blast Site Restricted Area

The Blast Site Restricted Area shall be established and maintained by the Quarry Manager or Shotfirer at the commencement of the surveying of a blast site and remains in place until the day of the blast.

The Shotfirer must have photographed the blast site prior to any surveying to ensure they have a reference point when maintaining the site prior to the blast.

Its purpose is to secure a safe workspace for personnel engaged in surveying and drilling and to prevent unauthorised access to or alteration of the blast site, disturbance of survey reference points, damage to drill holes, their collars or cap/plug.

[Insert details of working distances, exclusion parameters]



Example of a Blast Site Restricted Area

Daily inspections are carried out by the Quarry Manager ensuring there are no stability issues or evidence of face failure or movement, risk controls in place are effective and there is no unauthorised activity taking place within the restricted area.

Persons are not to enter a blast site without approval of the Quarry Manager or Shot Firer.

Blast Exclusion Zone

[Outline the blast management zone procedure. A map may be of assistance]

A blast exclusion zone shall be established for each shot to allow work to continue in surrounding areas during loading of the shot but will be controlled to prevent unauthorised access of personnel, plant and equipment. All mobile plant and the Shot Firers shelter, where applicable will be removed from the blast exclusion zone before firing can commence.

No work is to be undertaken within the blast exclusion zone by any person during firing.

The size of the blast exclusion zone must take into consideration that all fly rock and associated debris is to be contained within the zone.

A competent person shall determine the size of the blast exclusion zone through consultation with the Shot Firer and taking into consideration the historical monitoring results from blast monitoring equipment and video surveillance.

The minimum burden, charge mass, blasthole angle and stemming height are critical in determining the blast exclusion zone.

In the absence of being able to calculate the blast exclusion zone, the default evacuation is [### metres].

All persons on site will be directed to a nominated blast shelter before the firing sequence can commence.

A pre start meeting or tool box talk on the day of the blast will be conducted to ensure all personnel are aware of the nominated exclusion zone.

Exclusion zones must be implemented by the Shot Firer and Quarry Manager so as to comply with the requirements of AS 2187.2-2006 Explosives - Appendix L Exclusion Zones of Storage and Use of Explosives.

10. *Blasting Parameters*

Blasting Method

Blasting methods have been determined over time. Face heights, face orientation, sub drill, hole diameter, hole angle, blasting patterns, explosive types, loading techniques, stemming height, initiation type and firing sequences have been determined to meet blast design parameters governed by acceptable environmental limits [if applicable], source rock geology, type and size of loading tool and fragmentation required to meet crushing plant size and feed rate needs.

All of the abovementioned aspects of blast design may be reviewed over time as new products and technology becomes available, or if source rock geology or environmental limits change.

Blast Hole Management

[Insert procedures, responsibilities and method by which holes are approved for loading, taking into consideration surveying, profiling, drilling, bore tracking, auditing and approval for loading]

Where explosives are delivered in bulk, care must be taken to ensure not to over charge holes in cracked ground and to achieve the correct stemming height due to product rise.

Where practicable, only one hole should be initiated at any instant to reduce the environmental impacts

Blast Hole Parameters

The shot design is based on geological conditions. Refer to the Work Authority licence and reference the *Shot Firer's Report Book* [CMPA 1340].

The minimum design spacing of shot holes on this site, when using full strength bulk explosive for a nominated drill hole is listed in the table below.

Blast hole diameter [mm]	89
Design Front Row Burden [m]	3.1
Design Front Row Spacing	3.2
Min. Load Front Row Burden [m]	2.9
Design Stemming Height [m]	3.0
Min. Stemming Height [m]	2.9
Hole Angle	5° - 15°
Average Bench Height [m]	10
+Sub Drill [m]	0.5
Explosives Density [g/cm ³]	1.2
Column charge mass [kg/m]	7.5

Where practicable all blasts should have the face, laser profiled to determine the appropriate location of the front drill hole row and thus assist in preventing fly rock.

The initial blast at the quarry, blasts in any new areas of the quarry or when the circumstances have changed, these designs are to be reviewed and nominated by a suitably qualified person.

Staggered patterns are used in preference to square patterns to improve the distribution of explosive in the ground.

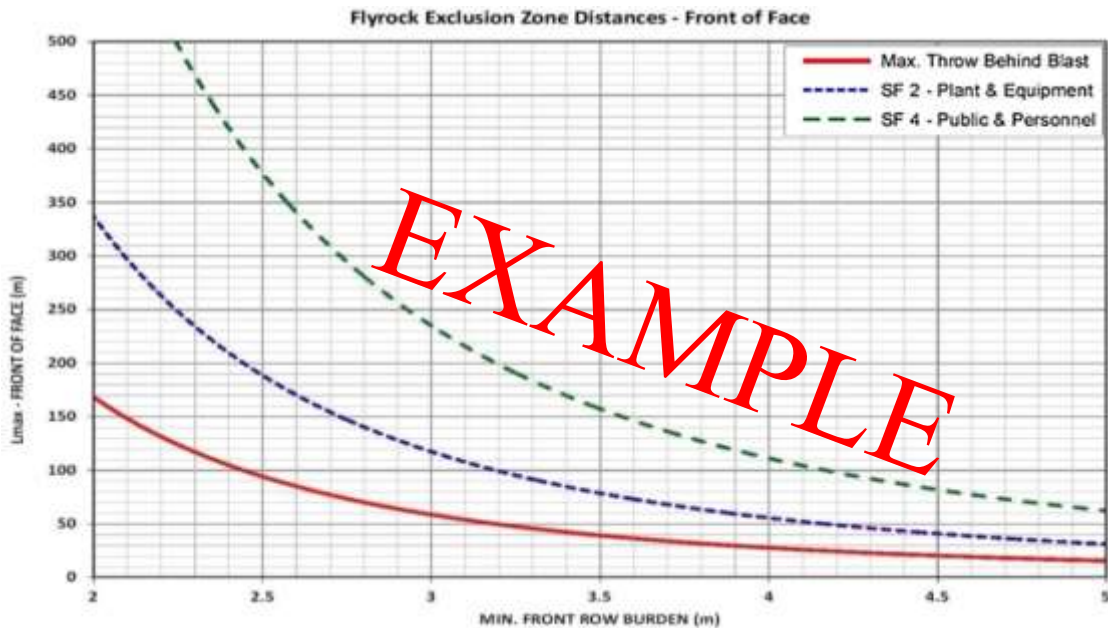
[Insert Company Name] Blast Management Plan

Strict blast parameters in terms of blast geometry, minimum burdens for explosives deployed, maximum instantaneous charge, stemming heights and initiation sequences have been established.

