VULCAN MINE

Standard Operating Procedure
Hot Work

Contents

1. PURPOSE

The purpose of this procedure is to describe the requirements and to ensure the effective management of hazards and risk associated with Hot Works and Hazardous Hot Works at the Vulcan Mine.

This procedure has been developed to ensure compliance with section 96(c)(ii) of the CMSHR.

- Section 96(c)(ii) cutting and welding, including using cutting and welding equipment in a confined, wet or dusty location.

2. SCOPE

This procedure is applicable to all persons at the Vulcan Mine including employees, contractors and visitors.

The controls within this procedure are mandatory.

3. DEFINITIONS

Authorised Person	A Person who has been assessed as competent and authorised under the authority of the SSE/SSE delegate to undertake a specific task at Vulcan Mine.
Competent Person	A person for a task at a coal mine that has the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons.
CMSHA	Queensland Coal Mining Safety and Health Act (1999).
CMSHR	Queensland Coal Mining Safety and Health Regulation (2017).
CMW	Coal Mine Worker.
CPR	Cardiopulmonary Resuscitation.
Designated Hot Work Area	A specific location designed and approved for hot work operations that is maintained fire safe that is of non-combustible or fire resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.
Fire-watch	A person or persons responsible for continuously observing the hot work area, maintaining fire safe conditions, responding to emergencies during hot work conditions and emergencies during hot work operations and in the established period following
Hot Work	Means welding, soldering, heating, cutting, grinding in which the surface temperature of the work, or a tool used for the work, is likely to exceed 150ºC.
Hazardous Area	An area in which flammable liquids, vapors or gases, combustible materials / liquids, dusts, fibers, or other flammable or explosive substances may be found.
Hazardous Hot Work	Hot works that is conducted in a confined, wet or dusty location. Where risk of engulfment and work being completed can introducing a noxious and irrespirable atmosphere.
JHA	Job Hazard Analysis.
MOP	Mine Operating Procedure
Non-designated hot work area	Areas that have been used for Hot Work activities for temporary work that is out of the designated Hot Work area.
PPM	Parts Per Million.
RCD	Residual Current Device.
RPE	Respiratory Protective Equipment.
SHMS	Safety and Health Management System.
SOP	Standard Operating Procedure.
SSE	Site Senior Executive.
Take 5	Personal Risk Assessment.
VRD	Voltage Reduction device.

4. RISK MANAGEMENT

Where Hazardous Hot Works are to be conducted onsite or where there is a potential of injury when performing Hazardous Hot Works, the Risk Management process shall be followed to the level of the task being undertaken in accordance with ***VUL-MOP-049-Risk Management***.

The risk management process should consider the following points:

- Control measures for Welding.
- Control measures for Heating.
- Control measures for Grinding.
- Control measures for hot substances.
- Control measures for volatile atmospheres.
- Electrical equipment and usage.
- Equipment and usage.
- Housekeeping of the work area.
- Hot work areas.
- Ignition sources.
- Fire watching; and
- Fire and explosion.

NOTE - Workers have a duty to take reasonable care for their own health and safety and to not adversely affect the health and safety of other persons. Workers must comply with reasonable instructions, as far as they are reasonably able, and cooperate with reasonable health and safety policies or procedures that has been notified to workers, including information, instructions and training in relation to work carried out by the worker in a confined space. If personal protective equipment (PPE) is provided, the worker must so far as they are reasonably able, use or wear it in accordance with the information, instructions and training provided.

5. PROCEDURE

5.1. General

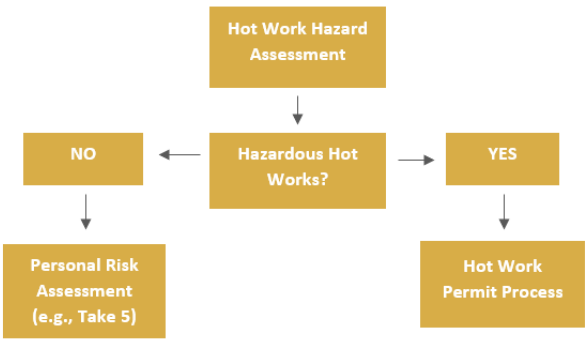
VUL-FRM-02-05-Hot Work Hazard Assessment shall be completed prior to hot work tasks being conducted, to determine if the work is hazardous hot work.

