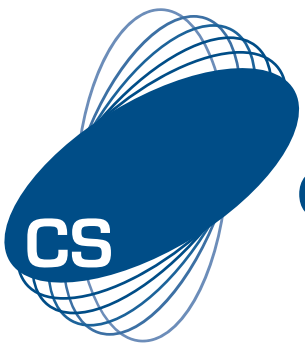
Protecting against airborne dust exposure in coal mines



Coal Services

Protecting against airborne dust exposure in coal mines

NSW Work Health and Safety legislation defines airborne dust to include both respirable dust and inhalable dust.

In the NSW coal mining industry, dust control measures such as the enforced regulation of dust monitoring and health surveillance continue to help protect NSW coal mine workers from developing pneumoconiosis (black lung disease).

Coal Services Pty Limited's **Standing Committee on Airborne Contaminants and Occupational Hygiene** (Standing Dust Committee) has produced this booklet to promote a better understanding of the health effects and control of airborne dust.

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Why the subject of dust is important

Long-term exposure to many dusts, including coal dust and crystalline silica, can cause disabling lung diseases.

In 1947 coal workers pneumoconiosis (commonly known as black lung disease) was prevalent throughout the NSW coal industry, affecting 16 per cent of all coal mine workers with 4.5 per cent showing obvious symptoms.

The creation of the independent Joint Coal Board (JCB) in 1947 provided a greater commitment to enforcing compliance against the new dust standards recommended by the 1939 Royal Commission into Health and Safety.

Controls initiated and implemented by the JCB such as periodic health surveillance, chest x-rays and independent airborne dust monitoring continue today as statutory obligations performed by Coal Services.

Today, global statistics from the World Health Organisation (WHO) estimate there were 25,000 deaths from pneumoconiosis and 46,000 deaths from silicosis in 2013.

These statistics are a sobering reminder that continued vigilance must be a key factor in ensuring the eradication of this disease in NSW.

Our collaborative model unites all stakeholders across the NSW coal industry to prevent, detect, enforce and educate about occupational disease.

This book aims to promote a better understanding of the health effects and controls of airborne dust.

What is the difference between inhalable, respirable and respirable crystalline silica dust?

Inhalable dust

- Inhalable dust particles are <100 microns in diameter and can be easily seen.
- Inhalable dust is usually breathed in but is trapped in the mouth, nose and upper respiratory tract. Inhalable dust can also include respirable dust particles.

