



Managing silica dust at mine sites and quarries

Guidance Note

This guide is not legal advice. You should read it along with the Work Health and Safety Act 2012, the Work Health and Safety Regulations 2022, Mines Work Health, and Safety (Supplementary Requirements) Act 2012, Mines Work Health, and Safety (Supplementary Requirements) Regulations 2022, and any other laws that apply. You can find these documents on the WorkSafe Tasmania website: www.worksafe.tas.gov.au

These laws use the term ‘Person Conducting a Business or Undertaking’ or ‘PCBU’ instead of ‘employer’.

We welcome your feedback on this guide. Please email your comments to: wstinfo@justice.tas.gov.au.

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Overview of this guidance note



Silica dust exposure is life-threatening.

Exposure is preventable.

Keep your workers safe by taking the right safety measures.

This guidance note aims to help Persons Conducting a Business or Undertaking (PCBUs) at mining, mining process plants and quarry sites. It explains:

- the hazards and risks of breathing in silica dust (also known crystalline silica)
- how to control the risks of working with silica-containing materials that can make silica dust when you work with them
- how to make sure your workplace is safe when working with silica-containing materials.

Understanding silica dust

Silica is a type of natural, mineral crystal made of silicon dioxide that is found in rocks, stones, sand, gravel and clay.

Silica-containing materials consist of tiny particles, which can get into the air when disturbed. Disturbance can be caused by working with them such as when blasting, drilling or excavating, like in the photo here.

Silica can be found in the materials listed in this table:



Image 1: Workers excavating a site.

Table 1: Materials with silica content

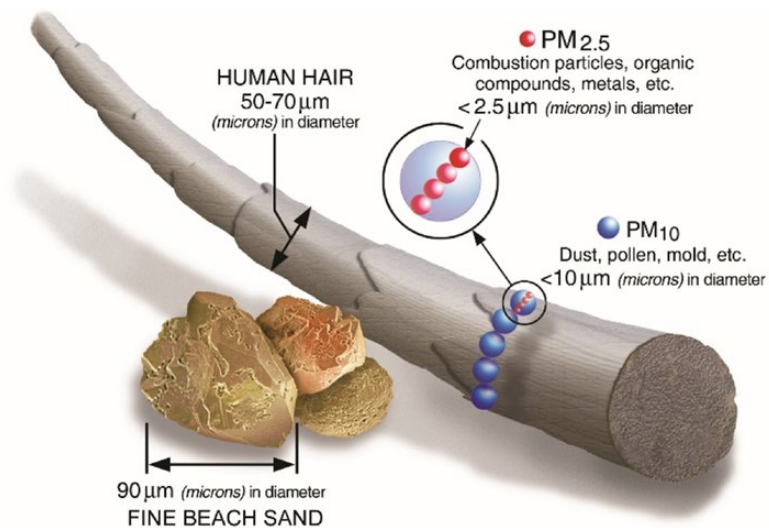
Material containing silica	% of crystalline silica
Sand	Over 95%
Engineered stone products	Up to 92%
Sandstone	70 to 90%
Granite	25 to 60%
Ceramic tiles	5 to 45%
Autoclaved aerated concrete panels, concrete bricks and pavers	20 to 40%
Slate	20 to 40%
Fibre-cement sheeting	5 to 40%
Concrete	Up to 30%
Bricks	5 to 15%
Marble	Up to 5%



Regardless of the percentage of silica, the PCBU must implement controls to manage the risks of exposure to silica dust.

When workers disturb these materials, tiny particles called silica dust, 100 times smaller than a grain of sand, are released into the air. The air can retain these particles for a long time and workers can breathe them in without realising it. Image 2 below shows the comparison of dust particle sizes with human hair.