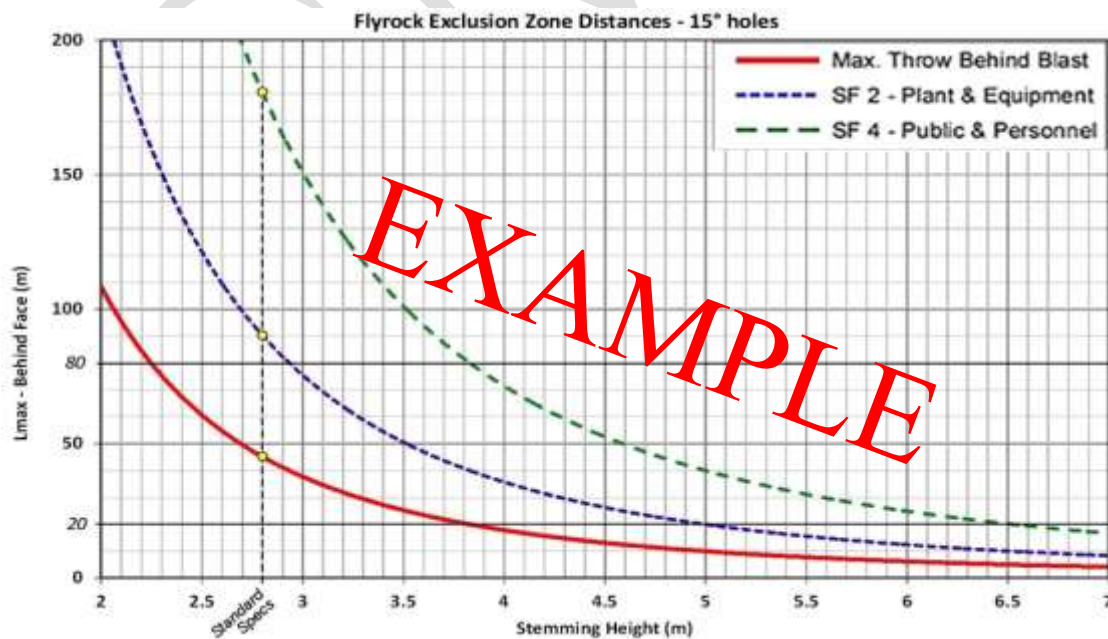
Burden		Spacing		Minimum Stemming	Maximum Instantaneous Charge
Minimum	Maximum	Minimum	Maximum		

There are controls in place to ensure there is an approval process to move outside these parameters.

[Include information regarding separation distances - refer EPA guideline]



Example of Front Row Burden vs Lmax [front of face]



Example of Stemming Heights at 15° to maintain Safety Factor of 4

Blast Hole Parameter Tolerances

The shot location, direction and layout must comply with the staged development of the quarry as per the Work Plan. This has been set out in a way to minimise risk to infrastructure, flora and fauna, adjoining properties and considered the geological report attached to the Work Plan.

[Insert site blasthole parameter tolerances]

Review of Blast Hole Parameters

Blast outcomes are reviewed through video and photographic evidence, blast monitor results, face stability inspections, laser profile reports, Shotfirer's reports, digability and fragmentation results.

A review of blast parameters may be initiated by the Shotfirer or the Quarry Manager through the Issue Resolution Process.

Changes to Blast Hole Parameters

Changes to blasthole parameter designs may be required from time to time due to changing geological conditions, to improve blast performance, to maintain a Safety Factor of 4 and to maintain company standards and community expectations.

Stemming Parameters

The stemming parameters over the shot are critical for managing fly rock. Stemming height increases are required to manage fly rock when the angle of the hole is increased.

Stemming material acceptable to use must be nominated for the drill hole size used. Stemming material must not contain fine material and drill cuttings and dust must not be used for this purpose.

[Insert procedures on placing stemming on a blast site and process of placing in blast holes]

False Burden

[Insert methods of placing false burden if this is a technique used at your site]

Subsequent Row Holes [Between front row and back row holes]

[Insert details of shot plan for hole angles, stemming heights by design, charts if available]

Back Row Holes

[Insert details of back row design, final face requirements, and any special rules applied]

Air Deck

[Insert methods of placing air decking if this is a technique used at your site]

Deck Loading

[Insert methods of deck loading if this is a technique used at your site]

Reducing Fly rock Throw in Front of a Face

Increasing front row burden from standard specifications will reduce the Fly rock Exclusion Zone distances in front of a blast face.

This may need to be considered in order to provide a Safety Factor of 2 for blasts that face toward fixed quarry plant and equipment.

Blasting at the Extraction Limit

This section has been included to give guidance as to blasting practice as the blasts approach the extraction limit, giving consideration to keeping any fly rock within the Work Authority boundary. Consideration is given to the land use beyond the Work Authority.

[Insert special loading and design rules if this is a technique used at your site]

CMIPA

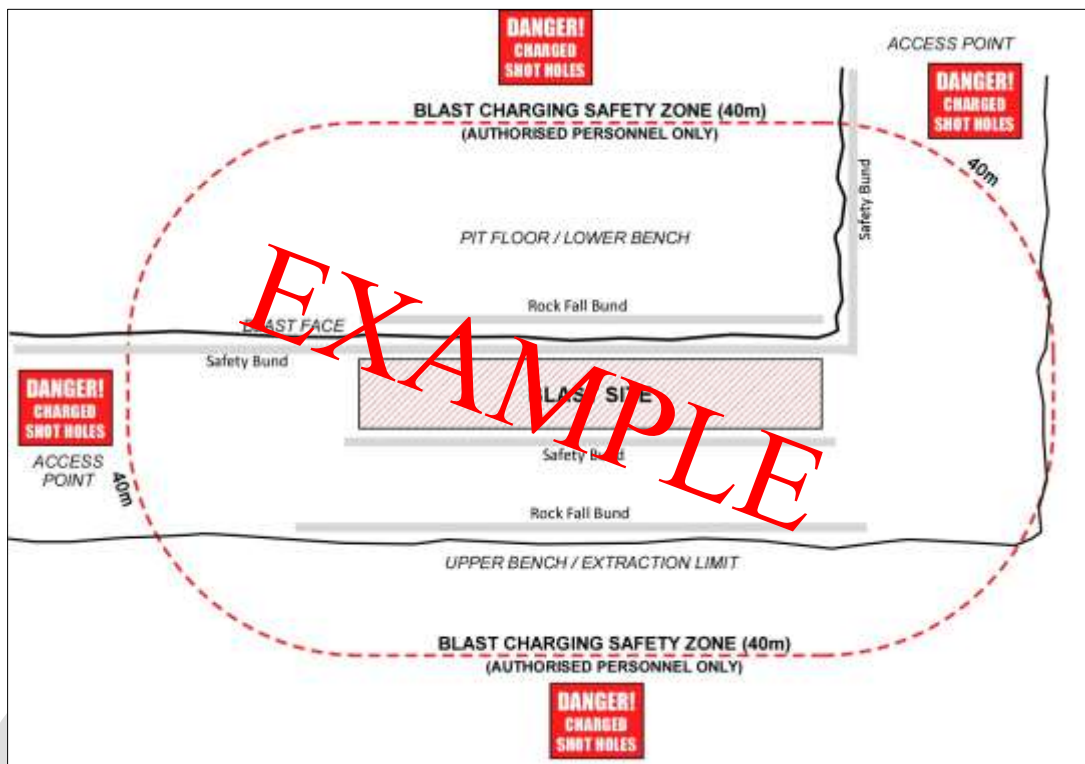
11. Establishing Blast Charging Safety Zone

