AUSTRALIAN INSTITUTE OF OCCUPATIONAL HYGIENISTS ®

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15 November 2016

Mrs Jo-Ann Miller MP
Chair
Coal Workers' Pneumoconiosis (CWP) Select Committee
Queensland Parliament
Parliament House
George Street
Brisbane Qld 4000

Phone: 07 3553 6621
Email: cwpsc@parliament.qld.gov.au

Your Ref: *INQ-CWP*
AIOH Submission - Coal Workers' Pneumoconiosis (CWP) Select Committee

Dear Mrs Miller,

Please find enclosed a written submission from the Australian Institute of Occupational Hygienists, Inc. (AIOH) to the Coal Workers' Pneumoconiosis (CWP) Select Committee established by the Queensland Parliament.

The AIOH would be happy to appear before the Select Committee and expand on any matters raised in our submission; alternatively we can provide additional information in writing.

If you require further information, please do not hesitate to contact me.

Yours faithfully,

Caroline Langley
2016 President
AIOH

Attachment: AIOH Submission - Coal Workers' Pneumoconiosis (CWP) Select Committee

AIOH Submission – Queensland Parliament
Coal Workers' Pneumoconiosis (CWP) Select Committee

About the Australian Institute of Occupational Hygienists Inc. (AIOH)

The AIOH is the professional society representing qualified Occupational Hygienists in Australia (www.aioh.org.au).

Our mission is to advance the knowledge, practice, and standing of occupational health and occupational hygiene; and to promote and preserve the health and wellbeing of Australian workers. The AIOH seeks to achieve this by:

- Promoting the profession of occupational hygiene;
- Improving the practice of occupational hygiene and the knowledge, competence and standing of its practitioners;
- Representing the profession nationally and internationally; and
- Increasing public awareness of the field of occupational hygiene.

Occupational Hygienists specialise in the assessment and control of chemical, physical, and biological hazards in the workplace.

The AIOH was formed in 1979 and incorporated in 1988. The AIOH is an independent professional society, and is not aligned with any political party, industry, trade, employer, or employee group.

The AIOH is a member of the International Occupational Hygiene Association (IOHA). The AIOH's professional certification scheme, Certified Occupational Hygienist (COH)® is an internationally recognised qualification through the IOHA National Accreditation Recognition (NAR) scheme.

Executive Summary

Coal workers' pneumoconiosis (CWP) is a long latency occupational disease, which can be entirely prevented by effective control of airborne dust.

Monitoring of personal dust exposure and the effectiveness of controls is the cornerstone of CWP risk assessment, and currently the only means of estimating future risk.

Health surveillance provides an important feedback loop to ensure the adequacy of workplace exposure controls and Exposure Standards. Health surveillance may also assist in guarding against a false sense of security regarding the effectiveness of worker protection.

Certified Occupational Hygienists (COH)® are uniquely qualified to plan and evaluate interventions aimed at minimising dust exposure.

The AIOH notes that suitable and effective technologies and expertise to control dust exist in the mining industry. **All stakeholders in the industry must continue to work together to anticipate, identify and characterise dust hazards; then assess and control them**.

That said the re-identification of CWP is sobering evidence of previous systems failure that present an opportunity to prevent future disease. Given the lag time for the development of CWP, there is now also a need to understand future risk.

The AIOH recommends that regulation requires that operators to develop and implement an evidence-based dust management plan to control dust exposure in mines. This plan should include:

- A mine ventilation plan;

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- mandated engineering controls such as closed air-conditioned cabs and properly engineered crushers and other plant;
- a personal respiratory protection program including fit testing and training for workers where other controls are inadequate to keep dust levels below acceptable Exposure Standards;
- regular personal exposure assessment of airborne dust levels, dust characterisation, and monitoring to ensure controls are in place and working, and to assess health risk;
- submission of personal dust exposure monitoring data to a secure database that can be routinely interrogated and analysed, and the results reported to all industry stakeholders.
- raising awareness amongst workers and employers of the health effects of dust exposure and the techniques to control it;
- active mandatory health surveillance with clear mandated procedures and reporting requirements; and
- independent audit and review of the abovementioned elements.

