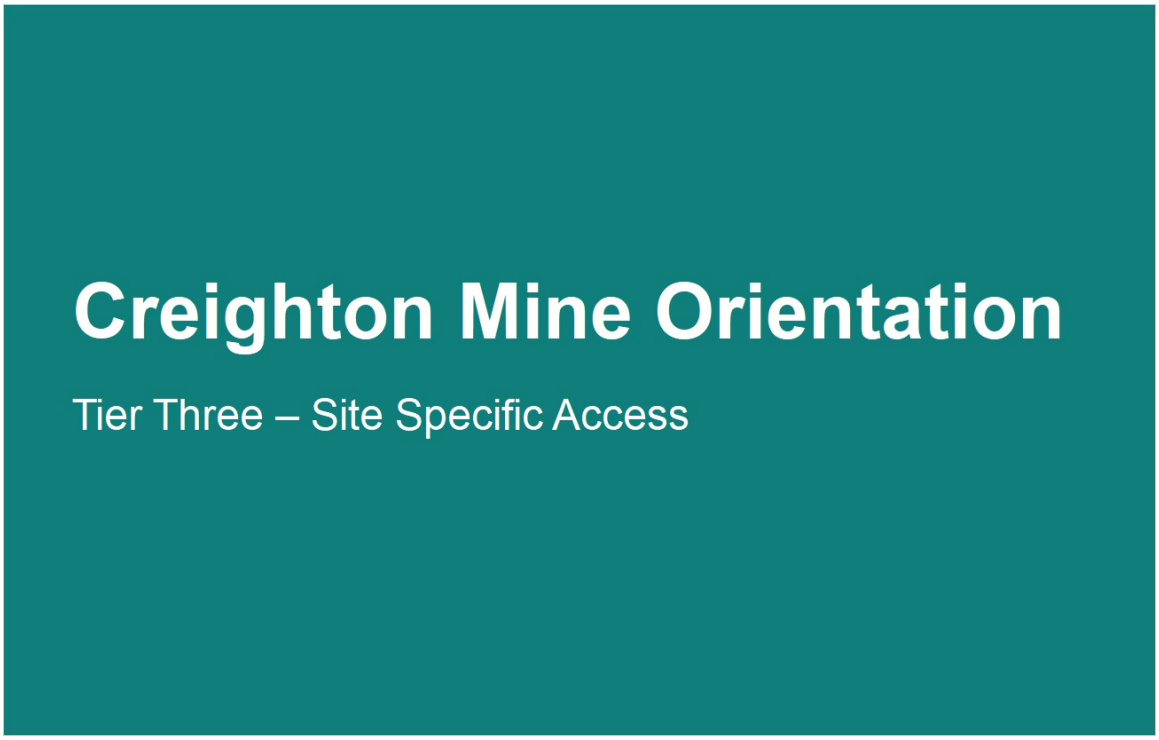
# Tier 3: Creighton Mine Orientation - 10

## 1. Creighton Mine Orientation

### *1.1 Creighton Mine Orientation*

***1.2 Creighton Mine Orientation***

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### *1.3 Course Objectives*

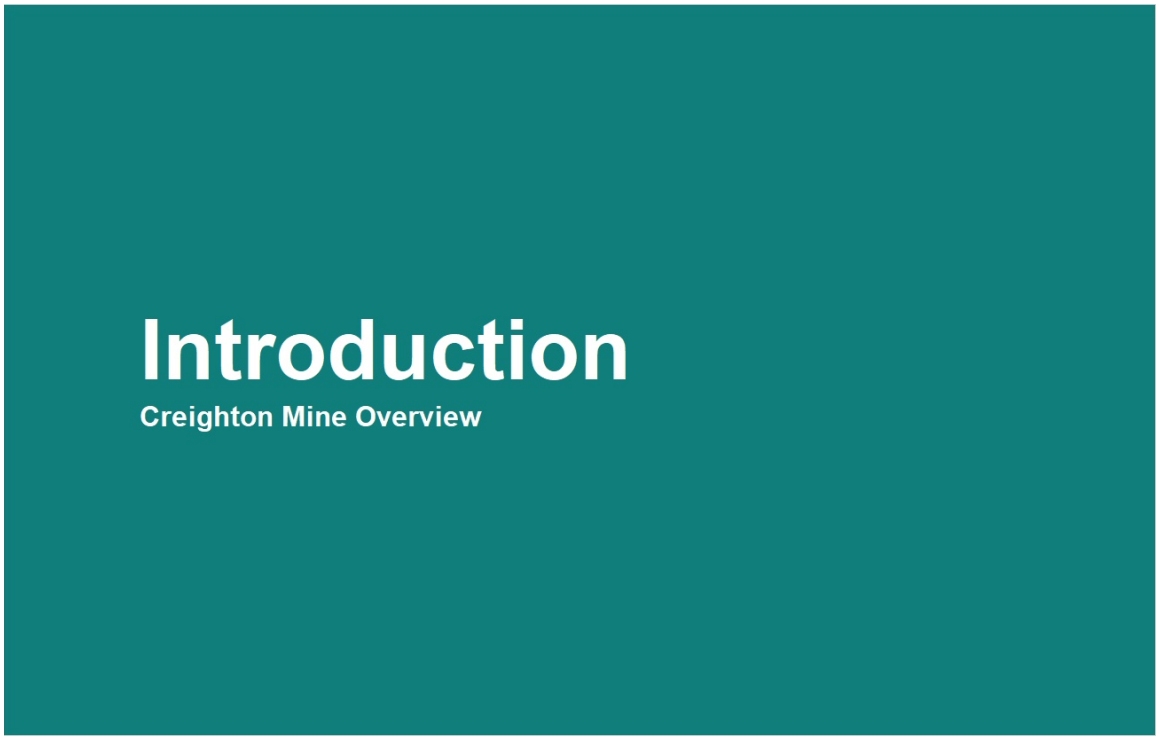
## Course Objectives

**Upon completion of this module as a worker you will be able to:**

- Follow Plant Entry Procedure
- Identify Site Specific Hazards and Controls for Creighton Mine.
- Follow Procedures in the event of:
  - Equipment Damage
  - Personal Injury
  - Process Upset (Emergency Preparedness)
- Complete Plant Exit Procedure Checklist

## 2. Introduction

### *2.1 Introduction*



## *2.2 Creighton Mine Overview*

# Creighton Mine Overview

**Creighton Mine is the deepest of Vale's mines, having surpassed 8000 feet in 2012. It also houses the Sudbury Neutrino Observatory Lab (SNOLAB). Access to the mine is through 9 shaft, the only operating shaft remaining at Creighton Mine.**

Within the mine there are three Divisions, separated by locations:

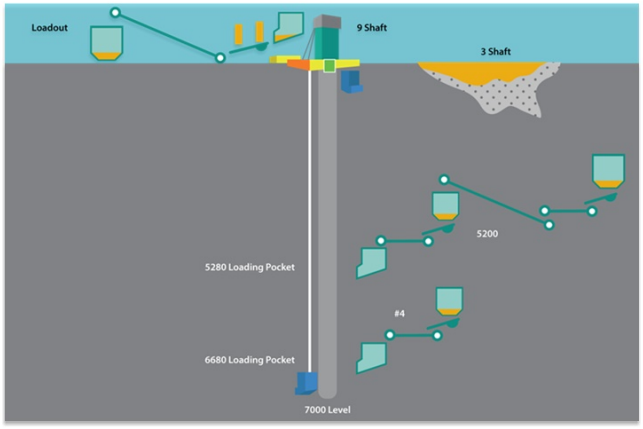
**Division 4:** 3310 level to 5280 level

**Division 5:** 5400 level to 6400 level (mining has stopped in this area) and

**Division 6:** 6600 level to 8200 level (development continuing deeper into the mine)

## *2.3 Creighton Mine Overview*

# Creighton Mine Overview




### Process Flow:

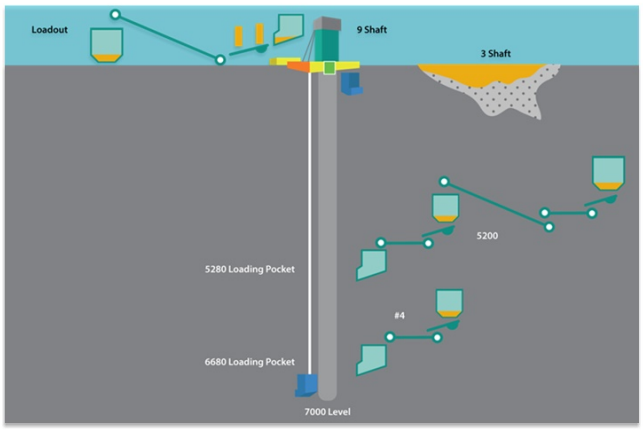
Both *nickel and copper* are mined, mainly via the Vertical Retreat (VR) mining method.