[Insert your method of activating the Blast Charging Safety Zone immediately prior to the arrival of explosives on site]

The Blast Charging Safety Zone is to provide protection for personnel involved with blast preparation and personnel working in the vicinity of the blast site by reducing the potential for accidental initiation.

No unauthorised work is to be conducted inside the Blast Charging Safety Zone. Only personnel and vehicles involved in explosives delivery and blast hole loading operations are permitted access.

Position signage on the morning of a blast at the site entrance and all entry points to the Blast Charging Safety Zone.



Example of a Blast Charging Safety Zone

12. Planning-Pre Loading and Firing

Charging and Firing a Shot

Prior to any loading activities, the Shotfirer must review the blast exclusion zone to ensure no changes have been made. The Shotfirer must also review all available information to identify any blast holes requiring abnormal loading or stemming, ensure the powder factor is an acceptable level, that all minimum burden and spacing parameters can be achieved, the firing sequence has been designed and maximum instantaneous charges are not exceeded and that the required amount of explosive products are available to ensure the firing time can be achieved.

The charging and firing of a shot must comply with [\[Insert your procedure for Loading and Firing a Shot\]](#), taking into consideration the requirements of this BMP.

[\[Insert your procedures on preloading meetings and direction given to MMU operators\]](#)

Suspension or Postponement of Loading and Firing

On days of blasting, the Quarry Manager in consultation with the Shot Firer may need to suspend or postpone the loading of the shot:

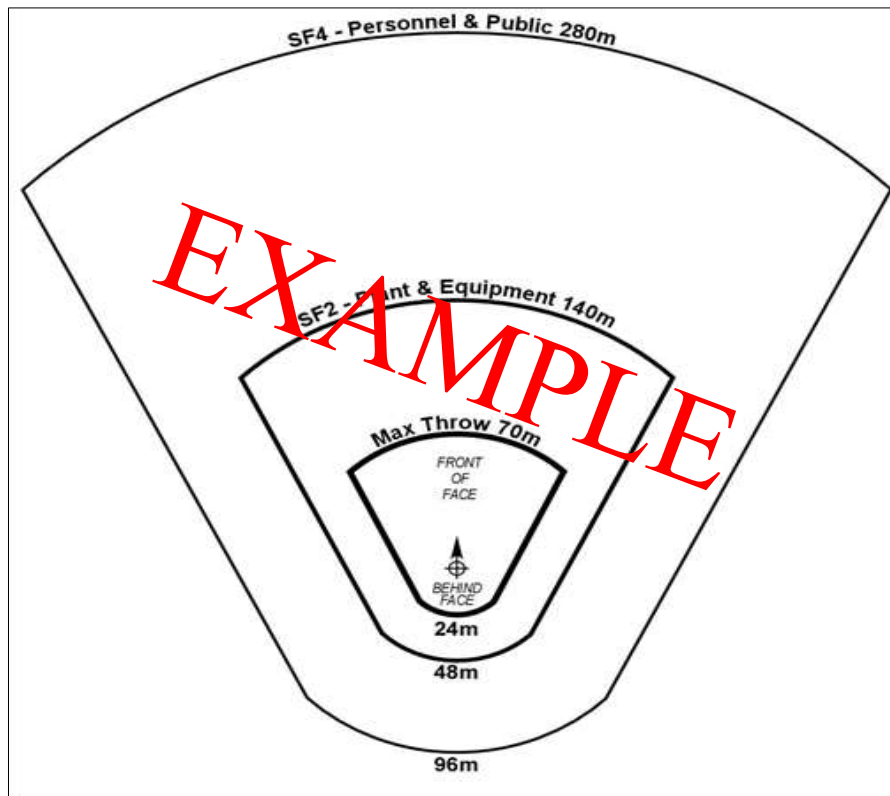
[\[Insert your procedures on what will warrant suspension or postponement of loading and firing a shot\]](#)

Blast Exclusion Zone

[\[Insert your procedures on final inspection once loaded, before releasing the Blast Charging Safety Zone, activating the Blast Exclusion Zone\]](#)

A Blast Exclusion Zone is to be jointly developed by the QM, SF and any other suitably qualified persons, drawing on site history where possible.

The minimum area of a Blast Exclusion Zone can be set as long as full compliance to the BMP has been proven. The Blast Exclusion Zone should be identified and recorded in the *Shot Firer's Reporting Book for Drilling and Firing Shot* [\[CMPA 1340\]](#) and where possible incorporates the whole site.



**Example of a Minimum Blast Exclusion Zone [Single Hole]
where stemming height is at 2.8m and hole angle is 5° or less**

Blast Initiation, Timing, Plan of Firing Sequence

The blast timing sequence controls the relative heave energy and relative fragmentation energy of the blast, as well as a direction and placement of muck pile. Consideration is given to:

- Any environmentally sensitive areas requiring a soft start of the firing sequence;
- Any ground stability issues such as back break;
- Method of winning material for load and haul for processing, type of mobile plant, equipment used;
- Project specific requirements, size, grading and quality of rock required;
- Location of Blast Site relative to site access, distance to fixed assets, infrastructure and sensitive receptors.

The timing sequence has a bearing on both air blast and ground vibration readings which need to be closely monitored.

A Maximum Kg per delay will be used to determine maximum instantaneous charge. This will be used to ensure that any predicted ground vibrations are managed. Historical data including past blast results and geological conditions must be taken into consideration before loading to Max Kg per hole limits.

Max Instantaneous Charge	Max Kg per Delay per Front Row Hole up to 13m in depth
kg	kg
Max Instantaneous Charge	Max Kg per Delay per Hole up to 12m in depth
kg	kg

Accounting for All Personnel On-Site Prior to Firing Shot

[Insert your procedure to ensure that]:

- All non-essential persons have registered movement from site as no other work activities are to be undertaken during the warning and firing protocol;
- The mobile blast shelter has been positioned with any possible fume generation taken into consideration;
- All sensitive receptors have been contacted and informed of blast; and
- All essential persons on site have been accounted for.

