



DRILL AND BLAST OVERVIEW

Bamberton Quarry

Abstract

Overview of drilling and blasting procedures

Revised 2022

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Introduction

This Blasting Program document outlines the blast planning and procedures for conducting blasting operations at the Bamberton Quarry. Coast Mountain Resources 2020 (CMR) is committed to ensuring drill and blast best practices are applied at the Bamberton Quarry. All blasting on site complies with requirements set in Health, Safety and Reclamation Code for Mines in British Columbia (April 2021).

The Bamberton Quarry was originally started as a limestone quarry in 1912. It has been operational with blasting, up to the present with some periods of closure. It has been operating continuously as an aggregate quarry since 2014. During this lengthy period of time, the blasting program has been continuously improved to ensure the safety of people and the environment are maintained.

All personnel involved in the blasting operations will be familiar with this document to ensure the safety of themselves, other personnel on site and the equipment and structures in close proximity to the blast.

Blasting Concerns

Vibrations

Blast vibration traveling through the ground is the product of explosive energy travelling through the rock mass. The amount of vibration is directly related to the total charge weight per delay detonated in the blast. All blasts are designed with a maximum charge weight per delay to minimize vibration. Vibration monitoring has been set up at the nearest infrastructure, and over time, a strong correlation between the charge weight per delay has been developed.

Powder factor is a term to describe the total kg's of explosive per tonne of rock. Bamberton rock is a hard rock, however it can be heavily structured with joint sets (natural fractures) that improve the fragmentation. This allows the blasting to have a lower powder factor than other quarries.

Other best practices such as free face blasting are implemented to ensure the least amount of energy is sent into the surrounding rock mass, thus reducing the vibration.

Readings of high vibration are recorded, and a study is conducted to determine the root cause to prevent it from occurring again.

Air Blast

Similar to ground vibration, Air blast is the result of energy travelling through the air. This also has a strong correlation to the total charge weight per delay, and is mitigated through proper burden distance to the free face, as well as stemming and collar length. Other factors can play apart in the amount of airblast such as meteorological conditions, orientation and shielding of the blast.

The drill and blast program has been fine tuned to understand the airblast with the explosives used on site. Changes to the blasting location may require adjustment to the blasting program, which will be monitored and adjusted as required.

Frequency of Blast

With the maximum charge weight set as the total explosives per single hole, multiple holes can be detonated in the same blast, so long as they are separated by sufficient delay timing. The blast size and dimension varies depending on the location on the mining bench. Blast sequencing attempts to create blasts that generate more tonnage and reduce the frequency of blasting whenever possible. This even includes increasing the bench height to 12m to further reduce the blasting frequency.

Fly Rock

Fly rock can occur when incorrect loading of explosives or stemming of a blast hole occurs. Each hole follows a standard loading procedure that has been developed since 2014. All holes that do not follow the standard loading procedure are recorded and discussed prior to blasting. Each drill hole is designed prior to the blast, and reviewed with the driller to ensure sufficient burden and spacing is applied to each hole to prevent a blow out.

Dust

Blasting can result in higher amounts of dust when incorrect drill and blast procedures are applied. Dust is mitigated similar to fly rock. The correct amount of explosive distributed evenly and contained within the rock mass, shot to a free face will control dust within the hard rock at Bamberton.

Bootlegs

Bootlegs are the remnant of a blast hole which did not properly break when the blast was initiated. All blast holes are designed with previous holes surveyed to ensure no drilling within 30cm of explosives can occur.

The bench floor is blasted with 1.0 m of subdrill to ensure an even pit floor for equipment to travel. As the rock can not be exposed to the bottom of the drill hole to ensure all explosives have been detonated, a 1.0m tolerance is applied to the design location of all drill hole collars and toes as a further safety step.

Inadvertant Access to Blast

All accesses within the blast will be guarded prior to blasting. No one is permitted to enter the blasting area at this once guards have been set up. All locations within the blast perimeter will be checked and cleared as per the blast clearance procedure. Notification will be sent out and a blast sign will be posted on the day of the blast.