After being skipped to surface from 5280 and 6680 loading pockets, ore is sent by conveyor or trucked over to the train load out.

It is then loaded into railcars for delivery to Clarabelle Mill for processing.

## *2.4 Creighton Mine Overview*

# Creighton Mine Overview




**In addition to 9 Shaft, there have been various shafts sunk for access points and ventilation purposes over the years.**

**The following shafts remain in use for these purposes:**

- 3 Shaft
- 7 Shaft
- 8 Shaft and
- 11 Shaft

## *2.5 Creighton Mine Overview*

# Creighton Mine Overview

**3 Shaft** is an area of the mine that has a ramp from the surface to 2600 Level; this ramp is independent of the 9 Shaft area. The 3 Shaft area can also be accessed via 1400 Level.

**3 Shaft houses some of the required services for Creighton Mine, such as:**

- Mine de-watering pumps
- Sandfill infrastructure
- Ice fields that aid in cooling the mine by having fresh air drawn through the broken rock at the bottom of the decommissioned open pit before being sent through the fresh air system into the rest of the mine.

## *2.6 Creighton Mine Overview*

# Creighton Mine Overview

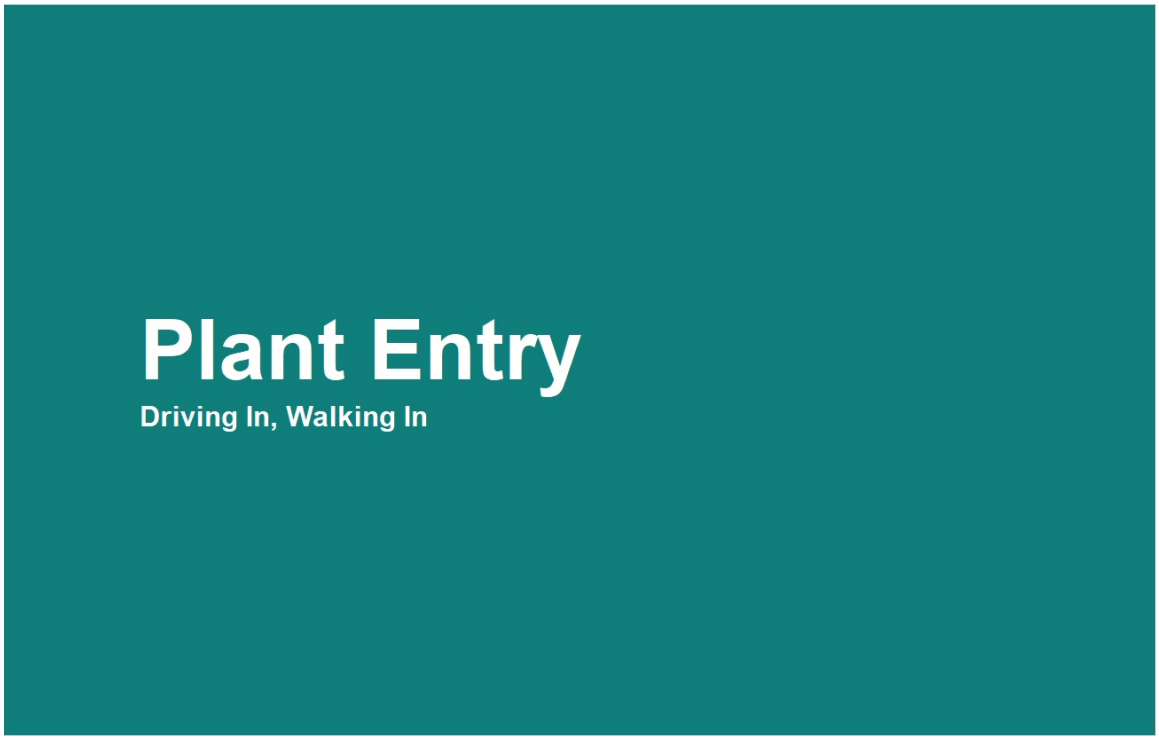
**7 Shaft** houses the sandplant for Creighton Mine fill purposes. The remainder of the building is used for storage and maintenance purposes.

**8 Shaft** is an internal shaft running from 4800 to 7200. It is used both as a fresh air ventilation raise and as part of our 2nd means of egress.

**11 Shaft** is for return air, Creighton Mine's three return air fans are located on the surface at the top of 11 Shaft.

## 3. Plant Entry

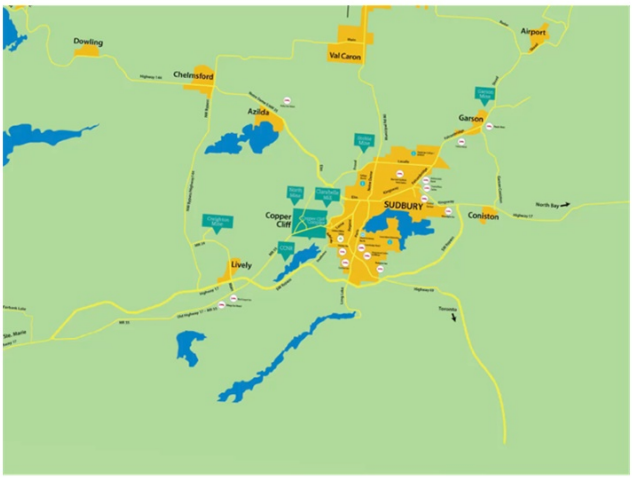
### *3.1 Plant Entry*



### *3.2 Approaching The Plant*

## Approaching The Plant

**Creighton Mine is accessed from Regional Road 24 near the town of Lively.**




### *3.3 Approaching The Plant*

## Approaching The Plant

**Turn onto Creighton Mine Road and continue past 7 Shaft to Creighton Mine 9 Shaft Headframe.**

**Drive cautiously as there is a very sharp turn on the road and a good chance there may be wild life on the road as well.**


### *3.4 Parking*

# Parking

**Turn left to access the Creighton Mine staff and visitor parking lot or continue straight to access the SNOLAB parking lot.**

The entrance to the Creighton Mine Staff and Visitor parking lot is one way (in only) and does not require Lenel gate access.

The gated entrance to the SNOLAB parking lot is restricted unless you have received authorization and have Lenel gate access.

Be aware that there is a stop sign and a pedestrian crosswalk that exists before the gate.


### *3.5 Approaching the Sign-In Location*

## Approaching the Sign-In Location

**There is a designated pedestrian crosswalk that runs the entire length of the Creighton Mine parking lot.**

After parking, pedestrians are to enter the crosswalk at the nearest location and follow it to the main entrance.

First Aid is located directly inside the main front lobby.

Be aware that there may be traffic going through the gate when crossing the road.

## *3.6 Surface Sign-in Requirements*

# Surface Sign-in Requirements

**All visitors working on the surface must sign into the surface sign-in book when entering the plant, and must sign out when leaving.**

The surface sign-in book is located directly inside the main entrance Door 3.

Smoking is only permitted in the designated smoking areas on the surface.

Designated Smoking Area


Surface Sign-in Book

### *3.7 Underground Sign-in Requirements*

## Underground Sign-in Requirements

**Every visitor and occasional worker traveling underground at Creighton Mine must sign in to the underground sign-in book before going underground, and must sign out when arriving on surface.**

**The underground sign-in book is located inside the First Aid office.**

Underground Sign-in Book

### *3.8 Underground Sign-in Requirements*

## Underground Sign-in Requirements

**First Aid will issue a spare lamp if required.**

- The lamp is to be signed out in the Visitor Lamp Sign Out Log book which is also located in the First Aid Office.
- The lamp is to be returned upon arrival to surface and the time noted in the log book.