Final Preparation before Firing a Shot

Prior to moving to the firing position and commencing warning and firing protocol the Shot Firer is to ensure:

- The Shot Firer has confirmed the ground vibration and air blast monitors have been set up in the required locations and are monitoring;
- The video camera is set up, recording and viewing the correct location of the working face;
- The face and blast site restricted area have again been reviewed;
- That all entry restrictions are in place for the Blast Exclusion Zone;
- No plant is in the Blast Exclusion Zone;
- That the weather conditions are appropriate for firing a shot;
- No persons remain in the Blast Exclusion Zone and that all remaining persons onsite are at the nominated site blast shelter;
- The blast site has been reviewed for any changes including signs of emulsion product escaping through the face and all stemming has been placed as required;
- That they communicate with the Quarry Manager and await for the site to be released prior to firing;
- The firing method has been correctly attached, being reviewed by the shotfirer and one other person;
- The surface detonators have been correctly attached, being reviewed by the shotfirer and one other person; and
- They are located in the mobile blast shelter.

Warning Sequence and Firing Protocol –

[Insert Warning Sequence and Firing Protocol procedure]

The table below lists the Warning Sequence for Blasting and is consistent with AS 2187.2 – 1998 Explosives – Storage, Transport and Use – Part 2:

Warning Siren Timings	
3 short sirens	Indicates the blast is to be fired in 4 minutes
3 minute pause	Allowing the Shot Firer to reconfirm the area is clear
2 short sirens	Indicates the blast is to be fired in 1 minute
1 minute pause	
Continuous siren sounded for 10 seconds	Indicates blast is about to be fired
Blast Fired	Once dust has cleared, Shot Firer checks area is safe
Continuous siren sounded for 10 seconds	“All Clear” indicating the area is safe

Assessment Prior to a Post-Blast Inspection

[Insert your Assessment Prior to a Post-Blast Inspection procedure]

The following sample is from *AS 2187.2-2006 Explosives - Storage and Use - Use of Explosives*.

Before proceeding to the blast site to carry out inspection, the Shot Firer or other competent person shall make an assessment to ascertain if it is safe to do so. The assessment shall include but is not necessarily limited to, consideration of the following factors:

- Whether fume dispersal has occurred;
- Whether dust dispersal/settlement has occurred;
- The identification of any apparently unstable ground;
- The stability of buildings and other structures;
- The safety and suitability of access and egress;
- Aspects of the blast that may indicate that not all of the charges have been initiated;
- In the case of a misfire, or a suspected misfire, whether the minimum waiting time has been observed there shall be no personnel in area for 5 minutes if initiation method was electric or signal tube, 30 minutes if safety fuse used;
- The availability of a competent person to inspect for safety, ground or material that did not move as it was intended; and
- Final communication with the person/s completing the warning sequence to give the “All Clear”.

Post Blast Inspection

The purpose of the post-blast inspection is to ascertain if it is safe for personnel and equipment to return to the blast site and for routine operations to resume.

[Insert your Post Blast Inspection procedures]:

- Fume and dust dispersal has occurred, refer to section 8.8 and 8.9 of this BMP;
- Firing and initiation sequence was successful;
- There are no other dangers present inclusive of geotechnical risks e.g. back break, over hang;
- Review results to ensure compliance to Work Authority Limitations and safe and efficient blasting; and
- Complete any required documentation.

The pre and post blast geotechnical inspections could be conducted using the CMPA's guideline titled Working Safely with Geotechnical Risk in Quarries, Attachment B - Pre and Post Blast Checklists.

13. Handling Misfired Explosives

As there are many circumstances under which a misfire may occur, it would be impractical to attempt to document exactly what steps must be taken. Utilising AS 2187.2, Section 10.3, and Risk Management procedures outlined in Section 1.10, misfires will be treated following the below steps:

1. Identify that a misfire has occurred.
2. Wait a minimum 5 or 30 minutes, depending on explosive selection, before approaching the blast.
3. Close inspection to locate hole collars and determine the cause of misfire.
4. Determine an appropriate course of action, following the order shown below.
5. Reinstall initiation system and re-fire
6. Remove stemming, re-prime, re-stem and re-fire.
7. Mechanically or manually retrieve the explosives and/or primers for later destruction
8. As a last alternative, drill a relieving hole, charge, stem and fire

The Quarry Manager is responsible for ensuring the misfire is treated. Treatment of a misfire must involve the Shot Firer.

Should it be deemed that the misfire cannot be treated or more than 1% of the shot has misfired the Quarry Manager may contact WorkSafe Victoria – Earth Resources Program and Hazardous Industries Group & Industry Practice Group and/or ERR. Note this is not currently a regulatory requirement.

Following the completion of the Misfire management process, a review of the incident must be undertaken to identify the cause of the issue and the best prevention for future blast.

[\[Insert your misfire management procedure or reference to your misfire management plan\]](#)

Refer Attachments - Misfire Management Flow Chart

References

Internal Documents

- [Identify and internal/company reference documents]

External References

- *Mineral Resources [Sustainable Development] Act 1990*
- *Dangerous Goods [Explosives] Regulations 2011*
- *Dangerous Goods [Storage and Handling] Regulations 2012*
- *AS 2187.1-1998 Explosives - Storage, Transport and Use - Storage*
- *AS 2187.2-2006 Explosives - Storage and Use - Use of Explosives*
- *Issue Resolution Form [CMPA 1325]*
- *Magazine Management and Safety Checklist [CMPA 1343]*
- *Shot Firer's Report Book [CMPA 1340]*
- *Orica Construction Blasting Standard Operating Procedures*
- *Mine Blast Fumes and You. Fact Sheet. NSW Government Health Department*
<https://www.health.nsw.gov.au/environment/factsheets/Pages/mine-blast-fumes.aspx>
- *Managing Blast Fumes Queensland Government* <https://www.business.qld.gov.au/industries/mining-energy-water/explosives-fireworks/requirements/blasting/blast-fumes>