Image 2: This image shows dust particle sizes. ([United States Environmental Protection Agency](#))



Breathing in silica dust is dangerous. It can harm your lungs, making them scarred and hard for you to breathe. Breathing in silica dust can lead to:



Silicosis (when your lungs become scarred, and they do not recover)



Chronic bronchitis (when the big airways in your lungs become inflamed)



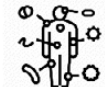
Emphysema (when the little air sacs in your lungs weaken, and it's hard to breathe)



Lung cancer (when cancerous cells grow in your lungs)



Kidney damage (when your kidneys don't function well and can't filter your blood like they should)



Autoimmune disease (when your body's immune system, which is supposed to keep you healthy starts attacking your organs and tissues)

Health professionals know that breathing in low levels of silica dust for a long time can lead to disease. Now, they also know that even brief exposure can be dangerous. Silica disease doesn't show immediate symptoms when you inhale it, but the harm has already begun.



Make sure your workers avoid breathing in silica dust by putting the right controls in place.



The amount of silica in a material or product and the time spent exposed to airborne silica dust determine how significant or high the risk is to a worker's health.

Significant risk = air monitoring shows more than the standard of an eight-hour, time-weighted average (TWA) of 0.05 milligrams per cubic metre (mg/m³).

Air monitoring will determine exposure levels and guide which control measures to put in place.



Identifying risk and exposure

Workers who use power tools or machines on rocks, stones, and other materials containing silica are the ones most likely to breathe in silica dust. This includes workers who:

- blast, dig, drill, cut, excavate or make tunnels in rocks containing silica
- take apart equipment or remove slurry
- move, pile, weigh or clean up the silica dust made by these activities, like sweeping or changing filters or dust bags
- are working nearby to these activities.

Make sure you know the types of natural materials present at your site by:

- referring to a mineralogical report to find out if quartz, cristobalite or crystalline silica is naturally present in your mine or quarry
- checking if there is a silica dust hazard sign at your site, like the one shown on this page
- getting help from occupational hygienists to find possible sources of silica dust at work.

Image 3: Silica dust hazard sign



Risk management strategies

Remove silica dust if you can. If you can't, protect your workers from breathing it in. This is important even for short tasks.

The work health and safety laws say you must:

- check how much silica dust there is at your site and how it can harm your workers
- have a plan to keep your workers safe and healthy
- be ready to deal with any problems caused by silica dust
- keep a record of safety implementation plans and actions.

You should train and supervise your workers to work safely with materials containing silica. This includes independent contractors and other people who might breathe in silica dust.

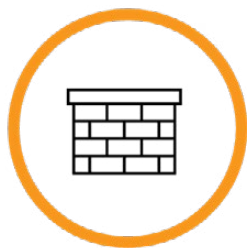
They need to know:

- how silica dust can harm them and their co-workers
- what you are doing to stop or reduce the dust
- how to wear and use their PPE gear, especially respiratory protection
- how their health will be checked and reported on.

Implementing the hierarchy of controls

Using the hierarchy of controls can effectively reduce the risk of silica dust exposure.

The best approach for the most protection is using a combination of controls, such as the I-SEE mix of control methods.



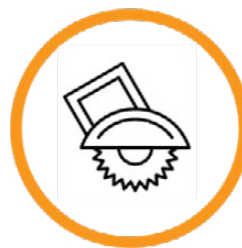
I

I - ISOLATE



S

S - SOAK
(Water suppression)



E

E - EXTRACT



E

E - EQUIP
PPE & RPE

Hierarchy of controls

Image 4 below shows what type of controls are used, from the most effective through to the least effective methods.