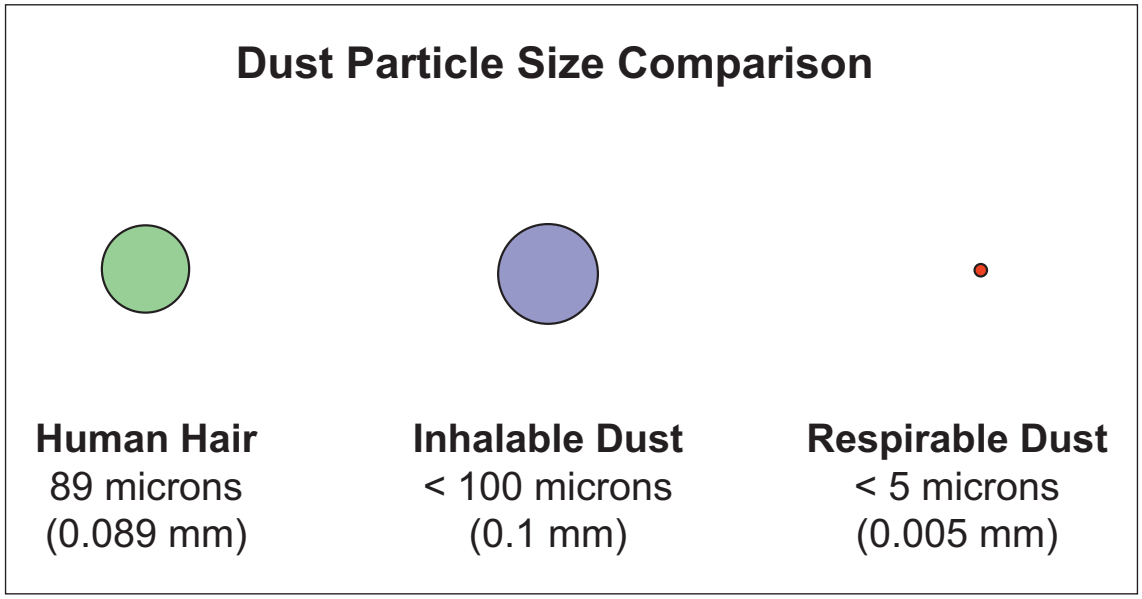
Respirable dust

- Respirable dust and respirable crystalline silica can be thought of as ‘invisible dust’ because the dust particles are too small to be seen with the naked eye.
- When air containing dust is breathed, the larger particles are either stopped by the nose, mouth or mucus lining of the upper airways. However, a small fraction of the dust cloud, the very small particles such as respirable dust, can be retained in the lungs.
- Just because you can’t see it does not mean that respirable dust is not present.

Respirable crystalline silica

- Respirable crystalline silica is the respirable dust fraction of crystalline silica which enters the body by inhalation.
- Quartz is the most common form of crystalline silica and is the second most common mineral on the earth's surface. It is found in almost every type of rock i.e. igneous, metamorphic and sedimentary. Quartz is present in nearly all mining operations.

To give you an idea of the sizes we are talking about, the diagram below compares dust particles to that of a single human hair.



Health effects of airborne dust exposure

What defences does your body have against dust that is breathed in?

The human body has three lines of defence against foreign particles (such as dust) entering the lungs:

(i) Particles may be trapped in mucus in the upper airways

(ii) Receptors can initiate sneezing and/or coughing to expel particles

(iii) The airways can constrict as a response to chemical or mechanical irritation.

What are the adverse health effects of inhalable dust?

- There is reduced visibility in the work place
- It can cause irritation of the eyes and nose
- It affects pre-existing conditions such as asthma; and it can cause bronchitis.

At this stage there is not enough research to indicate that inhalable dust is a contributor to Chronic Obstructive Pulmonary Disease (COPD).

What are some of the adverse health effects of respirable dust?

- Fibrosis and scarring of the lungs (see next section ‘Pneumoconioses’)

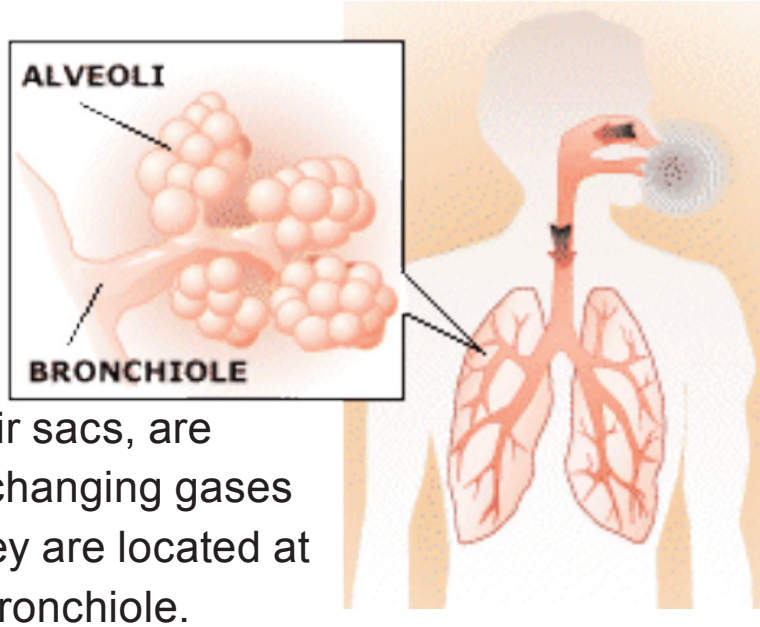
- Cough, sputum and shortness of breath
- Respiratory failure

Pneumoconioses (lung diseases)

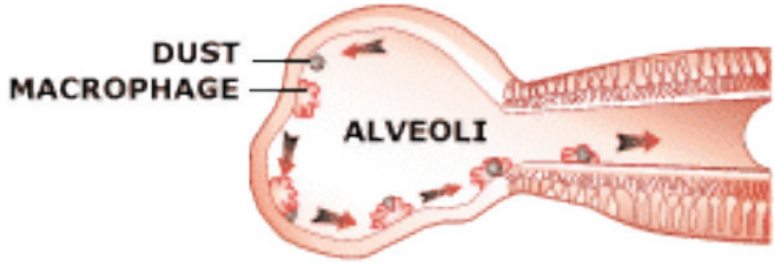
What are pneumoconioses and how are they caused?