Attachments

Example Blast Charging Procedure

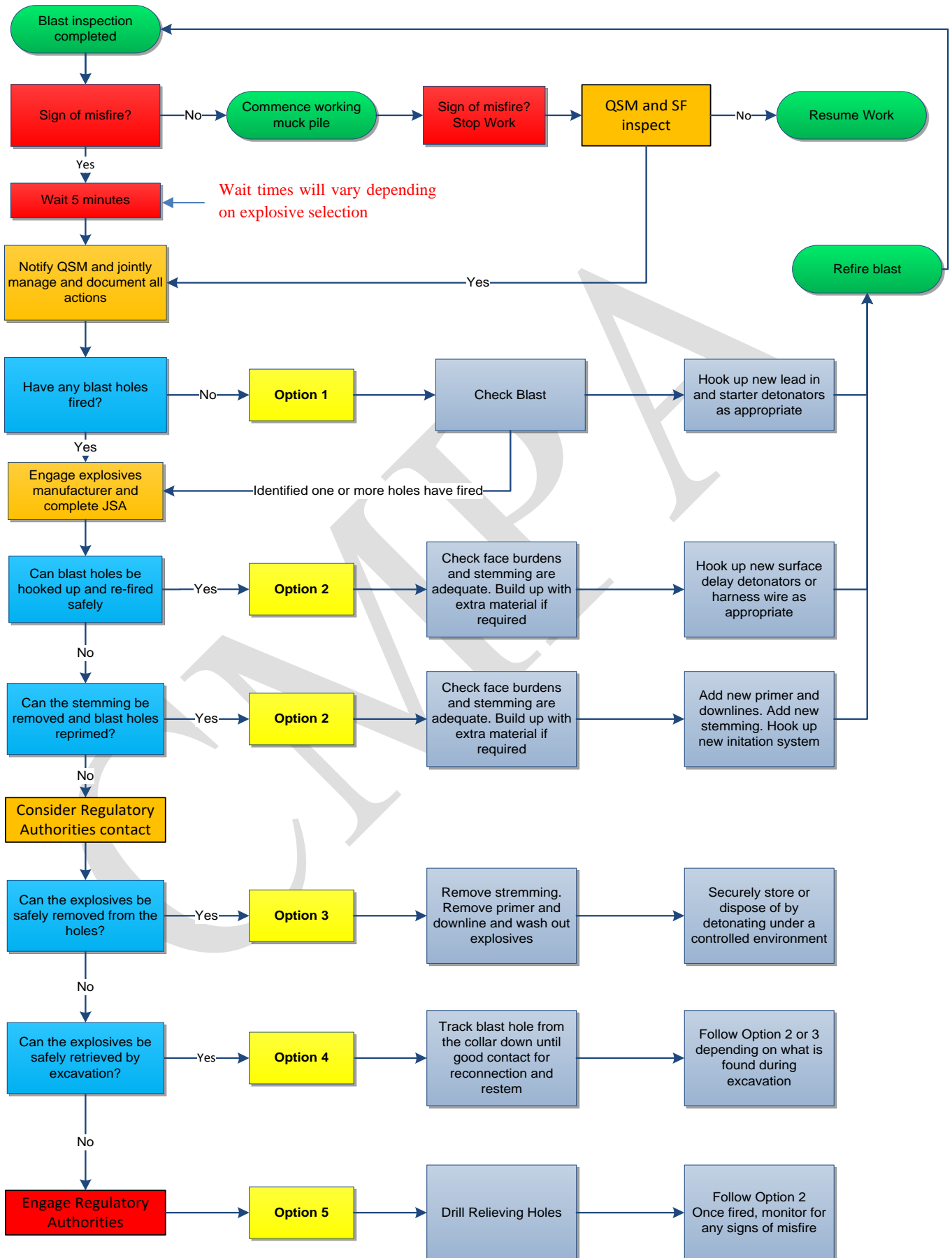
Blast Charging Procedure that can be amended to suit your requirements tabled below.

Requirement	Explanation
1. Shot Firers planning meeting	All personnel assisting on the blast must be made aware of how to do each task safely.
2. Define the blast area	Ensure a 10m clearance beyond any blast holes requiring charging
3. Visually inspect the blast face	Ensure that the blast face is consistent with any blast data that has been provided.
4. Blast barricading	Ensure signs and barricades are appropriately placed at all access ways to the blast site.
5. Check access/egress	Ensure all vehicle access/ramps are safe for use.
6. Blast hole check	Provide evidence of actual blast hole depths [i.e. Drillers Logs, dipping charts]. Check actual burden against design using fishing pole method and/or laser profiling and bore tracking methods.
7. Identify all exception holes	Ensure all blast holes that require special loading techniques are clearly identified for all personnel assisting on the blast.
8. Label all blast holes	Blast holes must be labelled according to the loading chart
9. Dip blast holes and record actual drill depths	Compare the actual depth of all blast holes against the design depth. Backfill if necessary and record any short depth blast holes.
10. Laying out stemming	Ensure appropriate stemming material [7 – 14mm clean aggregate] is placed at locations around the blast to suit manual or mechanical handling.
11. Lay out the boosters and down lines	Work systematically to ensure that no blast holes are missed. Carefully place the booster and down line or lead wire at the blast hole collar to avoid any boosters, down lines or lead wires disappearing beneath drillings or down the blast holes.
12. Assemble primers and lower into blast holes	Carefully insert the detonator into the booster according to the procedure and lower the primer into the blast hole.
13. Determine the appropriate explosives	Use ANFO or a dry bulk explosive in dry blast holes only. Use packaged or a water resistant bulk explosive in wet and dry blast holes.
14. Secure the down line while loading the blast hole	Anchor the down line or lead wires with a rock or place your foot over it to prevent losing the down line or lead wires into the blast hole. Ensure that the booster is pulled into clean product off the base of the hole and above the sub-drill section of the hole
15. Ensure that the explosive column is rising	If cavities or voids are present the explosive column may slump which may then require air decking or the placement of a solid deck.
16. Check the explosive column	Use a measuring tape or a non-ferrous measuring pole to check that the collar heights do not exceed their design. Note that pumpable explosives expand with time and overfilling of blast hole must not occur.

[Insert Company Name] Blast Management Plan

Requirement	Explanation
17. Secure the down line while stemming the blast hole	Slowly tip the stemming material into the blast holes, ensuring the blast hole collar is not disturbed or destroyed. Stemming must be sufficient to prevent fly rock.
18. Check the initiation timing plan	Check the initiation timing plan to ensure it is a true representation of the actual blast pattern.
19. Connect initiating explosive system	Connect the down lines or lead wires according to the design.
20. Check the tie up	Walk the shot and check that all blast holes are connected properly to the surface initiating system.
21. Securing the blast area	Confirm all access ways into the blasting area are clear and ensure that site procedures are adequate.
22. Blast guards	Confirm the position of blast guards or road blocks.
23. Communication	Ensure that any blast guards have a method of communication and understand the blast siren sequence.
24. Firing position	Ensure the firing position is at a safe distance from the blast site to be out of range of any fly rock.
25. Sequence check	Confirm the firing sequence with the appropriate site personnel.
26. Clear the blast area	Manage the clearance of personnel and mobile plant from the blast area.
27. Blast area check	Final check to ensure the blast area is clear of people and safe to fire.
28. Connect the blast initiation system	Connect the blast initiation system at appropriate time.
29. Blast firing	Proceed to the firing position, ensure the blast siren sequence conforms to legislation and initiate the blast.
30. Post blast inspection	Inspect the blast for Misfires when safe to do so.
31. All clear	Communicate all clear if all blast holes have been fired successfully.
32. Complete documentation	Complete the mandatory legislative and company documentation.