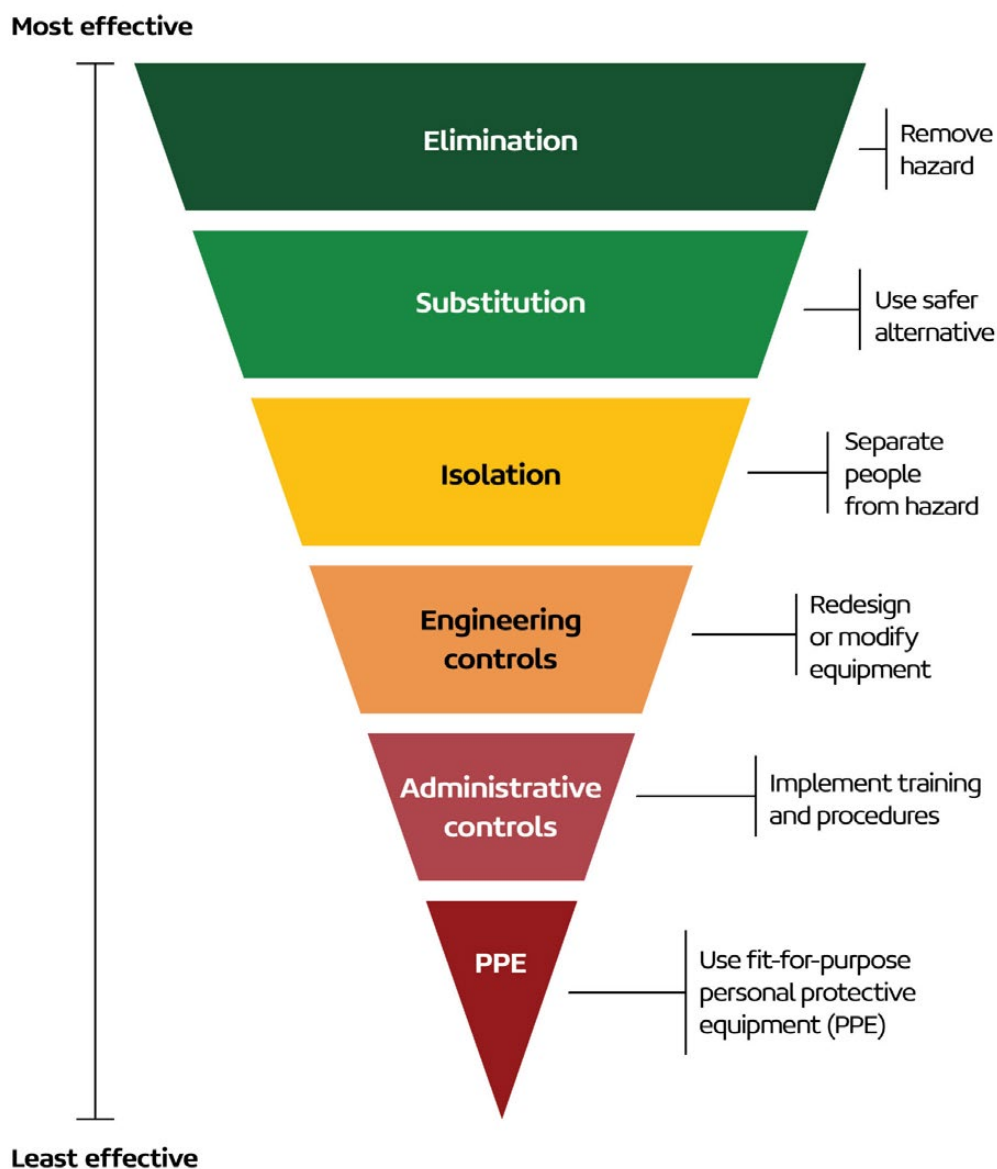


Image 4: Hierarchy of Controls. This image has been used with permission from Lung Foundation Australia.

Control 1: Elimination: physically remove the hazard

- Avoid using materials that contain silica (not relevant for mining and quarries).

Control 2: Substitution: use a safer alternative

- Choose materials with a lower silica content (not relevant for mining and quarries).

Control 3: Isolation: separate people from the hazard

- Use automated machines inside an enclosed space.
- Use fully enclosed operator cabins.
- Provide a safe distance between the workers and the source of the silica dust or remove the hazard.