The risk assessment shall consider any contingencies which may be required for the task to be undertaken such as:

- Placing first response firefighting in close proximity where hot work is being carried out; and
- Ensuring the availability of a supply of clean, cool water for the initial treatment of heat burns if sustained.

As per the Hot Works Risk flow chart (**Error! Reference source not found.**), a personal risk assessment shall be conducted for all hot work tasks deemed non-hazardous. All hazardous hot works require ***VUL-FRM-19-05-Hot Work Permit*** prior to commencing.

Figure 1 : Hot Works Risk flow chart



NOTE – If the work is to be undertaken in a Confined Space it must be in accordance with ***VUL-SOP-096a-Confined Spaces***.

5.2. Hot Work Permit

A VUL-FRM-19-05-Hot Work Permit shall be issued after a review of the ***VUL-FRM-02-05-Hot Work Hazard Assessment*** and all safeguards associated with the proposed hot work have been implemented and deemed satisfactory.

Where gas measurement or monitoring is necessary the work is to be carried out by a qualified and authorised tester in accordance with ***VUL-SOP-096a-Confined Spaces***.

Gas cylinders shall be located outside the hazardous location. The gas supply is to be turned off at the cylinders when not in use.

In areas considered a high fire risk, the work area shall be damped down or cleared of flammable or combustible materials and liquids.

The use of a spotter (fire watch) for hazardous hot work shall be used as required.

All personnel required to participate in or conduct hot work activities shall understand the requirements for the ***VUL-FRM-19-05-Hot Work Permit***.

Prior to approving a ***VUL-FRM-19-05-Hot Work Permit***, ensure:

- The permit is completed in full;
- Fire watch requirements have been reviewed and deemed appropriate to the risk;
- Hazards have been identified and controls are considered adequate;
- A JHA is to be completed and attached to the permit.

On close out of a ***VUL-FRM-19-05-Hot Work Permit,*** ensure:

- Isolations have been removed;
- A fire watch must be used for 30 minutes prior to activities completion;
- Relevant parties have been notified; and
- Equipment/Area is safe to return to service.
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5.3. Non-Designated Hot Work Areas

Areas that have been used for Hot Work activities for temporary work that is out of the designated Hot Work area.

- Not contain any flammable or combustible liquids or materials (other than those being used for the work itself). Chemicals e.g. acetylene, oxygen not in use must be stored outside the designated hot work area until they are required;
- Include fire extinguishers or other firefighting equipment appropriate to the particular type of fire hazard and be located within close proximity of the work area;
- Be appropriately sign posted as a Hot Work In Progress see ***Figure 1***;
- Have a risk assessment conducted and signed off by the supervisor; and
- Have permanent signage in place for demarcating.

Figure 1

Figure 2

5.4. Designated Hot Work Areas

Areas that have been prepared for hot work activities shall be deemed designated hot work areas and shall:

- Not contain any flammable or combustible liquids or materials (other than those being used for the work itself). Chemicals e.g. acetylene, oxygen not in use must be stored outside the designated hot work area until they are required;
- Include fire extinguishers or other firefighting equipment appropriate to the particular type of fire hazard and be located within close proximity of the work area;
- Be appropriately sign posted as a designated Hot Work area as per ***Figure 2***;
- Have a risk assessment conducted and signed off by the supervisor; and
- Have permanent signage in place for demarcating.

5.5. Inspections

The work area is to be inspected by the Permit Issuer and the authorised CMW prior to commencement of hot work. All flammable materials shall be removed or suitably protected from ignition sources.

