# QGL02: Dust controls are like safety critical controls.

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## Abstract

*QGL02 – Guideline for management of respirable dust in Queensland mineral mines and quarries* was first gazetted in August 2017. This paper is a view from the mineral mines and quarries (MMQ) inspectorate about how the industry has been managing respirable dust since QGL02 was gazetted, and the lowering of the respirable crystalline silica exposure limit to 0.05mg/m$^3$ occurred in September 2020. It also discusses the topic of 'inside looking out' by examining the benefits of using safety critical control management principles to manage the reliability and effectiveness of dust controls. Utilising this approach to dust control management will only become more important as a further lowering of the exposure limit for respirable crystalline silica occurs.

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### History of QGL02

QGL02 is a guideline that provides a way for the site senior executive and other persons to: Identify, analyse, and monitor risk associated with respirable dust hazards; and to establish and maintain effective controls associated with respirable dust hazards.

QGL02 was first gazetted in August 2017 in response to the Coal Workers' Pneumoconiosis Select Committee report released in May 2017.

Over the last 6 years, QGL02 has been revised three times due to industry feedback and compliance, legislative changes, the commencement of QGL04 respiratory health surveillance guideline and changes to workplace exposure standards (WES).

Version 1 of QGL02 focussed on the management of respirable crystalline silica and required the site senior executive to only report personal dust monitoring results to the Mines Inspectorate in the event of a respirable crystalline silica exceedance.

Version 2, published in May 2018, required all respirable dust and respirable crystalline silica monitoring data to be submitted to the Mines Inspectorate. The previous requirement to report exceedances commenced in Version 1 was discontinued at this time.

Version 3, published in April 2020, discontinued reference to the exposure limit of 0.01mg/m$^3$ for respirable crystalline silica, in preparation for the change to the WES for respirable crystalline silica to 0.05mg/m$^3$by Safe Work Australia. Critical control management principles were incorporated into a new section titled 'Establishing and maintaining effective and reliable controls.'. The scope of QGL02 was also broadened from 'Management of respirable crystalline silica' to 'Management of respirable dust' because mine dust lung disease can also be caused by exposure to other respirable dust.

Version 4, published in April 2021, saw the health surveillance requirements discontinued and replaced by new respiratory health surveillance regulations that came into effect on 1st September 2020 and the subsequent publishing of QGL04 – Guideline for the respiratory health surveillance of workers in Queensland mineral mines and quarries.

The compliance approach taken to date by the Mines Inspectorate has been mostly educational and corrective.

In the early years, the Mines Inspectorate devoted a lot of resources to ensuring that mines and quarries

- had engaged a competent occupational hygienist,
- that dust sampling had been commenced and
- any exceedances had been reported to the Inspectorate.

Over time this focus has turned to following up sites that have not been submitting dust sampling data to the Mines Inspectorate and checking compliance with investigating single exceedances.

Compliance tools available include the mines inspectorate using statutory powers to issue substandard condition and practice notices or to give a Directive to the mine or quarry operator to identify, analyse and monitor risk associated with respirable dust hazards and to establish and maintain effective controls associated.

Another compliance tool available to the Mines Inspectorate since the commencement of QGL02 is a civil penalty. A civil penalty is both a deterrent and punitive.

Since November 2018, a civil penalty may be imposed by the CEO of RSHQ on a relevant corporation if a representative of the relevant corporation contravenes a civil penalty obligation prescribed by regulation.

One of the civil penalty obligations prescribed by regulation is the requirement under section 136(2) for the site senior executive to ensure that a worker's exposure to a hazard is monitored and the monitoring results are analysed, regularly.

A civil penalty may be imposed on a mine or quarry operator if a site senor executive does not ensure that a worker's exposure to a hazard is monitored and the monitoring results are analysed regularly. The civil penalty for contravening this obligation is 750 units.

As at the 1st July 2023, a penalty unit was $154.80. Therefore, failing to conduct monitoring for respirable dust could currently result in a civil penalty of $116,100 - a significant deterrent. The Mines Inspectorate has found that being made aware of this civil penalty provision has motivated at least half a dozen operators to do the required monitoring.