Pneumoconioses are lung diseases caused by the inhalation of mineral dusts and the fibrotic reaction of the lung tissue to that dust.

In coal mining, both coal dust and respirable crystalline silica dust can cause lung diseases such as coal workers pneumoconiosis and silicosis.

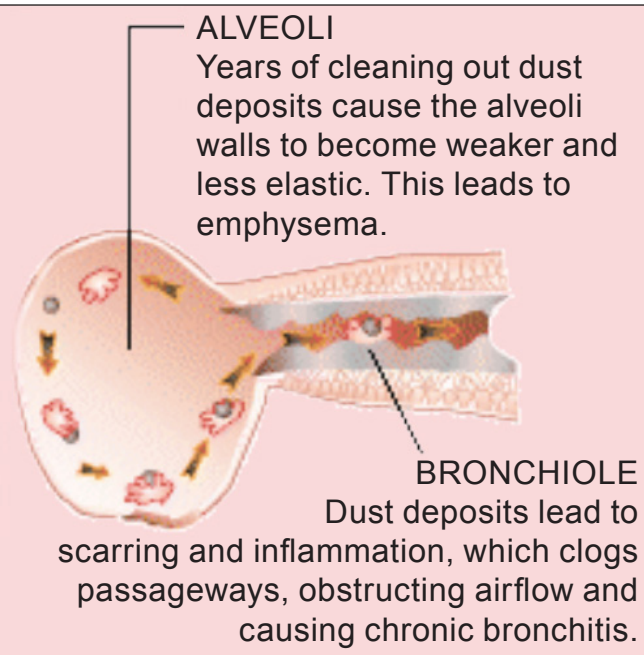


1. The alveoli, or air sacs, are responsible for exchanging gases with the blood. They are located at the ends of each bronchiole.



2. Macrophages, a type of blood cell, collect foreign particles and carry them to where they can be coughed out or swallowed.

3. If too much dust is inhaled over an extended period of time, some particles and dust-laden macrophages collect permanently in the lungs.



What is black lung disease?

Coal workers pneumoconiosis (CWP) is caused by the inhalation of coal dust and is commonly referred to as ‘black lung disease’. The disease gets its name because affected lungs appear to be black in colour rather than pink.

CWP is caused by prolonged exposure to respirable coal dust and the gradual build-up of coal dust particles within the terminal airways. Your body reacts to these particles by forming layers of scar tissue over the affected area.

The dust collections and scarring may later show up as small round shadows on your regular chest x-ray.

Who is at risk of developing CWP?

Anybody exposed to harmful levels of dust is at risk of developing a dust-related lung disease. Your risk is directly linked to your total level of exposure to dust.

What are the symptoms of CWP?

CWP usually takes several years to develop. There are usually no symptoms in the early stages of the disease.

Cough and sputum (mucus) may be present, but these symptoms may also be due to inhalable dust or smoking. In more severe stages of the disease there may be increasing shortness of breath on exertion and eventually at rest.

The onset and severity of the disease depends on the type of coal dust, how much dust was in the air, and how long you have been exposed to it.

If a person is breathless on exertion, does it mean that they have CWP?

Not necessarily. Bronchitis and other chest diseases like asthma, which may not be directly due to dust exposure, can cause breathlessness.

The single biggest cause of chest and related disease and disability is smoking.

Is CWP a serious disease? Is there a cure?

CWP is a serious disease.

CWP may exist as simple disease (Simple CWP) with nodules of less than 10mm in diameter. There are usually no symptoms to indicate Simple CWP.

Complicated CWP (progressive massive fibrosis) develops nodules of greater than 10mm in diameter. Symptoms may include increasing breathlessness and eventual respiratory failure.

There is no specific treatment for black lung disease. Most treatments are aimed at limiting further damage to the lung, managing symptoms and improving quality of life. For Simple CWP, avoiding exposure to harmful dust may stabilise the disease.

The aim of the preventative measures in the NSW coal industry is to stop CWP occurring or, at worst, stop any progression beyond the very early stages of the disease. As the symptoms may remain undetected for years, periodic health surveillance medicals are recommended.

Globally, thousands of mine workers die from CWP every year, even though it is a preventable disease.

What is silicosis?

Silicosis is a chest disease similar to coal workers pneumoconiosis. It is caused by prolonged exposure to respirable crystalline silica or quartz dust.