Welding equipment shall be inspected prior to use, using the Welding Equipment Pre-Start book, located with each welding unit.

Following completion of hot work and when closing a ***VUL-FRM-19-05-Hot Work Permit***, the Permit Issuer is to assess if all sources of ignition have been eliminated.

5.6. Firefighting Equipment

A fire safety check of the area is to be carried out by the authorised CMW prior to commencing the hazardous hot work. Appropriate firefighting equipment shall be located at a readily accessible location adjacent to the hazardous hot work.

When undertaking hot work in areas with installed fire detection systems, the permit holder is to contact the area supervisor and have the fire detection system disarmed. The area is to be occupied at all times when the fire detection system is disarmed, and the permit holder is to be advised when the hot work has been completed and the area has been ventilated. The fire detection system shall then be reactivated.

5.6.1. Fire Watch

A fire watch and associated monitoring periods shall be provided in accordance with the ***VUL-FRM-19-05-Hot Work Permit.***

5.7. Rules for Cutting and Welding

Welding machines must be switched off and isolated from the supply before connecting and disconnecting welding leads. All welding circuits shall be treated as 'live' including the return path.

Persons welding are to ensure no part of their body is placed so as to constitute a return path for the passage of welding current.

The following rules will apply to hot work carried out at any location:

- Screens shall be used between the welding and cutting operations and other persons in, or travelling through the area where practicable.
- All welding and cutting equipment purchased or brought onto the site is to comply with the relevant Australian Standards and is to be maintained, installed and operated in accordance with the relevant manufacturer's instructions.
- Hot work shall only be performed by authorised persons (refer ***VUL-ATN-16-Conduct Hot Work***);
- All gas equipment is to be inspected for damage before use and inspected for leaks immediately after cracking the cylinder valve.
- Flint guns are to be used for lighting gas equipment.
- Electric welding machines are to be inspected, tested and tagged by an electrical worker, every three months, in accordance with AS 1674.2 Safety in welding and allied processes – Electrical.
- The maximum open circuit voltage of a two-wire welding circuit shall not exceed 115V DC or 80V AC.

- The electrode lead is to be as short as is practicable. Where required lengths of electrode lead are in excess of nine metres, the allowable length is to be assessed and prescribed by a qualified electrician so as to restrict voltage drop to a maximum of 10% of the open circuit voltage.
- The return lead shall not be longer than the electrode lead and is to be positioned as close as is practicable to the work in order to prevent the return current from passing through mechanical machinery.
- Connect the work lead direct to the work to be welded and as close as practicable to the point of welding.
- Double eye protection must be worn at all times when cutting, grinding and gouging.

5.8. Flame Cutting, Welding or Pre-heating

Where there is a risk of accumulation of flammable or toxic gases, the work area shall be continuously monitored. Refer to ***VUL-MOP-142-Flammable and Toxic Gas in the Work Environment***.

Where excessive levels of gases are recorded, the area is to be evacuated and an adequate method of ventilation is to be installed.

Torches and pressure hosing connected to the supply are not to be left inside the working area when not in use. Very slow leaks of oxygen or fuel gas can allow an explosive atmosphere to build up rapidly.

Gas cutting may result in a build-up of oxygen levels due to not all the oxygen being used in the cutting operation. Ventilation is required to ensure the oxygen content remains at a safe level. Also, build-up of carbon dioxide and monoxide can occur.

Oxy/fuel gas hoses are to be of one continuous length if used within a confined space. For hot work outside of confined spaces, if joining couplings must be used, they shall be leak tested.

All gas hoses and cylinders used for hot work shall be fitted with flashback arrestors at the cylinder and hand piece.

5.9. Gas Cylinders

The following guidelines shall be followed for the safe use, transportation and storage of gas cylinders:

- To be stored upright, out of direct sunlight and away from sources of heat.
- Shall be secured to prevent falls and avoid shocks.
- Not to be allowed to come into contact with grease or oils.
- Transported either in the upright position or the semi-upright position on specially constructed welding trolleys with segregation between the cylinders.
- Will not be used if unlabelled. These cylinders are to be returned to the supplier.
- Will be segregated by type and content; and
- Empty cylinders will be tagged empty and segregated from full ones.