Visitor Lamp Sign-out Log Book

### *3.9 Underground Tagging Requirements*

## Underground Tagging Requirements

**Every long term employee coming to Creighton Mine will be issued identification tags.**

**These tags will include:**

- Photograph
- Full Name
- Employee Number
- Phone Number


**For visitors and occasional workers traveling underground, the First Aid Office will issue temporary numbered identification tags.**

**This number is to be recorded in the sign-in book entry.**

### *3.10 Underground Tagging Requirements*

## Underground Tagging Requirements

**Tags are to be placed on the underground tag-in board, located in Creighton Mine's warm room.**

**Those going to Division 6 are also required to tag in on 6800 level.**


### *3.11 Underground Tagging Requirements*

# Underground Tagging Requirements

**When tagging in, remember the following:**

- You are required to tag-in before going underground, and upon arrival to 6800 level.
- Do not tag in until it is permitted to do so in the case of the board being blocked for blasting or clearing.
- Be sure to tag in to the correct location.
- Always remember to remove your tag before leaving Division 6 and upon your arrival to surface. Also, follow all signs with regards to the 6800 tag board.


### *3.12 Going Underground*

## Going Underground

**Creighton Mine has two locations on surface to enter/exit the cage.**

**Regular personnel runs are generally loaded at the sub-collar, the level below the warm room (collar).**


### *3.13 Going Underground*

## Going Underground

Once the Shaft Service Leader (SSL) announces your scheduled personnel run on the PA system proceed to sub-collar via the ramp located in the warm room.

- Ensure you are wearing all required PPE at this time.
- Only lunch pails, bit bags and small hand supplies are allowed on regular scheduled personnel runs.


Any additional parts or tools needed underground are to be placed in the collar house and tagged for the level they need to go. They will be delivered during the parts run.

## 4. Plant Hazards and Controls

### *4.1 Plant Hazards and Controls*

## *4.2 Site Specific Hazards*

# Site Specific Hazards

Using the tools that you learned in Tier 1 Orientation, ensure you apply the necessary operation controls to mitigate risk associated with the identified hazards.

**Be Aware**
Be aware of your surroundings and the risks around you.

**Follow Policies & Procedures**
Our internal policies and procedures guide us in doing our work in a manner that reduces risk.

**The following section lists identified hazards that may be encountered in the work you're doing. Knowing if these hazards apply to your work can be found through:**

- Vale Contact Person
- PHA/PHR (or other Risk Assessment Tools)
- SLAM

*4.3 Site Specific Hazards*

# Site Specific Hazards

**At Creighton Mine, workers need to be aware of site specific hazards and their related controls.**

These include but are not limited to:

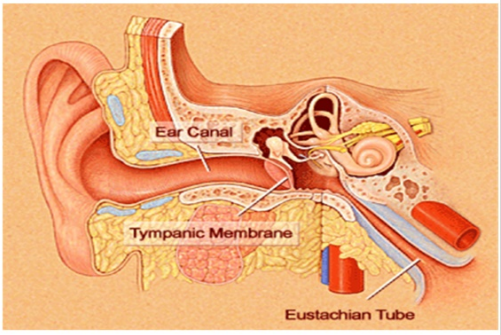
- Cage Travel – sinus pressure
- Seismicity
- 3 Shaft Ramp Travel
- Combustion Hazards
- Heat Stress
- Mobile Equipment and
- Electrocution

## *4.4 Traveling in the Cage – Hazard*

# Traveling in the Cage – Hazard

**Whether loading at collar or sub-collar, the speed and depth at which the cage travels creates a pressure differential on workers' ears.**

- Swollen nasal passages due to colds may block the eustachian tube which normally equalizes pressure between the middle ear and the air on the other side of the ear drum.
- The speed and depth of cage travel can also impact a person's sense of balance, leading to vertigo (dizziness) and possible loss of consciousness.




There have been instances of ruptured ear drums at Creighton Mine due to the depth and speed that the cage travels.

## *4.5 Traveling in the Cage – Control*

# Traveling in the Cage – Control

**To mitigate the hazard of injury from cage travel, be aware of the following controls:**

In most cases, workers are able to equalize the pressure as the cage descends by yawning or swallowing or closing their mouth and pinching their nose while exhaling out the nose.

## *4.6 Traveling in the Cage – Control*

# Traveling in the Cage – Control

**There is a Head Cold Protocol to be followed at Creighton Mine which includes taking the following measures:**

- Inform your Supervisor or plant contact that you have a head cold, sinus infection, etc. as descending in the cage can cause painful symptoms.
- In some cases, it may be possible to equalize the air pressure in the ears by descending at a slower rate of descent; these can be arranged through the SSL.
- If workers cannot breathe through their nose at all there is a strong chance the eustachian tube is blocked. In this situation workers should not go down in the cage.

*4.7 Seismicity – Hazard*

## Seismicity – Hazard

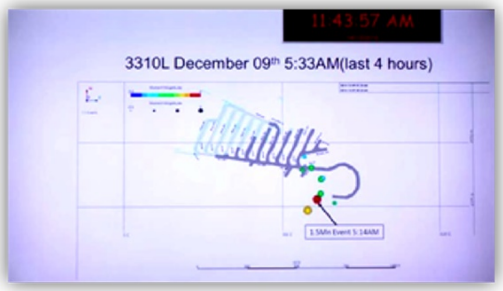
Creighton Mine operates at depths much deeper than other mines and therefore experiences more frequent seismic events.

Mining leaves voids that generally alter the balance of forces in rock, at times causing rock bursts.

*4.8 Seismicity – Controls*

# Seismicity – Controls

**To mitigate the hazards associated to seismic events Creighton Mine has ground support systems with key measures taken to eliminate or minimize any problems associated with ground instability.**

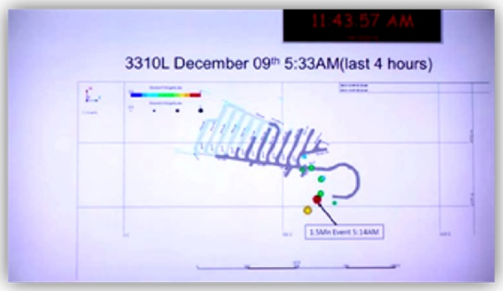


## *4.9 Seismicity – Controls*

# Seismicity – Controls

**In addition, Creighton Mine has implemented the following:**

- Sensors throughout the mine that record seismic activity.
- A display board in the warm room on surface that will provide details of any current seismic activity and restrictions.
- A requirement for workers to report any suspected seismic activity to their supervisor.
- An emergency broadcast system, that when warranted, will broadcast instructions on all radio channels that workers are to follow.




Always be alert for the potential of seismic activity.

*4.10 3 Shaft Area Travel – Hazard*

# 3 Shaft Area Travel – Hazard

The 3 Shaft area has many miles of drifts to travel and manways to climb, some of which include older styles of ground support.

In addition there are areas containing high water levels and ice, which is used for cooling the mine.

## *4.11 3 Shaft Area Travel – Hazard*

# 3 Shaft Area Travel – Hazard

**The 3 Shaft area presents the hazards of:**

- Getting lost due to the extensive network of drifts and manways.
- Slips and trips from uneven ground and loose rock.
- Falls from manway ladders if three point contact is not consistently used.
- Accumulation of water which can hide footing hazards.

## *4.12 3 Shaft Area Travel – Controls*

# 3 Shaft Area Travel – Controls

**To mitigate the risks to workers traveling in the 3 Shaft area, Creighton Mine has implemented the following controls:**


- Workers require proper authorization from Vale plant contact prior to performing work within the 3 Shaft area. Workers are to inform the control room where they will be going.
- Workers in the ice fields are to sign in at the control room, and must also be with a partner at all times. In addition, workers must be on the “working alone” system even though they are with a partner.
- Workers are to use the underground tag board at the 9 Shaft building before accessing the 3 Shaft area.
- Workers are to use the proper PPE in the proper areas. (i.e. hip waders in high water areas, and ice picks on boots in icy areas).

## *4.13 Combustion – Hazard*

# Combustion – Hazard

**Creighton Mine has old areas that contain rock with high pyrite that can spontaneously combust when mixed with old timbers and oxygen.**

These areas exist around the Division 4 area of Creighton Mine and are better known as “Heated Areas”.

The rock and timbers smoldering in these areas produce high levels of CO that have the potential to harm workers throughout the entire mine.

