



Copper Mines of Tasmania

Underground Induction



Contents

Welcome	3
Overview	3
CMT Tag Board Procedure & Firing Times	3
Cap Lamps	4
Personal Protective Equipment & Clothing	4
Visitors	5
Ventilation	5
Dust Control	5
Underground Gases	6
Shaft Work	6
Water Hazards	7
Before Commencing Work	7
Baring & Scaling Down	8
Entry into Old Mine Workings	8
Underground Mobile Equipment	8
Pedestrian Safety	9
Air Tools	9
Compressed Air	10
Hydraulic Safety	10
Timbering & Services	11
Full Body Harness	11
Barricades	12
Underground Emergency Procedures	12
First Aid Kits	16
Injury Notification	16
Drinking Water	16

Welcome

Employees undertaking this induction should have first completed:

- The TIMI General Induction (part A and part B);
- The TIMI Underground Induction (part C);
- The CMT Surface Induction (part D).

All employees working underground at CMT must learn, understand and comply with the contents of this induction.

Overview

Mount Lyell Mine, located in Queenstown, Tasmania is a copper mine with more than 100 years of operation. First started in 1896, it was re-opened by Copper Mines of Tasmania in 1995. Acquired by Sterlite Industries in 1999, Copper Mines of Tasmania (CMT) is a part of the fast growing Vedanta group of companies. Vedanta Resources Plc is a London listed metals and mining major with Aluminium, Copper and Zinc operations in the India, Zambia and Australia. Under Copper Mines of Tasmania, Mount Lyell remains a major contributor to the economy of the West Coast of Tasmania, Australia.

CMT Tag Board Procedure & Firing Times

You will be issued with two “Underground Tags” following your induction at CMT. These “Underground Tags” are used to indicate that you are in the underground operation.

The “Surface Tag Board” is located at the muster room in the administration building. **ALL** personnel entering the underground **MUST** tag in at the “Surface Tag Board” by placing their tag on the **IN** section.

If entering the Prince Lyell shaft you must also tag on at the “Surface Tag Board”. All personnel leaving the underground must remove their tag from the “Surface Tag Board”.

There is a second tag board at the 1640 level crib room. All personnel proceeding below the 1640 level **MUST** tag on to the “1640 Crib Room Tag Board”.

All personnel returning from below the 1640 must remove their tag from the “1640 Crib Room Tag Board”.

Note: You must be at or above the 1640 level tag board at firing times, & do not leave the crib room during firing times unless authorised by the Shift Supervisor.

No person is permitted to place or remove another person’s tag.

Firing times are as follows:

<u>Day Shift</u>	<u>Night Shift</u>
12:30 to 13:00 PM	00:30 to 01:00 AM
17:45 to 18:15 PM	05:45 to 06:15AM

Cap Lamps

- Always take good care of your own cap lamp as it can be very hazardous if your light fails underground.
- Check your cap lamp at the start of every shift by ensuring both globes are functioning, the cord is intact, the battery is not leaking sulphuric acid solution and the charging rack position is not damaged.
- If the battery is leaking sulphuric acid solution and you do not identify this, then the acid could burn through your clothing and cause skin problems when it contacts the skin. You should wash the area thoroughly with water and report the burn to the Supervisor/ First Aid Officer as soon as possible after contact.
- Wherever possible make sure your cap lamp battery stands up and is not left laying flat.
- DO NOT shine your cap lamp in the eyes of other persons and especially not in the eyes of persons operating machinery.
- DO NOT move around the underground workings of this mine without your cap lamp and it is essential to leave your cap lamp in the holders provided on your belt and hard hat whenever underground. Carrying the light part in your hand reduces your visibility to others.
- If your cap lamp fails whilst underground and you are alone, then remain in the place you are, until someone comes to find you. If someone is with you, then they can lead you out to a place of safety.
- Always use your own cap lamp. DO NOT take another person's cap lamp.
- Report all faults to the surface day electrician and replace your lamp in its cap lamp holder. If there is work to be done on your cap lamp then report this to the Supervisor for further action to be taken. Also place an Out of Service tag on the cord filled out correctly and tie a knot in the cord to identify it as non-operational.
If you require another cap lamp then a spare "contractor" light can be used.