Respirable crystalline silica can cause fibrous or scar tissue to form in the lungs (silica-induced pneumoconiosis) that reduces the lungs' ability to extract oxygen from the air.

Like CWP, silicosis has simple and complicated forms and the symptoms are similar to those of CWP.

Respirable quartz dust is more likely to be harmful to your health than respirable coal dust.

Who is at risk of developing silicosis?

Open cut workers are possibly at risk during drilling and shot firing operations in the stone overburden if not protected by proper procedures or cabin sealing.

Underground workers are particularly at risk at mines that regularly require the extraction of stone roof and/or floor as part of their normal process.

Any task that requires the cutting or drilling of stone has the potential to expose mine workers to unacceptable levels of quartz (crystalline silica).

What can you do if you are concerned about your health?

If you are unsure of when you last had a periodic health surveillance medical or x-ray, please contact CS Health and we will be happy to assist you. Alternatively, you may wish to see your own local doctor.

Health surveillance

Why do I need a pre-employment medical?

A pre-employment medical is required before you commence work in the NSW coal industry. This includes a chest x-ray for new entrants to the industry. The medical and chest x-ray serve as a baseline for future health surveillance.

If you were already working in the industry and were asked to attend a pre-employment medical, a chest x-ray would only be conducted if you were due to have one as required under Order 41, or if clinically indicated.

Why do I need a health surveillance medical?

As most occupational illnesses take many years to develop, regular health surveillance allows for early detection and intervention with the goal of ensuring that you can continue to work safely.

Under Order 41, every NSW coal worker must have a health surveillance medical (known as a Periodic Health Assessment) every three years.

The Periodic Health Assessment focuses on a range of occupational health issues including dust, noise, fatigue and vibration. It also includes an assessment for general health issues that may impact you in the workplace including an assessment of the cardiovascular system, general health issues, mental health, musculoskeletal issues and alcohol use.

The Periodic Medical Assessment ensures that your ongoing health is protected and monitored for any adverse health risks as a result of your employment.

How often do I need a chest x-ray?

A chest x-ray is required every six years if you have a high risk of dust exposure. For example, if you are an underground coal miner or an ‘at risk’ open cut miner. Sometimes a chest x-ray will be recommended if there has been a significant deterioration in lung function testing.

What are the qualifications of those who review my chest x-rays?

CS Health utilises qualified Radiologists, and when required, Respiratory Physicians. CS Health Doctors also review the reports from the Radiologists.

In Australia, Radiologists are Doctors who undergo a five year training program that equips them to read and interpret x-rays for any signs of abnormalities. Their curriculum includes the study and identification of dust disease such as pneumoconiosis and silicosis.

Respiratory Physicians are specialists in diagnosing any condition of the lungs.

What is the process used to check my chest x-rays?

All x-rays taken of NSW coal miners by CS Health are read and reported on by a Radiologist. From there, x-rays that show any abnormalities are referred for further investigation, which may include a high-resolution CT scan, and referral to a Respiratory Physician if there is any suspicion of a dust disease of any type.

As required by Order 41, medical assessments not conducted by CS Health, including x-rays and Radiologists reports, must be sent to CS Health for inclusion in the NSW coal database. All of these medical assessments are fully reviewed by CS Health and any abnormal x-ray

results would be discussed with the Doctor that conducted the medical to ensure appropriate investigation is being carried out. The results of these investigations would be sought for review and inclusion in the miners medical record held by CS Health.

What are the typical causes of abnormal x-rays?

In coal miners x-rays, the most common cause of abnormal x-ray results are due to medical conditions NOT associated with dust disease.

Medical conditions identified generally include:

- An enlarged heart due to high blood pressure
- Bony abnormalities such as scoliosis
- Old scarring due to previous lung infections
- Plaque due to previous asbestos exposure
- Tuberculosis
- Tumours
- Sarcoidosis (autoimmune inflammatory disease)
- Granuloma (a mass of tissue typically produced in response to infection, inflammation or the presence of a foreign substance)

I haven’t had a chest x-ray, or can’t remember when I last had one.

In either case, please contact your nearest CS Health office and we can assist you.

Exposure to airborne dust

In what way does longwall mining differ from continuous miners in respect to airborne dust hazards?

Longwall mining now provides the most difficult situation for dust control in coal mines because:

- longwall mining systems produce more coal which equals more coal dust
- there are different ventilation flow patterns involved
- workers' positions vary in relation to dust sources and ventilation flows
- there are additional dust sources such as coal crushers, powered roof support movement, BSL discharge to the conveyor belt.