NOTE - For further information refer to the *VUL-SOP-056-Hazardous Substances.*

5.10. Ventilation

Before hot work is performed there shall be provision for adequate ventilation in the work area to protect the worker from potential fume the hazards. If natural ventilation is inadequate, then adequate mechanical ventilation shall be provided that can deliver a current of fresh air in the vicinity of the worker.

Provision shall be made for rapid shutdown of the ventilation plant. The ventilation power supply is to be tagged to prevent unintentional or unauthorised shut down.

If mechanical ventilation cannot be provided because of the nature of the work and the airborne contaminants are known, air-purifying respirators are to be provided. Where the contaminants are unknown or there may be an oxygen deficiency, air supplied RPE shall be worn. RPE is to comply with current AS/NZS 1716 Respiratory protective devices.

Where there is any possibility of toxic or flammable gas, the area is to be ventilated and the air monitored for the contaminants by an authorised gas tester following the requirements of the ***VUL-SOP-096a-Confined Spaces.***

NOTE – For RPE and PPE to be used in conjunction with Hot Work activities refer to *VUL-SOP-065-PPE.*

5.11. Welding in Wet Situations

The presence of water in the work area when welding increases the risk of electric shock. Body contact between the electrode and wet surroundings shall be avoided.

Excess water shall be drained from the work area prior to and during the welding operation.

Where the welder is required to work in a wet situation, the following work method must be followed:

- Obtain a ***VUL-FRM-19-05-Hot Work Permit***.
- Isolate equipment in accordance with the ***VUL-SOP-078-Isolation and Tagging***.
- Lighting shall be of the extra low voltage type (i.e. 32 volts or less);
- Earth leakage and RCD on electrical circuits and mobile welders.
- A Stand-by Person competent in CPR and First Aid.
- Provision for the Stand-by Person to cut off power to the welding equipment.
- Welding leads shall be checked to ensure they are in good condition.
- Connections checked to ensure they have clean contact surfaces and are properly tightened.
- Check for adequate insulation against electric shock, e.g. footwear, insulating mat, gloves etc.
- The length of flexible welding leads shall be kept to a minimum. The earth lead is to be shorter than the electrode leads where practicable;
- The earth lead is to be connected directly to object to be welded and as close as practicable to the point of welding.
- Power to the electrode holder shall be switched off until the CMW is ready to commence welding, while electrodes are being changed and if the CMW is required to leave the job.
- Where water is present above the work area e.g. dripping roof or rain, suitable covers shall be positioned to protect the welder and equipment against any water from above; and
- Ensure the working floor area is dry.

5.12. Welding or Cutting Containers Which Have Held Combustibles

The welding or cutting containers which have held combustibles shall be determined by risk assessment and must be authorised by the SSE.

It is important to identify completely the type of liquid, gas or other flammable material which has been or is contained in the vessel. This aids in determining appropriate means of avoiding fire, explosion or other health risks.

In all situations (regardless of whether the work is completed within a designated hot work area) where such work is to be carried out, a ***VUL-FRM-19-05-Hot Work Permit*** shall be obtained.

- Even small amounts of residual gas forming substances can cause a serious explosion. The following requirements shall be met when welding or cutting on containers which hold, have previously held, or possibly has held, combustibles.
- Appropriate chemical testing methods shall be carried out by qualified personnel;
- Sight or smell shall not be used to determine if safe working conditions apply;
- Identification of the type of liquid, gas or other flammable material which has been or is contained in the vessel. If the previous contents of a vessel to be worked on are unknown, it should be treated as having contained a combustible substance;
- The container shall be purged;
- Personnel cutting, welding or heating shall only be carried out by experienced welders who fully understand the hazards involved;

