



HINDUSTAN ZINC LTD

Corporate Standard Rules & Procedure Sub-Committee <b>Underground Secondary Blasting Standard</b>	Date	30.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	1 of 21



HINDUSTAN ZINC  
Zinc & Silver of India

## HZL Standard

### “Underground Secondary Breaking Standard”

	Issued by	Approved by
Name	Corporate SRP Chairman	Corporate safety Council Chairman
Sign		
Date	31.12.2022	



HINDUSTAN ZINC LTD

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
Underground Secondary Blasting Standard	Revision No.	1
	Page No.	2 of 20

**DOCUMENT CONTROL DETAILS**

Revision	Date	Reason for Issue	Compiled by	Approved by
0	01.08.2020	First Issue	Nathu Singh Chowdhary	Arun Misra
1	30.12.2022	Secord edition	Anshul Khandelwal	
Next Review Date	01/01/2024			

**User Notes:** - The Corporate Safety Council (CSC) is the custodian of this document and is responsible for the Administration and Authorization of this Standard. CSC is responsible for confirming the accuracy and integrity of content and proposed changes to the Standard.

Controlled copy of the current version of this document is held at CSC and also available on its portal. Any printed / electronic copy of this document is uncontrolled. It is recommended that users verify that the version being used by them is the current version by referring to the controlled version.

**DOCUMENT ISSUE**

The "Underground Secondary Breaking" Standard is issued by the Corporate Safety Council on behalf of Hindustan Zinc Limited management and forms a part of the HZL Integrated Management System.

Name: ..... Vinod Jangir .....

Signed: .....  .....

Date: .....

This document contains proprietary and confidential information of Hindustan Zinc Limited and is intended solely for the internal use of authorized personnel. This should be treated as BUSINESS CONFIDENTIAL and its external use or disclosure, unless specifically authorized, is strictly prohibited.

<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b>  <b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	3 of 20

**Acknowledgement** The management acknowledges the contributions of the following individuals for being a part of the Zone / location workgroup and for their assistance in preparing this standard on Underground Secondary Breaking operations

<b>Zone / Location</b>	<b>Members</b>
Sindesar Khurd Mine	Mr. Anshul Khandelwal Mr. Nilesh Pandey Mr. K. Srinivas
Rampura Agucha Mine	Mr. Vedant Krishna Tiwari
Zawar Group of Mines	Mr. V. P. Joshi
Kayad Mine	Mr. K. C. Meena
Rajpura Dariba Mine	Mr. Nathu Singh Chowdhary
Corporate HSE	Mr. Vijay Kumar Goyal
Mentor	Mr. Praveen Sharma

<b>Corporate Standard Rules &amp; Procedure Sub-Committee  Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	4 of 20

## Table of Contents

1. PURPOSE .....	5
2. SCOPE .....	5
3. MANAGEMENT RESPONSIBILITIES .....	5
4. REFERENCE DOCUMENTS: .....	6
5. BRIEF PROCESS DESCRIPRION .....	6
6. DEFINITIONS .....	6
7. THE DESIGNATED SECONDARY BREAKING POINT SHALL BE .....	7
8. TIMING OF SECONDARY BLASTING .....	7
9. HSE CONSIDERATIONS: .....	8
10. PRE - REQUISITES .....	9
11. PRECAUTIONS:.....	10
12. TASK PROCEDURE:.....	10
13. RAMMER AND BROKK MACHINE: .....	16
14. QUALITY OUTCOMES: .....	17
15. HOUSE KEEPING: .....	17
16. RECORDS: .....	18
17. AMENDMENT TABLE:.....	18
18. RACI CHART: .....	18

<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b> <b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	5 of 20

## 1. PURPOSE

The purpose of this document is to provide common best practices for secondary breaking to be adopted across all the UG mines of Hindustan Zinc Limited. The prescribed safe work method to be followed for secondary breaking in all underground mines. This procedure is developed to help all personnel involved in secondary breaking for safe work execution.

## 2. SCOPE

- This standard is applicable to all Underground Mines of HZL.

## 3. MANAGEMENT RESPONSIBILITIES

Overall Responsibility lies with the Mine Manager

- **Assistant Manager/ Section In-charge:**

- Ensure all applicable standard training to the persons involved in secondary breaking operation.
- Training and awareness on SOP for Secondary breaking.
- Ensure availability of resources for secondary breaking.

