

Safe Work Australia

Decision Regulation Impact Statement: Prohibition on the use of engineered stone

August 2023

Disclaimer

Safe Work Australia is an Australian Government statutory agency established in 2009. Safe Work Australia includes Members from the Commonwealth, and each state and territory, Members representing the interests of workers and Members representing the interests of employers.

Safe Work Australia works with the Commonwealth, state and territory governments to improve work health and safety and workers' compensation arrangements. Safe Work Australia is a national policy body, not a regulator of work health and safety. The Commonwealth, states and territories have responsibility for regulating and enforcing work health and safety laws in their jurisdiction.

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Abbreviations

Acronym or term	Meaning
Agency	The Safe Work Australia agency
AIOH	Australian Institute of Occupational Hygienists
DALY	Disability adjusted life year
EY	Ernst and Young Pty Ltd
HSR	Health and safety representative
iCare	Insurance and Care NSW
Members	Safe Work Australia Members
PCBU	Person conducting a business or undertaking
PPE	Personal protective equipment
RCS	Respirable crystalline silica
RIS	Regulation impact statement
RPE	Respiratory protective equipment
TWA	Time weighted average
SWMS	Safe work methods statement
WES	Workplace exposure standard
WHS	Work health and safety
WHS ministers	Jurisdictional ministers with responsibility for work health and safety

Background

On 28 February 2023, Work Health and Safety (WHS) ministers considered the recommendations of the Decision Regulation Impact Statement: Managing the risks of respirable crystalline silica (RCS) at work ([Silica Decision RIS](#)) and agreed that the Safe Work Australia Agency (the Agency) undertake further analysis and consultation on the impacts of a prohibition on the use of engineered stone under the model WHS laws (DEWR 2023). Ministers noted this should include:

- consideration of silica content levels and other risk factors
- a national licensing system for work with products that are not subject to a ban, and
- a national licensing system for work with legacy products.

This Decision Regulation Impact Statement (Decision RIS) provides the analysis of the regulatory impacts of options under the model WHS laws to prohibit the use of engineered stone. It builds on the evidence and analysis considered by WHS ministers and should be read in conjunction with the Silica Decision RIS.

A prohibition on the import of engineered stone is outside the scope of this Decisions RIS as this is a matter for the Commonwealth. The Department of Employment and Workplace Relations is considering the prohibition on import of engineered stone (DEWR 2023).

This Decision RIS is informed by stakeholder feedback on a consultation paper released by the Agency in March 2023. It also draws on the Safe Work Australia Members' (Members) workshop in April 2023, an independent expert review of scientific evidence regarding the risk profile of working with engineered stone undertaken by the University of Adelaide, and an economic impact analysis undertaken by independent consultants, Ernst & Young Pty Ltd (EY).

This Decision RIS has been prepared in accordance with the Regulatory Impact Analysis Guide for Ministers' Meeting and National Standard Setting Bodies, as updated in June 2023 (the Guide). The Office of Impact Analysis (OIA) has confirmed this Decision RIS meets the requirements set out in the Guide.

Acknowledgements

The Agency thanks all stakeholders who participated in the consultation process, in particular the important contributions of our Members, stone benchtop industry businesses, unions, and peak health bodies.

The Agency engaged the University of Adelaide and Monash University to review the available evidence on the risk profile of engineered stone and thanks the Universities for that work.

The Agency also engaged EY to support development of this Regulation Impact Statement. The Agency thanks EY for undertaking the impact analysis. This impact analysis was undertaken in May and June 2023, with parameter assumptions current at June 2023.

Executive summary

Statement of the problem

Australian workers are developing silicosis as a result of working with engineered stone.

The first Australian case of silicosis associated with engineered stone was reported in 2015 (Frankel, Blake and Yates 2015). Silicosis case numbers in engineered stone workers have risen substantially since this time. While silicosis cases have been found in workers across a range of industries and silica-containing materials, a disproportionate number of silicosis diagnoses are in engineered stone workers. In these workers (compared to workers exposed to silica from natural sources), silicosis is associated with a shorter duration of exposure to silica, faster disease progression and higher mortality (Hoy, et al. 2023).

One of the key reasons for this is the nature of engineered stone and the RCS it produces:

- Engineered stone often has significantly higher crystalline silica content, resulting in the generation of more dust containing RCS when processed, compared to natural stone.
- Engineered stone can be processed more easily than natural stone, meaning more stone can be processed in one shift (leading to higher exposure to dust), and a less skilled workforce can be used.
- RCS produced from engineered stone has different physical properties from that produced from natural stone, including a greater proportion of very small (nanoscale) particles of RCS which can penetrate deeper into the lungs.
- In addition to RCS, other components of engineered stone, such as resins, metals, amorphous silica, and pigments, may contribute to the toxic effects of engineered stone dust, either alone or by exacerbating the effects of RCS.

The exposure of workers and others to RCS is regulated by the model WHS laws as a risk to health and safety arising from work. Since 2011, there have been robust and consistent laws in place requiring persons conducting a business or undertaking (PCBUs), including designers, importers and manufacturers, to eliminate or minimise the risks to workers and others from RCS so far as is reasonably practicable, including that generated from engineered stone. Under those laws, workers are also required to take reasonable care for their own health and safety and ensure that their acts or omissions do not adversely affect the health and safety of others.

In response to the diagnoses of silicosis in engineered stone workers, the model WHS laws have been amended to remove any doubt in relation to the applicable control measures when working with engineered stone, for example, the prevention of dry cutting. The workplace exposure level for RCS has also been reduced from 0.1 mg/m³ to 0.05 mg/m³ (8-hour time weighted average), with Members recently agreeing to recommend a further reduction to WHS ministers (to 0.025 mg/m³). Safe Work Australia and Commonwealth, state and territory governments have also undertaken increased compliance activities, education and awareness campaigns and health screening programs to prevent further unlawful exposure to RCS.

However, it is tolerably clear that **historically there has been insufficient compliance activities in respect of the engineered stone industry for the level of risk.** Further, there has been, and continues to be, **non-compliance with the obligations imposed by the model WHS laws, by both PCBUs and workers.**

The **nature of the engineered stone industry** has also arguably contributed to non-compliance and hence the extent of cases of silicosis in the industry. It is comprised of mostly small businesses with few barriers to entry and a lower understanding of WHS obligations. Relevantly, these PCBUs had limited awareness of the risks of engineered stone, and their duties to manage those risks, including to assess the risks and implement the necessary control measures to keep their workers safe. Workers too were often unaware of those risks and duties, and their rights and responsibilities.

Some of the mechanisms in the model WHS laws that assist to better manage health and safety risks in workplaces were less likely to be present because of the nature of the engineered stone industry and the workforce. For example, there is unlikely to be a health and safety representative (HSR) or a health and safety committee at these workplaces. Where present, an HSR or a health and safety committee can monitor compliance with the WHS laws and raise concerns about risks to health and safety in the business.

The **lack of available and accessible information about the risks of working with engineered stone** is also problematic. Importers, manufacturers and suppliers have failed to provide end users with comprehensive up to date health-based data and evidence on the risks of RCS in relation to engineered stone.

What policy options are being considered?

In the Silica Decision RIS, WHS ministers considered and agreed a number of policy options to address the high rates of silicosis in engineered stone workers. This Decision RIS considers only the possible prohibition on the use of engineered stone under the model WHS laws.

- Option 1:** Prohibition on the use of all engineered stone
- Option 2:** Prohibition on the use of engineered stone containing 40% or more crystalline silica
- Option 3:** As for option 2, with an accompanying licensing scheme for PCBUs working with engineered stone containing less than 40% crystalline silica.

All 3 options for a prohibition on the use of engineered stone under the model WHS laws allow for exemptions for certain work, including removal, repair and minor modifications of engineered stone already installed, provided the PCBU is licensed (licensing framework for work with legacy products).

What is the likely impact of the options?

Costs

For each option in Table 1, the greatest contributor to economic cost is the licensing framework for work with legacy products, accounting for between 96% and 100% of the total cost of each option.

This licensing framework for work with legacy products has a consistent cost, to PCBUs and government, across all options – \$240.5 million over the appraisal period (implementation period and first 10 years).

By contrast, the other costs to PCBUs, government and workers (not associated with the licensing framework) are \$10.6 million for Option 1, no additional cost for Option 2, and \$9.3m for Option 3. The additional cost for Option 3 compared to Option 2 reflects the costs of the licensing scheme for work with engineered stone containing less than 40% crystalline silica.

Table 1 Comparison of the estimated cost for prohibition options over the appraisal period (\$m), by component

	Option 1 – complete prohibition		Option 2 – prohibition ≥ 40% crystalline silica		Option 3 – prohibition ≥ 40% + licence for < 40%.	
	Cost – licensing framework for work with legacy products	Other costs	Cost – licensing framework for work with legacy products	Other costs	Cost – licensing framework for work with legacy products	Other costs
Cost to PCBU's	\$133.0	\$6.9	\$133.0	\$0	\$133.0	\$4.2
Cost to government	\$107.5	\$0.7	\$107.5	\$0	\$107.5	\$3.6
Cost to workers	n/a	\$3.1	n/a	\$0	n/a	\$1.5
Sub total (component)	\$240.5	\$10.6	\$240.5	\$0	\$240.5	\$9.3
Total	\$251.1		\$240.5		\$249.7	
% Total option costs	96%	4%	100%	0%	96%	4%

Breakeven analysis

Breakeven analysis estimates the number of silicosis cases which would need to be averted by each prohibition option to offset the costs of the option. It does not measure the relative benefits of each option. The breakeven point was determined by dividing the net present cost over the appraisal period by the \$4.9 million expected value of a life saved and illness avoided for silicosis. In total, depending on the option either 49 or 51 cases would need to be averted for the measures to offset the costs. The small difference in number of cases that would need to be averted between the options is because each option has a common licensing framework for work with legacy products, which is either 100% (Option 2) or 96% (Options 1 and 3) of the total cost.

Table 2 Estimated breakeven analysis results over appraisal period

Option	Total cost (\$m)	Estimated number of cases prevented required to breakeven over the period – total
Option 1	\$251.1	51
Option 2	\$240.5	49
Option 3	\$249.7	51

Benefits

Removing engineered stone as a source of RCS from the Australian market is expected to lead to a range of long-term benefits including reduced illness and death, increase quality of life for workers, and

avoided health system costs and improved workplace productivity. There are also benefits to workers' families, friends and communities.

The extent to which these benefits are realised will depend on the option implemented. A prohibition on the use of all engineered stone (Option 1) will have greater health benefits for workers compared to a prohibition on the use of engineered stone containing 40% or more crystalline silica (Options 2 and 3). There is no evidence to demonstrate that prohibiting engineered stone with 40% or more crystalline silica (Options 2 and 3) will prevent all adverse health effects associated with exposure to dust from engineered stone.

Consultation outcomes

Consultation on the proposed options showed clear stakeholder support for some form of prohibition (rather than maintaining the status quo), with preferences split across the options proposed. Only 16 of the 114 submissions did not support any of the proposed options. Unions, professional organisations and peak health bodies supported Option 1 (a prohibition on the use of all engineered stone). Industry groups, while not necessarily supportive of a prohibition of engineered stone, acknowledged there is an issue with silicosis in engineered stone workers. They consider it can be addressed through regulation of high risk crystalline silica processes previously agreed by WHS ministers (Option 5a in the Silica Decision RIS). The majority of stakeholders acknowledged there is not currently enough evidence to determine a threshold crystalline silica content at which engineered stone could be worked with without risk (for example, the 40% threshold proposed in Options 2 and 3). Around half of PCBUs working with or supplying engineered stone supported Option 3, commenting that a licensing scheme would enhance compliance in the sector.

