



Explanation of Exposure Standards and Action Limits used at Hazelwood  
TONKS, Craig

to:

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14/05/2014 07:40

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**From:** TONKS, Craig

**Sent:** Wednesday, 26 March 2014 4:20 PM

**To:** RAU, Peter; HOLLOWAY, Elizabeth

**Subject:** Explanation of Exposure Standards and Action Limits used at Hazelwood

Hi Peter,

The SafeWork Australia National Occupational Exposure Standard of 30 ppm CO, averaged over 8-hours (TWA-8hr) is set to prevent a worker's Carboxyhemoglobin (COHb) exceeding 5%.

In addition to the 30 ppm TWA-8hour exposure standard. There are short-term guides in the CO standard documentation to limit high CO concentration exposure and ensure the 8-hour average is not exceeded. These short term guidelines are:

- 1-hour: 60 ppm CO
- 30-minutes: 100 ppm CO
- 15-minutes: 200 ppm CO
- Peak: 400 ppm CO

We chose more conservative values as we had to consider the time needed to relocate to fresh air or don SCBA. For a 1-hour short-term limit, we selected 50 ppm. Our default standard was the United States Occupational Safety and Health Administration (OSHA), permissible exposure limit (PEL) for 8-hours of 50 ppm CO. Therefore, the use of 50ppm for one hour is considered conservative.

Selection of the peak level of 75 ppm was professional judgement resulting from a discussion between SAMFS DCO Mike Smith and myself. We did not want to go close to the SafeWork Australia peak guidance value of 400 ppm CO and felt that if we applied the mid-point between the adopted 1-hour limit of 50 ppm and the SafeWork Australia Guideline of 100 ppm for 30-minutes. That 75 ppm would be a very conservative peak that would allow fire fighters plenty of time to relocate to clean air and/or don SCBA in clean air.

Because of the requirement to keep the daily average below 30 ppm and to keep the 1-hour limit below 50 ppm as well as manage peak concentration exposure, we implemented a strict reporting procedure. Crew Leaders were required to record personal atmospheric results from each personal CO gas detector every 15-minutes, then radio the results to DivComm hourly. Furthermore, any two readings of 50 ppm or greater within the hour reporting period needed to be reported immediately and any single peak of 75 ppm or greater reported immediately. If either the short-term limit or peak was exceeded, the Crew Leader was advised to relocate the crew to clean air or the crew relocate and don SCBA in clean air for critical operations.

In addition, I had ran exposure scenario calculations using a CO Time-to-Dose calculation spread sheet authored by Professor Chris Gray of Deakin University. These calculations

reinforce the National Standards that by keeping the daily average exposures below 30 ppm, COHb will be kept below 5%.

Atmospheric CO (ppm)	Time of Exposure (hours)	COHb (%)
30	8	4.0
30	10	4.3
30	12	4.6

So, we used several reference standards to conservatively manage CO exposure. Along with the personal health monitoring for COHb, I believe we have implemented a reasonably practicable control measure for this event.

Regards,

**Craig Tonks MSc | Scientific Advisor**  
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