Control 4: Engineering controls: redesign tasks or modify equipment

Engineering controls involve changing the way tasks are done by using additional mechanical devices or processes to minimise or remove the release of silica dust into the air. Your choice of engineering controls depends on the type of tasks, and it must include one of the following actions numbered 2-4:

1. Automation: Using automated processes such as control rooms for crushing plants.
2. Water suppression: Using a system that puts water on the place where the silica dust comes from to stop the dust from going into the air. You should manage the water runoff well so that the silica dust does not go into the air when it dries.
3. On-tool dust extraction: Using a device that extracts silica dust at the point of generation. This system typically includes a captor hood or shroud fitted over the dust generation point, joined to an extraction unit with trade Class M vacuum cleaners with HEPA filter.
4. Local exhaust ventilation: Using hoods, booths, or walls that remove the silica dust when you make it and let it out at a safe place, filter or scrubber. While fans can lower silica dust levels by removing the air, water can stop the dust and on-tool extraction can provide better protection for workers.

Control 5: Administration controls: implement training and procedures

Administrative controls offer more protection after substituting, isolating and engineering controls are in place. To influence worker behaviour, these controls require procedures and training in the workplace.

Safe work procedures tell workers how to work to help lower silica dust exposure. These procedures might include:

- rotating shifts and limiting task times to minimise each worker's silica dust exposure
- following the manufacturer's instructions for equipment maintenance and filter changes
- putting up warning signs that show the dangers of silica dust clearly
- putting up signs that tell workers to use the control measures they need to lessen silica dust exposure
- decontaminating dusty clothing and respiratory protective equipment during and after work tasks
- keeping the workplace clean by wet sweeping, wet wiping, and mopping and using industrial H or M-class vacuum cleaners with HEPA filters
- giving workers dust-free areas for breaks, eating and drinking
- making sure workers are clean-shaven.



Image 5: Sign that instructs workers to use the control measure of wet sweeping when cleaning up silica dust.

Make the workplace safer by keeping silica dust away from other areas. You can do this by putting some space and barriers between the places where you work with silica. Working outside or in well-ventilated spaces can also help. Only let workers who need to work with silica enter the areas where silica dust is present.



Control 6: Personal protective equipment: protect the worker with PPE and RPE

Personal protective equipment (PPE) is anything used or worn by a person to lessen the risk to their health and safety. PPE is a secondary control measure, which means it should be used alongside higher controls such as substitution, isolation, and engineering controls.

Common PPE includes eye and hearing protection, masks to protect the respiratory system, and clothes to protect skin, arms and legs. Respiratory protection and clothing protection are important to reduce the risk of breathing in silica dust.



Do not rely on personal protective equipment (PPE) such as respiratory protective equipment (RPE) to keep you and your workers safe. You should use a mix or higher order of controls.

Seek advice to make an informed decision about RPE and risk.

Respiratory protective equipment (RPE) selection

You must select RPE that provides proper protection from silica dust. The form and type of respiratory protection you choose depends on the level of exposure, work setting and task. You can consult an occupational hygienist or RPE supplier to help you select the most suitable device. You also need to make sure that the RPE works well with other PPE your workers wear and does not create a new hazard by getting in the way of their hearing, head protection, or vision.

Workers must receive RPE with the appropriate protection factor from you to guard against silica dust. Refer to Table 2 for more information.

Table 2: Respiratory protective equipment (RPE)



Workers need to wear a properly fitted half-face respirator with a P2/P3 filter if silica dust levels are low and short-term, as determined by air monitoring.

Ask an expert, like an occupational hygienist, to help you in the decision making.



Workers should use a full-face respirator with a P2/P3 filter for tasks that create low to medium levels of dust, such as abrading or drilling. However, it is wise to seek advice from an expert to assist in decision-making.

You can consider an expert for advice when deciding whether to use a full-face respirator with a P3 filter for higher levels of dust produced by cutting or blasting.



Workers can wear a special breathing device called a powered air-purifying respirator (PAPR) for protection. This device brings in clean air and pushes it towards the worker's breathing space. They work well in certain situations where other devices might not be suitable, like when it's hot or if the worker has facial hair. It is wise to seek advice from an expert to assist in decision-making.

Respiratory protective equipment fit testing

No single type of mask can protect everyone, so each worker needs to undergo fit testing for the respiratory protective equipment they choose to check how well it works. A competent person performs fit testing, which can be qualitative (spray test) or quantitative (using a monitoring device such as a Portacount).