Furthermore, if oxygen is introduced it can cause the smoldering areas to flare up into fires.

*4.14 Combustion – Controls*

# Combustion – Controls

**To mitigate this hazard of fire or contaminated air associated to heated areas, be aware of the following controls:**

- Ventilation controls ensure CO does not enter areas of the mine in which people are working.
- Follow mining prints so as not to inadvertently break into heated areas.
- Control room has alarms for high heat and/or CO.

## *4.15 Heat Stress – Hazard*

# Heat Stress – Hazard

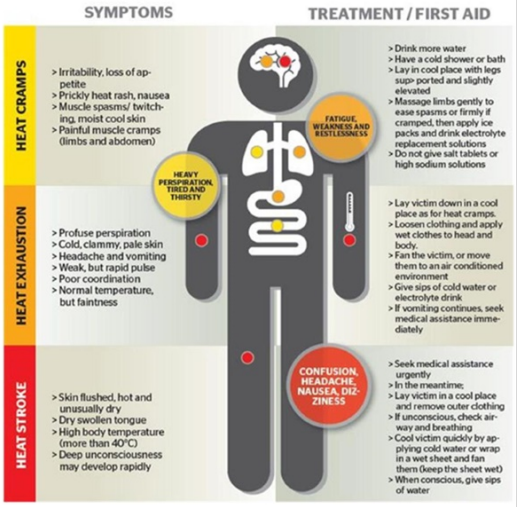
**Due to the depth at Creighton Mine, the inherent rock temperature is naturally higher.**

**This combined with humid environments increases the air temperature significantly.**

What is heat stress?

Heat stress can happen when hot, humid conditions and physical activity overcomes your body's natural cooling system.

**Heat stroke can kill quickly.**

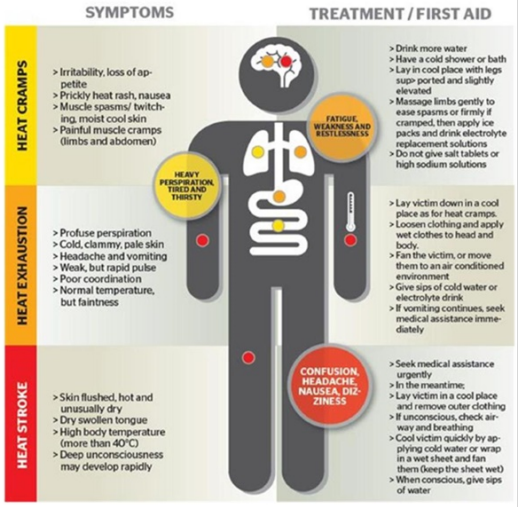


## *4.16 Heat Stress – Hazard*

# Heat Stress – Hazard

**Working in these areas creates a hazard of heat stress. Signs or symptoms of heat stress include;**

- Cramps
- Fainting
- Serious heat exhaustion and/or
- Heat stroke



## *4.17 Heat Stress – Controls*

# Heat Stress – Controls

**To mitigate the hazard of heat stress, Creighton Mine has implemented the following controls:**

- Ice fields are used to cool the air coming into the mine.
- Refuge stations are equipped with air conditioning units.
- Supervisors are trained in thermal management to assess workplace conditions.
- Work/rest regimes are in place for areas identified through workplace assessments.
- Drinking water is available to workers and can be found at locations throughout the mine.

## *4.18 Heat Stress – Controls*

# Heat Stress – Controls

**Drinking water at Creighton Mine can be found in the form of 5 gallon bottles of water both on surface and underground.**

The drinking water on surface is available in the warm room past the caplamps, along with ice.

The drinking water underground is located in refuge stations, either in the fridge or in a storage rack.


## *4.19 Mobile Equipment – Hazard*

# Mobile Equipment – Hazard

**Mobile equipment presents a high risk hazard of collision with vehicles or pedestrians.**

**The mobile equipment hazards at Creighton Mine include the following:**

- 2 electric trucks (Kiruna trucks) that operate in the Division 6 main haulage and travel ramp are fast moving and quiet so workers may not be aware of their approach.
- Diesel haulage trucks, boom trucks and other small mobile equipment operating in this area also hauling on this ramp increasing the chances of encountering other equipment or workers.
- Large scoops operating on different levels that have very limited visibility.
- Mobile equipment that runs on railway tracks for moving personnel, supplies and ore.

## *4.20 Mobile Equipment – Controls*

# Mobile Equipment – Controls

**To mitigate the risk of collision, Creighton Mine has implemented the following controls:**

**Level entry protocols :**

When a scoop tram is operating on the level, indicated by a large blue flashing light or gate – Follow the  protocol which requires workers to make contact with scoop operators prior to gaining access to the level.

*Headlights and vehicle blue flashing lights* are to remain on at all times when operating mobile equipment.

*Contact operators prior to passing through Restricted Track Tram Areas.* Gates and procedures are posted on levels that have these areas.

## *4.21 Electrocution - Hazards and Controls*

# Electrocution - Hazards and Controls

**The Kiruna trucks at Creighton Mine are being powered by a 660Volt overhead trolley line.**

**This energized line can create a hazard of energizing mobile equipment and electrocution to personnel working near the trolley line.**

If water is introduced to areas around the trolley line, there is an increased risk of electrocution as water is a conductor of electricity.

**To mitigate this hazard, ensure the following:**

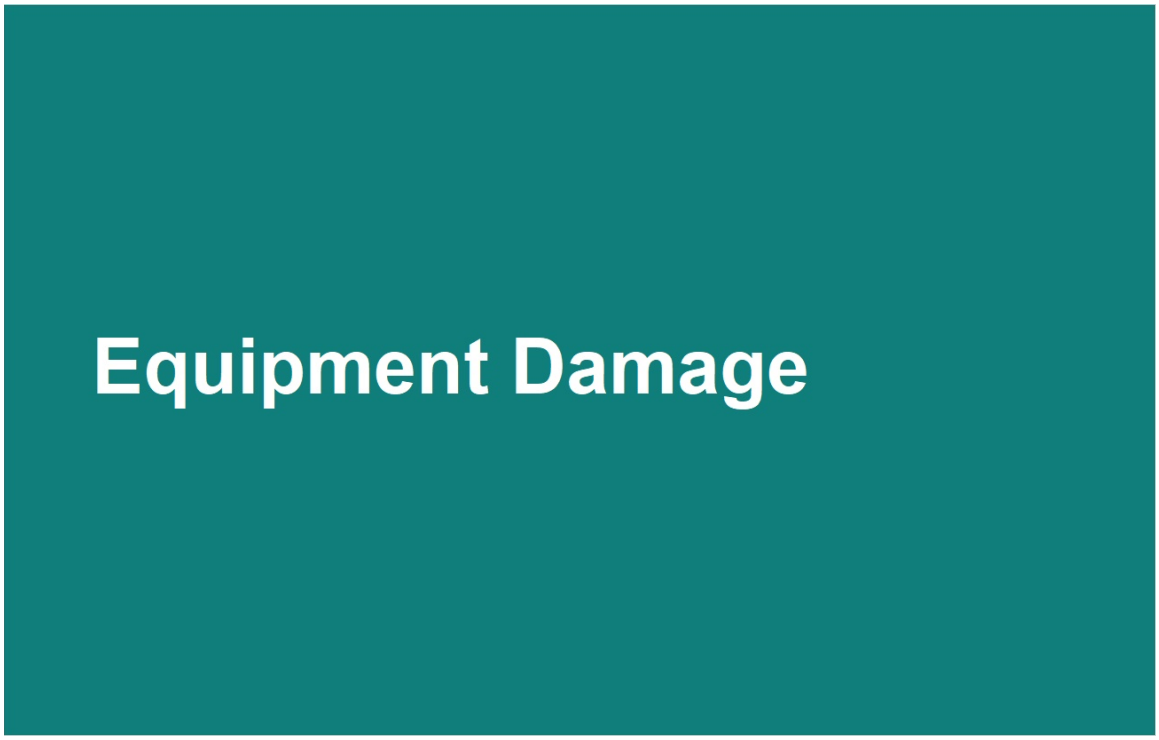
Anyone working within *10 feet of a trolley line must have the trolley line locked, tagged and grounded* by the Vale electrical department.

If mobile equipment comes in contact with the energized trolley line, *occupants are to remain inside the vehicle until directed otherwise* by authorized personnel.