- **Shift In-charge**

- Will ensure the safe Work execution.
- Conduct toolbox talk and give safety instructions for work.
- Will ensure Safety of Man and machine in his area.
- Inform to Mines manager and Safety Officer in case of Emergency.

- **Shift Foreman**

- Will ensure the safe Work execution.
- Conduct toolbox talk and give safety instructions for work.
- Inform to Shift In-charge in case of Emergency.

- **Mine Mate**

- Ensure availability and Use of all required PPE.
- Ensure availability of required resources to perform the activity
- Inform to Mine Foreman and Shift In-Charge in case of any Emergency.

- **Emergency Response Team (ERP)**

- Safe rescue of any personnel affected during work as per the information received from mine.
- Barricading & controlling movement of persons and vehicle from the rescue area.

<b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSR/Mining/02
	Revision No.	1
	Page No.	6 of 20

**4. REFERENCE DOCUMENTS:**

- 4.1.1. MMR 1961
- 4.1.2. Emergency rescue Procedure as per ERCP.

**5. BRIEF PROCESS DESCRIPRION**

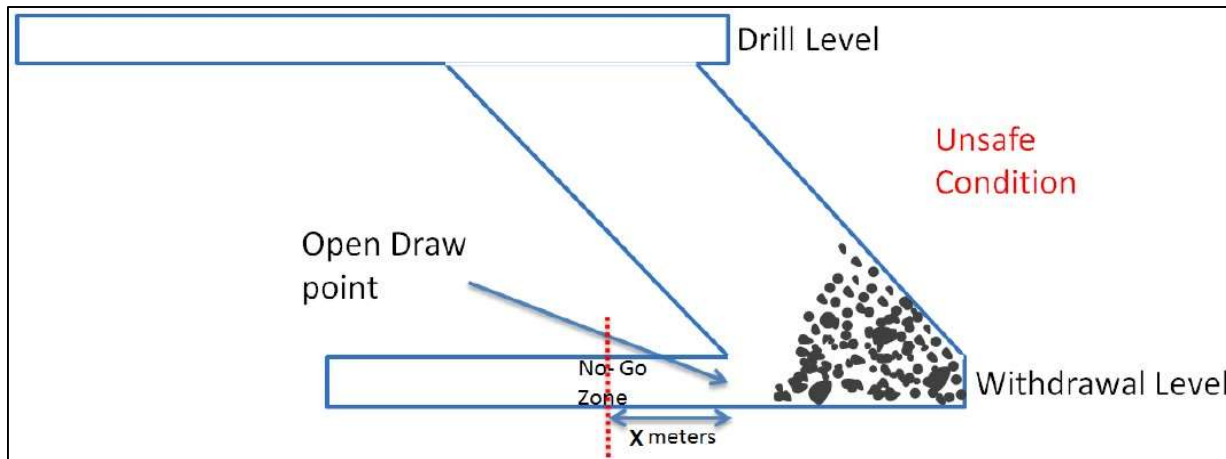
Oversize boulders larger than approximately 1m in diameter (and up to the size of the boulder which can be handled by available capacities of loader) are to be taken to designated x-cut well. Boulders which cannot be handled by LHD at brow and inside the stopes, any size of boulder that is larger than the aperture of grizzly and input size of crusher shall be blasted at designated point with all due precautions.

Following are the designated secondary breaking points:

- i) Secondary breaking at designated point -Plaster /pop
- ii) Secondary breaking at brow – Drilling and blasting, Air blast
- iii) Secondary breaking inside the brow- Mechanical breaking, Drilling blasting and Air blast