Always put your cap lamp back on the rack at the end of each shift to allow full recharge, ensuring it is clipped in correctly.

Personal Protective Equipment & Clothing

The minimum PPE required underground at Copper Mines of Tasmania is:

- Hard Hat
- Safety Glasses
- Steel Toe Safety Boots / Gumboots
- Reflective Clothing
- Cap Lamp
- Self - Rescuer

Visitors - Refer to CMT Visitor Procedure

Ventilation

At CMT keep the vent bag within **15 metres** of the face.

The primary ventilation airflow is drawn into the mine through the Main Decline and Prince Lyell Shaft.

The ventilation exhausts to the surface is through the Northern Exhaust Airway (NEA). The fan must never be turned off unless authorised by the Mine Manager. Underground workings require continuous ventilation to prevent hazardous build-up of dust, fumes, heat and gas.

The Ventilation officer conducts monthly checks and instructs supervisors on how many machines are allowed in a level or stope area.

Do not run other machines above the vent system allowable level; otherwise a build-up of fumes can occur.

Do not leave diesel engines idling for long periods as this adds to the fume and heat load.

Ventilation Work Practice

To reduce the hazard of gases the following work practices must be adhered to:

- Ventilation must be kept well up to the working face.
- No entry into unventilated or old areas.

Ventilation Failure

In the event of a power failure which causes failure of the mine ventilation system, all underground equipment is to be parked up and all personnel report to a refuge chamber, contact the Shift Supervisor and await further instructions.

Dust Control

Different forms of dust can have different health effects. If you make dust everybody underground can be affected. Dust can be significantly reduced by:

- Hosing down rock before and during mucking operations.
- Hosing down the backs and walls after firing.
- Using water sprays.
- Using water when boring holes.
- Keeping ventilation duct close to the face of the heading.
- Hosing down all machinery each shift. Cabs and floors of vehicles also need washing out

Underground Gases

Some Hazardous Gases that may be found underground are listed below along with their effect. In sufficient concentration they are all deadly.

GAS	SYMBOL	INDICATION OF ITS PRESENCE	WHERE FOUND
Carbon Monoxide	CO	Headache and nausea (produced by fires and explosives - very poisonous)	Backs
Carbon Dioxide	CO ₂	Match will not burn, feeling of warmth around legs. Difficulty in breathing (exhausts, old workings and dead ends). Combustion.	Floor
Sulphur Dioxide	SO ₂	Biting, irritating smell. Makes eyes water, causes coughing. (Occurs after Sulphide dust explosions.)	Floor
Hydrogen Sulphide	H ₂ S	Strong smell like rotten eggs. (Occurs after Sulphide dust explosions.)	Floor
Nitrous Fumes	(NO + NO ₂)	Irritates throat, eyes. (Produced by diesel engines and explosives.)	Floor
Ammonia	NH ₃	Irritates throat, eyes. (Produced by cement mixing with Ammonium Nitrate explosives)	Backs

Different mines will have issues with different gases. Your site inductions at these mines will need to familiarize you with:

- Types of gases and their health effects.
- Detection and monitoring
- Warning procedures if gases are at unsafe levels
- Emergency procedures, including use of rescuers.

In order to reduce the likelihood of exposure to hazardous gas levels, ventilation must be kept well up to the working area, and do not enter into old or unventilated areas.

Shaft Work

Only authorised personnel are permitted to access or perform work in the shaft. Persons working in the shaft must have completed a Platman ticket and be proficient in the use of the shaft code of signals. Workers must notify the winder driver prior to work commencing work and establish radio communications. A shaft access permit must be completed when any work is being undertaken in the shaft.