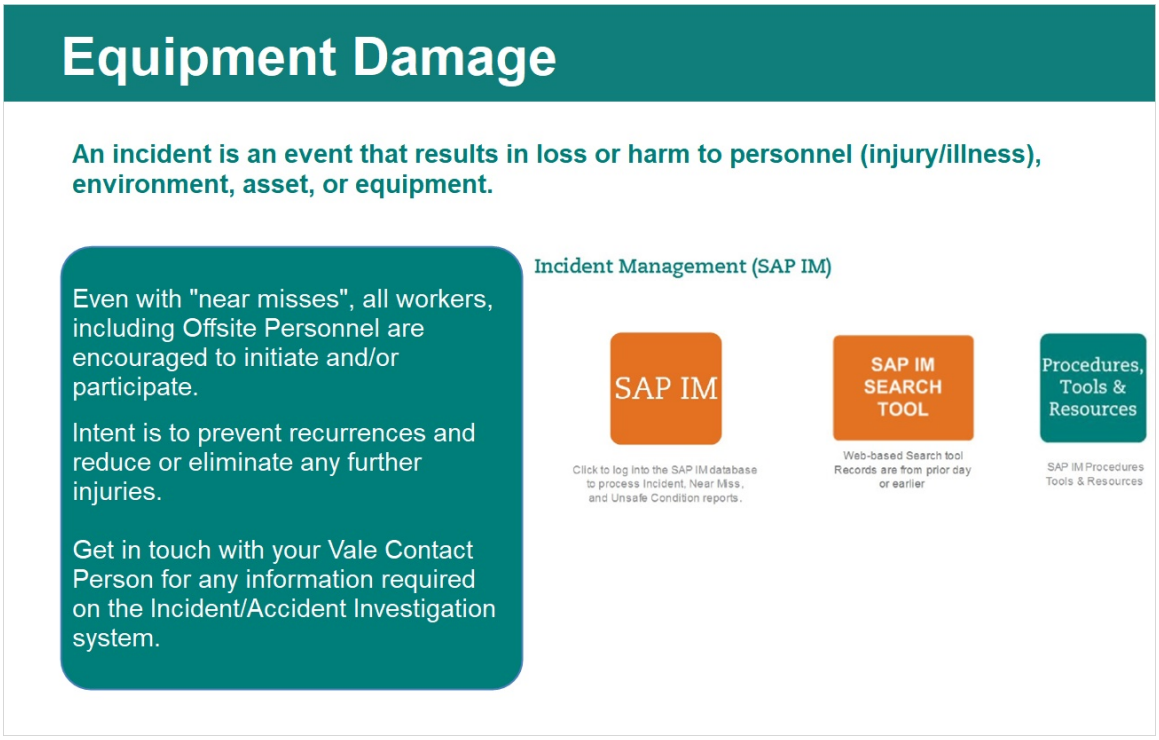
Care needs to be taken when spraying water near the kiruna ramp.