This strategy is underpinned by the existence of Exposure Standards for the assessment of exposure to airborne contaminants, and a robust standards setting process.

The AIOH recommends that changes to Australian Exposure Standards must be based on a proper scientific review and be relevant to the mining context in Australia.

The AIOH strongly recommends that only independent, experienced, and Certified Occupational Hygienists (COH)® should design, plan and report on the assessment of workplace dust exposures. The re-identification of CWP is a prompt for review of professional development and outreach activities in this area. Opportunities will be explored at the AIOH Annual Conference (AIOH2016), being held in Queensland from the 3rd to 7th December this year (https://aioh.cvent.com/AIOH2016C).

As current dust exposure predicts future health risk, the AIOH recommends a review of coal industry dust exposure levels and time trends. As part of the review, assessment of the impact of concurrent crystalline silica exposure should also be undertaken.

Finally, AIOH is aware that instrument and sensor technology is changing rapidly and a watching brief on new applications is essential.

Coal Dust

Dust is the scourge of many Australian industries including mining, quarrying, tunnelling, construction, and processing.

Coal dust exposure is a well-recognised occupational hazard in coal mining, but also during bulk handling including cleaning, blending and usage at for example coal fired power stations.

Coal mine dust is a complex mixture comprising organic carbon and a range of mineral components, including various elements and their oxides. Coal mine dust invariably contains respirable sized particles of crystalline silica the proportion of which is dependent on the parent material. The size of coal particulate varies with mining, processing and handling. Coal is classified according to its rank, which describes the degree of coalification ranging from lignite, sub-bituminous, bituminous through to anthracite.

Occupational Hygienists are concerned not only with the composition of airborne dust but its particle size. Different size fractions of dust have the potential to impact on different parts of the respiratory system. In simple terms inhalable dusts are generally less than 100 microns in diameter (the technical definition is more complex) and lodge in the mouth, nose and upper respiratory tract. Respirable dust is generally less than 5 microns in diameter and lodges deep in the lung in alveoli, alveolar ducts, and respiratory bronchioles where gas exchange occurs.

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Health Effects of Coal Dust Exposure

Pneumoconiosis

Workers who are exposed to prolonged and excessive levels of airborne coal dust are at an elevated risk of contracting lung diseases: Coal Workers' Pneumoconiosis (CWP), Progressive Massive Fibrosis (PMF), Silicosis and Chronic Obstructive Pulmonary Disease (COPD).

The AIOH notes that many different dusts can cause pneumoconiosis, but the vast majority of cases are caused by exposure to crystalline silica (causing silicosis), asbestos (causing asbestosis) or coal dust (coal workers' pneumoconiosis)[1]. The respirable crystalline silica content present in coal dust and some overburdens is also an important factor in pneumoconiosis[2].

There is evidence from epidemiological studies both in the United States and in Great Britain that the prevalence of more severe CWP and PMF is dependent on the rank of the coal dust to which miners are exposed[1].

Lung disease in coal miners is well documented. Nowadays the incidence of CWP in developing nations is very significant and likely under reported. CWP also remains an occupational disease in first world coal mines e.g. the United States[3].

Safe Work Australia[4] lists CWP as a 'Deemed Disease' in Australia on the basis that:

- there is a strong causal link between the disease and occupational exposure;
- there are clear diagnostic criteria; and
- the disease comprises a considerable proportion of the cases of that disease in the overall population or in an identifiable subset of the population.

The AIOH notes that it is probably not possible to ascertain the true incidence of pneumoconiosis in Australia. Typically, workplace disease is under diagnosed for many reasons, masking the scale and urgency of the challenge. The AIOH notes[5] that there is very significant under reporting of occupational disease in workers' compensation databases. There are many reasons for this including: long latency periods for occupational diseases such as cancer and coal workers' pneumoconiosis; and the difficulty of linking workplace exposure to disease. As with all long latency diseases, the current incidence of CWP in the industry is a result of exposures that occurred in the past. It does not necessarily reflect current working conditions/exposures and risk. The AIOH thus strongly cautions against reactive responses without proper consultation with relevant experts. It is also noted that there are clearly opportunities for reform to relevant systems including exposure monitoring programs, health surveillance, etc.

