



# AIOH Submission to Safe Work Australia Regarding Proposed WES for Respirable Coal Dust (RCD)

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Prepared by: AIOH Exposure Standards Committee

## Australian Institute of Occupational Hygienists Inc (AIOH)

The Australian Institute of Occupational Hygienists Inc. (AIOH) is the association that represents professional occupational hygienists in Australia. Occupational hygiene is the science and art of anticipation, recognition, evaluation and control of hazards in the workplace and the environment. Occupational hygienists specialise in the assessment and control of:

- Chemical hazards (including dusts such as silica, carcinogens such as arsenic, fibrous dusts such as asbestos, gases such as chlorine, irritants such as ammonia and organic vapours such as petroleum hydrocarbons);
- Physical hazards (heat and cold, noise, vibration, ionising radiation, lasers, microwave radiation, radiofrequency radiation, ultra-violet light, visible light); and
- Biological hazards (bacteria, endotoxins, fungi, viruses, zoonoses).

Therefore the AIOH has a keen interest in the potential for workplace exposures to hazardous chemicals, as its members are the professionals most likely to be asked to identify associated hazards and assess any exposure risks.

The Institute was formed in 1979 and incorporated in 1988. An elected governing Council, comprising the President, President Elect, Secretary, Treasurer and three Councillors, manages the affairs of the Institute. The AIOH is a member of the International Occupational Hygiene Association (IOHA).

The overall objective of the Institute is to help ensure that workplace health hazards are eliminated or controlled. It seeks to achieve this by:

- Promoting the profession of occupational hygiene in industry, government and the general community.
- Improving the practice of occupational hygiene and the knowledge, competence and standing of its practitioners. To this end, the Institute has developed a certification scheme, which was approved by IOHA in May 2006.
- Providing a forum for the exchange of occupational hygiene information and ideas.
- Promoting the application of occupational hygiene principles to improve and maintain a safe and healthy working environment for all.
- Representing the profession nationally and internationally.

More information is available at our website – <http://www.aioh.org.au>.

## Consultation with AIOH Members

AIOH activities are managed through committees and working groups drawn from member hygienists. This submission has been prepared at late notice through AIOH Council comment offered to AIOH members generally and active consultation with particular members selected for their known interest and expertise in this area. Due to time constraints this submission has not been considered by Council.

## Technical Comment on the Recommendation and Basis for the Workplace Exposure Standard

The Australian Institute of Occupational Hygienists Inc. (AIOH) is the association that represents professional occupational hygienists in Australia. That is, they are the scientists who evaluate workplace risk to hazardous chemicals and physical agents by measuring the degree of exposure, and design and implement exposure control strategies. In reality, it is occupational hygienists whose job it is to apply WES's in the working environment. As such, they hold the greatest accumulation of knowledge on the degree of implementation of exposure monitoring and degree of compliance with the WES's.

The AIOH stand by their Position Paper on respirable coal dust (RCD) (AIOH, 2018b), as cited in the Safe Work Australia (SWA) *Draft evaluation report* for RCD. While the AIOH is not a standards setting body, through its Position Papers they seek to provide relevant information on substances of interest where there is uncertainty about existing Australian workplace exposure standards (WES's). This is done primarily through a review of the existing published, peer-reviewed scientific literature but may include anecdotal evidence based on the practical experience of certified AIOH members. The Position Papers attempt to recommend a health-based guidance exposure value that can be measured; that is, it is technically feasible to assess workplace exposures against the derived exposure value. It does not consider economic or engineering feasibility. As far as reasonably possible, the AIOH formulates a recommendation on the level of exposure that the typical worker can experience without significant risk of adverse health effects.

The AIOH recommends limiting worker RCD exposure to below an 8-h TWA guidance exposure value of 1.0 mg/m<sup>3</sup> of respirable dust fraction in air, with the approach of applying a TWA value of 0.5 mg/m<sup>3</sup> as an action level which triggers investigation of the sources of exposure and implementation of suitable control strategies. Compliance with the AIOH guidance exposure value of 1.0 mg/m<sup>3</sup> via the application of specific occupational hygiene sampling strategies and statistical treatment would result in average long-term worker exposures of less than 0.5 mg/m<sup>3</sup> RCD. In addition to RCD, the inhalable fraction of coal dust and other dust types such as RCS (i.e. alpha quartz) and 'stone dust' are recognised as being issues of concern in coal mines and at coal handling facilities. Worker exposure to these dusts should be assessed in conjunction with the RCD and the relevant AIOH guidance exposure values and control strategies applied. The Position Paper provides detailed technical analysis and comment for this position.