All persons working on the top maintenance section of the cage must wear a safety lanyard and full body harness to prevent falls into the shaft.

Water Hazards

When uncontrolled in a mine, water can be a hazard. It also costs a lot to pump from the mine.

- Do not use leaking hoses. Repair them.
- Do not allow water to build up in your work area.
- Keep all drains clear. Allow water to continually drain.
- Do not allow water to run into ore passes. A build-up of water above material in the pass can cause a rush of fines and rock material which could lead to a serious injury.
- Report any leaking services to your supervisor.
- If you damage services with your vehicle or loader, report this immediately.
- Always inspect dam walls at pump stations and bund walls. Look for leakage and weeping. Report if noticed, as drowning may be the end result from water inrush.
- Turn off valves and manifolds before leaving your workplace.
- If water is noticed from drill holes and you suspect the risk of an inrush of water:
 - Report to shift Boss immediately.
 - Under Shift Boss's guidance, drill probe holes at floor level or along wall.

**NEVER DRILL IN CENTRE OF FACE AS THIS COULD LEAD TO AN INRUSH.
LEAVE AREA AND BARRICADE. GET A GEOLOGIST TO REVIEW**

Before Commencing Work

- Check the condition of the entrance and travel way to the place of work and review what is necessary to make these safe.
- Check that the working place and equipment are in good condition. Take any corrective action necessary.
- You are responsible for making your working place safe at all times.
- Where ventilation equipment is provided for the job, use it.
- Check for loose rock and bar it down each time you enter your working area and at regular intervals while working there.
- If you are short of gear in your job, consult your supervisor.

- At every working face there must be a scaling bar (or bars) of proper length and in a good condition.
- Before leaving any job, make sure it is safe. If for any reason you cannot make your working place safe, guard or barricade the area and report it immediately to your supervisor.
- A tidy job is a safe job. Keep your working place tidy and keep gear clear of travelling ways.

Barring & Scaling Down

If you identify ground that needs barring down, and you have not been assessed as competent to conduct this activity, move away from the area, barricade, and then report to your Supervisor.

Should you hear any rock noise or observe a rock fall, report it to your Supervisor.

Entry into Old Mine Workings

- **Authority is required from the Mine Manager and a JSA completed prior to entry.**
- Do Not enter alone.
- Person to be stationed at the entry point.
- Give time of entry and planned return time.
- Radios should be used to maintain contact.

Any person entering old mine workings must be accompanied by experienced mine personnel!

Underground Mobile Equipment

Underground mobile equipment is a core risk for underground operations. Fatalities and high potential incidents have occurred throughout the industry involving underground mobile equipment. The causes and contributing factors to these incidents have been:

- Interactions between vehicles/pedestrians e.g. passing or, working close by
- Speeding
- Non-adherence to operating procedures
- Rolling and tipping over of vehicles
- Unplanned inadvertent movements of vehicles down inclines and slopes
- Operator error due to fatigue and substance abuse
- Poor visibility

Note: The maximum speed limit for underground vehicles is 30km, & all moving vehicles must maintain a minimum distance of 30 meters from each other.

You must be trained and authorised in order to operate any underground machinery or mobile equipment at the CMT site.

Pedestrian Safety

Machinery must give way to pedestrians; however it is the responsibility of the pedestrian to make their presence known to the vehicle driver.

One of the major causes of serious injury underground is crushing by heavy equipment due to the pedestrian not being seen by the operator. You must take the following action to prevent being crushed or run over.

- The truck and loader operators have blind spots in front and back of the machine.
- REMEMBER THAT THE OPERATOR'S VISIBILITY IS LIMITED, ESPECIALLY CLOSE TO THE MACHINE. They will never hear you yell out.
- Use your cap lamp light to communicate and ensure that you get a response. Never assume that somebody has actually received the signal.