Example Misfire Management Flow Chart



Mapping Tools

Mapping AS.2187.2 Appendix A to the BMP

Mapping AS 2187.2 Appendix A to the Blast Management Plan

Requirements as per AS 2187.2	Relevant section within BMP Template
Section A2.1, Purpose	
a) Detail the objectives for the project or task.	1.1- Overview 6.2- Extraction Boundaries
b) Identify risks and hazards associated with the objectives, including control and/or mitigation.	Attachment 15.3.2
c) Identify site-specific requirements including selection of personnel, training programs and communication systems	2.2- Communication 2.5- Permits and Licences 3- All Sections 4- All Sections
d) Introduce blast as part of the overall task in a planned manner	1.1- Overview
e) Control the blast process from design to initiation, evaluation and misfire treatment.	Covered by all sections of the BMP
f) Implement a review process to ensure that the objectives are met.	1.2- Objectives of Blast Management Plan 1.9- Auditing 8.10- Record of Blast
g) Assure compliance with the approval/contract specifications.	1.3- Relevant Documentation, Guidance and Legislation
h) Assure the safety of the public, site personnel and surrounding properties.	1.2- Objectives of Blast Management Plan 1.4- Public Security 1.6- Public Infrastructure Assets & Water Management
Section A2.1, Contents	
a) Location of the proposed blasting.	2.1- Site Details
b) Description of the proposed blasting.	1.1- Overview 5.5- Explosive Selection 10- All Sections
c) Permits/licences required for the project.	2.5- Permits and Licences
d) Identification and position of the person responsible for the project including project safety and security.	3- All Sections 9.3- Blast Site Restricted Area 9.4- Blast Exclusion Zones
e) Identification and position of person who has given approval to use explosives on the project.	1.7- Record Keeping and Auditing, [CMPA 1340] 2.5- Permits and Licences
f) Key appointments and responsibilities.	3- All Sections
g) Shotfirer's details.	1.7- Record Keeping and Auditing, [CMPA 1340] 2.5- Permits and Licences
h) Details of the risk management assessment.	1.10- Risk Management Attachment 15.3.2
i) Details of adjacent structures or services that influence the blast design.	1.6- Public Infrastructure Assets & Water Management
j) Details of reports, drawings and records consulted.	2.4- Rock Formation 10- All Sections References

[Insert Company Name] Blast Management Plan

Requirements as per AS 2187.2	Relevant section within BMP Template
k) Layout plan of the blast including drilling pattern and hole depths.	1.7- Record Keeping and Auditing, [CMPA 1340] 10- All Sections
l) Detonation sequence/effective charge mass per delay (MIC)/powder factor.	12.4- Blast Timing, Plan of Firing Sequence
m) Type of explosive to be used and quantity required.	5- All Sections
n) Method of initiation	5.5- Explosive Selection
o) Type of firing equipment and procedures.	12.1- Charging and Firing a Shot [Company Procedure]
p) Drilling procedures.	3.6- Driller Obligations 10.1- Access to Blast Site and Face, Bench Stability 10.2- Stripping and Site Preparation
q) Explosive loading and charging procedures.	12.1- Charging and Firing a Shot[Company Procedure]
r) Explosive storage and handling procedures.	5- All Sections 13- Handling Misfired Explosives
s) Security procedures for the site and the blast, including explosives.	1.4- Public Security 5.1- Magazine Security 5.8- Theft of Explosives 9.3- Blast Site Restricted Area 9.4- Blast Exclusion Zone 11- Establishing Blast Charging Safety Zone 12- All Sections 13- Handling Misfired Explosives
t) Environmental considerations for airblast overpressure, ground vibration. NOTES: 1. Information on air blast overpressure and ground vibration is given in Appendix J. 2. Information on flyrock and fly is given in Appendix E2	8- All Sections
u) Details of communication systems.	2.2- Communication 12.4- Blast Timing, Plan of Firing Sequence
v) Warning procedures.	12- All Sections
w) Traffic management plan	2.3- Traffic Management
x) Proposed dates and times of blasting	1.7- Record Keeping and Auditing 6.3- Hours of Work 6.4- Firing Time
y) Details of the exclusion zone. NOTE: See Appendix L.	12.3- Blast Exclusion Zone 12.4- Blast Timing, Plan of Firing Sequence
z) Method of notification to owners and occupiers of structures, and providers of services adjacent to the blast	1.12- External Consultation System
aa) Influence of weather.	1.5- Fire 7.1- Weather 7.2- Fire
bb) Loading in poor light conditions or reduced visibility.	12.1- Charging and Firing a Shot [Company specific procedure on Loading and Firing]
cc) Cessation of explosive-related activities during electrical storms.	7.1- Weather
dd) Misfire management system.	13- Handling Misfired Explosives

[Insert Company Name] Blast Management Plan

Requirements as per AS 2187.2	Relevant section within BMP Template
ee) Post blast assessment and inspection procedures.	12.9- Post Blast Inspection
ff) Provision for post-blast comments.	1.7- Record Keeping and Auditing 1.10- Risk Management
gg) Signature spaces for the plan author, shotfirer and person who approves the plan.	Cover Page 1.7- Record Keeping and Auditing
Section A3, Blast Records	
a) Environmental conditions at the time of the blast.	1.7- Record Keeping and Auditing [CMPA 1340]
b) Monitoring equipment including type, serial number and location	1.7- Record Keeping and Auditing [CMPA 1340] 1.12- External Consultation System 2.1- Site Details- Sensitive Receptors 8.1 to 8.4
c) Details of measurements recorded during the blast.	1.7- Record Keeping and Auditing [CMPA 1340]
d) Details of flyrock or fly.	1.7- Record Keeping and Auditing [CMPA 1340] 8.7- Fly Rock
e) Details of incidents and complaints.	1.7- Record Keeping and Auditing 1.10- Risk Management 1.12- External Consultation System
f) Comment on the results of the blast	1.7- Record Keeping and Auditing [CMPA 1340]
g) Proposed modification to the blast plan for future shots.	1.9- Auditing 1.11- BMP Periodic Review