Current model Workplace Health and Safety (WHS) regulations require a person conducting a business or undertaking (PCBU) at a workplace to ensure that no person is exposed to a substance above the respective WES. The WES does not identify a dividing line between a healthy or unhealthy working environment, and it does not represent an acceptable level of exposure to workers. However, it does establish a statutory maximum upper limit (SWA, 2013).

This definition of a WES is however inconsistent with the same term used by SWA in their *Draft evaluation reports* for RCD. SWA have recommended a "health-based" WES and have purposely not taken into consideration practicality or feasibility. These considerations however should be required if WES's are to remain mandatory under WHS legislation.

The SWA recommended 8-hour TWA WES's of 0.9 mg/m<sup>3</sup> for respirable dusts of bituminous and lignite coal and 0.4 mg/m<sup>3</sup> for respirable dusts of anthracite coal reflect the TLV® values produced by the American Conference of Governmental Industrial Hygienists (ACGIH®). It is important to note however that the ACGIH TLV's® are "based solely on health factors" with "no consideration of economic or technical feasibility". Subsequently, the ACGIH® caution regulatory agencies against the application of TLV's® in regulations as they "are not designed to be used as standards" (ACGIH, 2015), particularly in circumstances where reliable test methods have not been validated to measure workplace exposures at the TLV®.

The incidence of lung disease is related to the amount of cumulative exposure (mg/m<sup>3</sup>.years) to RCD. Factors such as increasing worker age, the rank of the coal and other mineral contaminants influence

the prevalence of disease, being higher with higher rank coals and coal dust containing high levels of crystalline silica (i.e. alpha quartz). In addition, workers who have experienced substantial coal dust exposure are at an ongoing risk of disease occurring or progressing after exposure ceases.

The AIOH note that the prevalence of coal workers' pneumoconiosis (CWP) appears to increase from a cumulative exposure (average exposure x number of years of such exposure) of about 30 mg/m<sup>3</sup>.years, while below that cumulative exposure the trend is less clear. At 80 mg/m<sup>3</sup>.years (equivalent to 2 mg/m<sup>3</sup>), the data indicates the prevalence of CWP 1+ at about 13% for low rank coals rising to perhaps 21% for high rank coals. At 40 mg/m<sup>3</sup>.years, the corresponding prevalence is 6 to 10%, however at this cumulative exposure high rank coal does not show as the highest risk, possibly suggesting that at this lower level of exposure, coal rank may not be so important. Caution has been expressed by a number of researchers when extrapolating the risk of CWP to dust levels of less than 2 mg/m<sup>3</sup> working life, as these are lower than the range observed in the original studies made on British coal miners. The predictions are variable and highly dependent on the risk model selected for the analysis.

The US coal industry can serve as a good example of the complexity of the relationship between RCD exposure standard promulgation and related cases of disease. Over the years, US federal regulations have placed increasingly stringent upper limits on the allowable airborne RCD concentrations in underground mines to which coal miners can be exposed. A limit of 3.0 mg/m<sup>3</sup> was established in 1969. The limit was lowered to 2.0 mg/m<sup>3</sup> beginning in 1972. In 2014, the Mine Safety and Health Administration (MSHA) issued a dust rule that reduced the limit to 1.5 mg/m<sup>3</sup>, effective August 1, 2016. The concentration limit for RCS (technically, quartz) remained at 0.1 mg/m<sup>3</sup> (NASEM, 2017).

Following the introduction of these regulatory requirements, there were several decades of decreasing recognised prevalence of CWP in underground coal miners with more than 25 years of work tenure, decreasing from more than 30% prevalence in 1970 (NASEM, 2017).