## 5. Equipment Damage

### *5.1 Equipment Damage*



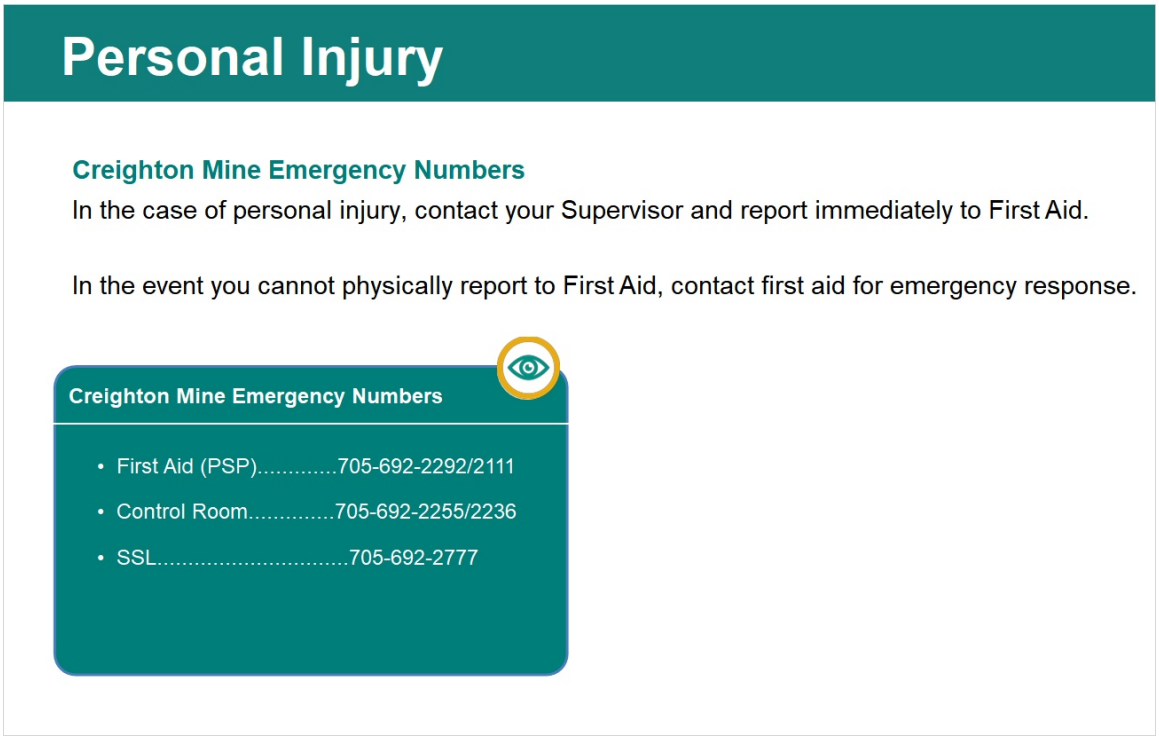
## *5.2 Equipment Damage*



## 6. Personal Injury

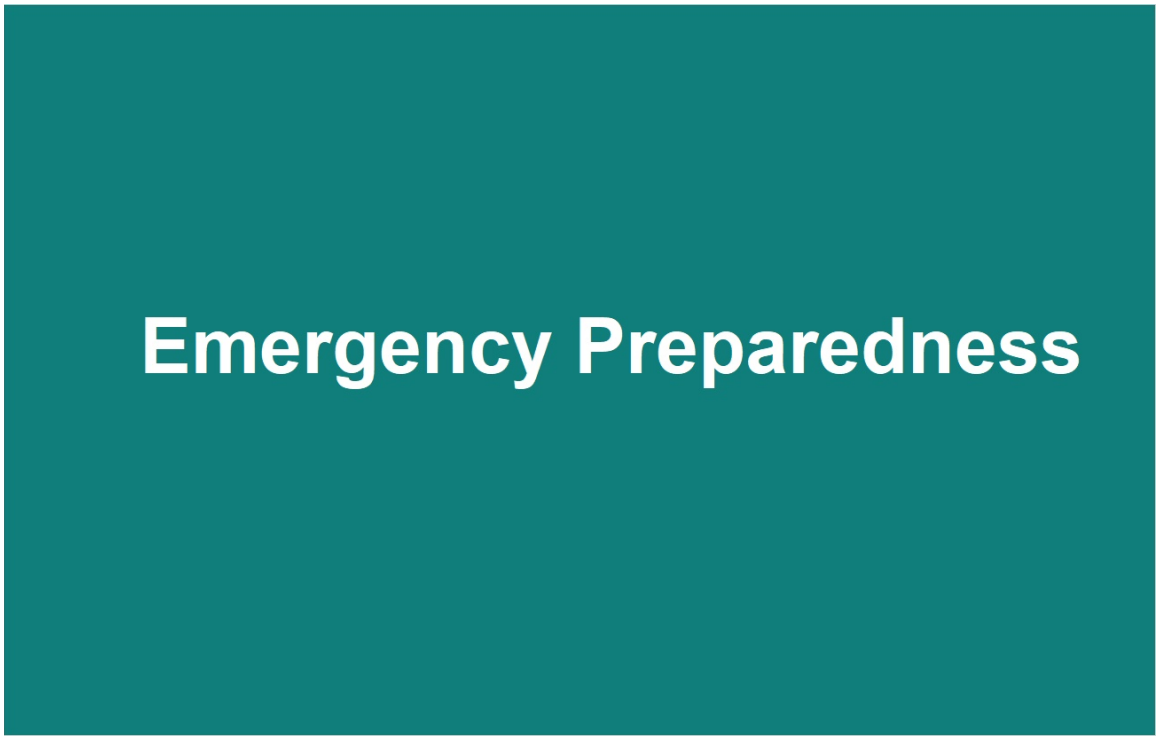
### *6.1 Personal Injury*

## *6.2 Personal Injury*



## 7. Emergency Preparedness

### *7.1 Emergency Preparedness*



## *7.2 Emergency Preparedness*

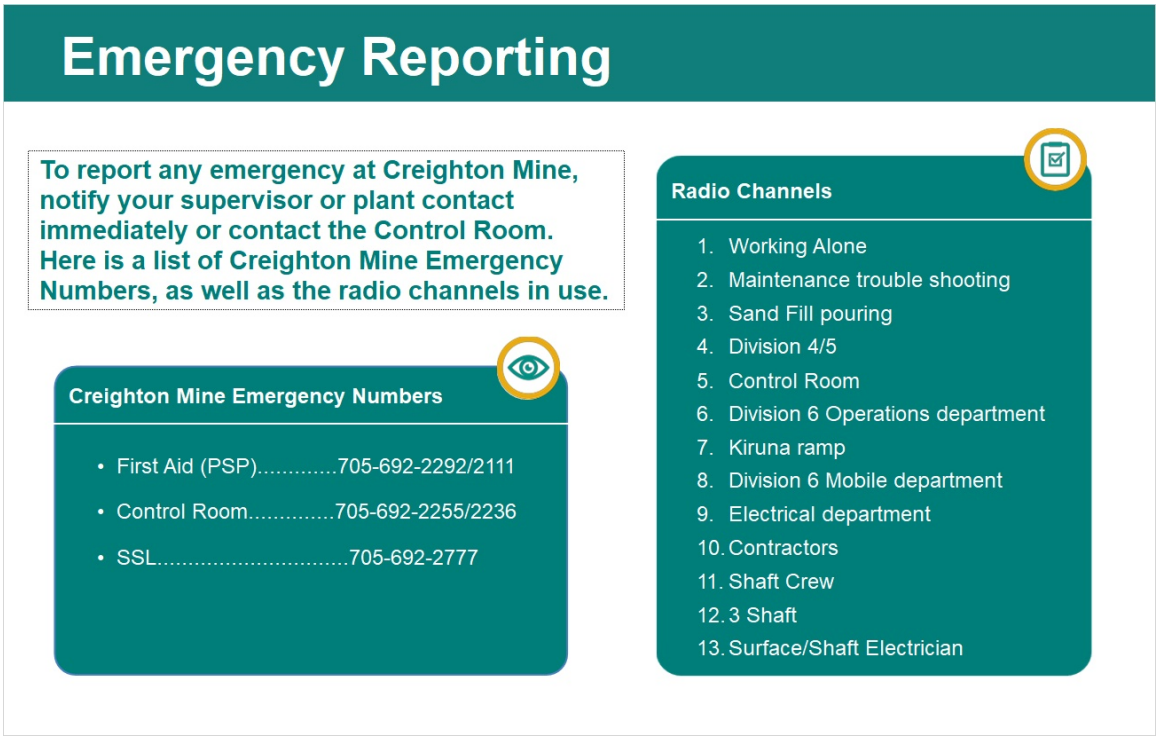
# Emergency Preparedness

The Mines Tier 2 Orientation provided guidance on the application of Emergency Preparedness including activating an emergency and how to classify one.

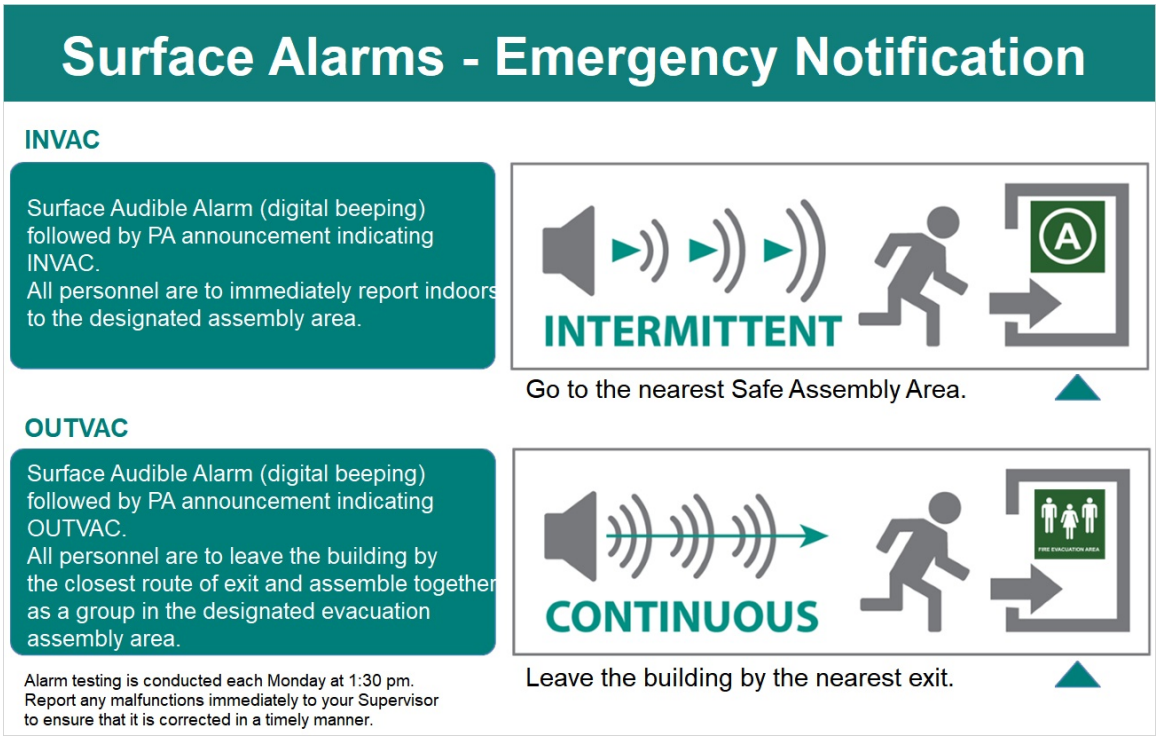
The following is a general overview of how to respond to an emergency at Creighton Mine.

It is necessary that you familiarize yourself with the fire procedure(s) that apply to your specific area(s) of work at Creighton Mine. Your Supervisor or plant contact should review this with you.

## *7.3 Emergency Reporting*



## *7.4 Notification – Central Tailings Area*



*7.5 INVAC - Surface Assembly Area*

# INVAC - Surface Assembly Area

The INVAC assembly area for Creighton Mine 9 shaft is the amphitheater directly across from First Aid surface sign in area, near door 3 entrance.

All workers, except specific qualified personnel, will proceed immediately to the assembly areas to await further instructions.

Do not leave the assembly area until instructed to do so, or until the all clear is given.



*7.6 INVAC - Surface Assembly Area*

# INVAC - Surface Assembly Area

The INVAC assembly area for 7 shaft is located near the west door entrance.

All workers at 7 shaft except specific qualified personnel, will proceed immediately to the assembly areas to await further instructions.

Do not leave the assembly area until instructed to do so, or until the all clear is given.

## *7.7 OUTVAC - Surface Evacuation Area*

# OUTVAC - Surface Evacuation Area

The Evacuation Area for Creighton Mine 9 shaft is located in front of the SNO building North West of First Aid.

All workers, except specific qualified personnel, will proceed immediately to the evacuation area to await further instructions.

Personnel may be directed from there to the SNOLAB building as it is used when weather conditions are severe.

Do not leave the evacuation area until instructed to do so, or until the all clear is given.


## *7.8 OUTVAC - Surface Evacuation Area*

# OUTVAC - Surface Evacuation Area

The Evacuation Area for 7 shaft (sand fill plant) is located in front of the pump house.

All workers at 7 shaft, except specific qualified personnel, will proceed immediately to the evacuation area to await further instructions.

Do not leave the evacuation area until instructed to do so, or until the all clear is given.