Respiratory protective equipment fit checking

Before wearing the respiratory protection, the worker should check it for damage and do a fit check. A fit check is a quick way to make sure that the respiratory protection fits properly on the face and seals well with the face and the respirator seal. Workers must be taught how to conduct a fit check. Fit checks are not a substitute for a fit test.

Supporting workers in the use of PPE and RPE

You will need the following systems to help workers use PPE and RPE:

- a policy and procedures on how to use and take off PPE safely
- a clean-shaven face policy for all RPE that needs to be sealed with skin
- training, supervision, and information on how to use PPE and RPE correctly, including regular fit checks
- maintenance, storage, and repair guidelines.

Worker training and protection

Refer to the Australian Standard 1715:2009 Selection, use and maintenance of respiratory protective equipment, and follow these steps to create a system for managing workers' use of respiratory protective equipment (RPE) and personal protective equipment (PPE):

Step 1: Develop a maintenance, storage, and repair program by:

- consulting with your workers to get input from them about the points below
- planning for the keeping, storing, and repairing of RPE and PPE
- checking equipment often to find any signs of wear, damage or failure
- storing equipment properly so it stays clean and safe from damage.

Step 2: Issue policies and procedures for silica material handling so you can:

- write clear and simple policies and procedures for using RPE and PPE when working with silica-containing materials
- explain why it is important to use equipment properly and follow safety guidelines.

Step 3: Ensure workers do not have facial hair:

- have a facial hair policy that tells workers to be clean-shaven when using RPE, as facial hair can make masks leak
- check workers often to make sure they are following this policy.



Step 4: Provide training, supervision, and information:

- provide full training to workers and supervisors on how to use RPE and PPE
- make sure your supervisors know the safety rules and can help workers
- give your workers information, such as pamphlets or posters, that show why it is important to use RPE properly.

Step 5: Check RPE regularly:

- check your masks when a worker changes weight, grows facial hair, or if you think the mask may not work well
- ask workers to tell you if anything changes that may affect how their masks fit and work
- Check filters are being changed regularly with the correct filters.

Step 6: Work with safety experts:

- work closely with an occupational hygienist or competent person in work health and safety.
- ask them for help in developing and putting into place strong control measures.
- talk to work health and safety experts often to learn the best ways to keep workers safe.

By doing these steps, you can help keep workers safe when working with silica-containing materials and avoid potential risks associated with the wrong use of RPE and PPE. Regular training, supervision and working with safety experts are key basics in maintaining a good safety program.

Health checks for workers

Silica dust can harm your workers' health. The PCBU must provide health monitoring for workers who could breathe in silica dust. To find out who needs health checks:

- find out which workers do jobs that make silica dust
- find out which workers clean the places or things that have silica dust on them
- include people who work near where silica dust is made.



A significant risk to a worker's health from working with silica dust triggers the need for health checks and monitoring.

Significant risk will be determined by using air monitoring.



Workers who are at significant risk should get health checks at these three times:

1. before they start working for you for the first time. This will show if their health changes later. If a worker has had a health check in the last two years before working for you, and you can see the results, you do not need to do this
2. every year, or more often if a health expert says so
3. when they stop working for you, such as when they retire or change jobs.

A registered health expert in silica dust and silica-related diseases will do the health checks. Usually, the check process involves asking some questions, testing how well the lungs work, and taking a picture of the chest with either an x-ray or a special scan called a High-Resolution CT scan. To find silica sickness early, Lung Foundation Australia says the High-Resolution CT (HRCT) is better than the x-ray.

The health professional may ask to check your workplace as part of the health monitoring program and request to see air monitoring records. They will tell you how often you need to do health checks and monitoring. This might be different for different workers.

Keep health check records confidential, like medical records. You must give the worker a copy of the health check report and keep records safely for 30 years. If the worker has questions about the report and their health, tell them to talk to the health expert who did the check or their doctor.

If you find out that a worker has developed a disease, illness or injury, report it to WorkSafe Tasmania as soon as you can by calling 1300 366 322 or completing the online notification form.