What is the best option or combination of options?

Recommended option:

Option 1: Prohibition on the use of all engineered stone.

All options, including maintaining the status quo (i.e. no prohibition on the use of engineered stone), were considered in the context of the problem statement, consultation feedback, workshop outcomes, an economic impact analysis and an expert review of available evidence on the risk profile of working with engineered stone.

A complete prohibition on the use of engineered stone is recommended.

The risks posed by working with engineered stone are serious and the possible consequences of being exposed to RCS generated by engineered stone are severe and sometimes fatal. To date, we – PCBUs, workers, regulators and policy agencies – have failed to ensure the health and safety of all workers working with engineered stone.

To ensure prevention is effective, it is vital all participants in the WHS system discharge their duties:

- importers, manufacturers and suppliers must provide adequate information on the risks posed by engineered stone
- PCBUs must do all that is reasonably practicable to eliminate or minimise those risks
- workers must take reasonable care for their own health and safety, and

- WHS regulators must adequately regulate the industry.

The failure of only one participant to meet their duties could mean increased incidence of silicosis in engineered stone workers.

Unfortunately, there is evidence of continued non-compliance with WHS laws by PCBUs and workers in the engineered stone industry, despite significant education and awareness-raising activities as well as compliance and enforcement action by WHS regulators. This means workers will continue to be put at risk from exposure to RCS.

A lower silica content engineered stone is not expected to result in improvements in compliance. The features of the sector that have contributed to the current levels of non-compliance remain. In fact, permitting work with lower silica engineered stone may encourage even greater non-compliance with WHS laws as there may be an incorrect perception that these products are 'safer'.

There is also no evidence that lower silica engineered stone poses less risk to worker health and safety. Manufacturers have not yet established (through independent scientific evidence) that these products are without risks to the health and safety of workers and others in the workplace. There is no toxicological evidence of a 'safe' threshold of crystalline silica content, or that the other components of lower silica engineered stone products (e.g. amorphous silica including recycled glass, feldspar) do not pose additional risks to worker health.

Given this, a precautionary policy response is appropriate. At present an unknown number of Australian workers will go on to develop silicosis because of their prior exposure to RCS from working with engineered stone. The only way to ensure that another generation of Australian workers do not contract silicosis from such work is to prohibit its use, regardless of its silica content. The cost to industry, while real and relevant, cannot outweigh the significant costs to Australian workers, their families and the broader community that result from exposure to RCS from engineered stone.

1. Introduction

1.1 About Safe Work Australia

Safe Work Australia is an independent Australian Government statutory agency jointly funded by the Commonwealth, state and territory governments through an Intergovernmental Agreement.

Safe Work Australia was established by the *Safe Work Australia Act 2008* (Cth) to lead the development of policy to improve work health and safety (WHS) and workers' compensation arrangements across Australia.

Safe Work Australia does not regulate WHS. The Commonwealth, states and territories have responsibility for implementing and enforcing WHS laws in their jurisdiction.

Safe Work Australia is governed by a tripartite body comprising 15 Members, including:

- a Chair
- nine Members representing the Commonwealth and each state and territory
- two Members representing the interests of workers
- two Members representing the interests of employers, and
- the Chief Executive Officer of Safe Work Australia.

Safe Work Australia's functions include:

- monitoring and evaluating the model WHS laws (the model WHS Act, model WHS Regulations and model Codes of Practice) to improve safety outcomes and address issues that have the potential to impede the effective and efficient operation of the laws, and
- facilitating the development of accessible, effective and practical material to aid understanding and compliance; minimise regulatory cost; and support improved WHS outcomes, particularly for small business and individuals.

The model WHS laws have been implemented in the Commonwealth and all states and territories except Victoria.

1.2 Background

The Safe Work Australia Agency (the Agency) finalised the Silica Decision RIS on 5 February 2023, for consideration by WHS ministers.

At a meeting on 28 February 2023, WHS ministers considered and agreed to the recommendations proposed by the Agency in the Silica Decision RIS:

- Option 2: National awareness and behaviour change initiatives
- Option 5a: Regulation of high-risk crystalline silica processes for all materials (including engineered stone). Ministers noted this should cover all industries, and
- Option 6: Further analysis and consultation on the impacts of a prohibition on the use of engineered stone under the model WHS laws. Ministers noted this should include consideration of silica content levels and other risk factors, and a national licensing system for products that are not subject to a ban and for legacy products.

This Decision RIS summarises outcomes of the further analysis and consultation on a prohibition of engineered stone and makes recommendations to WHS ministers on next steps.

This Decision RIS should be read in conjunction with the Silica Decision RIS, which contains a more complete introduction to the risks posed by RCS in the workplace.

This Chapter summarises new information since the Silica Decision RIS was finalised in February 2023. Chapter 2 expands on risks specific to RCS generated from engineered stone.

1.3 The case for government intervention

Silicosis and silica-related diseases pose an unacceptable health risk to workers. There are significant financial and non-financial costs associated with being diagnosed with silicosis and/or a silica-related disease, including significant physical and emotional harm, reduced ability to work, reduced quality of life and premature death of workers. There are also significant costs to the public health system, including for health screening, diagnosis, treatment and disease management.

The disproportionate number of cases, and age of diagnosis of silicosis and silica-related diseases in engineered stone workers, and the impacts on these workers, their families and communities present an urgent case for government intervention. Further details on the need for government action are included in the Silica Decision RIS.

1.4 Objectives of government intervention

The primary objective of government intervention is to reduce workplace exposure to RCS from engineered stone in Australia, with the ultimate aim of eliminating silicosis, a preventable disease, and other silica-related diseases in engineered stone workers. This is consistent with the shared objective in the *All of Australian Governments' response to the National Dust Disease Taskforce final report* of eliminating silicosis amongst workers and increasing the quality of life for those already impacted and their families (Australian Government 2022).

1.5 Purpose and scope of this Decision Regulation Impact Statement

The purpose of this Decision RIS is to consider and make recommendations to WHS ministers on the preferred options for a prohibition on engineered stone.

As explained in Section 2.2, RCS exposure from working with engineered stone can lead to earlier onset and more severe disease. The scope of this Decision RIS includes all workplaces subject to the model WHS laws and where workers use engineered stone.

Victoria has not implemented the model WHS laws, and therefore workplaces in Victoria are out of the scope of this Decision RIS. However, recent amendments to the Victorian *Occupational Health and Safety Regulations 2017* were considered in developing the options. The Victorian amendments include the introduction of a licensing scheme for employers working with engineered stone (defined as containing 40% or more crystalline silica), duties on manufacturers and suppliers of engineered stone, and additional regulatory oversight of high risk crystalline silica work outside of engineered stone across a broad range of industries (WorkSafe Victoria 2021).

The import of engineered stone is out of scope of this Decision RIS as importation prohibitions are within the remit of the Commonwealth. The Commonwealth Department of Employment and Workplace Relations is currently exploring an import ban on engineered stone, and the Agency understands this will involve consulting with states, territories and other affected parties on the effect of the ban.

1.6 Structure of this Decision RIS

This Decision RIS was prepared in accordance with the Regulatory Impact Analysis Guide for Ministers' Meetings and National Standard Setting Bodies June 2023 (Department of Prime Minister and Cabinet 2023). Table 3 indicates where and how each of the required questions have been addressed in this Decision RIS.

Table 3 The 7 RIS questions

Question	Location
Why is government action needed?	Chapter 1 – Introduction
What is the problem?	Chapter 2 – Statement of the problem
What policy options are to be considered?	Chapter 3 – What policy options are being considered
What is the likely net benefit of each option?	Chapter 4 – What is the likely impact of the options?
Who was consulted and how was their feedback incorporated?	Chapter 5 – Who was consulted and how was their feedback incorporated?
What is the best option from those considered and how will it be implemented?	Chapter 6 – What is the best option? Chapter 7 – Implementation and evaluation
How will the chosen option be evaluated?	Chapter 7 – Implementation and evaluation

2. Statement of the problem

2.1 Defining the problem

Australian workers are developing silicosis as a result of working with engineered stone

There has been a dramatic increase in cases of silicosis and silica-related disease in Australia in recent years, particularly in workers who have been exposed to silica dust from processing engineered stone.

Engineered stone workers are over-represented amongst people diagnosed with silicosis for a number of reasons. This is compounded by the unique hazards posed by engineered stone dust.

One of the key reasons for this is the nature of engineered stone and the RCS it can produce

Engineered stone differs from natural stone in several ways. It is often softer and more malleable, which means more stone slabs can be processed in one day, leading to higher exposure levels over time. Further, evidence suggests that RCS from engineered stone has different physical and chemical properties compared to RCS from natural stone, and other components in engineered stone dust may pose additional health risks or exacerbate the adverse effects of exposure to RCS.

There has been insufficient compliance with the model WHS laws for the level of risk

The exposure of workers and others to RCS is regulated by the model WHS laws as a risk to health and safety arising from work. Since 2011, there have been robust and consistent laws in place requiring PCBUs, including designers, importers and manufacturers of engineered stone products, to eliminate or minimise the risks to workers and others from RCS so far as is reasonably practicable, including that generated from engineered stone. Under those laws, workers are also required to take reasonable care for their own health and safety and ensure that their acts or omissions do not adversely affect the health and safety of others. There has been, and continues to be, **non-compliance with the obligations imposed by the model WHS laws, by both PCBUs and workers**. Additionally, **historically there has been insufficient compliance activities in respect of the engineered stone industry for the level of risk**.

The **nature of the engineered stone industry** has also arguably contributed to non-compliance and hence the extent of cases of silicosis in the industry. It is comprised of mostly small businesses with few barriers to entry and a significant culturally and linguistically diverse (CALD) workforce. Relevantly, these PCBUs had limited awareness of the risks of engineered stone, and their duties to manage those risks, including to assess the risks and implement the necessary control measures to keep their workers safe. Workers too were often unaware of those risks and duties, and their rights and responsibilities.

Some of the mechanisms in the model WHS laws that assist to better manage health and safety risks in workplaces were less likely to be present because of the nature of the engineered stone industry and the workforce. For example, there is **unlikely to be a health and safety representative (HSR) or a health and safety committee** at these workplaces. Where present, an HSR or a health and safety committee can monitor compliance with the WHS laws and raise concerns about risks to health and safety in the business.

The **lack of available and accessible information about the risks** of working with engineered stone is also problematic. Importers, manufacturers and suppliers have failed to provide end users with comprehensive up to date health-based data and evidence on the risks of RCS in relation to engineered stone.

The National Dust Disease Taskforce noted that "... every case of silicosis affecting a stone benchtop worker is evidence that businesses, industry and governments need to do more to recognise and control the risks of working with engineered stone" (Department of Health 2021).

2.2 Engineered stone – unique hazards

Engineered stone has been available in Australia since the late 1990s. It is an artificial product that contains high levels of crystalline silica (up to 90% by weight) along with other minerals, resins and pigments.

The composite nature of engineered stone materials makes the emissions produced during processing of these products different from those produced when processing natural stone (e.g. granite and marble).

To inform this Decision RIS, the Agency commissioned the University of Adelaide to undertake a review and critical analysis of available evidence of the specific hazards associated with engineered stone.

The review highlights the unique hazards associated with engineered stone that have likely contributed to the high rates of silicosis in engineered stone workers.

