FIRE SERVICES COMMISSIONER VICTORIA

Health Management & Decontamination Plan

Latrobe Valley Coal Mines Fires

WORKING IN CONJUNCTION WITH CFA MFB Victoria Department of Environment and Primary Industries

15.02.2014

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This Plan including all Attachments has been approved and endorsed by the following:

Approved by:

.....
Regional Controller
[date]

.....
Incident Controller
[date]

.....
CFA Medical Officer
[date] 6/2/14

Endorsed by:

.....
State Controller
[Date] 14/2/14.

.....
CFA Chief Officer
[Date] 14/2/14

.....
MFB Chief Officer
[Date] 14/2/14

.....
VICSES Chief Officer
[Date] 14/2/14

W Chivers
Fire Services
Scientific Officer

This Plan will be formally reviewed and where required amended every three days.

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Context

On Sunday 9 February 2014, a large number of grass fires started around Morwell. As a result, fires impacted a range of infrastructure, including the Hazelwood Power Station and Yallourn Power Station. Fire remains in the area around Morwell, including inside the Hazelwood mine site and in proximity to the Yallourn Power Station. There are complex health and safety issues specific to the environment. The fires are expected to burn for a number of weeks. Incident Control planning has been extended to 28 February and will be reviewed every three days.

Purpose

The Health Management & Decontamination Plan for the Latrobe Valley Coal Mine Fire (the Plan) has been developed to manage the health and safety of all personnel on the fireground at the Hazelwood and Yallourn Mines.

The Plan documents the health, safety and welfare arrangements in relation to:

- General Health and Crew Selection requirements for deployment to Hot Zones
- The health monitoring process for personnel that have been deployed to the mine fire due to the risk posed by elevated levels of Carbon Monoxide
- The management of Personal Protective Clothing & Equipment used in the Hot Zones.

Validation and Audit of Plan

Following approval and endorsement this Plan, it is intended that independent validation through of the implementation of the Plan and associated processes be undertaken by a third party to monitor compliance. There will also be random audits undertaken to validate that the Plan and associated processes have been implemented and are followed for the duration of the event.

Carbon Monoxide Information

Carbon monoxide, or CO, is an odorless, colorless gas that can cause sudden illness and death. Exposure to high levels of Carbon Monoxide have significant health impacts. The use of 5% as the limit for operational activity has been determined by a range of Health Professionals including the CFA Medical Officer and MFB Brigade Medical Officer.

This amount is half the recommended level of NIOSH and Safe Work Australia. This level was also determined with consideration given to previous protocols set in past incidents at this site.

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Crew Selection

General Health Issues

Individuals, who are heavy smokers, have a history of cardiovascular or respiratory conditions should not be deployed to this incident.

This is due to the increased physiological sensitivities that might be attributable from increased carbon monoxide levels in the open cut fire.

Crews planning to be deployed for a shift in the open cut fires should have 24hrs of "clear time" away from smoke logged incidents (e.g. prior deployments).

Female Personnel

Due to the increased presence of carbon monoxide within the Open Cut Hot Zone there is a risk to the foetus of pregnant women exposed to high levels of concentrations from the carbon monoxide at this incident.

Due to this risk any female fire-fighter who is pregnant or there is any chance they may be pregnant, should not attend this incident due to the increased potential exposure to carbon monoxide.

It is the responsibility of staff who are allocating members to this incident to ensure that the above guideline is followed and ensure that all personnel have been clearly briefed.

Pre Deployment, Pre Entry, Pre Tasking,

Prior to deployment personnel are given a Carbon Monoxide Information Sheet (Refer Attachment 2) and briefed of the risks and safe work practices prior to deployment.

At the commencement of shift crew leaders are given a Crew Leader Instruction for Carbon Monoxide Management (Refer to Attachment 3)

Crew Health Management

The following is to occur:

- Agencies providing crews for deployment are to ensure the crew selection criteria are met.
- The Incident Controller will determine the Hot Zone and Warm Zone.
- The Incident Controller will identify 'Dirty' and 'Clean' areas and appropriate areas for decontamination and disrobing.
- Crew health observations are to occur and be recorded in accordance with the Health Monitoring Process (Attachment 4).