[Insert Company Name] Blast Management Plan

Blasting Hazards/ Risks and their Controls in the BMP

Blasting Hazards/ Risks and their Controls in the Blast Management Plan

Hazard	Risk	Causes	Controls in this BMP
Ground Vibration	Ground vibration exceeding limits set within Work Plan	Rock Formation Personnel Contractor Procedures Explosive Selection Monitoring Equipment Blast Site Preparation Blast Parameters <ul style="list-style-type: none"> Stemming Diameter Burdens Spacing Sub Drill Charging Procedures Blast Timing and Sequence	2.4 3, 4 3.4, 6.1 5.5 8.1, 8.2, 8.3 9.3 10 10.3 10.7 10.3 10.3, 10.8 10.3 10.3 12.1 12.4
Air Blast	Air Blast overpressure exceeding limits set within Work plan	Rock Formation Personnel Contractor Procedures Explosive Selection Explosives disposal Weather Conditions Monitoring Equipment Blast Site Preparation Blast Parameters <ul style="list-style-type: none"> Stemming Diameter Burdens Spacing Sub Drill Charging Procedures Blast Timing and Sequence Misfire Management	2.4 3, 4 3.4, 6.1 5.5 5.7 7.1 8.1, 8.2 9.3 10 10.3, 10.7 10.3 10.3, 10.8 10.3 10.3 12.1 12.4 13

[Insert Company Name] Blast Management Plan

Hazard	Risk	Causes	Controls in this BMP
Ground Stability	Blasting activities affecting ground stability across the site	Rock Formation Personnel Blast Site Preparation Blast Parameters <ul style="list-style-type: none"> Diameter Burdens Spacing Establishing Blast Charging Safety Zone Blast Timing and Sequence	2.4 3, 4 9 10 10.3 10.3, 10.8 10.3 11 12.4
Explosives Theft	Personnel on-site steal explosive products	Site access/security Personnel Record keeping of Explosive products Magazine upkeep/ management Misfire Management	1.4 2.2, 3, 4 5.2, 5.6, 5.8 5.1 13
Fly Rock	Rock travelling beyond the blast exclusion zone as nominated in the blast management plan	Rock Formation Personnel Contractor Procedures Explosive Selection Explosives Disposal Practises Blast Site Preparation Blast Site Restricted Area breach Blast Parameters <ul style="list-style-type: none"> Stemming Diameter Burdens Spacing Charging Procedures Blast Timing and Sequence Misfire Management	2.4 3, 4 3.4, 6 5.5 5.7 9 9.3 10 10.3, 10.7 10.3 10.3, 10.8 10.3 12.1 12.4 13

[Insert Company Name] Blast Management Plan

Hazard	Risk	Causes	Controls in this BMP
Misfires	Explosive product left contained within the muck pile post firing	Rock Formation Personnel Contractor Procedures Explosive Selection Explosives Handling procedures Blast Sleep time Ground Conditions/ Reactive ground Blast Site Preparation Blast Site Restricted Area breach Blast Parameters <ul style="list-style-type: none"> • Stemming • Diameter • Burdens • Spacing Loading and Charging Procedures Blast Timing and Sequence Misfire Management	2.4 3, 4 3.4, 6 5.5 5.6 6.4 8.6 9 9.3 10 10.3, 10.7 10.3 10.3, 10.8 10.3 12.1 12.4 13
Personnel Safety	Personnel working on the blast site need to be protected from all surrounding activities that may possibly affect them	Communication Traffic Management Rock Formation Personnel Contractor Procedures Explosive Control Weather conditions Bench Stability Blast Site Access Blast Site Restricted Area breach Establishing Blast Charging Safety Zone Loading and Charging Procedures Misfire management	2.2 2.3 2.4 3, 4 3.4, 6 5 7 9.1 9.2, 9.3 9.3 11 12.1 13

[Insert Company Name] Blast Management Plan

Hazard	Risk	Causes	Controls in this BMP
Damage to Assets	Blasted rock damaging public or private assets	Traffic Management Rock Formation Personnel Contractor Procedures Explosive Selection Explosives Disposal Practises Blast Site Preparation Blast Site Restricted Area breach Blast Parameters <ul style="list-style-type: none"> • Stemming • Diameter • Burdens • Spacing Blast Exclusion Zone Charging Procedures Blast Timing and Sequence Misfire Management	2.3 2.4 3, 4 3.4, 6 5.5 5.7 9 9.3 10 10.3, 10.7 10.3 10.3, 10.8 10.3 11, 12.3, 12.6 12.1 12.4 13
Fumes and Dust	Fumes generated from blasting activities, affecting on-site or off-site areas	Rock Formation Personnel Contractor Procedures Explosive Selection Blast Sleep Times Weather Conditions Blast Site Preparation Blast Parameters <ul style="list-style-type: none"> • Stemming • Diameter • Burdens • Spacing Blast Exclusion Zone, Blast Shelter position Charging Procedures Blast Timing and Sequence Misfire Management	2.4 3, 4 3.4, 6 5.5 6.4 7.1 9 10 10.3, 10.7 10.3 10.3, 10.8 10.3 11, 12.3, 12.6 12.1 12.4 13
Unlicensed Shotfirer's	An unlicensed person completing blasting activities	Permits and License management practises Communication Personnel	1.3, 1.7, 1.9, 2.5 2.2 3, 4

[Insert Company Name] Blast Management Plan

Hazard	Risk	Causes	Controls in this BMP
Contractor Compliance	Contractors utilised do not comply to or understand the Work Plan limits or site specific requirements	Permits and Licensing management practises Communication Personnel Contractor Procedures Incomplete BMP Not complying to BMP	1.3, 1.7, 1.9, 2.5 2.2 3, 4 3.4, 6

CMIPA

Sample Magazine Management Safety Checklist

Name of Quarry / Mine: _____

Date: _____

Magazine Type: _____ Magazine No.: _____

Location: _____

Purpose of Opening Magazine: _____ (Please circle relevant letter)