**6. DEFINITIONS**

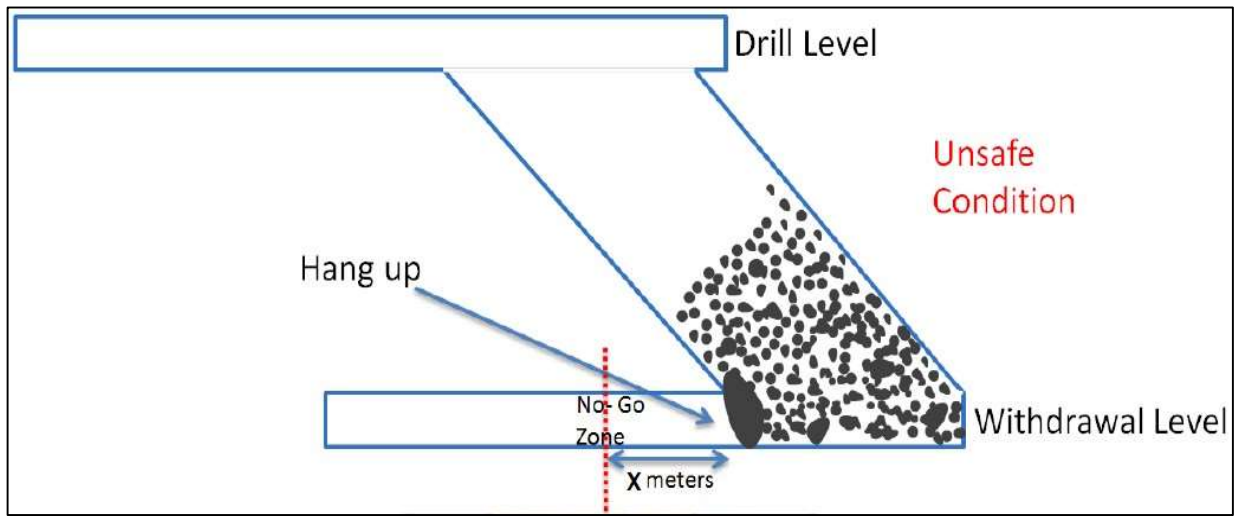
6.1. **Open Draw Point** - is an area which is not completely with either fresh dirt or cave dirt.



**X meters = 6 meters**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	7 of 20

**6.2. Choked off and Hang up Draw Point** - A draw point that has been completely sealed from floor to backs.



**X meters = 6 meters**

## 7. THE DESIGNATED SECONDARY BREAKING POINT SHALL BE

- As possible as close to the running brow.
- Away from permanent structure (Substation, Services lines and power cables).
- Away from machine parking area.

## 8. TIMING OF SECONDARY BLASTING

- Secondary blasting shall be done at the end of shift after evacuation of persons

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	8 of 20

b. Secondary Blasting shall be done from the designated firing point



- c. The designated firing point shall be negotiating with at least two 90° turns and at least 200 meters radial distance from the blasting point.
- d. Ventilation plan to be displayed at all prominent places in UG (e.g., fresh air base) for awareness of mine mate & foreman.
- e. After the blast, site Inspection shall be done by Mining mate/Mine Foreman before re-entry of persons and equipment

## 9. HSE CONSIDERATIONS:

a. Job specific Personal protective equipment (PPEs)





<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	9 of 20

## 10. PRE - REQUISITES

a. Minimum Required Competency of working crew team leader to perform secondary breaking activity:

- At designated point - Mine mate/ Mine Foreman.
- Near the Brow before No go line - Foreman/Shift in-charge/Mine Mate.

**Risk assessment to be carried out by Mine Foreman, shift in-charge before initiating the job.**

b. TRAINING:

- Mine mate/Foreman/Shift in-charge should be trained and competency to be checked in this standard.
- Refresher training to be provided to all relevant persons after every 6 months interval.

c. Equipment and Test Tools required for secondary breaking-

- Signs and chain barricades
- Approved underground vehicle for explosives transport with functional 2-way radio.
- Approved circuit tester/Ohm meter.
- Non-ferrous tamping sticks.
- Non-ferrous blowpipe for cleaning out collapsed holes, cuttings or misfire explosives.
- Detonating cord cutters (non-ferrous).
- Integrated Tool carrier & elevated charging platform (earthed).
- Copper hole scraper
- Appropriate length scaling bar.
- Packaged explosives (plugs)
- Approved underground vehicle for explosives transport with functional 2-way radio.
- Detonating Cord
- Nonel Detonators
- Electric Detonators Bell Wire
- Exploder tester (It can be used to discharge exploder if in case any residual energy is present)
- Bamboo of 6-meter length
- PVC pipes
- Charmec
- Water Cannon
- Brokk in remote if available

<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b>	Date	24.12.2022
	Standard Document No.	HZL/CSR/Mining/02
	Revision No.	1
	Page No.	10 of 20