2.2.1 Material science of engineered stone

The available scientific literature shows that processing engineered stone products with a high crystalline silica content generates much higher RCS compared to natural stone (Ramkissoon, C, et al. 2022) (Carrieri, et al. 2020) (Hall, et al. 2022) (Thompson and Qi 2023). Cutting engineered stone generates high concentrations of RCS, and personal air monitoring has shown common tasks involved in engineered stone fabrication can expose workers to RCS at levels well above the current WES (0.05 mg/m³ 8-hour TWA) if effective controls are not in place. High levels of airborne RCS have been detected in all areas of an engineered stone fabrication workshop, including areas that were not used for processing of engineered stone (Jennings 2021).

Processing engineered stone materials can produce higher levels of ultrafine particles (<0.1 µm) compared to natural stone materials (Carrieri, et al. 2020) (Ophir, et al. 2019). Particles in this size range are more easily able to penetrate deep into the lungs leading to inflammatory responses and are associated with effects beyond the respiratory system such as autoimmune disease. The Australian Institute of Occupational Hygienists (AIOH) highlighted in their consultation submission that the emission of ultrafine particles is of high significance for a range of reasons, include an increased ability to stay airborne, the larger number of overall particles, the larger available reactive surface area and potential for increased toxicity.

There is also evidence the dust generated from engineered stone differs in terms of the forms of crystalline silica present, surface characteristics, resin and elemental composition and particle size distribution, all of which may influence its reactivity (Pavan, Polimeni, et al. 2016) (Ramkissoon, C, et al. 2022) (León-Jiménez, et al. 2021) (Hall, et al. 2022) (Ramkissoon, et al. 2023). The different polymorphs identified in engineered stone dust, primarily quartz and cristobalite, may influence their reactivity, compared to natural stone which contains mostly quartz.

In addition to contributing to the creation of volatile organic compounds when processed; the presence of resin in engineered stone may influence the risk associated with RCS exposure by coating the reactive

surface groups of RCS particles, affecting how the body responds to the inhaled RCS (Hall, et al. 2022) (Ramkissoon, et al. 2023).

The presence of other, potentially reactive elements in engineered stone dust emissions as well as lung biopsies of silicotic patients, suggests the potential contribution of metal ions in engineered stone to disease risk (León-Jiménez, et al. 2021).

Lower crystalline engineered stone products are being manufactured with products such as amorphous silica (including glass and recycled glass) and feldspar. While little is known about the risk profile of emissions (including dust) produced when these products are processed, there is some evidence of increased toxicity of freshly ground amorphous silica from these materials (Ghiazza, et al. 2010) (Porter, et al. 2002) (Pavan, 2020) (Marques Da Silva, et al. 2022), as well as differing toxicity profiles of dust from different varieties of feldspar (Grytting, et al. 2022). Further work is required to ensure the materials that may be used in place of crystalline silica in next generation engineered stone products do not pose risks to workers.

2.2.2 Risk profile of engineered stone based on crystalline silica content

There is insufficient evidence to establish a threshold crystalline silica content of engineered stone, beyond which the risk of adverse health effects is unacceptably increased (for example the 40% threshold proposed in Options 2 and 3 of this Decision RIS).

Adverse health effects are associated with airborne silica dust exposure, not the silica content of the bulk material. The limited empirical evidence available supports that a lower silica stone produces less RCS when processed (Qi and Echt 2016) (Ramkissoon, C, et al. 2022), and this in turn supports the logical presumption that reducing the crystalline silica content in the engineered stone slab results in reduced exposure to RCS. However, there is no epidemiological or laboratory toxicological evidence describing how the risk of disease would differ for workers exposed to RCS generated from engineered stone over a range of crystalline silica concentrations, or how it compares to that generated from natural stone. This is particularly important as the processing method is a known determinant of RCS production (Healy 2014) (van Deurssen, et al. 2014), and it can also impact the size of the particles emitted (Hall, et al. 2022).

2.2.3 Impact of manufacturing methods on risk profile

Different manufacturing methods may affect the risk profile arising from processing engineered stone. Resin-based engineered stones have been the most utilised product to date. Moderate heat cures the organic resin binder that holds the stone particles together. Processing resin-based engineered stone can generate high heat which leads to emission of hazardous airborne substances, such as volatile organic compounds (VOCs) (Hall, et al. 2022) (Ramkissoon, et al. 2023).

Sintering is a different manufacturing technique that involves subjecting the stone particles to high temperatures and pressure, causing them to compact together, simulating the formation of natural granite, and eliminating the need for resin as a binding agent. Unlike resin-based engineered stone (comprised of organic and inorganic constituents) sintered stone has only inorganic ingredients. There is however still uncertainty as to whether the additional mechanical energy and different abrasive action required to process sintered engineered stone results in a different toxicity profile for the dust.

The health risks of emissions produced when processing porcelain-based benchtops (which may contain crystalline silica and feldspar) or benchtop materials free from crystalline silica will require further consideration.

2.2.4 Detection of silica content

Understanding crystalline silica content in bulk (slab) engineered stone products currently relies on composition information provided in manufacturer Safety Data Sheets. These documents may provide silica content as a range and are sometimes prepared for a collection of engineered stones that have differing content, rather than a specific stone product or batch. There is currently no specific technique available to directly determine crystalline silica content in bulk stone materials (i.e. real-time, direct, non-destructive detection and quantification). Should a prohibition on use of engineered stone above a specific silica content be introduced, there is a need to investigate novel real-time, direct detection technologies to ensure it is enforceable. Some techniques have been explored for other industries such as mining and defence.

2.3 Duties under the WHS legal framework

Australia has a strong, nationally consistent WHS legal framework to protect the health and safety of workers. This includes ensuring workers are not exposed to any hazards from engineered stone dust. In response to the diagnoses of silicosis in engineered stone workers, the model WHS laws have been amended to remove any doubt in relation to the applicable control measures that must be implemented when working with engineered stone, for example, the prevention of dry cutting. The workplace exposure level for RCS has also been reduced from 0.1 mg/m³ to 0.05 mg/m³ (8-hour time weighted average), with Safe Work Australia Members recently agreeing to recommend a further reduction to WHS ministers (to 0.025 mg/m³). Table 4 summarises the duties applicable to PCBUs, workers and other duty holders, expanded on in Appendix A.

Table 4 Duty holders under the model WHS legislation

Duty holder	Duties
PCBUs	<ul style="list-style-type: none"> • primary duty of care to ensure the health and safety of workers • ensure others are not put at risk from work carried out by the business • eliminate risks arising from exposure to RCS or, where not reasonably practicable, minimise the risks so far as is reasonably practicable to workers and other persons at the workplace: <ul style="list-style-type: none"> ▪ provision and maintenance of workplace environment without risks to health and safety ▪ provision of safe systems of work ▪ provision of any necessary information/training/instruction/supervision, and ▪ consultation with workers or their representatives. • ensure no one at workplace exposed to RCS at a concentration above the workplace exposure standard • must not process, or direct or allow a worker to process, engineered stone unless the processing of the stone is controlled • undertake air monitoring in breathing zone of workers if there is uncertainty that the workplace exposure standard is being exceeded or if it is necessary to determine whether there is a risk to a worker's health • provide and pay for health monitoring for workers if they carry out ongoing work generating RCS, or if there is a significant risk to the worker's health because of exposure, and • prepare a Safe Work Method Statement for any high risk construction work that may generate RCS.
Designers, manufacturers, importers, suppliers and those who install or commission plant, substances or structures	<ul style="list-style-type: none"> • must ensure, so far as is reasonably practicable, that the silica containing products they design, manufacture, import, supply or install are without risk to health and safety. This includes undertaking necessary testing and providing adequate information about the hazards of their silica containing products.
Duties of workers	<ul style="list-style-type: none"> • take reasonable care for their own health and safety • take reasonable care to not adversely affect the health and safety of other persons • comply as far as they are reasonably able with any reasonable WHS instructions given by the PCBU, such as participating in health monitoring and wearing relevant personal protective equipment (PPE), and • co-operate with any reasonable policy or procedure relating to WHS at the workplace that has been notified to them.
Duties of officers (of body corporate PCBUs)	<ul style="list-style-type: none"> • must exercise due diligence to ensure the PCBU complies with its duties under the WHS Act and WHS Regulations.
Duties of other persons at the workplace	<ul style="list-style-type: none"> • must take reasonable care for their own health and safety and must take care not to adversely affect other people's health and safety, and • must comply, so far as they are reasonably able, with reasonable instructions given by the PCBU to allow that person to comply with the WHS Act.

2.4 Inadequate levels of compliance in the engineered stone industry

2.4.1 Lack of compliance with the model WHS laws

Engineered stone workers have contracted silicosis and other silica-related diseases because they have not been adequately protected from exposure to RCS dust. This is the result of a failure of PCBUs to ensure the health and safety of workers, as required by the model WHS laws. Workers have also failed to take reasonable care for their own health and safety and ensure that their acts or omissions do not adversely affect the health and safety of others.

Importers, suppliers and manufacturers of engineered stone products have failed to comply with their upstream duties to ensure these products are without risks to health and safety of the workers who will use the products. Most have not provided engineered stone PCBUs with adequate information about the hazardous properties of the products and the conditions necessary to ensure that the products are without risks to the workers' health and safety in the fabrication processes. Where information is supplied by importers, manufacturers and suppliers there is little consistency about the hazardous properties of their products. This is likely to cause confusion and uncertainty on the part of PCBUs about the nature and extent of the risks to their workers.

For example, while some suppliers provide a safety data sheet (SDS) with their engineered stone product, the SDS may state that the product is 'not classified as hazardous' but then disclose that dust created when the product is processed may contain crystalline silica that may be respirable.

Other suppliers provide an SDS that states the product is hazardous because of the dust created when the product is processed and note the control measures required in handling the product including wet cutting and the use of RPE.

Commonwealth, state and territory WHS regulators are responsible for the enforcement of WHS laws in their jurisdictions. Despite WHS regulators indicating that they have observed a general improvement in compliance in the engineered stone industry in recent years, data from WHS regulators indicates that non-compliance with WHS laws, relating to a broad range of regulatory duties, continues to occur in the engineered stone industry, evident by, for example, the number and types of notices issued and prosecutions undertaken by WHS regulators or relevant government prosecutors.

2.4.1.1 Notices

PCBUs must comply with the WHS laws in their jurisdictions. If PCBUs contravene these laws, WHS regulators can issue a range of notices, including:

- improvement notices – requires action to be taken to address a safety issue or if workers' compensation requirements are not being met
- prohibition notices – can be issued if an activity at work involves a more serious risk to health or safety, a prohibition notice requires the PCBU to stop work immediately until the risk is rectified, and
- penalty/infringement notices – can be issued for certain serious offences, for example failing to comply with a prohibition notice. These notices are accompanied by a monetary fine specified in legislation.

For the engineered stone industry, data supplied by WHS regulators for the period 2018–2022 shows that notices were commonly issued for non-compliances with the WHS laws related to:

- failure to undertake air and health monitoring
- failure to provide training and instruction

- failure to provide or ensure proper use of personal protective equipment (PPE) including proper fit of respiratory protective equipment (RPE)
- failures in housekeeping leading to further exposure to silica dust
- failure to make available safety data sheets
- uncontrolled/dry processing of engineered stone, and
- evidence of airborne silica dust.

Non-compliance with these duties is an issue regardless of the crystalline silica content of engineered stone. There is a need to address the ongoing compliance issues with all WHS laws and not just those related to exposure to RCS in this industry.

Several factors identified during consultation may be influencing the levels of compliance, including financial costs of complying with the model WHS laws, workplace cultures with embedded non-compliant practices, and a lack of access to persons with specific competency for conducting health and air monitoring.

2.4.1.2 Prosecutions

In addition to compliance notices, WHS regulators have the power to take further actions including enforceable undertakings and prosecutions.

An enforceable undertaking is a legally binding agreement between the WHS regulator and a person. It is given in connection to a contravention, or alleged contravention, of the WHS Act and is an alternative to prosecution.