- Crew Health Observations may be undertaken by first aiders under the supervision of a Health Professional
- Where any results do not meet the criteria established they are not to be deployed.
- Crew deployment shift times are to be recorded and monitored to ensure they do not exceed the maximum timeframes (Refer to Attachment 3)
- There will be ambient gas monitoring in Hot and Warm Zones.
- A 'bagging' and 'tagging' process will be followed.
- The incident is to be deemed a non-smoking site to reduce the impact of CO build up in individual's
- All gas monitoring results are to be logged and maintained. Results that exceed defined levels are to be investigated to ensure crew welfare is not placed at risk and appropriate control strategies are in place
- All injuries, near misses or hazards are to be notified via the chain of command, recorded and action taken where deemed appropriate
- The importance of eating well, being properly hydrated – for every two litres of water consumed, 1 litre of electrolytes should be consumed.
- Rest breaks should be taken and crews should not undertake any strenuous activity during this period.
- At the commencement of each shift crew leaders are given a Crew Leader Instruction for Carbon Monixide Management (Refer to Attachment 3)

Personal Protective Clothing (PPC)

- Bushfire protective clothing is to worn at all times.
- Crews are to use BA in accordance with Attachment 3
- Crews operating outside the Hot Zone are to use a P2 particulate filter in accordance with Attachment 4
- Where appropriate open up PPC clothing to allow adequate ventilation

Shift Arrangements

Maximum shift durations for this incident are outlined in Attachment 3 Crew Leader Instruction

These shifts arrangements should be regularly reviewed and will be modified based on risks identified such as:

- extreme heat
- heavy smoke logging
- work activity
- work rate
- on the recommendation of the CFA Medical Officer or MFB Brigade Medical Officer.

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Shift Release

Prior to release crews should be made aware of the symptoms of CO exposure and advise to present to hospital should these occur. Symptoms include headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion. (Refer to Attachment 2 & 4)

PC/E Management

To ensure ongoing availability of fit for purpose PPC for rotating crews at the Latrobe Valley open-cut mine. The following plan is proposed to ensure required quantities of PPC remains available for the duration of this incident.

Key areas requiring direct management:

- Onsite cleaning of PPC
- Offsite cleaning of PPC
- Staging area PPC resupply point
- SLC ongoing resupply
- Disposal of unserviceable items

Onsite cleaning of PPC

The following items of PPC can generally be cleaned on site:

- Bushfire Helmet (including Head Cradle/Harness)
- Goggles

Use a mild detergent pH range 6.0 to 10.5 with warm water and a soft cloth to wipe. Dry in well-ventilated area not in direct sunlight.

- General Purpose Leather Firefighting Boots (external contamination only)

Hose off and/or scrub with brush as required, air dry.

Offsite cleaning of PPC

Where any of the below items of PPC are heavily soiled the following offsite decontamination arrangements can be implemented:

- Bushfire Jacket (24 hours)
- Bushfire Trousers and Braces (24 hours)
- Bushfire Helmet Neck Protector (24 hours)
- General Purpose Leather Firefighting Boots (48 hours)

The contracted Decontamination and Cleaning Service Provider can attend and collect items from the staging area. Cleaned items will be returned to the staging area within 24 hours (excluding boots which will take 48 hours due to drying time).

Staging Area PPC Resupply Point

A cache of the following items can be established at the Staging Area for managed allocation:

- Bushfire Jackets x 200

- Bushfire Trousers and Braces x 200
- Bushfire Helmet Neck Protector x 100
- General Purpose Firefighting Boots x 100
- Goggles x 300
- Bushfire Gloves x 300
- P2 Respirators x 1000

Cache quantities would be established to cater for approximately 200 wearers to support crew rotation frequencies and cleaning processes.

A cache will be drawn from both CFA and MFB stores.

It is recommended that all items issued from the staging area resupply point (as appropriate) be issued on a one for one replacement basis.

State Logistics Ongoing Resupply

Incident duration will determine the need for any additional supplies which would be arranged directly with the State Logistics Centre (SLC) and/or MFB equivalent.

Disposal of Unserviceable Items

Items deemed unserviceable should be consolidated at the staging area for later disposal in accordance with local industrial waste arrangements.

PPC/E Planning Considerations

The following PPC/E is immediately available and should be considered:

- Significant quantities of FirePro (Level 2) gloves are immediately available from the SLC and should be considered for this incident.

- Significant quantities of Bushfire Overalls are immediately available from the SLC and should be considered for this incident.

- Detailed steps, processes and responsibilities require documenting upon acceptance of any or all of this proposed Management Plan.