When you are on foot:

- Always indicate your presence to the operator to make sure that he/ she has seen you. (A quick flash of your cap lamp to the operator is normally sufficient.)
- When a machine is approaching, stand in the nearest cuddy or if there are no cuddies close by, stand on the OPERATOR'S SIDE OF THE MACHINE so they can see you. The operator will stop and indicate for you to walk past. Then signal the operator that you are clear.
- Walk to the outside arc of the corner. This extends your visibility.
- Do not walk down the decline in front of vehicles. Walk behind.
- Do not walk up the decline behind vehicles. Walk in front.

Air Tools

Only trained operators are permitted to use air tools.

- Be alert - avoid operating any tool when you are fatigued.
- Avoid loose fitting clothing.
- Good footing is most important in all hand tool work. Always maintain a firm balanced footing. Wear safety boots, gloves, eye protection, hard hat and ear protection.
- A high impact face shield and safety glasses are required when using grinders or disc cutters. Your shift supervisor and the workshop have these.
- Before commencing any work involving air tools always inspect them for damage, leaks or defects. If there is any doubt regarding the safety or effectiveness of the air tool do not operate it. Report it to your supervisor.

Compressed Air

Never blow compressed air at any person or endeavour to clean off personal clothing as the air, or contaminates, may penetrate the skin causing injury or death.

Before connecting compressed air or water hoses to equipment, always blow the hoses out to prevent dirt getting into equipment and causing damage.

Always use safety clips on snap couplings on compressed air hoses.

Always tie down the arms of Kamlock couplings with wire.

Hydraulic Safety

To do their work, hydraulic systems must store fluid under high pressure, typically 2,000 pounds or more per square inch.

One hazard comes from removing or adjusting components without releasing the pressure.

The fluid, under tremendous pressure, is also hot. The worker then is exposed to three kinds of hazards: burns from hot, high-pressure fluid; bruises, cuts or abrasions from flailing hydraulic lines and hydraulic injection of fluid into the skin.

Many systems store hydraulic energy in accumulators. These accumulators are designed to store oil under pressure when the hydraulic pump cannot keep up with demand, when the engine is shut down, or when the hydraulic pump malfunctions. Even though the pump may be stopped or an implement disconnected, the system is still under pressure. To work on the system safely, relieve the pressure before the work begins.

Pinhole Leak Injuries

Probably the most common injury associated with hydraulic systems is the result of pinhole leaks in hoses. These leaks are difficult to locate.

A person may notice a damp, oily, dirty place near a hydraulic line. Not seeing the leak, the person runs a hand or finger along the line to find it.

When the pinhole is reached, the fluid easily can be injected into the skin as if from a hypodermic syringe.

Another hazard is improper coupling of low-and high-pressure hydraulic components. Do not connect a high-pressure pump to a low- pressure system.

A low-pressure component, hose or fitting should not be incorporated into a high-pressure system. Component, hose or fitting ruptures are likely to occur.

Pressure relief valves incorporated into the hydraulic system will avoid pressure build-ups during use.

Keep these valves clean and test them periodically to ensure correct operation.

Dangers of Hydraulic Pressure

- Injection Injuries
- Dangerous properties of fluid (toxic)
- Contact with hot fluid
- Other material movement (explosion, whipping hose, etc.)

Immediately after the injection, the person experiences only a slight stinging sensation and may not think much about it.

Several hours later, however, the wound begins to throb and severe pain begins. By the time a doctor is seen, it is often too late, and the individual loses a finger or entire arm.

Unfortunately, this kind of accident is not uncommon. To reduce the chances of this type of injury, run a piece of wood or cardboard along the hose (rather than fingers) to detect the leak.

Where Do You Find Hydraulic Hazards

Hydraulic lines, airless paint sprayers, fluid 100 psi or above, high-pressure fuel injection, high- pressure air lines, high-pressure grease guns, general work shop air, high pressure grease and paint guns are the most common cause.

Timbering and Services

Eye protection must be worn when using an air saw or an air driven auger. Relevant procedures must be completed.