Go to safeworkaustralia.gov.au and search for 'health monitoring for crystalline silica' for more information about health checks and monitoring.

Air monitoring in the workplace

You (the PBCU) must ensure that no person at your worksite is exposed to substance or mixture in an airborne concentration that exceeds the workplace exposure standard of 0.05 milligrams of silica dust time-weighted average in one cubic metre of air in eight hours. An occupational hygienist who studies how work affects health should do the air monitoring. It is important to remember that air monitoring is a measurement tool, not a way to control silica dust. Occupational hygienists help to see if your control measures to reduce silica dust exposure are working well.



The workplace exposure standard (WES) for respirable crystalline silica is 0.05 mg/m³ over an eight-hour workday, five days a week. You must not be exposed to levels exceeding 0.05 mg/m³ during your regular eight-hour daily shifts.



Image 6: Comparable dust particle sizes per cubic metre of air



Air monitoring needs to be done:

1. when you are not sure if you are below the worker exposure standard, such as when you use new control measures or choose the right RPE
2. to see if the workers or other people at the workplace have significant health risks from silica dust exposure.

An occupational hygienist can look at and advise on the air monitoring you need and how often. They can also do air monitoring and write a report that shows how much silica dust is in the air and if it is more than the standard of an eight-hour, time-weighted average (TWA) of 0.05 milligrams per cubic metre (mg/m³). In the report, they can advise on control measures.

You must keep the air monitoring reports for 30 years.

Compliance and reporting to WorkSafe Tasmania

You (the PCBU) or the person in control of the workplace should tell WorkSafe Tasmania quickly if a notifiable incident happens. A notifiable incident is a serious or dangerous event, such as a death, injury, illness or near miss. Also, telling WorkSafe Tasmania is needed in these situations:

- when there is a failure of physical isolation or engineering controls leading to an uncontrolled release of silica dust or;
- when a health monitoring report shows an injury, illness or disease in a worker, or when the doctor recommends a review of workplace controls.

WorkSafe Tasmania inspectors will check the work safety and health risks at your site. For silica dust, they will look at how you have:

- identified and talked about the risk of silica dust exposure at the site to workers
- written down the risk check for jobs that make silica dust
- completed air monitoring and written down the results
- checked how well the control measures work
- written down what you did for each control measure that the occupational hygienist said and why you did not do some of these if that is the case
- made sure that cleaning policies and procedures are followed
- see if the workplace is right for the work you do
- checked respiratory protective equipment (RPE) and personal protective equipment (PPE) you give, including how you choose them, how you fit test them, keep them, and look after filter changes
- made sure that workers have had health checks, and you can see the health check reports.

You will find a list of things to do for silica dust at the end of this guidance note. Use it to see if there is silica dust risk in the workplace and if you have measures in place to protect workers from silica dust. You can check your workplace yourself with this list.

More information

WorkSafe Tasmania at [worksafe.tas.gov.au](https://www.worksafe.tas.gov.au):

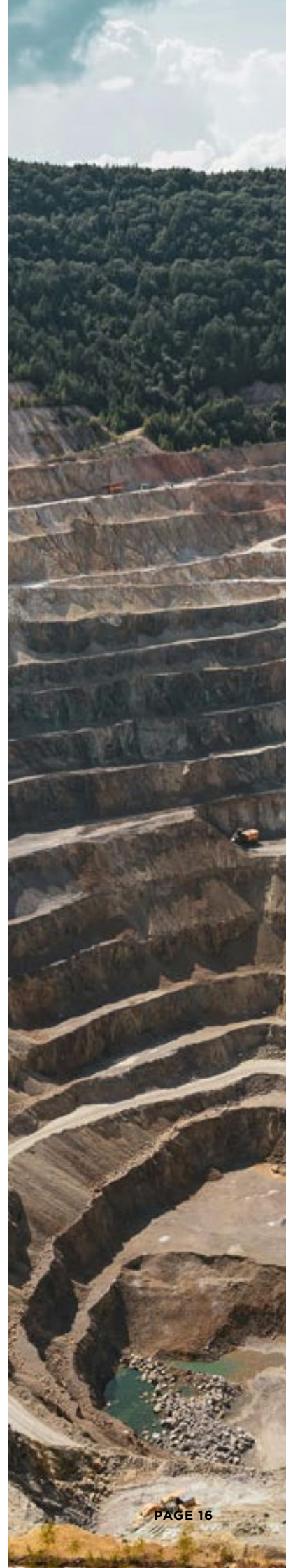
- [Managing the risks of respirable crystalline silica from engineered stone in the workplace code of practice](#)