Breathing Apparatus

Arrangements for the maintenance, filling and supply of breathing apparatus will be established in light of the expected incident duration and volume of B/A being used. The Incident Controller should liaise with PPE/C Management Centre or MFB Protective Equipment Manage to enable appropriate planning.

Vehicles & Appliances

CFA, MFB, SES and contractor vehicles and appliances MUST be signed off by a CFA District Mechanical Officer (DMO) or MFB mechanic, as appropriate, prior to returning 'home' or being redeployed due to the fire risk caused by coal dust in the brakes.

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The Incident Management Team via the Resourcing Unit will be required to supply vehicle numbers, types and names to the Fleet Services Duty Officer prior to demobilising from the incident. As much forward notice should be given to ensure DMOs are prepared.

All vehicles deployed to the mines must have a full decontamination wash to the body, pump, cabin interior and underside of vehicle, prior to leaving the mine site.

All vehicles will be delivered by CFA 'Operations' to CFA workshop at Moe to have wheels and brake drums removed for inspection and cleaning prior to returning 'home' or redeployment. This task will be organised by CFA Fleet Services to ensure vehicles are prepared for redeployment in the shortest possible time frame.

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Attachment 1 - Carbon Monoxide Specific Information

Background

Carbon monoxide (CO) has a high affinity for haemoglobin (Hb) in blood. Hb is the compound that transports oxygen (O2) in the blood stream. CO is absorbed via the lungs into the blood stream where it forms carboxy-haemoglobin (COHb). CO has 240 times the affinity for Hb than oxygen so that:

$$\frac{\text{CO Hb}}{\text{O2Hb}} = \frac{240\ \text{pCO}}{\text{pO2}}$$

In basic terms, low levels of CO will rapidly displace O2 from Hb and rapidly reduce the bloods oxygen carrying capacity. Small quantities of carbon monoxide (CO) are produced in the human body naturally. This leads to a background level of 0.3 – 0.7% COHb in normal individuals.

Ambient air that has a CO level of 35 ppm will result (under normal circumstances) in a CO Hb concentration of 5 %.

The half-life of COHb is 2 – 5 hours.

CO – Acute poisoning:

The appearance of symptoms in someone suffering from acute exposure is dependent on the following:

- The concentration of CO in air breathed
- The exposure time
- The degree of physical exertion
- Individual susceptibility

Susceptible individuals include the following:

- Pregnant females – toxicity to foetus
- People with anaemia (low blood count)
- People who have cardio –vascular or blood vessel disease(CVD)
- Smokers and those with respiratory disorders

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Acute effects are summarised in the following:

CO Hb Concentration %	Principal signs and symptoms
0.3 – 0.7	No signs or symptoms, normal endogenous background
2.5 – 5	No symptoms. Compensatory increase in blood flow to vital organs. People with CVD may lack compensatory reserve and experience chest pain.
5 – 10	Visual light threshold increased
10 – 20	Headache ("frontal tightness"), possible shortness of breath. May be lethal for someone with severe heart disease.
20 – 30	Moderate headache, nausea, flushing
30 – 40	Severe headache, dizziness, nausea
>40	Collapse, coma, convulsion, death

N.B. This is given as a guide only and there may be considerable variation depending individual history.

Acute poisoning

Acute CO poisoning may result in neurological problems.

Primary recovery may be followed by a subsequent neuropsychiatric relapse days or even weeks after poisoning. The degree of brain damage after CO poisoning is determined by the intensity and duration of exposure.

Repeated exposure

CO does not accumulate in the body, it is completely excreted after each exposure if sufficient time in air is allowed. Remember half life of CO in blood is 2 – 5 hours. However it is possible that repeated mild / moderate poisonings can lead to permanent nervous system damage (headaches, dizziness, impaired memory, personality changes and weakness in limbs).

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Attachment 2 – Carbon Monoxide Information Sheet for Personnel

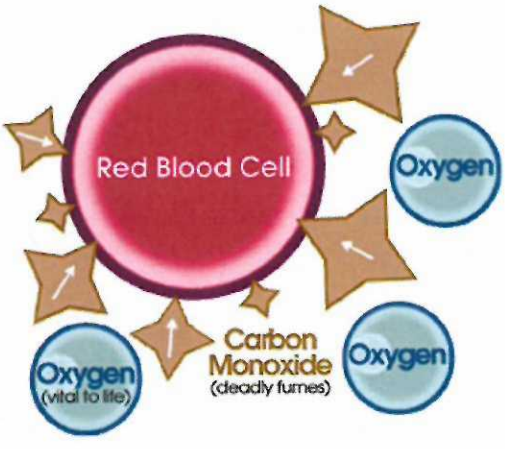
Frequently Asked Questions

What is carbon monoxide?
Carbon monoxide, or CO, is an odorless, colorless gas that can cause sudden illness and death.