Blasting Conditions

General

Blasting frequency will typically average 2 to 3 times in a month. Drilling and blasting is currently contracted out to experienced and reputable drill and blast contractors. The drill and blast program is maintained and updated on site to ensure any change to the blasting contractor will not impact the drill and blast program. The blasting contractor will be responsible for transporting the explosives to site, and storage.

All blasts will be conducted under the guidance of a personnel certified with the BC Ministry of Energy and Mines. This is a person with a valid certificate granted under Section 8.2.1 of the Code. No one is

permitted on the blast pattern without approval of the certified blaster. All blasts will be bermed or blocked off to prevent inadvertent access to the blast pattern.

Ministry of Mines Site Specific Conditions

Blasting activities shall not be undertaken during the Nesting Period of birds protected under section 34(b) of the Wildlife Act.

All blasts shall be electronically monitored and the records shall be maintained at the Mine Office and

- a. These records shall be made available to an Inspector on request.
- b. Blast limits shall not exceed 120 Db on the "L" scale and 50mm/sec (2in/sec) PPV.
- c. Residences within a radius of 1000 metres shall be provided with 24 hours notification of blasting. This notification will specify a 4 hour window within which the blast will occur.

Rock Blasting

General

Rock blasting is the controlled use of explosives and other methods such as gas pressure blasting pyrotechnics or plasma processes, to excavate, break down or remove rock. It is practiced most often in mining, quarrying and civil engineering such as dam or road construction. There are many aspects of this process that can pose serious injury or death to workers or the public.

Supervisors and employees of Coast Mountain Resources Ltd. should be familiar with blasting operations to ensure safety on all jobsites where blasting occurs.

Hazards to be aware of:

- Fly Rock
- Unauthorized Access
- Bootlegs
- Noise
- Mobile equipment
- Explosives devices
- Flammable materials
- Dust

PPE Required:

- Hard hats
- Hi-Vis vests
- Hearing protection
- Steel toed boots
- Dust Protection

Definitions

"Blaster" means a person who is the holder of a valid blaster's certificate issued by the Board or acceptable to the Board.

"Blasting area" means an area extending at least 50 m in every direction from a place where explosive materials are being prepared or fixed, or where an unexploded charge is known to exist.

"Blasting log" means a written record of loading details, and site examination after the blast.

"Bootleg" means the remnant of a blast hole which did not properly break when the blast was initiated; also called socket, butt or button;

"Magazine" means a structure used for the unattended storage of either detonators or explosives, which meets the regulations and standards of the explosives act.

"Misfire" means a charge or part of a charge which, on initiation, failed or to complete detonation or function, a dangerous condition.

"Primer" means an explosive to which a detonator or other initiating device has been attached.

"Stemming" means placing inert material in the portion between the top of the explosive column and the collar of the blast hole, intended to confine the explosive gases for an effective blast. Angular gravel is often used for this.



BLASTING NOTIFICATION

COAST MOUNTAIN RESOURCES WILL BE CONDUCTING A
BLAST FOR ITS QUARRY OPERATIONS.

YOU'RE REQUIRED TO NOTIFY ALL YOUR EMPLOYEES/
CONTRACTORS OF THE UPCOMING BLAST.

BLASTING WILL COMMENCE ON
FRIDAY MARCH 8TH, 2019
BETWEEN 10:00 AM AND 1:00 PM

AND WILL BE CONDUCTED IN THE UPPER QUARRY AREA
IF YOU HAVE ANY QUESTIONS OR CONCERNS, FEEL FREE TO
CONTACT US:

JACKLYN KWIATKOWSKI (SCALES ADMINISTRATION/OFFICE)

778-356-4056

RICK HANNAH (MANAGING PARTNER/SHIFT BOSS)