**Industry management of respirable dust (view of the regulator)**

For the large mines and quarries, particularly those with a corporate health and safety group or those directly employing health and safety professionals or occupational hygienists, the way provided in QGL02 for the risk assessment of hazards such as respirable dust and respirable crystalline silica was neither new or required little change to existing exposure assessment and control programs. It was the cases that most of the larger mines had already undertaken qualitative health hazard risk assessments and had developed monitoring programs to quantitatively assess risk associated with respiratory hazards.

While most of the small to medium mines and quarries have been willing to comply with the requirements set out in QGL02, the concept of exposure assessment using statistical analysis of monitoring data was very new to them.

Issues that came to light during the early years include:

- Some mines and quarries were found to have used persons to conduct dust monitoring that did not meet the competency requirements for an occupational hygienist or an occupational hygiene technician. To assist the industry the Mines Inspectorate developed a list of pre-qualified occupational hygiene consultants to assist site senior executives to engage a competent occupational hygienist.
- Some mines and quarries started reporting to the Mines Inspectorate that their mineral or rock resources contained no or little crystalline silica and argued that the way provided by QGL02 to manage risk associated with respirable crystalline silica didn't apply at their site. While respirable crystalline silica may not have been present at these mines and quarries, it was the mines Inspectorates view that respirable dust that can cause mine dust lung diseases was potentially present at all mines and quarries. This was one of the reasons why QGL02 was retitled - 'Management of Respirable Dust in Queensland Mineral Mines and Quarries' in April 2020.
- After obtaining multiple quotes from various occupational hygiene consultants, some of the smaller mines and quarries were reluctant to proceed with any of these quotes because they did not want to commit to the expense. To correct this situation, the mines inspectorate has issued substandard condition and practice notices and used statutory powers to give a Directive to the mine or quarry operator to conduct dust monitoring.

In more recent times the main issue observed by inspectors is the practices around investigating exceedances. Inspectors have found that:

- Investigation of a single exceedances hasn't occurred. In fact, inspectors have found that some safety and health management systems do not have a documented technique for investigating the nature and cause of any incident, whether related to safety or a dust sampling exceedance.
- Persons involved in the sampling exceedance have not participated in the investigation.
- Multiple exceedances have been investigated together in one investigation report even though they occurred in different locations, in different similar exposure groups, during different tasks, and on different days.
- The exceedance investigation process was deficient in that it hadn't considered the tasks being undertaken at the time of sampling or the effectiveness of existing controls or the findings made by the consultant occupational hygienist. In one case that occurred at an underground mine, ventilation conditions in the area where sampling had occurred had not been considered during the investigation.
- The investigation findings and controls measures have not been communicated to the relevant workers.

The Mines Inspectorate has also observed that since the lowering of the respirable crystalline silica exposure limit to 0.05mg/$m^3$ in September 2020, that this has not resulted in the industry rushing to re-evaluate the effectiveness and reliability of dust controls. Many of the dust controls previously established at mines and quarries have not materially changed since the lowering of the exposure limit.

**Inside looking out**

This year's conference theme is 'inside looking out'.

The Mines Inspectorate believes the concept of 'inside looking out' is an important part of the risk management practices and procedures at a mine or quarry.

In fact, under the Mining and Quarrying Safety and Health legislation the site senior executive is required to ensure that hazard controls used to reduce risk in the mine's work and local environments are appropriate having regard to the following: the interaction of hazards present in the work and local environments; and the effectiveness and reliability of the controls; and other reasonably available relevant information and data from, and practices in, other industries and mining operations.

So, there is an obligation on the site senior executive to look outside the mine or quarry to other operations, other industries and even research or documented practices to decide if a control being used to reduce risk at the mine or quarry is appropriate.

The Mines Inspectorate is also required to take the 'inside looking out' approach.

When revising QGL02 in 2019, the Mines Inspectorate recognised that many of the engineering controls established to reduce dust exposure often became ineffective or unreliable over time. Inspectors often see example dust controls like wet suppression systems that are no longer effective or reliable or have been turned-off because of scale deposits in spray heads, or spray heads have fallen off or been damaged or no longer point in the intended direction, or the filters are clogged. Sometimes these wet suppression systems have been developed 'inhouse' so the technical or performance specifications are not documented as it would be for an OEM designed and installed system, so that the system can be properly serviced and maintained.