## *7.9 Underground Fire*

# Underground Fire

**In the event of a fire underground at Creighton Mine, stench will be injected into the fresh air system, as well as a message broadcast on all channels saying, "There is a fire underground. Report to the nearest refuge station."**

Report to the nearest refuge station and follow the underground fire procedure.

In remote areas of Creighton Mine that do not have standard refuge stations, Creighton Mine has several styles of emergency fresh air installations to protect workers:

- Hard style emergency fresh air station
- Tent style emergency fresh air station
- Cascade systems inside a standard refuge station

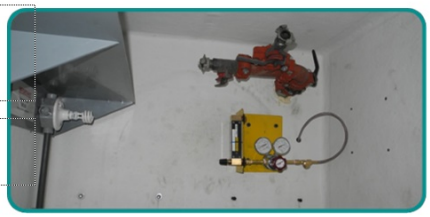

## *7.10 Emergency Fresh Air Station – Hard Style*

# Emergency Fresh Air Station – Hard Style

**Emergency fresh air stations (EFAS) are located in more remote areas that do not house standard refuge stations.**

**They are intended for use only if you are unable to reach a refuge station. They are equipped with compressed breathing air cylinders.**


- For the EFAS containing cylinders outside, turn on the bottle valves before entering.
- Remove the door seal and crack open the compressed air valve inside the EFAS.
- If the compressed air line fails, follow the steps that are posted inside the EFAS to use the cascade system.
- Follow the procedure for the hard style EFASs as described in the underground fire procedure book.



## *7.11 Emergency Fresh Air Station – Tent Style*

# Emergency Fresh Air Station – Tent Style

**The Emergency Fresh Air Stations are temporary shelters offering breathable air in the event of an emergency.**

**They are intended for use in the event of a fire, ONLY if you are unable to reach a refuge station or are trapped in the workplace due to smoke.**

**Proceed to Emergency Fresh Air Station (EFAS).**

- Turn on compressed air valve (main line) to EFAS.
- Un-zip the access door and step inside.
- Watch footing on tubing floor as it is slippery.
- Re-zip the door shut.

## *7.12 Emergency Fresh Air Station – Tent Style*

# Emergency Fresh Air Station – Tent Style

**The Emergency Fresh Air Stations are temporary shelters offering breathable air in the event of an emergency.**

**They are intended for use in the event of a fire, ONLY if you are unable to reach a refuge station or are trapped in the workplace due to smoke.**

**Proceed to Emergency Fresh Air Station (EFAS).**

- Ensure that the compressed air valve (inside roof) is open to pressurize the enclosure.
- Contact the Control Room via radio, give the location, name and numbers of persons inside and verification the compressed air is on.
- Remain inside of enclosure until rescued or released by Control Group.

## *7.13 3 Shaft Refuge Station*

# 3 Shaft Refuge Station

**The refuge station at 3 shaft contains 5 compressed air cylinders (cascade system) that are located inside.**

**One person will take charge and carry out the Standard Refuge Station Procedure.**

**Using the compressed air cylinders to pressurize the Refuge Station;**

1. Turn on the first air cylinder only.
2. Watch the air pressure by checking the gauge regularly, when the gauge reaches a pressure of 100 psi close the cylinder.
3. Turn on the next cylinder and repeat step 2 above.
4. Contact the CONTROL BASE (Manager's office) each time a new cylinder is turned on.
5. Do NOT adjust the regulator.
6. Remove the plug in the door after the first compressed air cylinder is turned on.

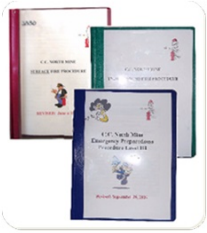
## *7.14 Other Mine Emergency*

# Other Mine Emergency

**In the event there is a mine emergency that may effect personnel underground, other than an underground fire, the emergency will be broadcast on all channels.**

Report to the nearest refuge station, ensure you are accounted for and wait for instructions.

Do not clay the doors unless otherwise instructed.



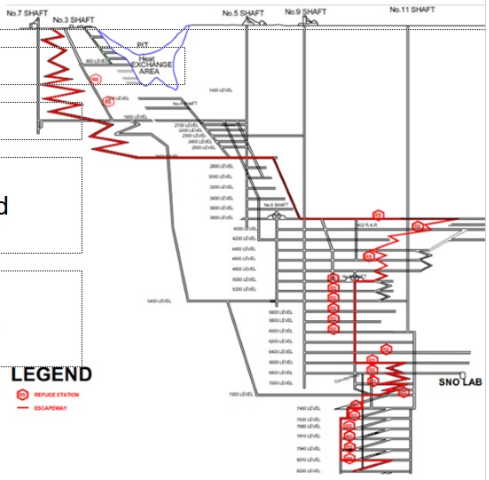
## *7.15 Underground Evacuation*

# Underground Evacuation

**In the event there is a mine emergency that results in a decision to evacuate the mine, there will be a person in charge of the process.**

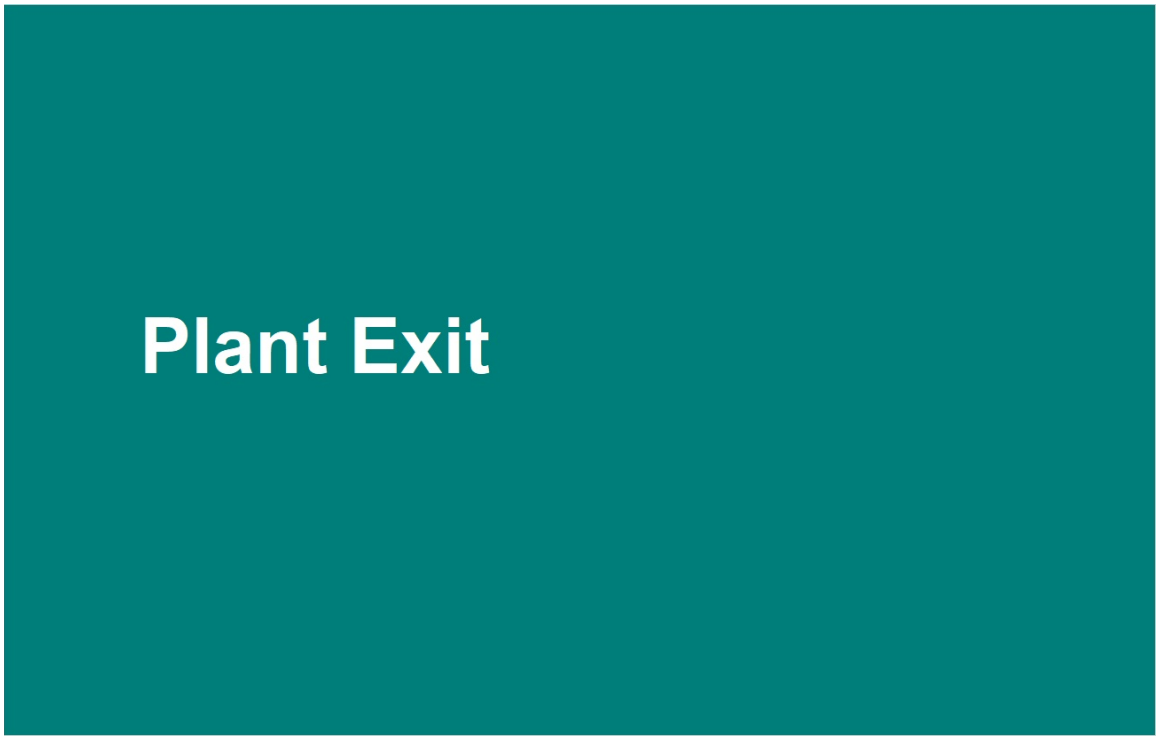
**Do not take evacuation measures on your own.**

- The main egress is via the cage.
- If the cage is not available the skips may be used.
- If this option is not available, another egress is the shaft manway. Note: This is not to be entered at any time unless coordinated through the SSL.
- If the above options are not available, another egress is through a series of manways throughout the mine to 3 shaft.