One of the worst mining practices causing high dust results on longwalls is people working on the return side of the shearer and/or advancing supports.

Is dust exposure a problem for open cut mine workers?

It is important to remember that anybody exposed to coal dust is at risk of developing pneumoconiosis or other dust-related diseases.

In open cut mines, exposure to coal and other dusts is usually minimal as most workers are located in enclosed, air-conditioned cabins. This lower level of exposure assumes proper cabin sealing is maintained and appropriate work procedures are in place.

Any task that is conducted outside the cabin, particularly where drilling has or is occurring (e.g. shotfirers) should be viewed as a potential high-risk activity and controls should be applied to reduce dust exposures.

Can exposure to visible dust (e.g. large dust clouds) in an open cut mine be harmful?

Yes – because they may contain respirable dust and quartz and the large fraction (inhalable dust) is thought to contribute to respiratory disorders.

A coal mine worker can be exposed to large clouds of dust but still be within the respirable dust exposure limit. However, excessive dust levels can cause respiratory disorders, such as bronchitis, and exposure should be kept to a minimum.

Where are coal miners exposed to respirable crystalline silica?

The most common exposures occur in, but are not limited to, the following environments:

Underground

- cutting stone roof or floor or stone bands in the seam during continuous miner or longwall operations
- roof bolting or drilling into sandstone or mudstone, dry drilling
- at material transfer and loading points
- in ventilation returns
- spraying or grouting with products that contain crystalline silica.

Open Cut

- drilling or shotfiring operations, dry drilling
- any tasks that require an operator to work from outside a sealed cabin, particularly in areas where fine drill tailings remain on the ground untreated.

Exposure standards

What are the specified dust exposure limits?

In the NSW coal industry, the specified dust exposure limits are:

- Respirable dust 2.5 mg/m^3
- Inhalable dust 10 mg/m^3
- Respirable crystalline silica 0.10 mg/m^3

Note: Dust exposure limits as at June 2016

Should the exposure limits be less for extended shifts?

The current exposure limits for dust and quartz are based on a 40 hour week (8 hour shifts, 5 days a week).

For working weeks greater than 40 hours, the exposure limit may need to be adjusted.

For more detailed information on this matter please refer to the *Guidance on the Interpretation of Workplace Exposure Standards for Airborne Contaminants* published by Safe Work Australia in April 2012.

Personal dust monitoring

What is the purpose of personal dust monitoring?

A comprehensive, targeted monitoring programme is continually being carried out to determine whether dust levels at every coal mine are kept below the approved limits and to protect the long-term health of mine workers.

Regular monitoring also allows the mine operator to identify any areas or tasks within the mine that could potentially present a risk.

It also provides data for mines to review the effectiveness of existing dust controls. Many mine operators engage Coal Services to provide additional dust monitoring to ensure continued effective dust control.

How is airborne dust monitoring undertaken?

Independent, onsite dust sampling is carried out by a Coal Industry Act Inspector. Inspectors are experienced mining practitioners who are trained in Occupational Hygiene and

monitoring techniques. These Coal Services employees perform dust monitoring and analysis.

They operate under:

- Order 42 (see Appendix 1)
- AS 2985 and AS 3640
- Work Health and Safety (Mines) Regulation 2014

The frequency of monitoring is based on requirements outlined in Order 42 and the Work Health and Safety (Mines) Regulation 2014. In general, all shifts/crews are monitored every 6-12 months depending on their location, tasks undertaken and exposure risk. Typically five crew members will be sampled during each shift monitored.

A single sample that exceeds the exposure limit requires the entire crew to be re-sampled to ensure no systemic problems exist. Re-sampling occurs after the mine has conducted a review of the exceedance to identify contributing factors and opportunities for improvement, and is typically within 14 days of the original exceedance.

Coal Services works closely with mine operators to improve exposure levels where assistance is required. This is not just to ‘pass’ re-samples, but to ensure dust control measures are both in place and adequate. Best practice dust control initiatives are shared by Coal Services across the industry to improve the workplace environment and reduce the likelihood of lung disease.

Who receives the dust monitoring results?

The results of statutory airborne dust samples are sent to:

- The mine where samples were taken
- NSW Department of Industry (NSW Mines Safety)
- Coal Services
- CFMEU
- Standing Committee on Airborne Contaminants and Occupational Hygiene (Standing Dust Committee)

All statutory dust results are held in a single database by an independent monitoring authority.