Alternately, criminal proceedings may be brought for a breach of a WHS offence provision. There are three categories of offences under the model WHS Act for a breach of a health and safety duty, including:

- category 1 offence – where a duty holder, without reasonable excuse, engages in conduct that recklessly or with gross negligence exposes a person to a risk of death or serious injury or illness. This is the most serious category
- category 2 offence – where a duty holder fails to comply with a health and safety duty that exposes a person to risk of death or serious injury or illness, and
- category 3 offence – where a duty holder fails to comply with a health and safety duty.

A court will impose a penalty, such as a fine or in some cases a term of imprisonment, on a person found guilty of one of these offences.

In addition, there are numerous offences created by the model WHS Regulations for breaches of specific obligations relevant to RCS exposure including a failure to:

- manage risks to health and safety associated with generating a hazardous chemical at a workplace (reg 351)
- ensure exposure standards are not exceeded (reg 49)
- monitor airborne contaminant levels (reg 50), and
- provide PPE to workers and ensure its use, maintenance, repair etc (reg 44).

Offences against the WHS Regulations are punishable by a monetary penalty.

Table 5 summarises publicly available information on successful prosecutions relating to engineered stone from relevant jurisdictions. A total of 12 successful prosecutions have been reported since 2021, with many related to the uncontrolled processing (dry cutting) of engineered stone materials. These prosecutions are a further example of ongoing issues relating to compliance with WHS laws within the engineered stone industry, and the resistance of some PBCUs within the industry to comply with duties.

Table 5 Summary of successful prosecutions under WHS laws relating to engineered stone

Jurisdiction	Successful prosecution details
NSW	<p>Number One Stone Marble and Granite Pty Ltd</p> <ul style="list-style-type: none"> In February 2023, Number One Stone Marble and Granite was fined \$25,000 for failing to provide training on the correct fitting and use of respiratory protective equipment.
Queensland	<p>EzyStone Benchtops Pty Ltd</p> <ul style="list-style-type: none"> Four employees were diagnosed with silicosis. In October 2018, WHSQ discovered there was no dust suppression for electric grinders, no fit testing for disposable respirators, and worker health was not monitored. In April 2021, EzyStone Benchtops was sentenced for failing to ensure the health and safety of its workers and fined \$240,000. <p>Willis Bros Installations Pty Ltd</p> <ul style="list-style-type: none"> In 2018, workers were instructed to cut a bench top onsite using an angle grinder instead of returning it to the workshop where it could be cut with appropriate equipment. This exposed two workers to silica dust, as well as two other people who entered the apartment where the work was being done. In June 2023, the offender pleaded guilty and was fined \$32,500 for breaching WHS laws and ordered to pay the prosecutor's costs.
Tasmania	<p>Heritage Stone Pty Ltd</p> <ul style="list-style-type: none"> In November 2018, WorkSafe Tasmania was notified of concerns about unsafe work practices at a workshop which had resulted in three workers contracting silicosis. During the investigation, WorkSafe Tasmania found that workers were exposed to RCS dust when dry cutting and shaping engineered stone. WorkSafe Tasmania issued 7 Improvement Notices and 1 Prohibition Notice, and charged Heritage Stone with failing to comply with a health and safety duty that exposes a worker to the risk of death or serious injury or illness. In February 2022, Heritage Stone pleaded guilty and was convicted and fined \$500,000.
Victoria	<p>Bas Brother Marble and Granite Pty Ltd</p> <ul style="list-style-type: none"> In February 2021, a WorkSafe Inspector attended the workplace and observed an employee using a powered abrasive polishing tool to abrasively polish a slab of white coloured stone which was from the brand Stone Ambassador. The tool was being used without the required control measures in place. Instead, the employee was applying water to the stone from a bottle with a small hole in the lid when the tool was in use. The offender pleaded guilty and in July 2023 was without conviction sentenced to pay a fine of \$5,000 and to pay costs of \$3,906. <p>Miter Square Pty Ltd</p> <ul style="list-style-type: none"> In October 2020, a WorkSafe inspector attended the workplace on two occasions and identified employees were exposed to health and safety risks

Jurisdiction**Successful prosecution details**

arising from exposure to crystalline silica, and that the employer had failed to eliminate or control that risk in a number of ways.

- The offender pleaded guilty and in November 2022 was without conviction sentenced to pay a fine of \$7,000.

Pure Design Projects Pty Ltd

- In January 2021, a WorkSafe Inspector attended the workplace and observed an employee using an electric angle grinder to grind a piece of white engineered stone.
- The offender pleaded guilty and in September 2022 was without conviction sentenced to pay a fine of \$10,000 and to pay costs of \$3,000.

AR Marble Pty Ltd

- In November 2019, December 2019 and January 2020, WorkSafe inspectors attended the workplace and observed unsafe practices, including the absence of proper PRR equipment and dry cutting practices exposing employees to hazardous substance crystalline silica.
- The offender pleaded guilty and in September 2022 was without conviction sentenced to pay a fine of \$5,000 and to pay costs of \$5,044.

United Investment Group Pty Ltd

- In October 2019, WorkSafe inspectors attended the workplace and observed unsafe practices, including dry grinding/cutting/polishing of engineered stone and improper use of PPE.
- The offender pleaded guilty and in July 2022 was without conviction sentenced to pay a fine of \$6,000 and to pay costs of \$3,325

Hilton Stone Pty Ltd

- In March 2020, a WorkSafe inspector attended the workplace and observed a number of breaches, including grinding/cutting/polishing engineered stone without proper controls to help reduce the risk of an employee being exposed to and inhaling silica dust.
- The offender pleaded guilty and in June 2022 was with conviction sentenced to pay a fine of \$25,000 and to pay costs of \$6,157.

SC101 of 2021

- In October 2016, a WorkSafe Inspector attended the workplace and observed employees dry grinding/polishing reconstituted stone and employees cleaning up dust using a broom, and was informed that health monitoring had not been provided to employees who were exposed to RCS.
- The offender pleaded guilty and in May 2021 was without conviction sentenced to pay a fine of \$29,000 and to pay costs of \$3,589.58.

TTN Stonework Pty Ltd

- In May 2019, June 2019 and July 2019 an inspector attended the workplace and noted that the offender had not complied with two previously issued improvement notices relating to dry grinding processes, PPE, health monitoring and unsafe cleaning methods.
 - The offender pleaded guilty and in April 2021 was without conviction sentenced to pay a fine of \$10,000, and ordered to pay statutory costs of \$84.40 and WorkSafe's costs of \$1,655.83.
-

2.4.2 Insufficient compliance and enforcement activities

Although WHS regulators have undertaken targeted compliance and enforcement activities in the engineered stone industry in recent years, stakeholder submissions to the National Dust Disease Taskforce expressed concern that compliance monitoring and enforcement by WHS regulators had been inadequate (Department of Health 2021). They noted a “lack of sanctions applied, penalties not being

enforced, and a perception amongst businesses that non-compliance can go unpunished.” This is further supported by submissions to NSW Parliament 2021 Review of the Dust Diseases Scheme; the inquiry report noting “[a]n ongoing concern for stakeholders is that there is insufficient compliance and enforcement of existing regulations, with unsafe work practices continuing, leading to preventable silica related illnesses and deaths” (NSW Parliament 2022).

2.5 The nature of the engineered stone industry

Engineered stone has become the dominant benchtop material in Australia, commanding an estimated 55% market share, due to a combination of factors including aesthetics, durability, price, and ease of processing.

In addition to the faster processing time of engineered stone, the ease with which this product can be fabricated means less skill is required to handle these materials compared to more brittle natural stone slabs and many workers in this industry do not have formal stonemason qualifications. Additionally, many workers in this industry are from a CALD background. More than half of those workers diagnosed with silicosis in a recent study in Victoria had migrated to Australia (Hoy, et al. 2023). CALD workers are at increased risk of occupational disease more broadly (Hargreaves, et al. 2019), and a recent case study of silicosis in engineered stone workers in California highlights this issue (Fazio, Gandhi and Flattery 2023) (Hua, Rose and Redlich 2023). PCBUs need to ensure culturally and linguistically appropriate WHS training. The language diversity in engineered stone businesses in Australia is well understood, with one third of engineered stone businesses in NSW using a language other than English on the shop floor, with Mandarin being the most common language (Australian Institute of Occupational Hygienists 2023).

There is evidence of lack of industry awareness of the risks of engineered stone. PCBUs in the engineered stone industry had limited awareness of the risks of workplace exposure to the dust from engineered stone. They also lacked awareness of their duties to manage those risks, including to assess the risks and implement the necessary control measures to keep their workers safe. The small size of many fabrication businesses (less than 20 employees) means they may also have less ability to invest in automation and other technology to minimise risks, with a resultant increase in the use of handheld tools, which is likely to lead to increased worker exposure to RCS.

Workers too were often unaware of those risks and their PCBU’s duties, as well as their rights and responsibilities.

The nature of the engineered stone industry and the associated workforce also means that some of the mechanisms in the model WHS laws that assist to better manage health and safety risks in workplaces were also less likely to be present. For example, there is unlikely to be an HSR or a health and safety committee at these workplaces. Where present, an HSR or a health and safety committee can monitor compliance with the WHS laws and raise concerns about risks to health and safety in the business.

2.6 Silicosis disease onset and profile differs in engineered stone workers

Silicosis from exposure to dust from engineered stone is associated with shorter duration of exposure prior to onset of symptoms and diagnosis; more rapid disease progression and higher mortality (Hoy, et al. 2023) (Wu, Xue and Yu 2020) (Fazio, Gandhi and Flattery 2023). This has been suggested to be due to different nature of RCS in engineered stone and/or the effects of other components in the engineered stone, such as resins, pigments and metals.

Diagnosis of silicosis in workers employed in the stone benchtop industry in Victoria correlates with assessed exposure – 30% of workers who assessed their exposure to stone dust as high to very high were diagnosed with silicosis, compared to 11% with low or medium exposure (Hoy RF 2023).

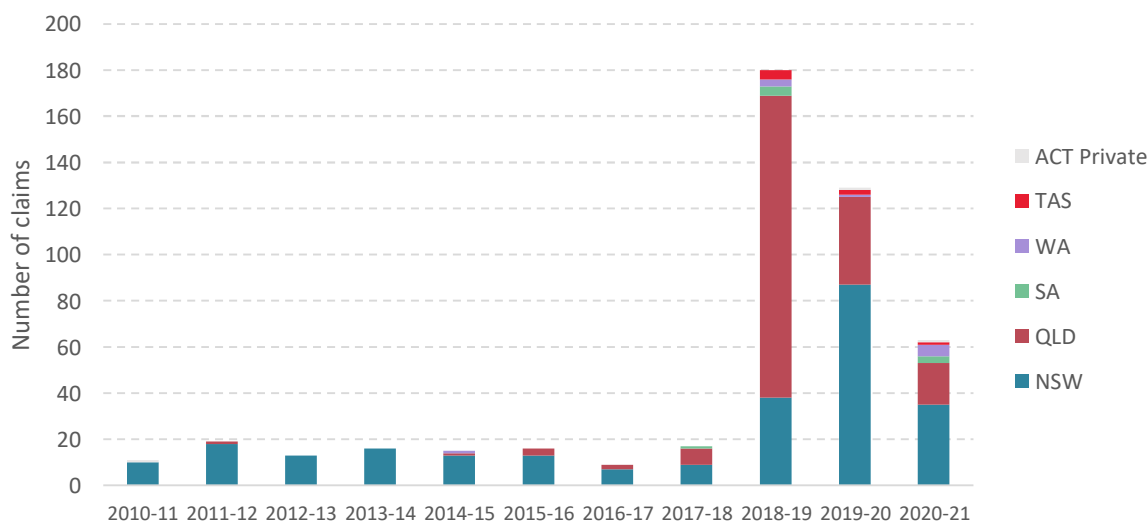
The first cases of silicosis in Australian engineered stone fabricators were reported in 2015 (Frankel et al. 2015). Subsequent health screening of stonemasons and other engineered stone workers has revealed a high prevalence of silicosis in this cohort of workers.