- Rammer in remote if available

## **11. PRECAUTIONS:**

---

- Blasting shall be done only by people authorized by the Mines Manager.
- Risk assessment to be done by Mine Foreman, shift in-charge before initiating the task for secondary blasting, particularly at brow/ inside the brow.
- Secondary Blasting shall be done only from the designated firing point
- All the required regulations of MMR 1961 shall be strictly followed.
- Only D.G.M.S. approved type Exploder shall be used.
- Main cable shall be laid down just before blasting and simultaneously a loud and clear danger signal of BOMB-BOMB/ Siren or whistle shall repeatedly be given by the blaster.
- A safety guard shall be stationed, and it shall be ensured that all the driveways are closed and fenced off with signage. Workers working nearby shall be sent to a safe place.
- The exploder should be checked. The keys of the exploder should always be with the blaster. The end of the main blasting cable (towards the exploder) should be shorted and taped properly.
- The main blasting cable should then be checked up to the brow.
- The wire at brow should then be connected to the main blasting mother cable.
- While returning from brow all the cable connections up to the blasting station should be thoroughly checked with the help of Ohm - Meter
- Fencing to be done with adequate signage in subsequent upper and lower level. No person shall be present in return airways and secondary blasting area.

## **12. TASK PROCEDURE:**

---

Following procedure shall be adopted for secondary breaking: -

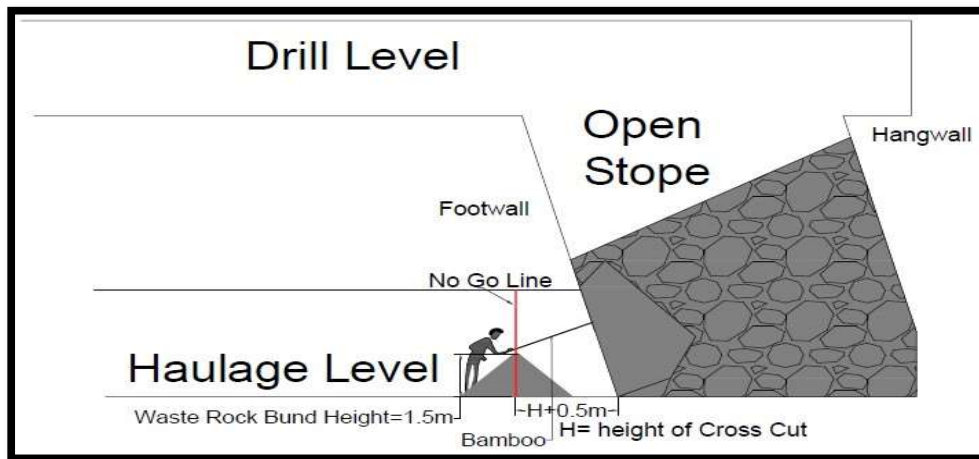
- I. Secondary breaking at designated point plaster/ pop
- II. Secondary breaking at brow drilling and blasting
- III. Secondary breaking inside the brow

### **i). Secondary blast at designated point plaster /pop**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	11 of 20

The Production Supervisor (mining mate/foremen) will provide a list of rocks to be broken at the shift start work allocation/ at the working point.

- Mining Mate shall ensure proper inspection of designated blasting area in particular any loose, services, parking of any equipment etc.
- Mining mate shall ensure to use fine mud with minimum stones for plaster shooting to avoid fly rocks.



**Fig. 1 Manual charging and blasting of the boulder inside the brow with the help of Bamboo**

**IMPORTANT**

The Mining mate/ Foreman will designate a method (popping or plastering) every time Secondary Breakage will take place using explosives

**ii). Secondary blast at brow**

If oversized boulder cannot be handled by boulder at brow then following procedure shall be adopted:

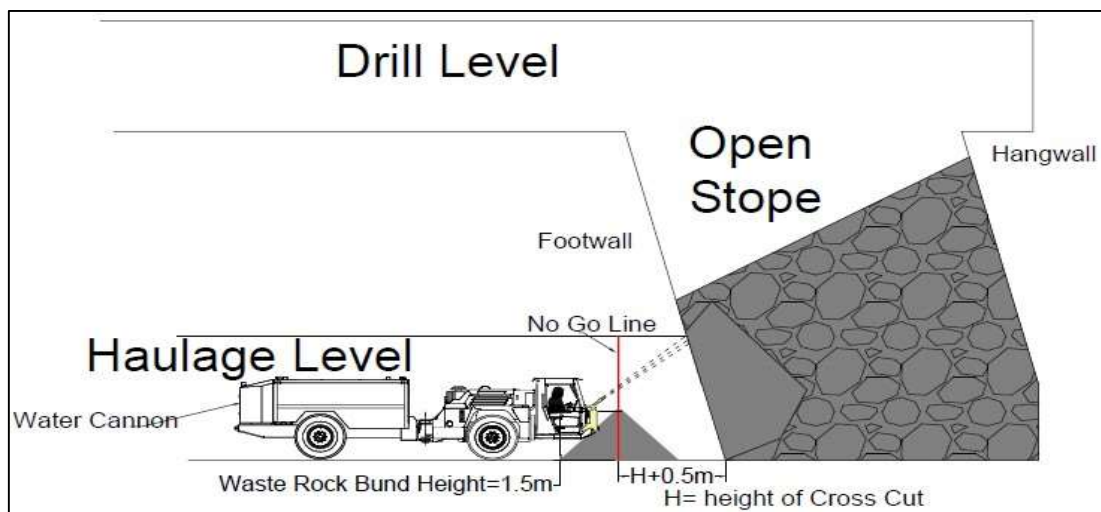
**a) Hazards Identification and Notification**

- Mine Foreman/shift in charge along with mining mate shall Inspect work area and do complete risk assessment and make suitable procedure to deal with boulder
- Ensure that bund of height 1.5m is made at near the brow (If bund is not available No-Go line will be at 6 m from the brow).
- Ensure ventilation is adequate.
- Visual checks for loose at brow and misfires in boulder.

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	12 of 20

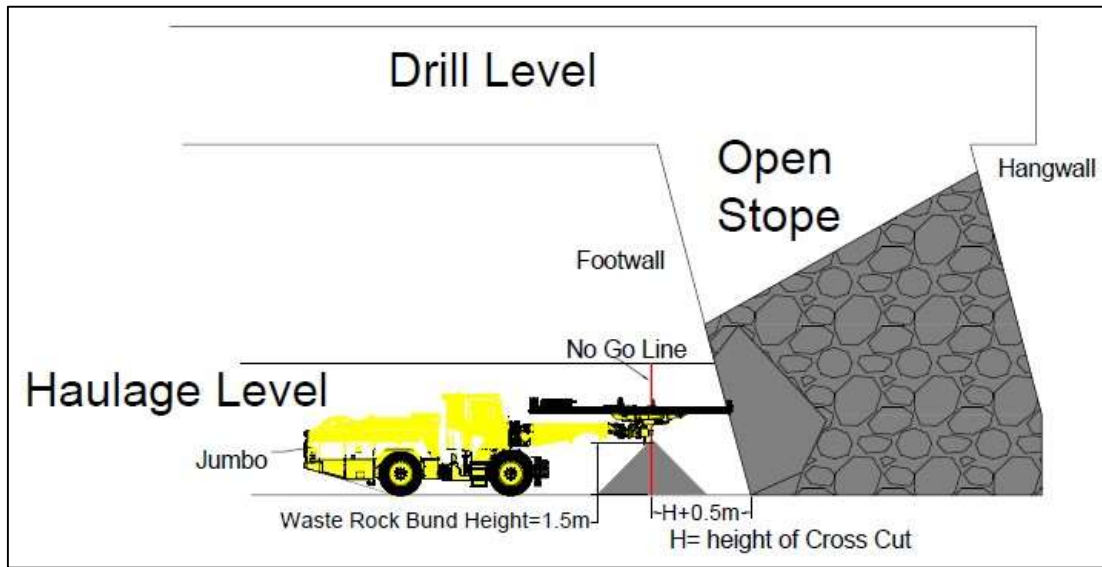
### b) Procedure to deal with boulder

- If water cannon with pressure jet (10-15 length with 10 bar pressure) is available, pressure jet shall be directed toward boulder and loose material to bring it down (refer Fig.2)
- If boulder is not coming down, deploy rammer for boulder breaking in remote (refer Fig.7) If boulder doesn't come down, use lifting equipment or Charmec to place explosive at/near the boulder using at least 6 mts long bamboo and do air blast for 2-3 times. (Refer Fig.4)
- Again, if boulder doesn't come down, deploy a jumbo/brokk machine in remote (if available) for drilling of suitable length of holes depending on boulder at the spacing of less than 1m\* 1m. Ensure that no person go beyond the cabin of jumbo during drilling. (Refer Fig.3 and 5)
- Charge boulders by using Charmec/lifting equipment with help of HDPE pipes (Used for bottom hole at development charging) for guiding the explosive cartridge/Charmec pipe. (Refer fig.4)