Gloves must be worn when handling timber or when handling and mixing cement. Barrier cream should be considered for use on hands and should be applied before handling cement.

Before and while using axes, bars, hammers, picks and other tools, ensure that no one is in danger from their movement.

With all chemicals read the Material Safety Data Sheet prior to using and follow all warnings and directions.

Full Body Harness

Note: A miner's belt is no longer acceptable as a fall restraint device.

A full body harness (preferably with a rear dorsal D ring) must be worn when:

- Within 3 metres of any unguarded downward opening. (hole, shaft or stope)
- There is a danger of falling
- Working in a rise

- Working on a ladderway
- Working in a shaft
- Working on the cage maintenance platform

Where the hazard is a “fall” then **fall arrest** equipment must be used rather than **fall restraint** equipment.

Keep your safety devices in good condition. If in doubt have it checked out. Safety ropes or lanyards shall not be used to secure or lift equipment. Lifting equipment is to be used.

Barricades

Barricades are structures that are erected to prevent access where a potential hazard may exist. A barricade may be a suspended rope, chain, wire, fence, mesh or ventbag across an opening. Treat them all as solid impenetrable fences.

Safety signs must be placed on all erected barricades and have to be strictly obeyed. These signs can only be removed if permission has been obtained from your supervisor. The ground or air quality may be dangerous or for any other reason that you may not be able to identify.

If a “No Entry” sign has been placed on a barricade, it may only be removed with the permission of the Underground Manager. If you see an unsafe situation, report the matter to your shift supervisor. Whenever possible erect a barricade to protect your fellow workers before you leave the area.

Underground Emergency Procedure

Emergency notification procedure:

- Attempt to eliminate the hazard if safe to do so.
- Warn personnel in your vicinity if they are not already aware of the situation
- Raise the alarm by dialling Emergency Telephone Number 555 (if near telephone) or use the two way radio and put out an emergency call until answered, when raising alarm report all relevant information:
 - Your name.
 - Location.
 - Nature of emergency.
 - How many casualties or people involved and their injuries if known.
 - Stay in contact with person you are reporting to and then follow instructions.
- At no time enter or go below the area of the emergency.
- Make your way to the nearest refuge chamber and await instructions.

Stench Gas and Evacuation Procedure

Stench gas is a pungent smelling gas that is used to warn personnel of the immediate need to evacuate the mine workings. It is non-toxic but has a strong unpleasant odour that is very distinctive and it cannot be mistaken for other gases or fumes that are sometimes smelt underground.

A person instructed by the Incident Controller, Emergency Services Coordinator or Shift Supervisor can activate the Stench Gas System.

When personnel in the underground workings of the mine detect Stench Gas or are notified by radio, or other means of an evacuation are to proceed as follows:

- Cease all work immediately, make safe and isolate all equipment.
- Make your way to the nearest refuge chamber.
- Do not don your self-rescuer unless having to enter smoke to make your way to a refuge chamber.
- Stay in refuge chamber and relay names and number of personnel in refuge chamber to the Emergency Control Centre on **111** and follow instructions from the Emergency Control Centre.
- If directed to go to **U/G Emergency Muster Area** make your way to the **18 LEVEL PLAT** in quickest, safest manner and follow all instructions.
- If told to remain in refuge chamber, activate the regenerative oxygen system of the refuge chamber.
- Remain in refuge chamber until advised by Incident Controller or when Mine Rescue arrives and advises personnel it is safe to leave Refuge Bay.

Emergency Response

When the Emergency Coordinators or the Mine Rescue Team are responding to an underground incident they will give an “Emergency, Emergency, Emergency” call over the radio and the details of where the emergency vehicle is traveling to.

When personnel hear this call all vehicles are to park safely off the decline and maintain radio silence until the all clear is given by the Emergency Coordinator.

Escapeways

Escapeways are a system of ladder ways used for personnel to evacuate from working areas of the mine to nearest refuge chamber.