Where is CO found?
CO is found in combustion fumes, such as those produced by cars and trucks, small gasoline engines, stoves, lanterns, burning charcoal and wood, and gas ranges and heating systems. CO from these sources can build up in enclosed or semi-enclosed spaces. People and animals in these spaces can be poisoned by breathing it.

What are the symptoms of CO poisoning?
The most common symptoms of CO poisoning are headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion. High levels of CO inhalation can cause loss of consciousness and death. Unless suspected, CO poisoning can be difficult to diagnose because the symptoms mimic other illnesses. People who are sleeping or intoxicated can die from CO poisoning before ever experiencing symptoms.

How does CO poisoning work?
Red blood cells pick up CO quicker than they pick up oxygen. If there is a lot of CO in the air, the body may replace oxygen in blood with CO. This blocks oxygen from getting into the body, which can damage tissues and result in death. CO can also combine with proteins in tissues, destroying the tissues and causing injury and death.



Reference: Centers for Disease Control http://www.cdc.gov/co/faqs.htm

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Attachment 3 – Crew Leader Instruction for Carbon Monoxide Management

All crew must be checked by Health Monitoring personnel prior to entering the mine.

All crew leaders are to collect carbon monoxide detectors and ensure there is one per appliance

Log the detector reading every 15 minutes on the attached sheet.

Provide average and peak readings and map grid reference of location to the DIVCOM every hour via radio.

Crews must not work in the mine for a continuous period of greater than 2 hours without leaving the mine. These 2 hour periods of operation within the mine must not exceed 4 in any 12 hour period.

If in any 1 hour period there are two measurements greater than 50ppm on the personal monitoring device but less than 75ppm, workers must withdraw from the area immediately don CABA to remain working in this location.

At any time a carbon monoxide reading of 75ppm or greater is recorded, CABA must be immediately donned or workers must withdraw from this area. This must be immediately reported to the DIVCOM.

All crews must be rechecked by Health Monitoring Personnel at the conclusion of their shift prior to leaving the site. Personnel will not be permitted to leave the site without appropriate clearance provided by the Health Monitoring personnel.

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Attachment 4 – Latrobe Valley Coal Mine ICC – Heath Monitoring Process

The following process is being undertaken to monitor and manage the health of all personnel on the fireground at the Hazelwood & Yallourn Mines. The process will be overseen by a qualified Health Professional to ensure the protocol is followed.

On Arrival

1. Personnel (emergency service organisation personnel, mine workers and contractors) enter the staging area and hand in 'T cards' to the Staging Officer
2. Personnel are directed to enter the official entrance of the DIVCOM building.
3. Hygiene stations have been established at the DIVCOM entrance for personnel to wash hands before entry.
4. Personnel enter the Health Monitoring (HM) assessment area via cordoned walkway and sit with available HM team member.
5. HM team member (HM team member includes CFA Health member with appropriate qualifications or Health Professional) attaches Pulse Oxymeter probe to personnel's third finger and obtains a CO reading.
6. HM team member records:
    - CO reading
    - Time
    - Name
    - Smoker or non – smoker status
    - Previous activity associated with fire in the last 24 hours
7. Based on the CO reading, the HM team member directs the person to take the specific actions.

CO READINGS	ACTIONS
Reading is less than 5%	1. Person is released from HM assessment area via designated exit and instructed to: - enter the incident control centre for tasking, or - return to staging area for deployment to the Hot Zone, and/or - rest, and/or - eat.
Reading is equal to or greater than 5%	The person is unable to start work in the Hot Zone. Will either be reassigned or released.