As detailed in Section 2 of the Silica Decision RIS, health screening programs carried out by state and territory WHS regulators and health authorities since 2018 have determined that of the 4,743 stonemasons and engineered stone workers screened, approximately 11% received a probable or confirmed diagnosis of silicosis because of workplace exposure to RCS. There is also a suggestion that current case numbers, particularly in NSW, are an underestimation (Cole, Yates and Davidson 2023).

The time lag between RCS exposure and diagnosis presents challenges for determining current case numbers, estimating future burden, and understanding when recent initiatives to increase awareness of the risks of RCS exposure may result in fewer cases being diagnosed.

Between 2010–11 and 2020–21^P, there were 488 accepted workers compensation claims in those jurisdictions covered by the model WHS laws¹ (Figure 1).

Figure 1 Total number of accepted silicosis compensation claims in jurisdictions subject to the model WHS laws, 2010–11 to 2020–21^P



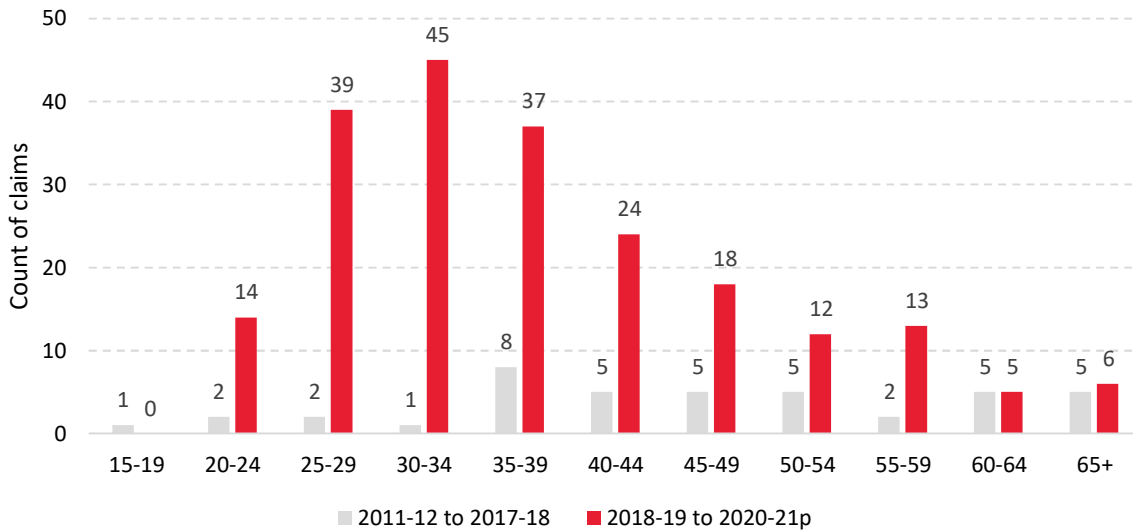
Sources: Safe Work Australia's National Data Set for Compensation-based Statistics and icare.

Three quarters of the claims shown in Figure 1 were accepted after mid-2018, following the implementation of awareness and health screening programs for stonemasons and engineered stone workers.

Since 2018, there has been an increase in the number of people aged under 35 when submitting a claim for silicosis. Over the 2011–12 to 2017–18 reference period 18% of silicosis claims (7 claims) were made by workers under the age of 35. In the 2018–19 to 2020–21^P period, nearly half of all silicosis claims (46% or 100 claims) were made by workers in this age category (Figure 2).

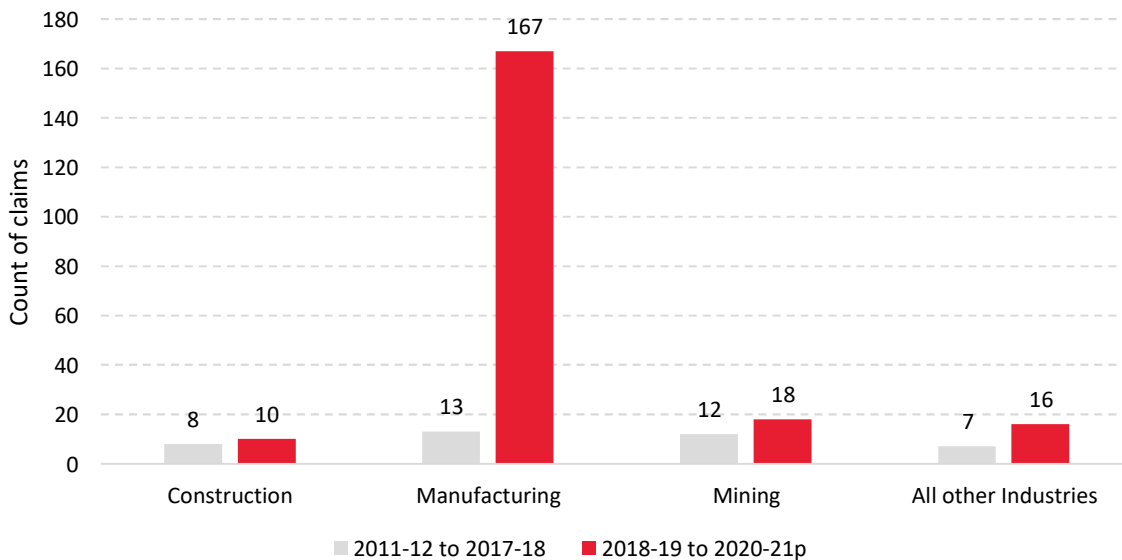
¹ Victoria is excluded from this data as this jurisdiction has not implemented the model WHS laws. ^P denotes data are preliminary and subject to revision in future years as further claims are finalised. Figure 1 includes data from the National Data Set (excluding Victoria) and iCare (NSW).

Figure 2 Silicosis claims (count) by age group, time series comparison²



Silicosis claims have traditionally been concentrated across the construction, manufacturing and mining sectors. In recent years, there has been a significant increase in the number of silicosis claims from workers in the manufacturing industry from 13 claims in 2011–12 to 2017–18, to 167 claims over the 3 years from 2018–19 (Figure 3).

Figure 3 Silicosis claims (count) by industry, time series comparison³



Further analysis of the claims from workers in the manufacturing industry reveal that they fall in 2 main labour market breakdowns, consistent with many of these claims being from the benchtop manufacturing industry:

² Figures 2 is based on data from the National Data Set and does not include data from Victoria or NSW.

³ Figures 3 is based on data from the National Data Set and does not include data from Victoria or NSW.

- 90% are in 'Other Non-Metallic Mineral Product Manufacturing' (ANZSIC Group 209, based on the industry of employment classification), and
- 88% are 'Bricklayers and Stonemasons' (ANZSCO Unit group 3311, based on the occupation of employment classification).

The rate of silicosis diagnosis amongst engineered stone workers is much higher than in other workers exposed to RCS. According to the Australian Engineered Stone Advisory Group (2019), around 10,000 people work in engineered stone fabrication businesses in Australia. A recent Curtin University report estimates that 584,050 workers are currently exposed to RCS in the workplace workers in Australia (Carey and Fritschi 2022), meaning that engineered stone workers represent less than 2% of all those who are exposed to RCS at work. Figure 3 shows that 80% of accepted silicosis compensation claims are from the manufacturing industry, with labour market breakdowns suggesting most of these are likely to be from the benchtop manufacturing industry. This suggests that engineered stone workers are dramatically over-represented amongst workers diagnosed with silicosis.

The increase in claims seen from 2018–19 onwards (Figure 1), together with the concentration of these claims in the manufacturing sector (Figure 3) coincides with concerted awareness raising and health screening efforts targeted at stone masons and engineered stone workers. Targeted screening of workers in other silica-exposed industries has not occurred to the same extent, and it is not known if a similar result would be found if this were to occur. Indicatively, a screening program aimed at Queensland's mine and quarry workers saw a 27% increase in diagnosed mine dust diseases, including but not limited to silicosis, between the 2021–22 and 2022–23 financial years (The Daily Telegraph 2023).

2.7 Problem statement summary

There is a disproportionate number of cases of silicosis in engineered stone workers.

Silicosis in engineered stone workers is characterised by a shorter time to disease onset and faster disease progression.

This is due to combination of factors, including the unique hazards posed by engineered stone dust (RCS, as well as other hazardous substances), a lack of compliance with, and enforcement of, the WHS laws, and the nature of the engineered stone industry and workforce.

Given these factors, Government intervention to prohibit the use of engineered stone should be considered.

3. What policy options are being considered?

3.1 Overview

Building on the impact analysis undertaken for the Silica Decision RIS, in March and April 2023, the Agency consulted on 3 different options to prohibit the use of engineered stone. These options are considered a revised base case, which includes those recommendations from the Silica Decision RIS recently agreed to but not yet recommended.

Non-regulatory options were considered as part of the Silica Decision RIS and agreed to by WHS ministers. Given this, no further non-regulatory options were considered here.

3.2 Base case

The base case represents the existing duties under the model WHS Act, the recently amended model WHS Regulations and relevant model Codes of Practice that are described in the Silica Decision RIS. It assumes compliance and enforcement activities of state and territory WHS regulators, and education and awareness activities undertaken by Safe Work Australia, state and territory governments and non-government organisations, will continue at current levels.

The base case also incorporates measures recommended in the Silica Decision RIS, and agreed to by WHS ministers at their meeting on 28 February 2023:

- Option 2 – national awareness and behaviour change initiatives, and
- Option 5a – regulation of high-risk crystalline silica processes for all materials (including engineered stone) across all industries.

For Option 5a, this includes:

- developing a silica risk control plan
- provision of information and training to workers
- provision of health monitoring for workers, and
- undertaking air monitoring and reporting WES exceedances to the WHS regulator.

3.3 Option 1: Prohibition on the use of all engineered stone

This option would prohibit the use of all engineered stone by PCBUs, irrespective of its silica content.

The prohibition on use of engineered stone would be similar to but not the same as that for asbestos, as per Chapter 8 of the model WHS Regulations. A PCBU would be prohibited from carrying out, or directing or allowing a worker to carry out, work on engineered stone, including manufacture, supply, fabrication (cutting, shaping, polishing), installation or use.

The prohibition would apply to any product meeting the definition of engineered stone in the model WHS Regulations.

As for the asbestos regulations, exemptions to the prohibition would apply to certain work with engineered stone that was in place prior to the prohibition, such as removal, repair and minor modification. PCBUs wanting to undertake exempt work with engineered stone already in place (legacy products) would require a licence through the licensing framework for work with legacy products.

The requirements of a licensing framework for work with legacy products are consistent across each of the proposed options.

Importantly, the licensing framework for work with legacy products proposed is largely an administrative framework that ensures regulators are aware of which PCBUs are undertaking this work. This is because existing regulations, including the prohibition of uncontrolled processing of engineered stone; and the additional requirements agreed for Option 5a of the Silica Decision RIS (including requirements for risk control plans, training, air and health monitoring, and reporting) would already apply and no additional regulations are proposed.

3.4 Option 2: Prohibition on the use of engineered stone containing 40% or more crystalline silica

This option would limit the prohibition described for Option 1 to engineered stone containing 40% or more crystalline silica (higher silica engineered stone).