What method is used to determine the respirable dust concentration?

The approved sampling method adopted by the NSW coal industry is personal gravimetric sampling. In this method, respirable dust is collected from the air within the breathing zone of a mine worker (close to the nose and mouth). The amount of dust is then measured by weighing. The weight of this fine, respirable dust gives the most accurate prediction of the likelihood of developing pneumoconiosis.

The samples are taken by means of a small battery-powered pump worn by the mine worker. The pump is connected with a piece of plastic hosing to a sampling unit (or cyclone) that is clipped to the individual's shirt within their breathing zone. A steady stream of air is drawn through the sampling unit where the coarse dust is first removed and only the very fine respirable dust is collected on a filter and weighed.

What method is used to determine the inhalable dust concentration?

The gravimetric method used for respirable dust sampling is also used for inhalable dust sampling. The main difference is the sampling head which collects dust particles below 100 microns, rather than only the very small respirable dust particles.

What happens if the person sampled is exposed to one very dusty task for a short time and no dust for the remainder of their shift?

The method of dust sampling is designed to give the

average result for the duration of the shift and takes into account periods of high and low exposure to dust.

Job rotation during a shift is beneficial to the overall health of a worker because of the dilution effect of him/her being exposed to a non-contaminated atmosphere following a short but high exposure to a dusty environment.

One of the key factors involved in the onset of lung dust disease is the total amount of coal dust or respirable crystalline silica that a person has inhaled during their working life. It is not based on whether the person has been exposed to a high level of dust in a single event on one part of a shift or due to a particular mining method.

What happens to the dust results?

Copies of all results are sent to the Mine Operator, Inspector of Coal Mines and Industry Health and Safety Representative.

Following a failed result (an exceedance of the exposure limit), the Mine Manager informs the person who was sampled. The mine should conduct an investigation to review the effectiveness of the existing controls, and to identify if there are any opportunities or actions to correct the situation.

Coal Services, through the Standing Committee on Airborne Contaminants and Occupational Hygiene, also maintains an overview of all dust sampling programme results from across the industry. The Standing Dust

Committee reviews all dust exceedances including contributing factors and any actions taken, such as PPE compliance. The Standing Dust Committee recommends that all results are displayed on the mine site's noticeboards.

All dust sampling results are held within the Coal Services database.

Control Measures

What are the most effective methods of dust control?

It is difficult to control dust if you firstly do not identify all the potential dust sources affecting a work area. You must identify first, then control!

Controlling dust at the source is key to effective control.

(i) Adequate ventilation and the application of water, in sufficient quantity and in the correct location, are the best answers to the problem. Since water will not control dust once the dust is airborne, water should be applied as near as possible to the point where the dust is produced in order to wet the dust and prevent it being carried away in the air current.

Water sprays are useless unless they are operating effectively.

(ii) Dust capture by using scrubber systems on continuous miners and longwall BSL crushers and discharge to conveyor belt. Again, as with water sprays, if scrubber systems are not maintained adequately, they will be ineffective.

(iii) In continuous miner panels, in particular, ventilation must be maintained at the face by erecting tightly fitting brattice or ducting which should be extended systematically so that mine workers are never working ahead of the ventilation.

One of the worst mining practices causing high dust results is working inbye ahead of the ventilation ducting or brattice, and on longwall operations, working on the return side of the shearer and/or advancing supports.

(iv) Operator positioning.

In longwall operations, any task that has the potential to place mine workers on the return side of the shearer and/or advancing supports should be reviewed and controlled. A committed approach to effective utilisation of automation, particularly on Bi-Directional (BiDi) faces, is considered best practice in positioning operators and reducing their exposure to airborne dust.

Cutting stone in development panels can potentially place operators at significant risk of inhaling crystalline silica dust. Operators on the vent side of the continuous miner are at higher risk if dust generated from the discharge is not controlled adequately. The cutting/loading cycle should be interrogated to identify the parts of the cycle that have the potential to expose face operators to unacceptable levels of airborne dust e.g. loading while cutting stone.

What about using personal respiratory protective equipment?

Respiratory Protective Equipment (RPE) is the last line of defence in the control of airborne dust inhalation.

Coal Services observations indicate a high level of RPE use by longwall operators.

Other high risk exposure tasks such as continuous miner operation, service installations/retractions and open cut shot firers require improvements in RPE use.