250-883-3645

BLASTING NOTIFICATION CONTACT LIST

Contacts		Date Sent Out	Emailed	Phoned	In Person
Rene/MICO rene@malahatinvestment.ca	250-743-3737 250-618-7288	Mar 7, 19	✓	✓	
Alan/MICO alan@malahatinvestment.ca		Mar 7, 19	✓		
Heavy Metal brian@heavymetalmarine.com	250-883-0693	Mar 7, 19	✓		
Lehigh Cement Ltd dgarnett@lehighcement.com	250-480-9126	Mar 7, 19	✓		
Ruskin Construction gbrown@rcl.bz	250-360-0672 jcaulfield@rcl.bz	Mar 7, 19	✓		
Kinsol Timber Systems info@kinsoltimber.com	250-588-8770 jeff@kinsoltimber.com	Mar 7, 19	✓		
PM Technical pmunzar@shaw.ca	250-818-4579	Mar 7, 19	✓		
Ian Davis (Caretaker)	250-732-3581	Mar 7, 19		✓	
Bob and Char Roth	250-732-0519	Mar 7, 19		✓	

Figure 2 - Record of Notification

Date (YYYY-MM-DD) March 8 / 19		Time (hh:mm) 0940 ±		<input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m.		Blast number 1	
Blast location Bamberton Quarry				Type of material medium			
Number of rows 4		Number of holes 17		Drilling pattern (specify metres or feet) Burden 10' Spacing 10'			
Depth of holes (specify metres or feet) AV 14m				Diameter of holes (specify millimetres or inches) 5"			
Maximum number of holes per delay 1				Maximum explosives weight (specify kg or lbs) (delay of 5 ms or greater) 112kg			
Number of decks per hole 1				Deck separation (specify metres or feet) NA			
Stemming (specify metres or feet) 10				Stemming material local			
Total weight of explosives (kg or lbs) 1645kg		Overall rock volume (m³ or y³) 2,411.2 m³		Powder factor (kg/m³ or lbs/y³) 0.68 kg/Kg			

Explosives				Detonator assemblies											
Known name	Qty	Dual delay	Length	Qty	In-hole delay	Length	Qty	Surface delay	Length	Qty	Electric or electronic	Length	Qty		
Anastomite	45	25/500	12m	16				40ms	20	4					
Redapure	32	✓	15m	16											
WR	17														
3" Hydramite	33st														

Weather <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> Clear <input type="checkbox"/> Snow pt pt				Wind direction 15 		Wind speed (specify km/h or mph) 5 kph	
Cover protection? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Type and size NA		Blasting mats total used NA			

Seismograph monitoring location No Reading Lake		Calibrated? <input type="checkbox"/> Yes <input type="checkbox"/> No NA		Type of initiation system tube	
1. Seismic data NA		2. Seismic data NA			
Distance to closest structure 250m		Description of closest structure office trailers		Electric cap and circuit test? <input type="checkbox"/> Yes <input type="checkbox"/> No NA	
Name of blaster of record (please print) DON DAEM					
Helpers 1. TERRY St. THOMAS 2. JASON BAILEY 3. Ryan Conley 4.					
Signature (blaster of record) 					

Figure 3 - Typical Blast Design Log (sheet 1 of 2)

Blast Design Log

Blast #1

Sketch of shot/layout
Show direction of the north, distance to nearest structure (metres/feet), and timing

North ↗

Check off what you use

Type A

- ☐ Overburden
- ☐ Rock
- ☐ Stemming
- ☐ Main charge
- ☐ Primer
- ☐ Spacers/Decking
- ☐ Main charge
- ☐ Primer
- ☐ Sub-drilling

Type B

10'

Stop

- ☐ Overburden
- ☐ Rock
- ☐ Stemming
- ☐ Main charge
- ☐ Primer
- ☐ Spacers/Decking
- ☐ Main charge
- ☐ Primer
- ☐ Sub-drilling

Russell & Rader

Post blast

Overhang hazards?

☐ Yes ☒ No

Cutoffs?

☐ Yes ☒ No

Remarks

Figure 4 - Sheet 2 of 2 Blast Design Log

References

Health, Safety and Reclamation Code for Mines in British Columbia

<https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/health-safety/health-safety-and-reclamation-code-for-mines-in-british-columbia>

Worksafe BC OHS Regulation Part 21: Blasting Operations

<https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-21-blasting-operations#SectionNumber:21.43>