After some consideration critical control management principles were incorporated into Section 3.3.2 'Establishing and maintaining effective and reliable controls' in Version 3 of QGL02 in April 2020.

Naturally, when it comes to health, there has been some resistance from the more safety-oriented professionals to the concept being used for the management of dust controls because critical controls have been primary focused on controls associated with unwanted material safety events. And surely worker exposure to respirable dust is an unwanted material event, how could it not be?

The Mines Inspectorate is of the view that a 'material unwanted event' for health at a mine or quarry is the potential for a significant adverse health effect, mine dust lung disease or death arising from repeated exposure to respirable dust above the occupational exposure level. This also aligns with the view of the ICMM.

So why are dust controls like safety critical controls? They are like safety critical controls because many of the elements used in the management of a safety critical control also can also be used to manage a dust control or health critical control.

The health and safety critical control management approach described in the ICMM good practice guide consists of nine steps. Six steps relate to planning and three steps related to implementation (See Figure 1).

**Planning Phase**

Step 1 – Planning the process

Step 2 – Identifying material unwanted events (MUEs)

Step 3 – Identifying controls

Step 4 – Selecting the critical controls

Step 5 – Defining performance and reporting

Step 6 - Assigning accountability

**Implementation Phase**

Step 7 – Site implementation

Step 8 – Verification and reporting

Step 9 – Responding to inadequate critical control performance

**Figure 1 – Health and Safety Critical Control Management Process**

When developing and implementing effective and reliable controls for respirable dust, QGL02 provides references that include:

- NIOSH Dust Control Handbook for Industrial Minerals Mining and Processing 2nd edition.
- Breathe Freely Australia – Breathe Freely in Mining.
- ICMM Health and Safety Critical Control Management Good Practice.
- ICMM Critical Control Management Implementation.

QGL02 defines those dust controls that are required to be documented in the safety and health management system as those controls that include: plant, equipment and systems established to prevent respirable dust entering a worker's breathing zone. This would include control measures such as dust enclosures, dust collection, dust filtration and wet suppression plant, equipment and systems and respiratory protection.

QGL02 requires the site senior executive to ensure that the following is documented in the safety and health management system for the mine:

- description of hazard and controls;
- person/role responsible for the controls;
- objective/goal of the controls;
- technical specifications and performance requirements of the controls;
- activities that maintain the effectiveness and reliability of the controls;
- activities that verify control performance (i.e. inspection or testing); and
- person/role responsible for control verification activities.

So, what would this look like in practice?

For an engineering control like a cabin pressurisation and filtration system it could look like this:

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| Description of hazard and controls | Crusher Operator Respirable Dust Exposure – Crusher Control Cabin |
| Person/role responsible for the controls | Maintenance Supervisor |
| Objective/goal of the controls | Prevent or reduce worker exposure to respirable dust in control cabin to < 50% of shift adjusted WES (e.g. < 0.020mg/$m^3$). |
| Technical specifications and/or performance requirements of the controls | • Enclosure certified ISO 23875 compliant.<br>• Enclosure integrity - Door and windows closed, air leakage = 0.<br>• Enclosure pressurisation – XX – XX Pa. |

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| | • Intake pre-cleaner installed.<br>• Intake air quantity – XX $m^3$/h.<br>• Intake HEPA efficiency – 99.99% @ 0.5um.<br>• Recirculation air quantity – XX $m^3$/h.<br>• Recirculation filter efficiency – 99.99% @ 0.5 um.<br>Enclosure cleanliness.<br><br>Crusher operations must not commence or continue, unless enclosure pressurisation is between XX to XX Pa, with door closed.<br><br>Crusher operations must not commence or continue, unless real-time monitoring shows average respirable dust concentration in cabin is < 0.020mg/$m^3$ over 1 hour with door closed.<br><br>Crusher operations must not commence or continue after service/maintenance if:<br>• Enclosure leakage is > 0 with door closed.<br>• Air intake quantity is < XX $m^3$/h.<br>• Recirculation air quantity < XXX $m^3$/h.<br>• Enclosure pressurisation is between XX to XX Pa with door closed. |
| Activities that maintain the effectiveness and reliability of the controls | • Check for cabin leaks - Annually.<br>• Pre-cleaner emptied – Daily.<br>• HEPA vacuum and damp dust of cabin - Daily.<br>• Air intake filters replaced - Weekly.<br>• Air recirculation filter replaced - Monthly.<br>• A/C unit and pressure fan service - 6 Monthly. |
| Activities that verify control performance (i.e. inspection or testing) | Control audit and verification – Annually.<br>• Review of pressure monitoring data to check cabin door is not open for periods longer than 30 seconds.<br>• Review 25% of crusher cabin maintenance records to check filters were replaced according to service schedule.<br>Cabin pressure monitoring – Continuous.<br>Cabin real-time dust monitoring – Monthly.<br>Visual inspection of cabin (weekly)<br>• Look for evidence of dust on surfaces (other than the floor) such as sills, fire extinguishers, shelves and in the air-conditioner filter |
| Person/role responsible for control verification activities | Operations Supervisor. |