Escapeways are not fresh air bases or muster areas they are to be used as emergency travel ways only.

In some areas of the mine you may have to descend down an escapeway to the nearest refuge chamber.

Refuge Chambers

Scrubber units in Refuge Chambers work on the principal of sucking in the room's air through chemical granules to absorb carbon dioxide and add pure medical grade oxygen. It sustains a normal atmosphere for many hours or days if necessary.



Once in refuge chamber follow the instructions on the wall.

The location of the refuge chambers change frequently due to mining activities, all underground personnel must ensure that they know location of the nearest refuge chamber at all times.

Self-Rescuers

The oxygen self-rescuer provides the wearer with a supply of oxygen. It contains a chemical that reacts with the moisture and Carbon Dioxide that the wearer exhales to generate oxygen.

These units allow you to escape from atmospheres that are low in oxygen and they also protect you from other toxic gases as well as Carbon Monoxide.

The rate of oxygen generation depends on the amount of exertion by the wearer. At complete rest the unit will last approximately 100 minutes. Moderate exertion shortens the duration to about 60 minutes and heavy exertion will shorten the duration to about 30 minutes.

A Self Contained Self Rescuer (e.g. MSA 30/100) must be carried at all times.

Procedure for Donning Oxygen Self Rescuer

- Lift the sealing lever on the Rescuer and break the seal.
- Pull the rescuer from the container using the neck strap.
- Remove your safety helmet, place the neck strap around your neck and replace your safety helmet.

- Insert the mouthpiece into your mouth and bite down on the lugs to seal your lips around the mouthpiece.
- Inflate the breathing bag by exhaling into the mouth piece. (this starts the oxygen generation process)
- Place the nose clip on the fleshy part of the nose to seal your nostrils.
- Tighten the neck strap and waist strap. (allow comfortable movement)
- Proceed to the nearest refuge chamber - **DO NOT RUN.**

Additional site requirements not covered in TIMI

The following are a list of site requirements, procedures and services not covered in the TIMI generic inductions.

Toilets

Toilets have been installed at various locations underground please ask for their current locations.

Keep them clean and hygienic for all personnel. It is a disciplinary offence to soil in a mine other than in a proper toilet.

Telephone

Internal site telephones are located throughout the mine. If phone lists fade or are missing, advise your Shift Supervisor.

Do not abuse the phone!

Radios

The underground workings are equipped with a “leaky coaxial cable feeder” communication system which allows radio contact from the surface to most locations underground.

The radio channels used underground are:

Channel 1 This is the main underground channel and is used when travelling in the decline and on all the levels.

Channel 2 Line of site' channel, it cannot be heard in other areas of the mine. Mainly used for truck/boggers in loading bays.

Channel 3 This channel is used to contact the underground fitters and electricians.

Channels 4 & 5 These channels are used for long conversations between underground personnel.

Channel 6 - **EMERGENCY CHANNEL** - This channel will transmit over all other channels but will not receive, this channel is to be used in case of an emergency. Once you have broadcasted an emergency message on channel 6 you **MUST** return to channel 1.

Only approved radios are allowed underground, as their power output is restricted to prevent initiation of electrical detonators.

First Aid Kits

First Aid Kits are **located on the surface and underground** at various locations including:

- Admin (main office)
- Winder House
- Main Workshop
- Crib Rooms
- Main First Aid Room
- Light Vehicles
- Refuge Chambers

If you have used gear from the kits, inform the OH&S Department so it can be replaced.

Injury Notification

Always report ALL injuries no matter how minor to the Shift Supervisor or First Aid Personnel prior to going off shift.

This includes, but is not restricted to, the following types of injuries:

- Eye
- Head
- Neck
- Back
- Fuming
- Electrical shock
- Vehicle accident
- (Or if you're not sure)

Injuries must be reported and first aid assistance obtained immediately!

Drinking water

Water from the general mine service lines is not suitable for drinking. Fresh drinking water is available at the underground crib rooms.