Safe Work Australia resources at [safeworkaustralia.gov.au](https://www.safeworkaustralia.gov.au):

- [Workplace exposure standard for respirable crystalline silica](#)
- [Exposure standards: airborne contaminants](#)
- [Guidance on the interpretation of workplace exposure standards for airborne contaminants](#)
- [Health monitoring for crystalline silica](#)

Other resources

- AS/NZS 1715:2009 Selection, use and maintenance of respiratory protective equipment





Appendices

Silica dust risk management checklist

Use this checklist to manage silica dust at your site. The checklist lines up with the regulatory requirements under:

- Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2022
- Mines Work Health and Safety (Supplementary Requirements) Act 2012 and Mines Work Health and Safety (Supplementary Requirements) Regulations 2022.

Your trade, tasks and the materials you use will affect how much and how many risks of silica dust you have, as each workplace is different. Some questions in the checklist may not be for your workplace.

Find more information:

- go to the WorkSafe Tasmania website at [worksafe.tas.gov.au](https://www.worksafe.tas.gov.au)
- call WorkSafe Tasmania on 1300 366 322
- refer to the matrix of controls following this checklist
- consult this guidance note.

Regulation	Managing risks	Yes	No
r34	Have all materials that contain crystalline silica been identified?		
	Have all tasks that are silica dust generating been identified?		
r36 (3)	Have one or more higher-level control measures been implemented?		
	Is work performed nearby visible dust that a person would reasonably believe contains silica?		
	Are engineering controls implemented?		
r40 (e)	Is there adequate ventilation to perform work?		
r36 (4)	Are there appropriate policies and procedures prepared for: <ul style="list-style-type: none"> • housekeeping? • cleaning and disposing of slurry? • equipment maintenance? 		
	Is there signage?		
r36 (5)	Is appropriate personal protective equipment provided?		
r44	Is it suitable to support higher-order control measures?		
	Is the protection factor provided suitable?		
r37 and 38	Is there a schedule of review and maintenance for the control measures implemented?		
r351 (s19)	Are the risks of silica at the workplace being managed?		

Regulation	Managing risks	Yes	No
Respiratory protective equipment (RPE)			
r44(2)	Is appropriate RPE for use by the workers at the workplace to control the remaining risk?		
r44(3c)	Is RPE being worn or used by workers?		
r44(3ai)	Is the RPE provided suitable for the RCS risk?		
	Is the RPE provided consistent with that recommended by the safety data sheet (SDS) or product information sheet?		
	Does the RPE have an appropriate assigned protection factor?		
r44(3b)	Is the RPE clean and in good operating order?		
r44(3a)	If RPE is tight fitting, has a fit test been completed (in accordance with AS1715)?		
r44(4)	Has the worker been provided training for the use, wearing, storage, and maintenance of their RPE?		
r46	Is the worker wearing their RPE in accordance with their training?		
	Is the worker following clean-shaven policies?		
	Is there evidence that the worker conducts a fit check when putting on and wearing their RPE?		
r49	Can the PCBU demonstrate that the workplace exposure standard is not being exceeded?		
r50	Has air monitoring been undertaken to confirm workplace exposure standard has not been exceeded or to determine a risk to health?		
Engineering controls			
r36 (3)	Is work with silica-containing materials isolated?		
	Are wet methods in use?		
	Are dust extraction methods used either on tool or local exhaust?		
r351(1)	Are water suppression and/or dust extraction methods being used?		
	Is it adequate?		
	Is it well-directed?		
	If water suppression is being used, is the mist controlled and slurry collected?		
	If dust extraction is being used, is it capturing most of the visible dust generated?		
	If a dust extraction plant (vacuum cleaner/dust extraction unit) is being used, does the plant or plant filter system meet the requirements of at least M-class (H-class is also acceptable) as described in AS 60335.2.69?		
	Is a tool-mounted dust extractor fitted with a HEPA filter?		