The use of engineered stone containing less than 40% crystalline silica content would be subject to the additional regulation as described in Option 5a of the Silica Decision RIS and agreed by WHS ministers.

This option also includes a licensing framework for work with legacy products, as described for Option 1. Where the crystalline silica content of the legacy product is 40% or more, or where it cannot be determined, a PCBU would need to apply for a licence to work with legacy products to undertake removal, repair or modification work.

3.5 Option 3: As for Option 2, with an accompanying licensing scheme for PCBUs working with engineered stone containing less than 40% crystalline silica

In addition to the prohibition on the use of higher silica engineered stone proposed in Option 2, Option 3 also outlines an additional licensing framework for PCBUs working with lower silica engineered stone (< 40% crystalline silica content).

This would result in 2 separate licensing frameworks for PCBUs working with engineered stone:

- the previously described licensing framework for work with legacy products with higher, or unknown, silica content, and
- a licensing framework for work with lower silica engineered stone – for those PCBUs who fabricate (cut, shape, polish etc) and/or install new engineered stone products that have a crystalline silica content below 40%.

4. What is the likely impact of the options?

4.1 Overview of approach

This Decision RIS has taken the following approach to the impact analysis:

- options have been assessed relative to the base case
- where information is available, costs to industry and government have been monetised
- health benefits have been qualitatively assessed for each option, and
- breakeven analysis has been undertaken to show the number of avoided deaths and illnesses required to offset the costs of each option.

A detailed methodology to the impact analysis can be found in Appendix B. An overview of the approach used is provided in Table 4.

Table 4 Impact analysis approach

Stages	Description
Define the market	<ul style="list-style-type: none">• Conduct a current state analysis of the engineered stone industry – identifying the number of PCBUs by size (e.g. sole trader), the number of workers working with engineered stone, uses of engineered stone and alternative products to engineered stone available to consumers.
Identify impacts	<ul style="list-style-type: none">• Determine the decisions the engineered stone industry is expected to make (specifically PCBUs and workers) as a consequence of each prohibition option.
Identify costs	<ul style="list-style-type: none">• Conduct analysis to identify the costs to PCBUs and workers from a prohibition on engineered stone (e.g. costs of complying with license requirements and business closure costs).• Define the cost to government associated with a prohibition on the use of engineered stone including costs to implement a licensing framework, processing of licensing applications and compliance audits.
Assess costs	<ul style="list-style-type: none">• Estimate the costs to PCBUs, workers and government associated with each proposed prohibition option.
Undertake breakeven analysis	<ul style="list-style-type: none">• Calculate the level of monetary benefits required for each of the options to break even.• Convert the monetary benefits into the required avoided number of deaths and illness to provide a meaningful comparison.

4.1.1 Impact analysis framework

Guiding the impact analysis, the framework at Figure 4 summarises the impacts of a potential prohibition across all sectors of the economy – including PCBUs, workers, consumers, government and the broader community. For each group, the framework shows the direct and indirect benefits and costs, and measures of those impacts, including whether those impacts were subject to qualitative, quantitative or breakeven analysis.

Figure 4 Impact analysis framework

Group Impacted	Impact		Impact measure
Workers	Direct Benefit	Health and quality of life improvement	<ul style="list-style-type: none"> ▶ Reduction in premature deaths due to silicosis and silica-related diseases ▶ Reduction of people living with silicosis and silica-related diseases
	Indirect cost ¹	Worker displacement	<ul style="list-style-type: none"> ▶ Costs to retrain ▶ Lost income over period of unemployment (net of income support and redundancy payments)
PCBUs	Indirect cost	Business closure costs/financial loss	<ul style="list-style-type: none"> ▶ Business closure costs ▶ Redundancy packages paid to workers
	Direct cost	Costs of applying & complying with new regulations	<ul style="list-style-type: none"> ▶ Licence application costs (time and effort) ▶ Administration costs of complying with new licensing requirements ▶ Costs to retrain workers in licensing requirement (minimal)
	Direct cost	Costs of transition to alternative products	<ul style="list-style-type: none"> ▶ New equipment costs ▶ Other transition costs (e.g. design and advertising) (not monetised) ▶ Costs to retrain employees with alternative products (minimal)
	Indirect benefit	Avoided costs of workers legal claims for injury	<ul style="list-style-type: none"> ▶ Avoided workers compensation claims/legal costs ▶ Avoided higher insurance premiums for workers compensation
Government	Indirect benefit	Avoided costs	<ul style="list-style-type: none"> ▶ Avoided hospitalisations and outpatient care
	Indirect cost	Costs of displaced workers	<ul style="list-style-type: none"> ▶ Jobseeker payments over period of unemployment ▶ Worker training support costs
	Direct cost	Costs of implementing licensing framework	<ul style="list-style-type: none"> ▶ ICT set up and maintenance ▶ Communication costs ▶ Drafting of licensing regulation ▶ Processing of license applications ▶ Costs of undertaking compliance audits
Community	Indirect benefit	Productivity	<ul style="list-style-type: none"> ▶ Improved worker productivity from reduced incidence of silicosis
	Indirect cost	Environment	<ul style="list-style-type: none"> ▶ Environmental costs from disposal of unused engineered stone
Consumers	Indirect cost	Increased costs for engineering stone related goods and services	<ul style="list-style-type: none"> ▶ Reduced choice in products ▶ Increased costs for engineered stone products and substitutes ▶ Increased cost of removal of engineered stone due to licensing costs

¹ Indirect costs are negative impacts or externalities of the regulation rather than the intended costs of the regulation.

Qualitative
 Break even analysis
 Monetisable

The key direct benefit sought through the prohibition of engineered stone is to improve the health and quality of life outcomes of those who work with engineered stone products. Given the health benefits are difficult to assess quantitatively for the prohibition options, a breakeven analysis has been undertaken. This shows the reduction in premature deaths due to silicosis and silica-related disease, as well as a reduction in the number of people living with silicosis or silica-related diseases, that must be avoided to offset the costs of the options.

There are also indirect benefits to PCBUs, government and the broader community resulting from the improved health benefits of the prohibition options, which have not been monetised to avoid double counting or because it has not been possible to monetise them (see following sections for more information). These indirect benefits include avoided government costs of hospitalisations and outpatient care, improved worker productivity and participation, avoided costs to PCBUs due to fewer workplace compensation claims and improved health and quality of life to families and friends of workers.

Direct costs to PCBUs resulting from the prohibition of engineered stone and associated changes in regulation include costs of complying with new regulations and costs to transition to alternative products, while for government it includes implementing and operating licensing frameworks.

Moreover, the increase in regulatory burden may bring about indirect costs such as financial loss and business closure for PCBUs, resulting job loss for workers, and an associated increase in income support and training support payments for government. These costs have been monetised.

Cost recovery for licensing schemes has not been considered in this impact analysis, as any decision to offset government costs of administering a licensing framework through a fee structure would be a policy decision for each jurisdiction to make.

If governments choose to pass the costs of a licensing framework on to PCBUs, this may in turn be passed on to consumers with an increase in costs for goods and services related to engineered stone, including increased costs associated with the removal or repair of already installed stone, as well as an increase in costs for engineered stone and substitute products. There may also be environmental costs to the community associated with the disposal of unused stock of engineered stone in landfill.

4.1.2 Time period for appraisal

This impact analysis considers the costs and benefits of the prohibition options over the implementation period and a 10-year operational period, referred to as the appraisal period throughout.

4.1.3 Avoiding double counting and financial transfers

The impact analysis avoids counting the same costs and benefits multiple times as they move through the economy by attributing impacts to the group directly impacted. For example, higher production and licensing fees are assigned to PCBUs, though the costs may eventually be passed onto consumers through higher prices for goods and services. Direct financial transfers between different groups are also excluded (e.g. licensing fees from PCBUs to governments), as these do not lead to a net change in costs or benefits to society.

4.1.4 Data sources

The cost estimates developed for this Prohibition Decision RIS are based on information on costs collected through:

- the *Decision Regulation Impact Statement for Managing the Risks of Respirable Crystalline Silica at Work* published in February 2023 (Silica Decision RIS; SWA, 2023)
- public consultation on prohibition on the use of engineered stone undertaken in March and April 2023 (consultation to inform the Prohibition Decision RIS; SWA, 2023), and
- targeted desktop analysis where there were gaps in information.

4.1.5 Dealing with uncertainty

A paucity of data has meant the modelling of the costs of the prohibition options were based on assumptions in several instances, documented in Appendix B.

4.1.6 Base case

The impacts of the prohibition options have been assessed against the base case. The base case represents the status quo or continued operation of the regulatory environment as is, including committed policy decisions.

The base case includes the existing duties under the model WHS Act, model WHS Regulations and relevant model Codes of Practice. It assumes compliance and enforcement activities of state and territory WHS regulators and education and awareness activities undertaken by governments and industry groups will continue at current levels. It is anticipated that such activities will continue regardless of what option may be chosen by decision makers.

The base case also includes the measures agreed to by WHS ministers at their meeting on 28 February 2023 on the Silica Decision RIS including implementation of:

- Option 2: national awareness and behaviour change initiatives, and
- Option 5a: regulation of high-risk crystalline silica processes for all materials (including engineered stone).

As such, the costs to PCBU's associated with the additional requirements agreed for Option 5a have not been included in this Impact Analysis. These include costs for undertaking/preparing risk assessments and risk control plans, training of workers, undertaking any additional air and health monitoring, and reporting of any exceedances of the RCS exposure standard to the WHS regulator.

4.2 Overview of industry

Almost all engineered stone in Australia is manufactured overseas and imported from countries such as China, Spain, Israel and the United States. Given this Decision RIS does not cover impacts outside of the domestic market, manufacturers are not a focus of this Impact Analysis.

A relatively small number of wholesalers (around 12) import engineered stone from overseas.⁴ They sell the stone to businesses who process (or fabricate) slabs into finished products and install them (hereafter referred to as engineered stone PCBU's). Other tradespersons, such as builders, electricians, tilers, and carpenters, may also work with engineered stone products (referred to as other industry PCBU's throughout this document).

The 2 key cohorts, engineered stone PCBU's and other industry PCBU's, are expected to be most significantly impacted through the prohibition of engineered stone, and are the focus of this Decision RIS:

- Engineered stone PCBU's comprise businesses that fabricate (i.e. cut, shape, polish) and install new engineered stone⁵.
 - There are 750 to 1,250 engineered stone PCBU's, 44% of which are sole traders, 42% are small businesses (1 to 20 employees) and 14% are medium businesses (21–200 employees).
 - Processing and installing engineered stone is their primary activity (along with natural stone for some businesses).
 - Workers in this cohort have the highest exposure to RCS produced from engineered stone, and consequently the greatest health risks.
- In the course of their primary activities, other industry PCBU's may work with engineered stone that has previously been installed (legacy engineered stone) For example, cutting an existing benchtop to fit an electrical outlet, replacing a cooktop, repairing or modifying plumbing, or removing a benchtop.
 - The estimated number of other industry PCBU's working with legacy engineered stone is 179,750, of which 55% of which are sole traders, 44% are small businesses (1 to 19

⁴ Caesarstone submission.

⁵ For the purpose of this analysis, it has been assumed that no engineered stone PCBU's work with legacy engineered stone, and no other industry PCBU's fabricate or install new engineered stone.

employees) and 1% are medium-large businesses (more than 20 employees). (ABS, 2022)

4.3 Overview of monetised costs

4.3.1 Summary costs by option

Table 5 summarises the estimated net present cost to PCBUs, governments, and workers from each option.