The AIOH strongly asserts that CWP is entirely preventable by controlling workers' personal dust exposures.

Other effects

Workers may also be susceptible to irritation of the eyes, nose and throat and inflammatory reaction in the lung, when exposed to respirable and inhalable fractions of, what the public would refer to, as 'general dust'. These dusts include natural organic and inorganic materials of inherently low toxicity that are generally insoluble or poorly soluble in water, free from toxic impurities, harmful bacteria or biological toxins[6]. In short, the human body's tolerance to airborne dust, regardless of its toxicity, is limited.

[1] ACGIH TLV Documentation, Coal Dust, 2015.
[2] Ibid.
[3] Centers for Disease Control and Prevention, Pneumoconiosis and Advanced Occupational Lung Disease among Surface Coal Miners — 16 States, 2010–2011, MMWR June 15, 2012 / 61(23); 431-434.
[4] Safe Work Australia, Deemed Diseases in Australia, August 2015.
[5] Safe Work Australia, Occupational Disease Indicators 2014.
[6] AIOH Position Paper, Dust Not Otherwise Specified (NOS) and Other Occupational Health Issues, 2014.

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Crystalline silica, usually in the form of quartz, and commonly found in coal dust is an aggressive, pneumoconiosis (lung damaging) producing dust when it is inhaled as 'respirable' dust.

There have been a number of occupational exposure studies that indicate crystalline silica is a human carcinogen. The International Agency for Research on Cancer (IARC) has classified crystalline silica as a human carcinogen, although not as a direct-acting cancer initiator.

There is compelling evidence that many forms of pulmonary fibrosis, including silicosis, represent a predisposing factor for lung cancer[7]. Thus, the variable but common presence of respirable crystalline silica in coal dust presents an additional health risk for coal workers.

That said IARC[8] has found inadequate evidence in humans for the carcinogenicity of coal dust itself.

Controlling Coal Dust Exposures

The AIOH considers that the application of professional occupational hygiene practice in collaboration with other key professionals, including Ventilation Engineers and Occupational Physicians, can ensure the control of coal dust hazards.

The AIOH strongly recommends that the selection of workplace dust controls must follow the hierarchy of control:

- elimination of the hazard;
- substitution;
- engineering strategies;
- administrative controls; and
- as a last resort the use of personal protective equipment e.g. respiratory protection.

The control principles that apply to coal dust are similar to those that apply to all mechanically generated dust exposures. The AIOH believes that suitable and effective technologies and expertise to control dust already exists in the mining industry. **The AIOH recommends that regulation should require operators to develop and implement an evidence-based dust management plan to control dust exposure in mines**. This plan should include:

- a mine ventilation plan;
- regular monitoring and exposure assessment of dust levels in the workplace to ensure controls are in place and working;
- raising awareness amongst workers and employers of the health effects of dust exposure and the techniques to control it; and
- active health surveillance.

The AIOH supports the use of respiratory protection for workers where other controls are not adequate to maintain dust levels below acceptable Exposure Standards. All workers required to wear respiratory protection must be trained in its use and maintenance.

Personal fit testing of respiratory protection is an essential part of the respiratory protection program. An ill-fitting respirator provides a false sense of security to both the worker and management. The AIOH recommends fit testing be performed by appropriately trained persons in accordance with recognised standards.

The AIOH notes that a legislative approach such as the NSW Order 40[9] can result in a management system that includes controls such as ventilation, appropriately designed and maintained air conditioned mobile plant, properly engineered crushers, safe work procedures and a respiratory protective equipment management program.