A B C D E F

General Checks	Circle relevant boxes			Comments
Are you fit for work? (i.e. adequately rested, free of drugs/alcohol)	✓	n/a	×	
Are you wearing PPE as nominated by your company's directions?	✓	n/a	×	
Have you Identified, assessed and controlled any risks present? (i.e. Take 5)	✓	n/a	×	
Are you reporting matters to your Manager as soon as they occur?	✓	n/a	×	
Are you ensuring only authorised personnel (over 18 years old) enter the Magazine Compound?	✓	n/a	×	
Magazine Compound Checks	Circle relevant boxes			Comments
Are the Magazine keys stored in an appropriate and secure place?	✓	n/a	×	
Does the Magazine fencing and locks meet the approved requirements? Is the required signage in place and in a good condition?	✓	n/a	×	
Is there a notice inside the magazine stating the kinds and quantities the magazine is licensed to store?	✓	n/a	×	
Are cleaning accessories (i.e. brooms, dust pans...) compatible with the contents of the magazine to minimise the risk of an accidental explosion?	✓	n/a	×	
Is the required fire equipment in place and in date?	✓	n/a	×	
Does the magazine earthing look to be intact?	✓	n/a	×	
Are the emergency plan and procedures readily available?	✓	n/a	×	
Is the area around the Magazine free of combustible materials?	✓	n/a	×	
Will access to the Magazine be safe and stable in all weather conditions?	✓	n/a	×	
Is drainage inside the Magazine Compound effective?	✓	n/a	×	
Is drainage outside the Magazine Compound effective?	✓	n/a	×	
Is the general housekeeping and maintenance of the Magazine Compound acceptable? (i.e.: rubbish)	✓	n/a	×	
Is the bunding inside the Magazine Compound clear of external material, compliant, stable and secure?	✓	n/a	×	
Does the Magazine contain the correct quantities of stock, as per license agreement?	✓	n/a	×	
Are explosives in a compliant or substantial packaging to prevent any escape of the contents?	✓	n/a	×	
Is stock being rotated and are 'use by' dates being checked?	✓	n/a	×	
Are out of date explosives disposed of safely and with compliance?	✓	n/a	×	
Are delivery dockets accompanying the delivery of goods?	✓	n/a	×	
Does the Purchase Order match the Delivery Docket?	✓	n/a	×	
Is delivery of goods to the shot being completed safely?	✓	n/a	×	
Is stock being counted against the Delivery Docket and again once stock is returned from the shot?	✓	n/a	×	
Has the Explosive Stock Record been updated?	✓	n/a	×	

Shotfirer to sign when completed: _____

Manager to sign when completed: _____

Sample Shotfirer's Book and Checklist

Shotfirer's Book

Blasting Site Details: _____ Date: _____ Blast No.: _____ Bench No.: _____
 Person(s) assisting in charging shot: _____ Person(s) assisting during firing shot: _____

Shot Information

Time of Blast	Front Row Burden (m)	Burden (m)	Spacing (m)	No. of Rows	No. of Holes	Drilled Length (average)	Drilled Length (total)	Charged column (total)	Diameter (mm)	Stemming Height (average)	KG of Explosives per			Explosive Total Kg	Air Blast dB(L)	Ground Vibration (mm/s)
											Delay (max)	Holes (average)	Charged (average m)			

Report Summary

Blast Monitored	Yes	No	Report No.
Blast Management Plan Prepared	Yes	No	Report No.
Contractor's Report Attached	Yes	No	Report No.
Boretracking and Laser Profiling Report Attached	Yes	No	Report No.
Air Blast Report Attached	Yes	No	Report No.
Ground Vibration Report Attached	Yes	No	Report No.
Driller's Report Attached	Yes	No	Report No.
Video Filed	Yes	No	Report No.
Shot Plan Report Attached	Yes	No	Report No.
Plan of the Firing Sequence Attached	Yes	No	Report No.
Shotfirer's Blast Safety Checklist Report Attached	Yes	No	Report No.
Did you talk to Drillers regarding conditions?	Yes	No	Report No.

WEATHER

Fine:	Cloudy:	Rain:	Other:
Wind Direction		Wind Speed	

(Has the conditions been checked regularly?)
 Comments:

EXCLUSION ZONES & SAFETY DISTANCES
 (At Time of Firing)

Safety Distance in meters from:
Back of Shot:
Side of Shot:
Front of Shot:
Exclusion Zone in meters around shot:

Name of Shotfirer: _____ Licence No. _____
 Signature of Shotfirer: _____ Date: _____
 Name of Inspector: _____
 Signature of Inspector: _____ Date: _____

Misfire / Incident Details
 Has a Misfire occurred? Yes No
 Have you raised documentation as per your company standards? (i.e. Issues Resolution form) Yes No

Comments: _____

Shotfirer's Book

General Checks Before Undertaking Task		Circle relevant boxes		Comments
Are you licensed to handle explosives and assessed as competent to handle explosives by your employer?		✓	n/a	x
Can the blast be initiated within site licence time restrictions and predicted weather? <i>(refer to radar reports, etc.)</i>		✓	n/a	x
Have you established who your Manager is and held discussions with them on the shot's activities?		✓	n/a	x
Do you have the correct number of assistants and all participants fit for work? <i>(i.e. adequately rested, free of drugs/alcohol)</i>		✓	n/a	x
Are all those under your responsibility supplied and wearing PPE as nominated by your company?		✓	n/a	x
Have you nominated a suitably qualified person to set up the blast monitoring and video equipment?		✓	n/a	x
Have you identified, assessed and controlled any risks present? <i>(i.e. used Table 5)</i>		✓	n/a	x
Do you have access to all MSDS / TDS and other literature regarding the explosives you are handling?		✓	n/a	x
Are you satisfied that required blast monitoring and video equipment is available, has been calibrated and charged and is in a good working order?		✓	n/a	x
Are you satisfied the safety signage present meets regulatory requirements, identifies the risks and secures the site?		✓	n/a	x
Have you been provided and are you familiar with relevant reports relating to the preparation and drilling of the shot? <i>(i.e. drifter's logs)</i>		✓	n/a	x
Is the shot area accessible with edge protection and the appropriate stemming materials in place? <i>(i.e. 14 / 10mm Aggregate)</i>		✓	n/a	x
Blast Safety Checks While Carrying out Task		Circle relevant boxes		Comments
Are you complying with the company's Blast Management Plan and any site specific Blast Zone Conditions?		✓	n/a	x
Have you inspected the pit and checked the face for any changes since blast design?		✓	n/a	x
Are you satisfied that all relevant parties on and off site have been notified of the planned blast time?		✓	n/a	x
Are you satisfied that only authorized personnel enter the blast area and that no work below or above the shot is being carried out while charging is being undertaken without your approval?		✓	n/a	x
Are you satisfied explosive transport vehicles within the site are suitable, roadworthy and meet regulatory requirements and are being driven by licensed / competent drivers?		✓	n/a	x
Are you satisfied that regulatory separation distances for explosive types and machinery are complied with?		✓	n/a	x
Have explosives been tested as per Australian Standards?		✓	n/a	x
Are you satisfied that the exclusion zones are correct and in place for the proposed blast and is correctly monitored before blasting sequence commences?		✓	n/a	x
Are all parties aware of their responsibilities and have they been informed the blasting sequence is about to commence?		✓	n/a	x

Shotfirer to sign when completed: _____ Contractor to sign when completed: _____ Site Manager to sign when completed: _____

Date Issued: 23/10/2019

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