Table 5 Comparison of the estimated cost for Prohibition Options, over appraisal period (\$m)

Criterion	Option 1	Option 2	Option 3
Cost to PCBUs	\$139.9	\$133.0	\$137.1
Cost to government	\$108.2	\$107.5	\$111.1
Costs to workers	\$3.1	\$0.0	\$1.5
Total	\$251.1	\$240.5	\$249.7

4.3.2 Costs of a licensing framework for work with legacy products

When WHS ministers requested the Agency undertake further consultation and analysis on the impacts of a potential prohibition on the use of engineered stone, they asked that this include a licensing system for work with legacy products – that is, for example, removal, repair and minor modification of engineered stone installed in homes and other premises prior to the prohibition.

To enable the modelling underlying this Impact Analysis, an assumption was made that such work would likely be undertaken by a different group of PCBUs (other industry PCBUs) to those undertaking the fabrication and installation of engineered stone (engineered stone PCBUs).

The costs of a licensing framework for work with legacy products are consistent across each of the options presented in this document.

For PCBUs, these costs include:

- labour costs associated with licence application
- labour costs associated with licence renewal every five years, and
- preparation and participation in licence compliance audits.

The licensing framework for work with legacy products will involve changes to the model WHS laws but is not proposed to be accompanied by any additional regulatory requirements. In accordance with the base case, PCBUs will need to comply with existing regulations including the prohibition of uncontrolled processing of engineered stone; and the additional requirements agreed to under Option 5a of the Silica Decision RIS including requirements for risk control plans, training, air and health monitoring, and reporting).

Costs to government for a licensing framework for work with legacy products include:

- drafting of relevant legislation

- licence administration costs such as purchasing licensing software, processing licence applications, and monitoring and compliance activities, and
- costs associated with communications activities.

Table 6 below summarises the estimated cost (to PCBUs and government) for the licensing framework for work with legacy products, consistent across each option. Further details of these costs are available in Table 8 and Table 9.

Table 6 Estimated cost of licensing framework for work with legacy products, over appraisal period (\$m)

Criterion	Estimated cost (over appraisal period) – licensing framework for work with legacy products
Cost to PCBUs	\$133.0
Cost to government	\$107.5
Total	\$240.5

The cost of this licensing represents 94% to 100% of the estimated cost for each option (Table 7). The licensing framework is common to all prohibition options presented and the associated costs are, therefore, consistent across each of the options. While costs to both governments and PCBUs under this licensing framework mainly relate to the administrative costs of implementing the framework, the overall costs, estimated to be \$240.5 million, are high due to the large number of PCBUs that may be impacted (estimated at 58,050 PCBUs of the 179,750 possible PCBUs across the relevant sector of industry). This cost is likely overestimated due to the conservative assumption that 50% of PCBUs across the relevant ANZSIC categories for construction would apply for a licence under this licensing framework.

In contrast, the costs to engineered stone PCBUs under each of the three prohibition options are a small fraction of the total costs (0% or 4%; Table 10). However, due to the smaller number of engineered stone PCBUs, the costs per individual engineered stone PCBUs will be significantly higher than that for individual other industry PCBUs.

- Option 1 has the highest costs to engineered stone PCBUs – a total prohibition of engineered stone would result in a higher number of engineered stone business closures and corresponding worker displacement.
- Option 2 has the lowest total cost impact. It is assumed that there will be no business closures or worker displacement under this option because lower silica products are expected to be available to meet demand. Engineered stone PCBUs are not expected to experience financial impact under Option 2.

Costs for each option are discussed further in Sections 4.4 to 4.6. Calculations for all cost tables presented in this chapter are provided in Appendix B.

Table 7 Further breakdown of the estimated cost for prohibition options over appraisal period (\$m)

	Option 1	Option 2	Option 3
Licensing framework for work with legacy products (other industry PCBUs)			
Cost to PCBUs	\$133.0	\$133.0	\$133.0
Cost to government	\$107.5	\$107.5	\$107.5
Sub Total	\$240.5	\$240.5	\$240.5
% Total option costs	96%	100%	96%
Option-specific costs (engineered stone PCBUs)			
Cost to PCBUs	\$6.9	\$0	\$4.2
Cost to government	\$0.7	\$0	\$3.6
Cost to workers	\$3.1	\$0	\$1.5
Sub-total	\$10.6	\$0	\$9.3
% Total option costs	4%	\$0	4%
Total	\$251.1	\$240.5	\$249.8

4.4 Option 1 monetised costs

4.4.1 Costs to PCBUs

A prohibition on the use of all engineered stone (Option 1) is estimated to result in costs to PCBUs of \$139.9 million. As shown in Table 8, this represents \$6.9 million in costs to engineered stone PCBUs and \$133 million attributed to the licensing framework for legacy products, impacting other industry PCBUs.

Table 8 Estimated cost of Option 1 – PCBUs

Cost	Estimated cost – 10-year appraisal period (\$m)			
	Sole traders	Small	Medium	Total
Engineered stone PCBUs				
Business exit and switching costs				
Business closure costs	\$0.3	\$0.2	\$0.04	\$0.5
Redundancy payments	\$0.0	\$0.0	\$4.3	\$4.3
New equipment purchase costs	\$0.0	\$0.0	\$2.1	\$2.1
Sub-Total	\$0.3	\$0.2	\$6.4	\$6.9
Other industry PCBUs				
Licensing framework for work with legacy products				
Licence application costs	\$26.2	\$24.2	\$0.7	\$51.1
Licence renewal application costs	\$16.0	\$14.8	\$0.4	\$31.2
Licence compliance costs (audit preparation)	\$25.9	\$24.0	\$0.7	\$50.6
Sub-Total	\$68.2	\$63.0	\$1.8	\$133.0
Total	\$68.4	\$63.2	\$8.2	\$139.9

4.4.1.1 Engineered stone PCBUs

Total costs to engineered stone PCBUs of Option 1 are estimated to be \$6.9 million over the appraisal period (Table 8).

Costs associated with business closure

Under Option 1, it is assumed that 10% of sole traders (44), 10% of small businesses (42) and 5% of medium businesses (7) would exit the industry due to a prohibition on the use of all engineered stone. The number of PCBU closures is smaller than that estimated for Option 6 in the Silica Decision RIS as result of data received through the consultation on the Prohibition Decision RIS. Of engineered stone PCBUs who responded to the consultation on the prohibition options, 95% indicated they also work with natural stone, meaning the transition to work with natural stone would likely have less impact than previously assumed.

It is expected that more sole traders and small businesses would leave the industry than medium sized businesses under this option as they have less ability to pivot to non-engineered stone products.

Business closure costs (e.g. financial wind up or liquidation costs) and redundancy payments paid to workers have been estimated at \$4.8 million across all engineered stone PCBUs for Option 1. Redundancy costs have been assumed to be paid only by medium businesses, with displaced workers from smaller businesses eligible for government income support (covered in Section 4.4.2).

Testing costs to engineered stone PCBUs at different business closure rates

The estimated costs to engineered stone PCBUs is relatively low, compared to the total estimated cost of the prohibition described for Option 1. This is because the majority of costs are associated with the licensing framework for work with legacy products which are assumed to impact other industry PCBUs

rather than engineered stone PCBUs. It is also due to the relatively small number of engineered stone PCBUs impacted (1,000 businesses total), with an even smaller number of these businesses (100 businesses) expected to close. As part of sensitivity testing of the model, costs for Option 1 were also calculated at 2 other rates of business closure:

- closures at 15% (sole traders/small business) and 7.5% (medium businesses) had a cost impact of \$9.3 million to engineered stone PCBUs, and
- closures at 30% (sole traders/small businesses) and 15% (medium businesses) had a cost impact of \$16.49 million to engineered stone PCBUs.

Costs associated with switching to non-stone products

Under Option 1, it is assumed that most engineered stone PCBUs would continue to work with natural stone, but a small number (5%) of medium sized engineered stone PCBUs may choose to expand their business to include non-stone products. This would result in new equipment costs of \$2.1 million over the implementation period.

Medium sized PCBUs are assumed to be more able to expand their offering to include non-stone products than sole traders and small businesses, as they are expected to have better access to the capital required to invest in new equipment, processes and training, and may already be undertaking work with alternative products such as laminate.

4.4.1.2 Other industry PCBUs

It is assumed that 30% of other industry sole traders, 35% of small businesses and 40% of medium to large businesses would choose to acquire a licence to work with previously installed engineered stone (under the licensing framework for work with legacy products). Costs include those administrative costs associated with applying for and renewing a licence, and participating in compliance inspections. These have been estimated to be \$133.0 million, consistent for each option (see Section 4.3.2).

Given that working with engineered stone is not likely to be the primary activity of other industry PCBUs, it is expected that only a very small number of these PCBUs would cease operating as a result of Option 1 (or the other prohibition options, as costs are consistent in each). Therefore, no business closure or redundancy costs have been estimated for other industry PCBUs.

4.4.2 Cost to government

Total cost to government of Option 1 is estimated to be \$108.2 million (see Table 9). These costs fall in to 2 groups:

- **Implementation of a licensing framework for work with legacy products** – \$107.5 million over the appraisal period, and is discussed in Section 4.3.2.
- **Provision of income and vocational training support for displaced workers** – \$0.7 million over the appraisal period for Jobseeker payments to displaced workers and financial incentive payments to workers and businesses for apprenticeships. As discussed in Section 4.4.1.1, it is assumed Jobseeker payments are made to workers displaced following the closure of sole-trader and small businesses. Estimated costs include an 8-week period of jobseeker payments, based on an assumption that any periods of unemployment will be relatively short given the tight labour market in the construction sector.

Table 9 Estimated cost of Option 1 – government

Cost	Estimated cost – 10-year appraisal period (\$m)
Licensing framework for work with legacy products	
Drafting of national licensing regulation	\$0.2
Licensing software	\$9.2
Processing of licence applications	\$11.5
Compliance and monitoring /enforcement	\$85.1
Communication costs	\$1.5
Provision of income and vocational training support for displaced workers	
Jobseeker payments	\$0.7
Training support costs	\$0.04
Total	\$108.2

4.4.3 Costs to workers

Total costs of Option 1 to workers, shown in Table 10, are estimated to be \$3.1 million over the appraisal period.

- **Lost income** – \$2.9 million, covering the difference between average wage in this sector and current jobseeker payments for the displaced workers from those sole trader and small business PCBU's that close as a result of a prohibition. The cost is calculated based on a worker receiving Jobseeker for an 8-week period. As discussed in Section 4.4.2, this relatively short period is based on an assumption that any periods of unemployment will be minimal given the tight labour market in the construction sector.
- **Retraining costs** – \$0.2 million over the appraisal period, based on average course fees for a Certificate III qualification for Civil Construction, Cabinet Making, Tiling and Fabrication Trades, for the 3% of displaced workers from PCBU closures who are assumed to retrain.

Table 10 Estimated cost of Option 1 – workers

Cost	Estimated cost – 10-year appraisal period (\$m)
Lost income over period of unemployment net of JobSeeker	\$2.9
Out-of-pocket costs for retraining to other trade	\$0.2
Total	\$3.1

4.5 Option 2 monetised costs

The costs associated with prohibition of higher silica engineered stone (engineered stone with a crystalline silica content of 40% or more) are those attributed to government and other industry PCBU's for a licensing framework for work with legacy products, as discussed in sections 4.3.2, 4.4.1.2 and 4.4.2. Engineered stone PCBU's will still be able to fabricate and install lower silica engineered stone (less than 40% crystalline silica content), and expected market availability of this product means there

will not be an impact on engineered stone PCBUs. According to the consultation submissions, 40% of engineered stone PCBUs already work with lower silica engineered stone, and several suppliers have indicated their ability to meet market demand by 2024. There are no estimated costs to workers for this option.