[7] AIOH Position Paper, Respirable Crystalline Silica and Occupational Health Issues, 2009.
[8] IARC Monograph 68 Silica, Some Silicates, Coal Dust and para-Aramid Fibrils, 1997.
[9] Orders made pursuant to the *Coal Industry Act 2001* Order 40 'Abatement of Dust on Longwalls'

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The AIOH believes that all stakeholders in the industry must work together to anticipate, identify, and characterise dust hazards; then assess and control them. This risk management approach is already recognised in the Queensland WHS Regulations, Codes of Practice and Guidelines, and in other jurisdictions e.g. NSW. In practice, this process must form the foundation of workplace health management systems to control dust as required in Clause 89(1) of the *Queensland Coal Mining Health and Safety Regulation, 2001*. *(We note that Queensland has adopted the harmonised WHS Regulations, but its Coal Mining legislation dates from 2001).*

However, the apparent re-identification of pneumoconiosis in Queensland indicates that the application of the risk management process is breaking down with resultant increased exposures. A key factor is appropriate characterisation of the coal dusts, monitoring to assess exposures, and timely assessment to ensure that controls are working.

A range of professionals all have an important role to play including Occupational Hygienists, Ventilation and Maintenance Engineers, Safety Officers, Occupational Physicians, Managers, Work Health and Safety Representatives, the legislative authority and the workforce.

Airborne Dust Monitoring

A systematic, transparent, and auditable exposure monitoring program is an essential part of best practice dust management in dusty workplaces including coal mines. Exposure monitoring is a means to assess exposure, and consequently health risk, and to evaluate the effectiveness of controls. The interpretation of exposure monitoring data, including an assessment of regulatory compliance should not be determined using single sample exceedances, but must be considered using recognised statistical analysis of representative whole datasets.

The AIOH strongly recommends that only experienced Certified Occupational Hygienists (COH)® should design, plan, and report on workplace dust monitoring programmes. This will ensure that:

- monitoring programs are adequate in scale and scope, and hence provide robust and representative information on which to base decisions and recommendations;
- sample collection and analytical methods conform to recognised national standards;
- analysis is carried out by NATA accredited organisations;
- reporting is robust, accurate and conclusions are supported by the data; and
- most importantly any data trends are identified, analysed and reported.

The AIOH recommends that exposure monitoring programs follow quality assurance principles – minimum standards for monitoring (number, frequency, etc.) should be based on risk, consistent with accepted occupational hygiene practice, and designed by Certified Occupational Hygienists (COH)®. It is understood that more optimal monitoring of remote sites such as randomly generated monitoring schedules are difficult to achieve for remote locations.

The AIOH understands that the conduct of dust exposure monitoring can vary dependant on the site e.g. it could be carried out by external consultants, or it could be carried out on site using local personnel but in all cases there must be robust quality assurance principles. The latter system is probably only applicable to larger sites, but it can mean that monitoring is more frequent, flexible, and representative. Such monitoring can also involve the local workforce. Regardless of whether a program is internally or externally executed, the AIOH recommends that monitoring procedures, plans and results must be transparent to employees, regulators, and other interested persons; and be regularly audited and reviewed by an independent body. This practice greatly enhances confidence in the accuracy of findings by all stakeholders.

The AIOH is strongly of the view that the results of the monitoring must be properly assessed with appropriate controls instituted – monitoring without actions will only describe a situation, not control it. Where a personal exposure monitoring program demonstrates that Exposure Standards are being approached or exceeded, then active steps must be taken to investigate the cause of the exceedance. This must include a review of exposure monitoring data and dust controls. The AIOH notes that third party or peer review via an independent appropriately resourced industry panel is a successful strategy to support conformance e.g. NSW Coal Services Standing Dust Committee.

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The AIOH notes that "fixed position" direct reading instrumentation is considered by some stakeholders as preferable to personal sampling of workers' exposure. The AIOH points out that the only means to determine the personal exposure of workers is to undertake representative sampling in the breathing zone of individual(s) while they perform routine tasks. Static sampling can underestimate (or overestimate) personal exposures. Fixed position instruments are an important and recommended means of ongoing monitoring of controls e.g. ventilation effectiveness. They must be used in conjunction with, rather than a replacement for, personal sampling devices. The AIOH is aware that instrument and sensor technology is changing rapidly and a watching brief on new applications is essential.