- Cleaning by methods appropriate to the size of the container and nature of its contents is required prior to cutting or welding, except where the hazard can be avoided by other methods.
- Ventilation during cleaning should ensure flammable gases are quickly and safely dispersed. Open air cleaning is preferred.
- Continuous monitoring of the container's oxygen level must be carried out during the cutting and welding. If oxygen level rises above 2% (20,000 ppm), then all cutting and welding must cease until the oxygen level is 2% or lower.
- Ignition sources such as flames, electric lights or equipment which could generate sparks are required to be moved from the vicinity of the container prior to cleaning or rendered inoperative and positively isolated.
- Chisels, hammers, etc. made of steel should not be used for cleaning or scraping of residues, as sparks can be generated and ignite gases. Wooden or bronze mallets and scrapers of non-sparking materials are preferred.
- Internal piping, baffles, trays, etc. should be removed and drained to facilitate cleaning where practicable.
- Residue removed from containers should immediately be stored in a safe place.
- Compartments within a container should all be treated in the same manner, even if only a localised portion of the container is to be worked on.
- Rendering of materials to a non-explosive or non-flammable condition may under certain circumstances, provide an alternative to cleaning; and
- Solvents may in themselves constitute a hazard in a welding environment and advice should be sought before their use.

NOTE - Washing with either hot or cold water is not generally an acceptable method of cleaning as many chemicals are not soluble in water.

6. ROLES AND RESPONSIBILITIES

SSE	Shall review and approve this procedure.
HST Manager	Shall ensure that all provisions of this procedure are implemented, and that compliance is achieved.
Superintendents	Shall be responsible for their area of operations and the implementation and application of this procedure. Provide adequate training, information, structure and supervision to ensure that this procedure is implemented. Carry-out a periodic review of activities to ensure the appropriate application and understanding of this procedure; and Ensure immediate and appropriate steps are taken to investigate and rectify any risks to health and safety arising from these activities.
Supervisors	Ensure all CMWs are familiar with, have access to and comply with the requirements set out in this procedure.
All CMWs (including visitors and contactor)	Shall comply with the requirements of this procedure.

7. REFERENCES

- AS 1319-1994 (R2018) Safety Signs for the occupational environment
- AS 1674.2-2007 Safety in welding and allied processes – Electrical
- AS 1940:2017 The storage and handling of flammable and combustible liquids
- AS 4332-2004 (R2016) The storage and handling of gases in cylinders
- AS/NZS 1596:2014 The storage and handling of LP Gas
- AS/NZS 1716:2012 Respiratory protective devices
- Coal Mining Safety and Health Act 1999 (Qld)
- Coal Mining Safety and Health Regulation 2017 (Qld)
- VUL-ATN-16-Conduct Hot Work
- VUL-FRM-02-05-Hot Work Hazard Assessment
- VUL-FRM-19-05-Hot Work Permit
- VUL-MOP-142-Flammable and Toxic Gas in the Work Environment
- VUL-SOP-056-Hazardous Substances
- VUL-SOP-078-Isolation and Tagging
- VUL-SOP-096a-Confined Spaces

8. REVIEW

This document shall be reviewed as follows:

- When there is a change of method and/or technology and/or legal or other requirement that may affect the accuracy of this document;
- When operational changes occur that effect the currency of the document;
- When there has been a significant event to which this document was relevant; and
- As a result of relevant audit findings.

9. DOCUMENT REVIEW

Version	Date	Description	Document Controller
01	03/03/2020	Creation of document	Rachael Dacker
02	03/07/2020	Risk workshop	Shane Johnson
03	30/04/2021	Classification of class C welding requirements, review and formatting	Nicole Davey
04	31/06/2021	Reviewed with cross section against MRE	Nicole Davey
05	24/09/2021	Reversion to hazardous hot works and review	Rachael Dacker
06	26/10/2021	EEM Review	Ben Kachel
07	25/10/2024	Review and formatting	Kelly Jensen