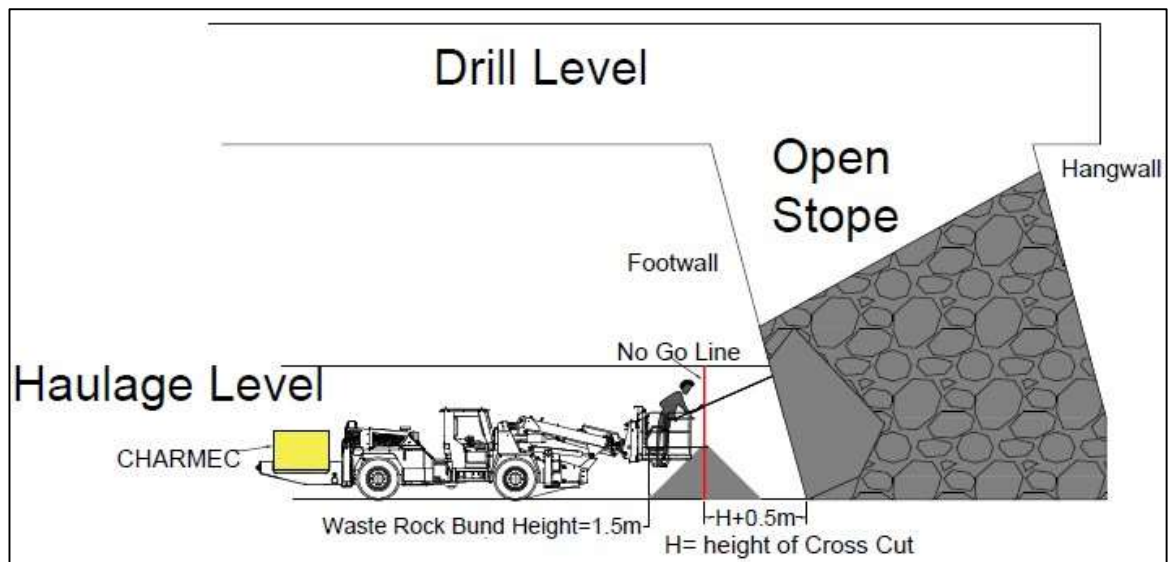


**Fig. 2 Use of water cannon to bring down the boulder with high water pressure**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	13 of 20



**Fig. 3 Mechanized drilling of the boulder inside the brow with Jumbo drilling machine**



**Fig. 4 Mechanized charging of the boulder inside the brow after drilling**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	14 of 20

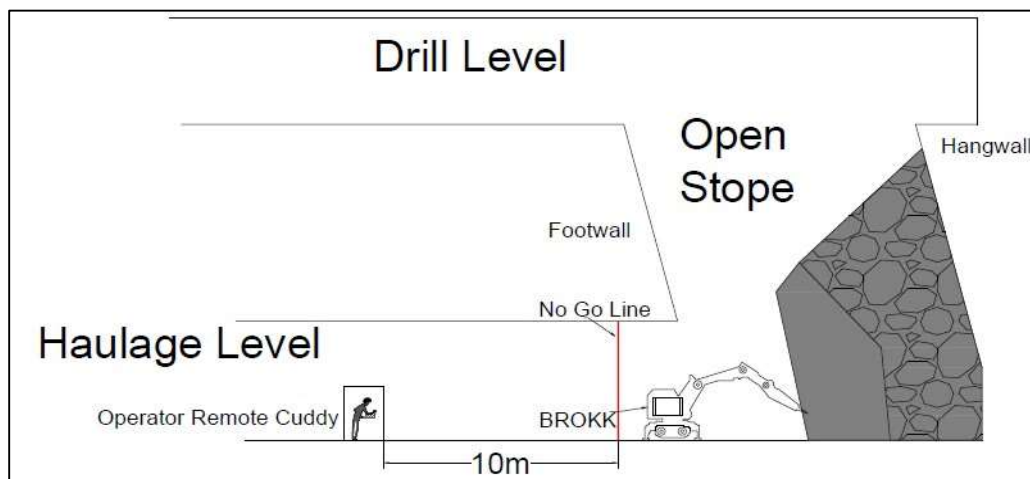
### iii) Secondary blast inside the brow