## 8. Plant Exit

### *8.1 Plant Exit*

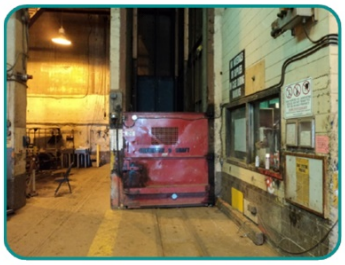


## *8.2 Arriving on Surface*

# Arriving on Surface

**Regular personnel runs returning to surface may unload either on collarhouse deck or at sub-collar.**

- Always watch for footing in all track areas.
- If on collarhouse deck, exit cage and make sharp right to return to the warm room area.
- Be aware of tugger cables and supply trucks or any work being performed on deck.
- Remove your underground tag from the tag-in board and sign out of underground book, if applicable.



### *8.3 Plant Exit*

## Plant Exit

**Good work practices dictate that you close the loop on work you were doing to avoid creating risks or hazards for other work groups, cross shifts, or other work in the area. Here are some tasks to consider when getting ready to exit the plant to ensure your safety and that of those around you:**

- ✓ **Housekeeping** - Is your worksite cleaned up after your job?
- ✓ **Personal Lock and Tag** - Has your personal protection been removed at the end of the shift?
- ✓ **Status Tagging** - Is there ongoing work that needs a status tag placed or is there equipment in Bad Order that needs to be identified?
- ✓ **End States** - Have you left the process in the proper state?
- ✓ **Waste Segregation** - Have you disposed of materials in the appropriate waste receptacles/bin/area?
- ✓ **Control room** - Do I need to let the control room know that I'm clear of an area?
- ✓ **Vale Contact Person** - Do they need an end of shift report from me?
- ✓ **Permits** - Do I need to close or hand in any permits?
- ✓ **Sign out -** At the gate or other designated areas.

*8.4 Plant Exit*

# Plant Exit

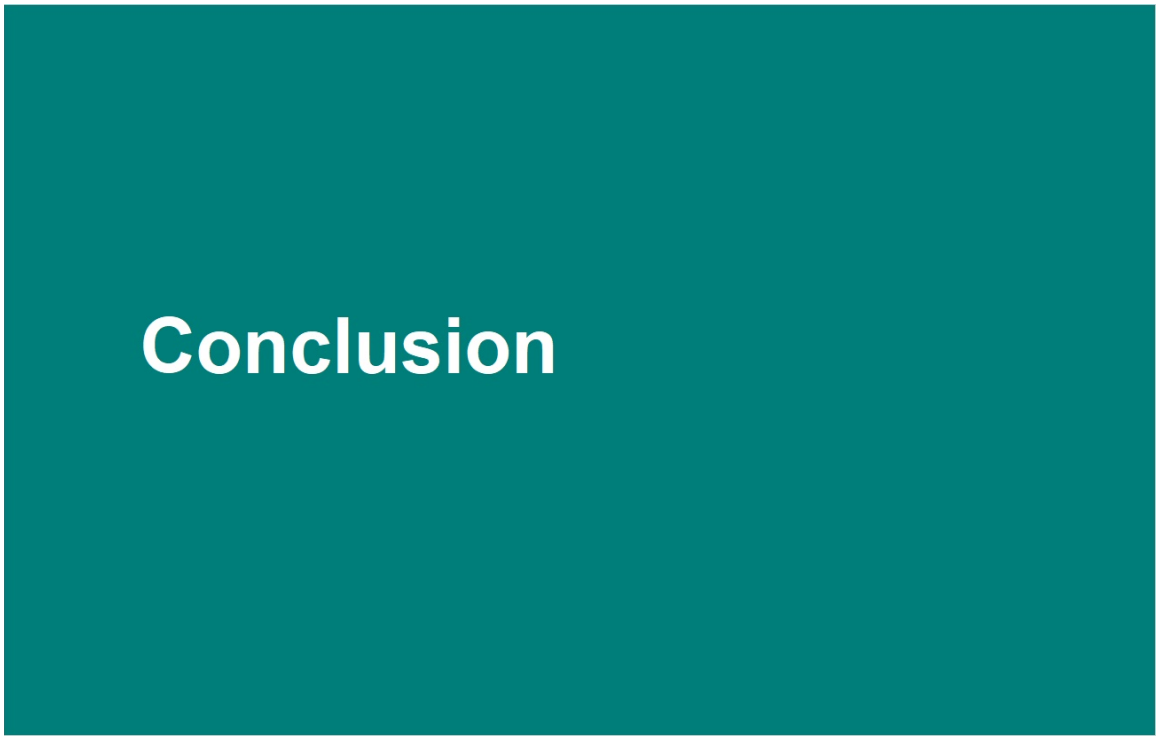
The exit from the parking is one-way, from the side opposite to the entrance.

Exit from SNOLAB is through the gate the same as the entrance.

Yield to pedestrians at the crosswalk and obey the STOP sign before accessing the main road to allow those exiting the parking lot entrance to proceed.

## 9. Conclusion

### *9.1 Conclusion*



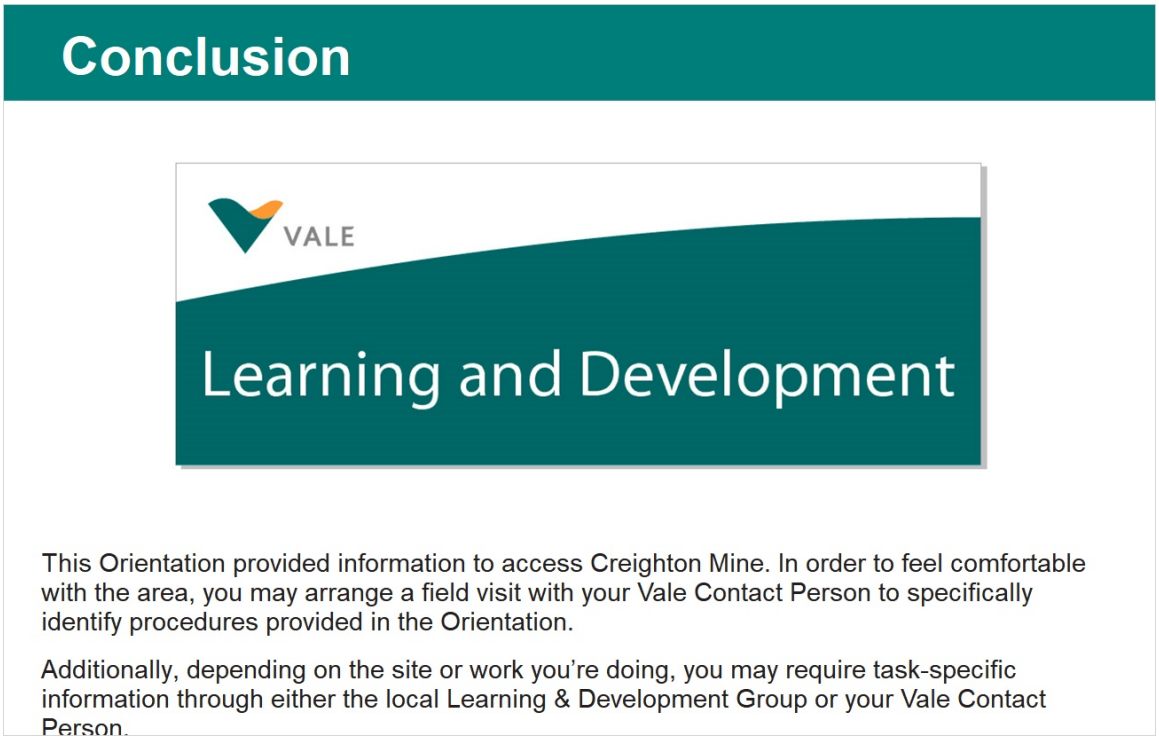
### *9.2 Conclusion*

## Conclusion

**This concludes the material for the Tier 3 Vale Creighton Mine Specific Orientation. You should now have a working knowledge and understanding of:**

- The mining plant layout and boundaries
- Plant entry and tagging requirements
- The high level general hazards and controls with regards to:
  - Cage Travel – sinus pressure
  - Seismicity
  - 3 shaft
  - Heated areas
  - Heat Stress
  - Mobile equipment
  - Electrical Hazards-trolley and
  - Emergency Preparedness

### *9.3 Conclusion*



## 10. Creighton Mine Orientation

### *10.1 Creighton Mine Orientation Review*

## *10.2 Conclusion*

Remember, At Vale we believe
**Life Matters Most** and that
*no job is worth doing if it cannot be done safely.*

Thank-you for your participation
and your commitment to safety at Vale.

HOME SAFE

### *10.3 Start The Module Quiz*