Site Respiratory Protection Equipment Programs should include:

- Regular training of workers in the correct selection, use and maintenance of RPE.
- Identification of high risk tasks and areas (such as cutting stone in development) which may require compulsory use of RPE.
- Regular audits of RPE use during identified high risk tasks.
- Regular ‘Fit Testing’ and consideration of Clean Shaven Policies for high risk profile activities.

Respiratory fit testing is recommended under AS 1715-2009 and should be performed every 12 months.

Are there any other measures that can be taken to manage airborne dust?

- Isolate or capture dust sources by sealing transfer points, BSL, crushers.
- Operate water sprays at appropriate locations and as near as possible to the point of breakage with sufficient water volumes, pressure and correct sizing of water jets/droplets.
- Ventilate the correct quantities and at the right location.
- Advance ventilation ducting/brattice to standard.
- Regularly maintain dust suppression equipment.
- Consider operator positioning, job rotation and automation.
- Control dust levels along travelling roads.
- Use of personal respiratory protective equipment such as respirators.

Longwall dust suppression

Mines across NSW are required to prepare plans to limit dust creation and exposure for each operating longwall panel.

Order 40 requires the Coal Services Board to review and approve these plans to ensure worker health and safety. Additionally, mines must submit an audit of these plans once longwall production commences. This is to confirm

all dust abatement provisions of the approval are in place and operational.

The Standing Dust Committee

The Standing Committee on Airborne Contaminants and Occupational Hygiene (Standing Dust Committee) is an expert advisory body comprised of representatives from across the industry.

The role of the Standing Dust Committee is to:

- Monitor the results of nominated hazard sampling
- Evaluate results and discuss improvement strategies
- Identify hazards which may present emerging health issues
- Research improved control strategies and methods for nominated hazards
- Educate mine personnel in control of nominated hazards
- Report back to industry stakeholders in the form of Airborne Contaminants and Occupational Hygiene Bulletins.

The Standing Dust Committee meets every two months to review all dust exceedances, including factors that may be contributing to the exceedances. There is also a review

of any investigations and controls that may have been implemented following exceedances. This information is also distributed across the industry via committee members that represent industry stakeholders.

Further information

The Standing Dust Committee endeavours to provide the industry with the latest information on airborne dust. Publications such as this booklet can be viewed on the Coal Services website at **www.coalservices.com.au**.

Coal Services can also provide information sessions on a range of occupational health exposure issues.

Further information and training may also be provided by your employer.

Appendix 1:Order 42 (current as at June 2016)

COAL INDUSTRY ACT 2001

ORDER NO. 42

Coal Services – Monitoring Airborne Dust

COAL SERVICES PTY LIMITED ACN 099 078 234 ('Coal Services'), pursuant to the powers conferred by the Coal Industry Act 2001 of New South Wales hereby ORDERS as follows:

1. An operator of a coal operation must allow persons appointed by Coal Services as Inspectors, pursuant to Section 25 of the Coal Industry Act 2001, to monitor airborne dust to:

   (a) enter any coal operation for purposes related to monitoring airborne dust,

   (b) to take dust samples, and

   (c) to undertake all other functions and activities necessary to monitor airborne dust.

In this Order:

Monitoring airborne dust generally means, but it is not limited to, undertaking the activities and functions in Schedule 1.

SCHEDULE 1

Monitoring airborne dust

1. Monitoring airborne dust involves the regular collection and analysis of samples of airborne dust from the breathing zone of people whose health may be affected by the dust. The frequency of sampling, places and persons to be sampled in each part of a coal operation will be generally as specified in the Table below according to the operations in that part of the mine.

   The Table gives minimum locations, frequencies and persons for sampling only. Where difficult, dusty or unusual circumstances occur, then rigorous sampling arrangements suitable to the circumstances will need to be undertaken

Column 1 *Location*	*Column 2* *Frequency of sampling respirable dust*	*Column 3* *Frequency of sampling respirable quartz-containing dust*	*Column 4* *Frequency of sampling inhalable dust*	*Column 5* *Persons to be sampled*
(a) In each part of a coal operation where longwall mining is carried out.	Each producing shift at intervals not exceeding six months.	Each producing shift at intervals not exceeding six months.	Each producing shift at intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least five persons including, where possible: • A Shearer operator. • Two powered support operators. • A deputy. • One other person selected by Coal Services Pty Limited.
(b) In each part of a coal operation where a continuous mining machine operates.	Each producing shift at intervals not exceeding twelve months.	Each producing shift at intervals not exceeding twelve months.	At intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least five persons including, where possible: • A continuous miner driver. • A sideman or cable handler. • A shuttle car driver. • A deputy. • A bootend attendant or other person selected by Coal Services Pty Limited.