#### a. Hazards Identification and Notification

- Mine Foreman/shift in charge along with mining mate shall inspect work area and do complete risk assessment and make suitable procedure to deal with boulder
- Ensure that bund of height 1.5m is made at near the brow (If bund is not available No Go line will be at 6 m from the brow).
- Ensure ventilation is adequate.
- Visual checks for loose at brow and misfires in boulder.

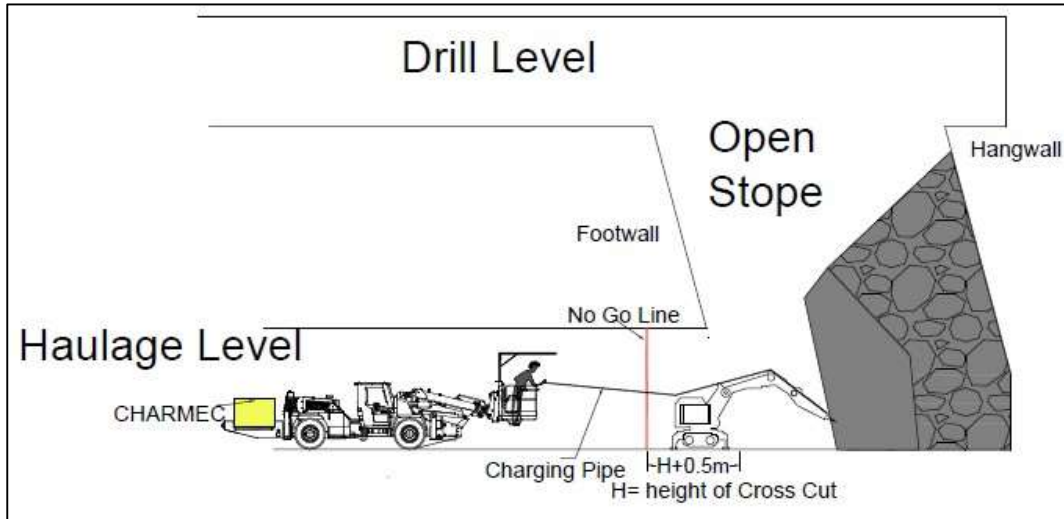
#### b. Procedure to deal with boulder

- Do air blast near the brow for any hang up Deploy remote equipment like rammer for boulder breaking
- If the boulder doesn't break, deploy Brokk machine in remote if boulder is less than 15m from brow to drill the hole. Charge boulder by attachment built on brokk machine for carrying the Charmec pipe.
- Make sure that cable and Charmec shall not be damaged during this operation
- No persons shall allow to go beyond no go line (If bund is not available No-Go line will be at 6 m from the brow).



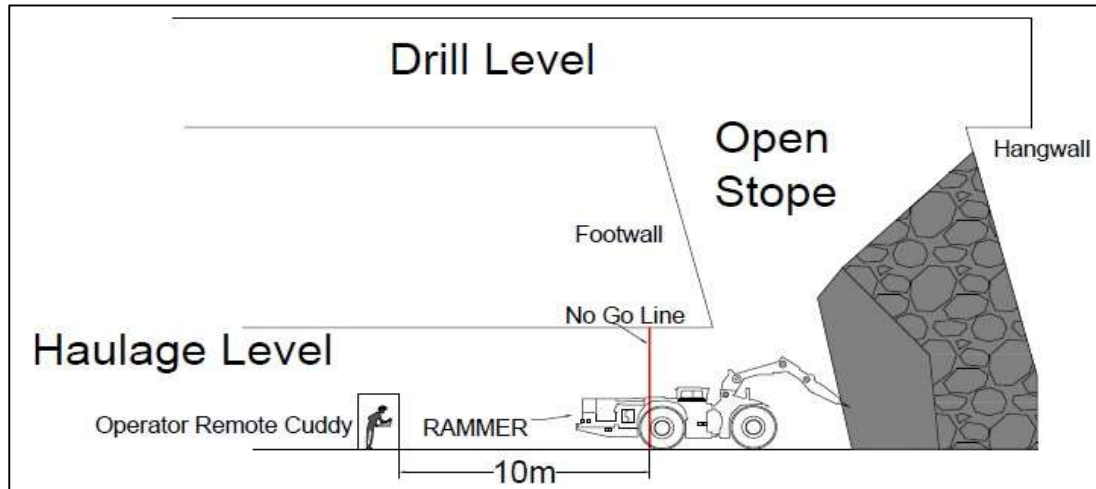
**Fig. 5 Mechanical breaking of the boulder inside the brow with brokk in remote operation**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	15 of 20