Table 1 – On Arrival – CO Readings & Actions

8. All personnel that have a reading under 5% are approved to enter the staging area for deployment to the Hot Zone.

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During Shift (Hot Zone & Warm Zone)

9. Over a 12 hour shift, allow for 4 by 2 hour work shifts, includes break times and travel in and out of the mine two levels of monitoring are provided:
    - personal monitors for a crew member who is active outside the vehicle
    - remote monitoring and recording of CO plus H_2S O_2 and VOC from 'Area Rae' remote monitors back to the monitoring station.
10. Wear SCBA at all times in the Hot Zone

Atmospheric Carbon Monoxide (CO) Action Levels

11. Atmospheric monitoring, personal and remote monitoring will continue on an ongoing basis and results will be collated and analysed for both special mapping and to correlate COHb levels with CO exposure levels.
12. Crew member CO concentrations are to be recorded every 15 minutes and results relayed every hour to the DIVCOM with both average and peak readings and provide map grid reference.
13. If in this hour period, there are two measurements exceeding 50 ppm (parts per million) but less than 75 ppm on personal monitoring device, workers must withdraw or utilise CABA.
14. Any single measurement exceeding 75ppm, CABA must be immediately used or workers must withdraw from the area. This result must be reported to the DIVCOM immediately.
15. Any crews registering 150ppm or above must immediately move out of the area into clean air, contact DIVCOM and report to the Health Monitoring team.

Blood Carbon Monoxide (COHb) Action Levels

16. At any time during monitoring of COHb during a shift if the 5% level is exceeded, the worker will not be allowed back to work in areas of CO contamination.

Shift Completion

17. At the completion of shift, all personnel are required to undertake the health monitoring process. The process is the same as 'On Entry'. The following actions are taken based on the CO reading.

CO READINGS	ACTIONS
Shift Completion Reading Less than 5%	2. Person is informed they can leave the site via designated exit. 3. HM team member briefs person of potential health issues and to seek further medical advice if required.
Shift Completion Reading equal to or greater than 5%	4. Person receives a cable tie wrist band (indicating excessive CO reading) and is assessed by a Heath Professional and managed accordingly. Any person reporting any symptom's such as headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion should be referred to Ambulance Victoria

Table 2 – Exit from the Hot Zone at Shift Completion

18. Personnel who exit the area of operations will be wrist tagged.

CO Reading of Equal to or Greater than 8%

19. Any person with a reading equal to or above 8% at entry or exit stage, are immediately referred to Ambulance Victoria where they will be assessed and either sent home or to hospital for further assessment and monitoring. Exposures over 8% are to be reported as a 'Health Issue'.

Briefings – Pre Entry, Pre Tasking and Pre Release

20. On change of shift, strike teams are given a specific briefing on health and CO issues.

Post Deployment Medical Monitoring

21. Crews are to be advised that if after release from the site they develop symptoms of potential CO poisoning such as headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion they should present to the emergency section of the local hospital. On return home personnel are advised to rest for 24 hours, avoid alcohol and ensure good hydration. If they still have any symptoms as mentioned above, personnel should return to their local doctor or hospital emergency department.

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Appendix 5 - Delineation of Safety Zones for Carbon Monoxide Exposure Management by Atmospheric Monitoring

Background

To support the site health surveillance program, continuous monitoring of Carbon monoxide levels is being undertaken.

One member of each operational Fire Appliance is wearing a CO monitor. Members of Hazelwood mining and power station employees are also monitoring CO in their work areas. Results are being recorded by DIVCOM and Hazelwood OHS respectively.

In addition, positional monitors (AreaRAEs) are continuously monitoring CO, Oxygen, Volatile Organic Compounds, Flammability and Hydrogen sulphide levels throughout the site, including administration areas. These monitors are deployed in areas of concern and results are transmitted wirelessly to the HazMat Team in the Staging Area for continuous surveillance and risk assessment.

The Scientific Advisor will advise the HazMat Sector Commander when and where zone classifications need to be changed. HazMat Technicians are also monitoring CO throughout the Morwell community.

Table 1: Safety Zones and Action Levels – Operational Areas

The purpose of the following zones is to minimise the risk of personnel exceeding the biological exposure limit of 5% Carboxyhaemoglobin.

Zone	CO Concentration (ppm)	Exposure Management
Cold - Offsite	9	DoH and EPA should be consulted for guidance
Warm - Unrestricted	<30	At this level firefighters/workers are permitted to work in standard PPE, including P2 respirator, standard work hours, and undergo health surveillance as per site procedure.
Warm – Protective Action	30-50	As per site SCBA, crew rotation procedure
Hot - Restricted	>50	As per site procedure for essential works

Reference: SafeWork Australia Occupational Exposure Standards, Health and Safety Information System.

Cold Zone - Community Health Limits

Government of Australia, Department of Environment and Heritage recommend the ambient air CO level be kept below 9 ppm and persons not exceed this level for more than 8-hours in one year. DoH and EPA should be consulted for guidance.