Column 1 *Location*	*Column 2* *Frequency of sampling respirable dust*	*Column 3* *Frequency of sampling respirable quartz-containing dust*	*Column 4* *Frequency of sampling inhalable dust*	*Column 5* *Persons to be sampled*
(c) In any part of an underground coal operation where cement products are being applied.			At intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least two persons including, where possible: • Persons loading cement into a mixer. • Persons spraying or applying cement products
(d) In any place in or about an underground coal operation other than those referred to in (a), (b) or (c) above, but including crusher stations.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least one person.
(e) In any place in or about an open cut coal operation where dust may be present.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least five persons including, where possible: • Drill operators, shotfirers and stemmers. • Mobile equipment operators.
(f) In any place in or about a coal preparation plant located within a coal operation where dust may be present.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	At intervals not exceeding twelve months.	Samples to be collected from the breathing zone of at least five persons where available.

2. Any further samples required by this Order will be additional to these frequencies.

3. Persons sampled must, as far as possible, remain at the same job for the duration of the test.

4. In the case where Coal Services selects the person to be sampled, the selection must be based on those activities where persons are likely to be exposed to airborne dust.

5. Failed samples will be re-sampled.

6. Determination of respirable dust:

   Samples are to be collected and analysed in accordance with Australian Standard AS2985 (Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Respirable Dust), except where varied by this Order.

7. Determination of respirable quartz:

   The preferred methods of determination of respirable quartz are one of either 'The Potassium Bromide Disc Infra Red Method' or 'The X-ray Diffraction Method' as described in "Guidelines for Determination of Respirable Quartz", publication MDG 3006 MRT 6, published by the Department of Industry & Investment – Mineral Resources.

8. Determination of inhalable dust:

   Samples are to be collected and analysed in accordance with Australian Standard AS3640 (Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Inhalable Dust), except where varied by this Order.

9. Sampling:

   Where practicable, sampling should commence at the start of the shift and cease at the end of the shift and be as close as practicable to the working place, for example, 'crib room to crib room'. The minimum sampling period is five (5) hours.

Definitions

In this Order:

'*airborne dust*' includes both respirable and inhalable dust, it is also known as 'airborne particulate matter' or 'airborne particulates'.

'*breathing zone*' has the same meaning as in Australian Standard AS2985 and AS3640.

'*coal operation*' has the same meaning as in Section 3 of the Coal Mine Health and Safety Act 2002.

'*inhalable dust*' has the same meaning as it has in Australian Standard AS3640 (Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Inhalable Dust).

operator has the same meaning as in Section 3 of the Coal Mine Health and Safety Act 2002.

'*quartz-containing dust*' means respirable dust which contains five percent or more by mass of respirable quartz.

'*respirable dust*' has the same meaning as it has in Australian Standard AS2985 (Workplace Atmospheres – Method for Sampling and Gravimetric Determination of Respirable Dust).

'*respirable quartz*' means the quartz present in respirable dust.

Notes:

The data obtained from the dust sampling operations will be entered onto Coal Services' Dust Database for the purpose of monitoring workers' health as required by the Coal Industry Act 2001. Copies of the data will be distributed to the mine operator, Chief Inspector of Coal Mines and the Industry Check Inspector.

The Coal Industry Act 2001 provides that a person (an individual or a corporation) must not, without reasonable excuse, refuse or fail to comply with this Order:

Maximum penalty: 200 penalty units in the case of a corporation or 50 penalty units in the case of an individual.

Dated this 31st day of January 2011

Signed on behalf of COAL SERVICES PTY LIMITED on the date abovementioned) Ron Land, Chairman;) Mark Coyne, Managing Director/CEO

Approval granted to Coal Services Pty Limited to make this Order pursuant to Section 13 of the Coal Industry Act 2001:

Dated this 8th day of February 2011.

The Hon. STEVE WHAN, M.P.,
Minister for Primary Industries

Coal Services Pty Limited

A.B.N 98 099 078 234

Hunter Valley | Illawarra | Lithgow | Mackay | Mudgee
Newcastle

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