**Fig. 6 Mechanized charging of the boulder inside the brow with brokk in remote operation**

Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	16 of 20



**Fig. 7 Mechanical breaking of the boulder inside the brow with brokk machine in remote operation**

**13. RAMMER AND BROKK MACHINE:**

- a. This machine is having capability of breaking the boulders by hydraulic hammering.
- b. The breaker feeder is attached to the lift arms of LHD and positioned by lift arm movement which enables it to reach the remote boulders.
- c. The machine is used in remote operation while hammering to keep the operator safe from any potential hazard



**Fig. 8 Rammer Machine**



Corporate Standard Rules & Procedure Sub-Committee	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
<b>Underground Secondary Blasting Standard</b>	Revision No.	1
	Page No.	17 of 20



**Fig. 9 Brokk Machine**

#### **14. QUALITY OUTCOMES:**

- Discusses with and receives information from Shift Supervisor on location and number of rocks to charge.
- Shift Supervisor to carry out checks on area where Secondary breakage will take place to ensure it's suitable.
- Contacts shift Supervisor to inspect any rock which may be in the rill for stability and barricades the area to ensure no personnel are, in the vicinity in case misfires are encountered while drilling.
- Charge crew checks the number of rocks required to be broken and collects explosives to carry out the job.
- Stores explosives correctly and Install signage before charging commences.
- Ensures Supervisor provides the charge crew with a direction on which to charge oversize (popping).
- Only uses the correct amount of explosives (20 to 25kg depending upon the size of the boulder to be blasted) to ensure no damage to services.
- Ensure area is clean and area is barricaded.

#### **15. HOUSE KEEPING:**

- All hoses to be rolled up and hung up.
- All empty explosives boxes area Checked, Collapsed, and removed from the charging area and returned to the magazine or disposed of in the appropriate rubbish bin.
- No explosives or rubbish were left in or near the area of the charging area.
- No equipment or tools left in the charged oversize

Corporate Standard Rules & Procedure Sub-Committee  <b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	18 of 20

**16. RECORDS:**

SN	Description	Responsibility	Location
1	Foreman Diary/ Shift Report	Foreman	Foreman Office
2	Mining mate diary	Mining mate	Respective Contractors Office
3	Blaster diary		
4	Misfire record		

**17. AMENDMENT TABLE:**

Revision Number	Date of Revision	Reason for Revision
00	NA	NA
01	24.12.2022	As per revision schedule

**18. RACI CHART:**

The roles and responsibilities to implement this standard are outlined below:

Activity Description	Area Supervisor/ Shift In-charge	Line Organization	Safety	Zone Apex	CSC
Hazard identification related to Secondary Breaking	R/A	A	C	-	-
Marking of NO-GO Line in Stope	R/A	A	-	-	-
Providing resources	R/A	A	-	-	-
Preparation of Bund in Stope	R/A	A	-	-	-
Incident Information	R/A	A	I	I	-
Audit/Inspection and monitoring for compliance of execution	-	A	R/C	C/I	I
Relevant risk assessment before execution of job	R/A	A	C	-	-
Training & Certification	-	R/A	C	I	-

**R: Responsible**

- People who are expected to actively participate in the activity and contribute to the best of their abilities.

**A: Accountable**

<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b>  <b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	19 of 20

- The person who is ultimately responsible for the results.

**C: Consulted**

- People who have the specific expertise and can contribute to decision making.

**I: Informed**

- People who are kept informed, but do not necessarily participate in the effort.

<b>Corporate Standard Rules &amp; Procedure Sub-Committee</b>  <b>Underground Secondary Blasting Standard</b>	Date	24.12.2022
	Standard Document No.	HZL/CSRP/Mining/02
	Revision No.	1
	Page No.	20 of 20

**End of the document**