The NIOSH Coal Workers' Health Surveillance Program, which had been reporting on the ongoing health status of US coal miners for more than 40 years had identified this steady decline until the late 1990's in the occurrence of progressive massive fibrosis (PMF) and chronic obstructive pulmonary disease (COPD), along with CWP (prevalence less than 0.1% of the studied workforce, 0.33% among the studied active underground miners with at least 25 years of mining tenure). The incidence of CWP then was found to have increased. In 2012, the prevalence of PMF in Appalachian working miners reached 3.23% (5-year moving average), the highest level recorded since the early 1970s. For the period 2000 to 2012 the prevalence of CWP subsequently increased among all Coal Workers' Health Surveillance Program participants with 15 or more years of tenure in underground coal mining, with those workers with 25 years of underground mining showing a prevalence of more than 10% for CWP and 3% for PMF. National surveillance of surface coal miners conducted across the US in 2010 to 2011 documented radiographic evidence of pneumoconiosis in 2% and PMF in 0.5% of workers. Following the uncovering of these health outcomes further investigations into the working conditions suggested that the dust exposures had not been adequately controlled (Blackley et al, 2014; Laney & Weissman, 2014). Mines in districts such as Kentucky and southwest Virginia had the highest exposure to RCS and experienced the highest incidence of CWP. It was found that the cases were mainly associated with small mines, working thin seams (typically 1.4m in height), with miners often working in the return air, and with a high rate of non-compliance with the regulatory exposure standard. On average 26% of the extracted material was rock resulting in respirable quartz of 20-24% in the respirable dust taken on roof-bolters and continuous miner operators, which were the groups most often reported with CWP (Blackley et al, 2016; Pollock et al, 2010).

The NSW coal mining industry from 1943 to 1983 had an exposure standard based on sampling using the Owens Jet Dust instrument and a particle count. 1984 saw the introduction of the 3 mg/m<sup>3</sup> RCD standard based on comparative field testing between the Owens sampler and personal respirable dust sampling instruments (UK MRE113A, SIMPEDS and UK Higgins Dewell cyclone). Sampling in NSW underground coal mines was conducted at 6 monthly intervals on 5 members of each production crew on all production shifts. If any sample exceeded the standard then the sampling was to be repeated within 7 days under similar circumstances to that of the original dust survey. The mine

manager may have been directed to carry out dust suppression procedures and dust testing continued at appropriate intervals until sufficient dust control was achieved.

Also, a mandatory medical surveillance program was conducted by the Medical Authority of the Joint Coal Board. 1954 saw the creation of the stakeholders Standing Dust Committee that regularly reviews and enforces actions on all dust monitoring results. In 1988 the results indicate that the overall program had resulted 'in the virtual elimination of coal miners pneumoconiosis from the industry' (Griffits, 1988).

A formalised dust monitoring program (Order 42), medical surveillance (Order 41) along with an education and training program has continued to this day in NSW coal mines (Kram et al, 2005; Coal Services, 2016). The outcome of compliance with the NSW respirable coal exposure standard of 2.5 mg/m<sup>3</sup> (and the 0.1 mg/m<sup>3</sup> RCS for NSW coal mines) was provided in the statements made by officers of Coal Services at the MSAC round table that no new cases of coal workers pneumoconiosis have emerged in the last 20 years for workers covered by the program (NSW Department Primary Industry, 2016).

The recent cases of CWP in Queensland coal mines and indeed in areas of the USA coal mining industry, have led to the call for a simplistic and idealistic approach to reducing the RCD WES. An examination of the official Queensland coal mine exposure data (and the USA coal mine dust data) indicates that the long-term average exposures were well in exceedance of the existing coal dust exposure standard. Had the regulatory authorities taken notice of the non-compliance with the existing WES across almost all mines the re-emergence of coal miners pneumoconiosis may not have occurred. The message is, it's not the value of the exposure standard that needed changing but the attitude to compliance.

## Comments on the Measurement and Analysis Information Provided in the Evaluation Report

There are specific state standards for monitoring respirable dust in coal mines, such as the NSW '[Order 42](#)' (published in 2011) and the Queensland '[Recognised standard 14](#)' (published in 2016), specifying accountabilities and competencies, minimum technical requirements and reporting requirements. The AIOH do not see any issues with the recommended measurement and analysis information provided in the SWA *Draft evaluation report* for RCD. The proposed limit values are measurable.

## References

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