Regulation	Managing risks	Yes	No
Safety signage			
r353	Has signage been put up?		
Health monitoring			
r368	Has relevant health checks been provided to all relevant workers?		
r375	Have workers been provided with a copy of their individual health check report?		
Duty of care			
r376	Have health monitoring reports been provided to WorkSafe Tasmania when they contain advice that test results indicate a disease, injury or illness or recommendations to take remedial actions?		
s19 (c)	Are safe systems of work established, maintained, and regularly reviewed?		
	Are these systems adequate to manage the risk?		
s19 (f) r 39	Have workers been provided the information, training, instruction, and supervision necessary to protect all persons from risks to health and safety?		
	Is there evidence of training for working with silica?		
	Is there evidence of training for RPE?		
s19 (g)	Is the health of workers and conditions at the workplace monitored to prevent illness and injury?		

Table 2: Matrix of controls

Combination of control measures and supporting requirements*								
Task/Product	Do I need isolation controls?	What cutting method should I use?	What dust collection or ventilation do I need?	What administrative controls do I need?	Do I need to provide RPE and what kind?	Do I need to organise air monitoring?	Do I need to provide health monitoring?	What else do I need to do?
Red: Engineered stone and high content silica materials	Yes: Significant exclusion zones from other workers RPE worn for surrounding workers	Wet only**	Local exhaust and/or H-class on tool dust extraction	<ul style="list-style-type: none">• Signage• Housekeeping policy• Maintenance policy for plant, equipment, and PPE• Clean-shaven policy for tight-fitting RPE• Task scheduling	Yes: APF 25-50 for operator	Yes, for control effectiveness and compliance as indicated	Yes, and consider the exposure of surrounding workers	Fit testing of RPE
Orange: Silica content up to 50%	Yes: Significant exclusion zones from other workers with RPE worn for surrounding workers	Wet only**	Local exhaust and/or H-class on tool dust extraction	<ul style="list-style-type: none">• signage• housekeeping policy• maintenance policy for plant, equipment and PPE• clean shaven policy for tight fitting RPE• task scheduling	Yes: APF 25-50 for operator	Consider when changing controls	Yes, and consider surrounding workers	Fit testing of RPE
Orange: Silica content up to 25%	Yes: Exclusion zones with RPE worn for surrounding workers		Local exhaust or H- or M-class on tool dust extraction Where controlled, modification can be undertaken outdoors	<ul style="list-style-type: none">• signage• housekeeping policy• maintenance policy for plant, equipment, and PPE• clean-shaven policy for tight-fitting RPE	Yes: APF 10-25 for operator			Fit testing of RPE
Yellow tasks: Silica content <15%	Consider exclusion zones	Wet or Dry with manual tools and dust capture	Local exhaust or M-class on tool dust extraction Where controlled, modification can be undertaken outdoors	<ul style="list-style-type: none">• Housekeeping policy• Maintenance policy for plant, equipment, and PPE	As indicated or as a backup for failure of higher-level controls	Control effectiveness and compliance	Yes, if exposure is significant	As indicated

* You should choose the best way to protect your workers from silica dust based on your risk assessment. The different ways you use should work well together. For example, if workers use water to cut down the dust, they should also use a good dust collector or fan to get rid of the mist.

** Workers should always control the dust when they cut materials that have silica in them. Do not cut them dry without any protection.

1300 366 322
www.worksafe.tas.gov.au

For more information contact

Phone: 1300 366 322 (within Tasmania)
(03) 6166 4600 (outside Tasmania)

Fax: (03) 6173 0206

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