



AMCOSH Pty Ltd
Occupational Health
& Safety Consultants
ABN 63 102 169 371

Suites 384/112 Symol Street
PO Box 650
Wendee VIC 3030
Ph: (03) 9731 1744
Fax: (03) 9742 2096
Email: enquiry@amcosh.com.au
Web: www.amcosh.com.au

MFB Regional Control Centre
Latrobe Valley Coal Mine Fires

13 February, 2014

Dear [REDACTED]

Re: Occupational Hygiene Advice (Health Monitoring Process) - Hazelwood Coal Mine Fire

At your request, I attended the Hazelwood mine yesterday evening and had discussions with [REDACTED] (Operations Officer), [REDACTED] (Operations Officer) and [REDACTED] (Scientific Officer) to review the health monitoring process for firefighters involved in fighting the mine fire. I understand that the process involves measurements of carboxy-haemoglobin (COHb) of the firefighters using a portable Masimo Rad-57 Pulse Oximeter fitted with SpCO sensor and that testing takes place at the ICC. The fire fighters are monitored when they first arrive on site and prior to entry to the mine. The tests are repeated when the crews come back to the ICC for their breaks or if the atmospheric monitoring indicates that they have been exposed to CO above the action limits which were set at >50ppm for 60 minutes or >150 ppm at any time. The following COHb action levels were in use at the time of the review:

COHb Concentration	Action
≤5 %	OK to enter/re-enter
>5 %	No entry O ₂ treatment for 20 minutes and retest. If repeat test ≤5 %, OK to return to the fire ground or go home. If repeat test >5 %, repeat O ₂ treatment for 20 minutes and retest etc
5-8 %	Send crew member home and refer to GP if symptomatic
>8 %	Refer crew member to paramedics

Monitoring of atmospheric CO levels was being undertaken using Drager PAC personal gas detectors (one per 4 man crew) with readings recorded every 15-minutes and radioed back to the ICC every 1-hour. Additionally, AreaRac Multi-gas/PID monitors with wireless remote monitoring capability back were being deployed in strategic positions to supplement the personal monitoring and provide spacial CO concentration information.

I observed the testing process and noted that there were a number of members who were being administered oxygen at the time (I observed 9 members at one time on O₂ therapy). During subsequent discussions, was advised that some of the members were arriving on site redeployed from other sites and had elevated COHb levels on arrival and that some (as high as 8 to 10% a level that would require them to be referred to paramedics). I also understand that some of the members

smoked following their tests before re-entering the fire ground, which would contribute to an elevation of their COHb.

Discussion

Safe Work Australia (formerly the National Occupational Health and Safety Commission – NOHSC) states in its documentation to the Occupational Exposure Standard for carbon monoxide that: "A level of 2.5-3% COHb is the lowest level at which clearly adverse health effects have been well-documented. These health effects are adverse cardiovascular effects on persons with pre-existing clinically overt coronary artery disease, giving rise to symptoms of angina pectoris" and that there are studies showing: "adverse effects in middle-aged clinically healthy men at 5% COHb, and one study showing non-specific effects suggestive of cardiac ischaemia in healthy young men at a level of 2.4%".

Safe Work Australia has set its Occupational Exposure Standard of 30 ppm for carbon monoxide in the breathing zone as an 8-hour time-weighted average concentration to maintain the COHb 5% to or below under normal temperatures, workloads and atmospheric pressures to minimise the risk to those persons with subclinical CAD and to foetuses of exposed pregnant women and also to protect against adverse behavioural effects arising from carbon monoxide exposure.


The setting of a COHb action limit of $\leq 5\%$ as a "Safe to Enter/Re-Enter" level in the Carbon Monoxide Exposure Management guideline for this incident appears to have no clear rationale or justification. Although loosely based on the Safe Work Australia standard, setting of this limit is inconsistent with the goal of maintaining a COHb level well below 5% to minimise the risk symptoms of CO poisoning. It also appears contrary to the advice provided by the MFB Medical Officer (Michael Sargeant) regarding the use of COHb limits as a decision making tool for this purpose. Under these limits, it is likely that members who are at or just below the 5% COHb level will be deployed in areas where their CO exposure will cause it to rapidly rise above this limit and thus potentially put them at risk of CO poisoning. This is particularly true given that the health-status of the members are unknown (particularly with respect to cardiovascular conditions) and that they will also be potentially exposed to depleted oxygen levels and elevated carbon dioxide levels (as well as airborne fine particulates and other airborne contaminants) and be undertaking increased levels of physical activity and elevated temperatures, all of which increase physiological stress and contribute to an increased risk of elevated levels. This was evident in my observations of the number of members being administered oxygen therapy, some with symptoms, during my review. The cumulative effects of repeated elevated COHb levels followed by recovery and subsequent CO re-exposure cannot be predicted and make the use of a strict COHb limit as a decision making tool questionable. Additionally, the accuracy and efficacy of using a portable COHb pulse oximeter for use in this scenario has not been validated and adds to the uncertainty of applying such limits.

A meeting was convened late on the 12th February with the Deputy Incident Controller [REDACTED], operations officers, the MFB scientific officer and paramedic representatives to discuss the above issues. The participants agreed that the situation with respect to potential CO exposure risk was untenable and that immediate action was required. The following resolutions were made at the meeting and were to be implemented on the night shift that evening:

- A strict "No Smoking" policy was to be enforced;
- Any entry into the mine would require compulsory SCBA use;
- Work around the perimeter of the mine fire where CO levels were low could be undertaken without SCBA;
- Atmospheric monitoring, both personal using Dräger personal gas detectors and AreaRAE monitors for CO was to continue on an ongoing basis and results were to be collated and analysed for both spacial mapping and to correlate COHb levels with CO exposure levels;
- COHb levels screening was to continue, both initially when entering the site and periodically, but this was to be used as a surveillance tool to assess the risk to individuals rather than as a decision limit for re-entry;
- The above was to apply to all personnel working at the mine fire site including mine personnel as well as fire crews;
- Where practicable, the use of fire fighting and asset protection methods which did not involve personnel entering high atmospheric CO levels would be employed.

It is believed the implementation of the above recommended actions would significantly reduce the potential for elevated CO exposure and ensuing risks of adverse health effects. However, continued evaluation of the situation and refinement of the implementation of these control and surveillance measures will ensure that the risk to fire crews and mine personnel are minimised.

Yours sincerely,



Robert Goloc FAIOH, COH
Principal Occupational Hygienist