Exposure Data Management and Reporting

The AIOH notes that there is little point in employers being required to submit exposure and health surveillance data, if it cannot be routinely interrogated and analysed, and the results reported to all industry stakeholders. The AIOH believes there is an important role for the Regulator to play in regularly reporting to the industry on trends in exposure and disease incidence. This assists all stakeholders to focus on areas that require improvement.

It may be of interest to the inquiry that the Western Australia Department of Mines and Petroleum is currently working to provide an accessible exposure data management system for the WA mining industry. Reported numbers will be used to check compliance against proposed risk based quotas.

Education and Training

The AIOH strongly supports the need for coal workers induction, and ongoing instruction and training regarding:

- the hazards of dusts (coal, crystalline silica, and dust not otherwise specified);
- the health effects of excessive exposure;
- exposure monitoring programs;
- health based Exposure Standards;
- dust controls including the use and maintenance of personal protective equipment; and
- health surveillance programs.

Additional information pertinent to the work environment e.g. emergency procedures should be included as required.

The training of all coal workers and management will assist all parties to take an active role in work health and safety.

The experience of AIOH members is that routine feedback to workers on the results of exposure monitoring programs is essential to ensure ongoing participation and to support a safe and healthy work culture.

Health Surveillance

The AIOH strongly supports the need for a comprehensive health surveillance program for all coal workers as an integral part of a workplace health and safety management plan. Competencies, methodologies, clear diagnostic pathways, and reporting criteria are all needed for health surveillance to ensure a thorough and consistent approach across the entire industry.

The AIOH recommends a best practice health surveillance be determined by examination of health surveillance programs in other jurisdictions, and liaison with appropriate medical and industry professionals.

Health surveillance for coal workers should not be collapsed or confused with fitness for duty or health promotion activities. Currently 'fitness for duty' reporting provides little information and support for employers to manage individual employees diagnosed with occupational disease or to enable monitoring of a change in individual health status.

Regular health surveillance is essential to ensure early detection of occupational disease and suitable medical interventions. It also provides an important opportunity for health promotion e.g. quit smoking. The AIOH believes there is significant community and industry benefit in the establishment of a health surveillance database, linked to the recording of exposure data. In order for this database to add benefit, it is essential that key stakeholders e.g. medical advisers have access to database reports, to assist them to perform informed medical assessments including direct comparisons. Further, the AIOH

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believes that the technology is now available to enable the medical status of all coal workers to be tracked throughout their career in coal industry, regardless of their employer or employment status. This concept is routine in other industries for example annual dose limit records for radiation workers.

The AIOH recognises the importance of health surveillance, including competent interpretation of test results such as X-rays, as a tool for early diagnosis and intervention. That said the discovery of disease during medical assessment is generally too late for the victim. **The primary focus of any work health and safety management system must be on prevention. It is therefore essential to have reliable and ongoing monitoring and reporting of the effectiveness of dust management**.

Exposure Standards for Coal and other Dusts

This issue again emphasises the importance of having Exposure Standards and a robust standards setting process.

Exposure standards are only effective if the regulatory scheme under which they are set is adequately enforced. Compliance should not be determined on the basis of single sample exceedances, but must be considered in the context of a statistically valid exposure data set. Excellent technical guidance on compliance assessment is available, but poorly understood by many stakeholders.

The current Safe Work Australia (SWA) 8-hour time weighted average Exposure Standard for coal dust (respirable fraction) containing less than 5 % quartz is 3 mg/m^3. Various jurisdictions have adopted different dust standards e.g. *Queensland Coal Mining Safety and Health Regulations 2001* – 3 mg/m^3; *NSW Work Health and Safety Mines Regulations 2014* respirable dust in the case of coal mines 2.5 mg/m^3 and inhalable dust 10 mg/m^3.

The current SWA Exposure Standard for respirable crystalline silica is 0.1 mg/m^3. The majority of Australian states have adopted this in their regulations. The AIOH consider it prudent to apply the SWA exposure standard (TWA) of 0.1 mg/m^3 to all industries until research demonstrates otherwise.