For respiratory protection, it could look like this:

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| Description of hazard and controls | Crusher Operator Respirable Dust Exposure – Crusher Area during operations. |
| Person/role responsible for the controls | Operations supervisor. |

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| Objective/goal of the controls | Protect worker while conducting inspections when crushing plant operating by reducing concentration inhaled inside of respirator to < 50% of shift adjusted WES (e.g. < 0.025mg/$m^3$). Sam – I would expect this to be much lower, unless the environmental concentration outside the respirator was excessive (i.e. > 0.25 mg/$m^3$) |
| Technical specifications and performance requirements of the controls | • Signage for mandatory use of respirator in crusher area is clearly displayed.<br>• Use of respirator is documented in crusher operating procedure and/or standard work instruction.<br>• Respirator is compliant with AS/NZS 1716.<br>• Required minimum protection factor - Up to 50.<br>• Full Face, P2 Filter.<br>• Facial hair compliant to AS/NZS 1715 - Appendix B.<br><br>Crusher operations must not commence or continue unless the crusher operator is fit-tested, a respirator has been selected, trained in use and maintenance of respirator and have been issued with selected respirator prior to working in crusher area.<br><br>If worker's facial hair is found to not be compliant with AS/NZS 1715 - Appendix B, crusher operations must not commence or continue until facial hair is compliant or the worker is provided with alternative, effective RPD.<br><br>If respirator is found not to be compliant with required technical specifications, crusher operations must not commence or continue until respirator is compliant. |
| Activities that maintain the effectiveness and reliability of the controls | • Fit-test by RESP-FIT accredited tester – Annually.<br>• Respirator training by RESP-FIT accredited provider – Induction and Annually.<br>• Respirator Cleaning and Inspection – Daily Pre-use.<br>• Clean-Shaven Check – Daily Pre-start.<br>• Supervisory check for respirator compliance and use - Daily. |
| Activities that verify control performance (i.e. inspection or testing) | Control audit and verification – Annually:<br>• Review personnel records to check if 100% of fit-testing and training has been conducted for crusher operators in last 12 months.<br>• Review 25% supervisor's shift log to check that crusher operator's facial hair is being checked pre-shift.<br>• Review 50% of supervisor's daily check of crusher operator's respirator compliance and use. |
| Person/role responsible for control verification activities | Site senior executive. |

**Further reductions to the respirable crystalline silica WES**

Again, as an industry it important to be 'inside looking out' from time to time to see what may be on the industry's horizon.

As the Queensland industry knows, the respirable crystalline silica exposure limit was lowered from 0.1mg/$m^3$ to 0.05mg/$m^3$ in September 2020.

Originally the health-based recommendation for respirable crystalline silica was to lower the WES to 0.02 mg/$m^3$. This WES had been recommended to protect for silicosis and fibrosis and to minimise the risk of lung cancer.

However, for technical limitations associated with measurability of respirable crystalline silica at this lower level, SWA members agreed to lower the respirable crystalline silica WES to 0.05mg/$m^3$ in 2019 and to reassess the technical limitations again within 3 years.

The 3-yearly review commissioned by SWA found that the same technical limitations on measurability, that had been previously identified, still exist.

While the technical limitations to measure respirable crystalline silica at 0.025mg/$m^3$ or below have not been resolved, it's probably only a matter of time before measurement at the lower level is able to occur.

The Mines Inspectorate believes that using critical control management principles to manage the reliability and effectiveness of dust controls will only become more important as a further lowering of the exposure limit for respirable crystalline silica occurs.