The Safe Work Australia value of 10 mg/m^3 for 'dusts not otherwise classified' (i.e. the substance is both of inherently low toxicity and free from toxic impurities) was first introduced in 1990 and has not been subject to update or review since then. It is now somewhat out of date given the findings reported in contemporary published research papers. The AIOH recommends that two 'Dust Not Otherwise Specified' trigger values (expressed as an 8-hour TWA) be adopted to protect workers from potentially serious health effects due to insoluble or poorly soluble (in water) dusts of inherently low toxicity (free from toxic impurities), for which there is no other listed applicable exposure standard:

- 5 mg/m^3 for the inhalable fraction; and
- 1 mg/m^3 for the respirable fraction.

A trigger value is not an exposure standard but a reasonably practicable criterion for implementing exposure controls.

The AIOH notes that where a professional chooses to monitor only a single fraction of mine dust, then this decision needs to be made on the basis of prior knowledge as to the fraction (inhalable or respirable) that is likely to have the greatest likelihood of exceeding the associated trigger value. In some circumstances the proportion of respirable crystalline silica rather than coal dust or inhalable dust Not Otherwise Specified is so significant that this is the controlling factor.

Available monitoring data from the Australian minerals industry indicates that controlling dust levels below the above trigger values may not always be achievable. While respirable dust levels may be more readily controlled below 2.5 mg/m^3, in some specific operations inhalable dust levels have been found to be higher than 10 mg/m^3, particularly in underground operations, and are often much higher than respirable dust levels. The fact that dust exposures are above the recommended trigger values indicates that controlling dust is no simple matter.

International Exposure Standards for coal dust vary considerably. Example 1: the American Conference of Governmental Hygienists (ACGIH) recommended in 2001 a lower 'Threshold Limit Value' (8 hour time weighted average-TWA) of 0.9 mg/m^3, as respirable particulate, for miners exposed to lignite coal dust; and of 0.4 mg/m^3, for miners exposed to anthracite coal dust. The ACGIH noted a small risk of developing PMF might exist even at exposure levels below the recommended TLVs, therefore exposure levels should be controlled to the lowest achievable level.

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Example 2: from August 2016, the US Mine Safety and Health Administration lowered the respirable coal dust limit for all underground and surface cut coal mines from 2 mg/m^3 to 1.5 mg/m^3, having already mandated the use of continuous personal dust monitors.

Example 3: in 2011, the United Kingdom listed three relevant Occupational Exposure Limit Values (8 hour reference period); coal dust (respirable fraction) 1.6 mg/m^3; anthracite 0.4 mg/m^3 and bituminous 0.9 mg/m^3.

Any changes to Australian Exposure Standards must be based on a proper scientific review and be relevant to the mining context in Australia. Parallels with the overseas industries such as the US, while providing some insight are not exact in their application in Queensland.

The AIOH notes that whilst there should always be ongoing robust debate and review of regulatory standards, the experience of some Australian jurisdictions most notably NSW, in controlling workers' personal coal dust exposure below the exposure standard of 2.5 mg/m^3 has been undeniably successful.

Ongoing debate on an acceptable exposure standard should not obscure the message that control and routine monitoring of personal workers' dust exposure is effective in minimising disease associated with excessive exposure to coal dust.

The AIOH strongly supports the concept of mandated dust Exposure Standards, and professionally designed, executed, and audited workplace exposure monitoring programs.

The AIOH recommends that Occupational Hygienists adjust Exposure Standards to take into account work shifts of longer than 8 hours. The model used for shift adjustment is a matter of professional judgement using recognised international and national guidelines[10].

The AIOH believes the pneumoconiosis issue has broader implications to other workplace health hazards i.e. we need scientifically robust systems that industry can rely on. The Safe Work Australia Code of Practice *Guidance on the Interpretation of Workplace Exposure Standards for Airborne Contaminants* and legislation do cover them, but there is poor awareness and monitoring of compliance.

___END OF SUBMISSION___

[10] AIOH Position Paper, Adjustment of Workplace Exposure Standards for Extended Work Shifts 2nd Edition, June 2016.

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