4.5.1 Costs to PCBUs

Under Option 2, costs to PCBUs are estimated to be \$133.0 million, comprising costs to other industry PCBUs arising from the licensing framework for work with legacy products (see Table 11).

Table 11 Estimated cost of Option 2 – PCBUs

Cost	Estimated cost – 10-year appraisal period (\$m)			
	Sole traders	Small	Medium-Large	Total
Other industry PCBUs				
Licensing framework for work with legacy products				
Licence application costs	\$26.2	\$24.2	\$0.7	\$51.2
Licence renewal application costs	\$16.0	\$14.8	\$0.4	\$31.2
Licence compliance costs (audit preparation)	\$25.9	\$24.0	\$0.7	\$50.6
Total	\$68.2	\$63.0	\$1.8	\$133.0

4.5.2 Cost to government

Total cost of Option 2 to government is for the licensing framework for work with legacy products- estimated to be \$107.5 million over the appraisal period (see Section 4.3.2).

Table 12 Estimated cost of Option 2 – government

Cost	Estimated cost – 10-year appraisal period (\$m)
Licensing framework for work with legacy products	
Drafting of national licensing regulation	\$0.2
Licensing software	\$9.2
Processing of licence applications	\$11.5
Compliance and monitoring /enforcement	\$85.1
Communication costs	\$1.5
Total	\$107.5

4.6 Option 3 monetised costs

In addition to the prohibition on the use of higher silica engineered stone proposed in Option 2, Option 3 also outlines an additional licensing framework for PCBUs working with lower silica engineered stone (< 40% crystalline silica content). Under this option there are additional estimated costs to PCBUs, government and workers.

4.6.1 Costs to PCBUs

Under Option 3, costs to PCBUs are estimated to be \$137.1 million over the appraisal period, as shown in the table below. Estimated costs are higher than Option 2 for 2 main reasons:

- the administrative costs to engineered stone PCBUs of applying for (and renewing) a licence to work with lower silica engineered stone, and participating in compliance inspections, and
- some engineered stone PCBUs are expected to close, or pivot to non-stone products, as a result of the additional cost and administrative burden of a licensing scheme to work with lower silica engineered stone.

Table 13 Estimated cost of Option 3 – PCBUs

Cost	Estimated cost – 10-year appraisal period (\$m)			
	Sole traders	Small	Medium	Total
Engineered stone PCBUs				
Business exit and switching costs				
Business closure costs	\$0.1	\$0.1	\$0.02	\$0.3 ⁶
Redundancy payments	\$0.0	\$0.0	\$1.7	\$1.7
Licensing framework for work with lower silica engineered stone				

⁶ Reflects rounding of summed numbers

Cost	Estimated cost – 10-year appraisal period (\$m)			
Licence application costs	\$0.4	\$0.4	\$0.1	\$0.8 ⁷
Licence renewal costs	\$0.2	\$0.2	\$0.1	\$0.5
Licence compliance costs (audit preparation)	\$0.4	\$0.3	\$0.1	\$0.8
Sub-Total	\$1.1	\$1.0	\$2.0	\$4.2
Other industry PCBUs	Sole traders	Small	Medium-Large	Total
Licensing framework for work with legacy products				
Licence application costs	\$26.2	\$24.2	\$0.7	\$51.2
Licence renewal application costs	\$16.0	\$14.8	\$0.4	\$31.2
Licence compliance costs (audit preparation)	\$25.9	\$24.0	\$0.7	\$50.6
Sub-Total	\$68.1	\$63.0	\$1.8	\$133.0
Total	\$69.3	\$64.0	\$3.8	\$137.1

4.6.1.1 Engineered stone PCBUs

Costs associated with business closure

Under Option 3, it is assumed that 5% of sole traders (22), 5% of small businesses (21) and 2% of medium businesses (3) would exit the industry due to the additional regulatory burden associated with licence requirements to work with lower silica stone. The total number of business closures are assumed to be lower than that modelled for Option 1, given Option 3 would not prohibit all engineered stone, and closures are attributed to the regulatory burden of the licensing scheme rather than an inability to work with engineered stone.

Costs associated with switching to non-stone products

As per Option 2, PCBUs are not expected to need to switch to non-stone products under Option 3, as engineered stone suppliers have indicated they expect to be able to meet market demand for lower silica engineered stone by mid-2024.

4.6.1.2 Other industry PCBUs

The legacy licencing costs to other industry PCBUs (\$133 million) are consistent with those described for Option 1 (see Section 4.3.2).

4.6.2 Cost to government

Option 3 poses an estimated total cost to government of \$111.1 over the appraisal period (see Table 14). These costs include:

- **implementation of licensing framework for work with legacy products** – as described for previous options, this amounts to \$107.5 million over the appraisal period.

⁷ As above

- **provision of income and vocational training support for displaced workers** – \$0.3 million over the appraisal period for Jobseeker payments to displaced workers and financial incentive payments to workers and businesses for apprenticeships, and
- **implementation of the licensing framework for work with lower silica engineered stone** – \$3.3 million over the appraisal period, covering drafting legislation, licence administration, monitoring and compliance programs and communications costs. Note that an assumption has been made that this licensing framework could utilise the same IT platform as the framework for legacy products and this has not been costed again here.

Government costs are highest under Option 3, due to the additional costs of implementing and operating 2 concurrent licensing frameworks.

Table 14 Estimated cost of Option 3 – government

Cost	Estimated cost – 10-year appraisal period (\$m)
Licensing framework for work with legacy products	
Drafting of national licensing regulation	\$0.2
Licensing software	\$9.2
Processing of licence applications	\$11.5
Compliance and monitoring /enforcement	\$85.1
Communication costs	\$1.5
Provision of income and vocational training support for displaced workers	
Jobseeker	\$0.3
Training support costs	\$0.02
Licensing framework for work with lower silica engineered stone	
Drafting of national licensing regulation	\$0.2
Licensing software	\$0.0
Processing of licence applications	\$0.2
Compliance and monitoring enforcement	\$1.4
Communications costs	\$1.5
Total	\$111.1

4.6.3 Costs to workers

Total costs of Option 3 to workers are estimated to be \$1.5 million over the appraisal period, due to lost income and retraining costs for those workers displaced by business closure (see Table 15). Costs to workers under Option 3 are expected to be lower than Option 1 given a smaller number of workers are expected to be displaced under Option 3.

- **Lost income** – \$1.4 million over the appraisal period, covering the difference between average wage in this sector and current jobseeker payments, for an 8-week period.

- **Retraining costs** – \$0.1 million over the appraisal period, from average course fees for a Certificate III for Civil Construction, Cabinet Making, Tiling and Fabrication Trade for the 3% of displaced workers from PCBU closures who are assumed to retrain.

Table 15 Estimated cost of Option 3 – workers

Cost	Estimated cost – 10-year appraisal period (\$m)
Lost income over period of unemployment net of JobSeeker	\$1.4
Out-of-pocket costs for retraining to other trade	\$0.1
Total	\$1.5

4.7 Qualitative costs

This section outlines identified costs to PCBUs, government, workers, consumers and the community that have not been quantitatively costed in this analysis.

4.7.1 Qualitative costs to PCBUs

4.7.1.1 Engineered stone PCBUs

Identified but non-monetised potential costs for engineered stone PCBUs include:

- **Licence fees:** While jurisdictions may make a policy decision to recover some of their costs through a licensing fee; cost-recovery via licence fees was not considered in this analysis to avoid double-counting.
- **Reduced revenue:** Engineered stone PCBUs may experience a reduction in revenue as they pivot to alternative products or as a result of business closure.⁸ The time required to develop and implement legislation is expected to allow engineered stone PCBUs to fulfil existing client orders, build up their business in natural stone or alternative products, or find alternative revenue sources, reducing revenue loss.
- **Other transition costs:** Engineered stone PCBUs may incur other transition costs such as costs of disposing of old stock, costs of dealing with contractual issues for scheduled work and additional costs to change their designs, productions, pricing, and/or marketing for alternative products.
- **Retraining workers to work with non-stone products:** There may be some training costs for employees to work with alternative products (e.g. laminate) or to recruit skilled workers.
- **Higher barriers to entry for new businesses:** There is expected to be a small increase in the barrier to entry to working with engineered stone under option 3 due to additional costs associated with licensing requirements. The financial burden is expected to be larger on sole traders and small businesses, as they have fewer economies of scale in which to absorb licensing costs. Depending on market competition, additional costs would be expected to be passed onto consumers.

4.7.1.2 Other impacted PCBUs

The following impacts to the engineered stone industry have been identified but not quantitatively costed:

- **Costs to importer/distributor/wholesale businesses:** There are a small number of businesses who import engineered stone and supply it to fabricators (estimated to be around 12 companies⁹). A 2019 report suggested that 77% of Australia's engineered stone was supplied by 3–4 companies (Australian Engineered Stone Advisory Group, 2019). While it is not possible to determine exact numbers, it appears that up to 4 of these supply companies are large multi-national companies who also manufacture engineered stone and other stone or stone-like products. The remainder are locally owned companies who import engineered stone from overseas manufacturers. Based on the limited information available, it appears that the companies importing and supplying engineered stone do not undertake fabrication themselves.

Very few of these companies made a submission to the public consultation, and no information about business size or financial turnover was available. The submissions from these companies

⁸ Based on submissions to the consultation, the average revenue of an engineered stone fabrication business is \$900,000 per annum for sole traders and small businesses; and \$8.3 million per annum for medium sized businesses.

⁹ Caesarstone consultation submission

focussed on the effect a prohibition would have on other companies in the supply chain, such as fabricators and other downstream users.

Based on available information, most companies that supply engineered stone also supply other products, such as natural stone and/or porcelain. A small number of companies appear to only supply engineered stone.

The multinational manufacturers have a global market and existing supply routes to other countries. They would be able to pivot sales of engineered stone to other markets if a prohibition is implemented. As above, many also supply other products and it is feasible that they may move their Australian operations to focus on these products.

In all cases, the operations of these businesses – warehouses, logistical operations, machinery for moving and storing heavy stone slabs etc. – can be repurposed for substitute products (natural stone, laminate etc). The demand for bench tops, cladding, flooring is not expected to decrease as alternatives to engineered stone are available. There may be costs associated with pivoting to alternative products and disposing of old stock, however, they are not able to be quantified due to a lack of information. A submission from one of the larger businesses noted that should work with high silica engineered stone be banned, a 12-month transitional period would allow manufacturers and distributors to sell current stock holdings and fulfill existing orders.

There may be costs associated with closure of a small number of businesses that import, manufacture or distribute engineered stone. However, due to a lack of information these costs are unable to be quantified.

- **Costs to retailers:** considered out of scope for this analysis. There may be additional labour and other costs to kitchen and bathroom retailers, architects and designers associated with required changes to their designs, production, pricing and/or marketing for alternative products. There may also be additional costs associated with removing and replacing existing engineered stone displays.
- **Change in the size of the market:** The proposed prohibition options are not expected to have any impacts on underlying demand for kitchen and bathroom benchtops, splashbacks and other products that engineered stone is often used for. Alternative product options exist for consumers.

4.7.2 Qualitative costs to workers

The proposed options are not expected to have significant longer-term impacts on employment levels or wages of engineered stone workers. This is because underlying demand for kitchen and bathroom benchtops and other surfaces is not expected to change regardless of any prohibition on engineered stone. Given significant workforce shortages across the construction sector (Judd, 2023), it is expected that displaced workers would find alternative employment in similar or related trades.

4.7.3 Qualitative costs to consumers

4.7.3.1 Potential for increased purchasing prices for new engineered stone products

Engineered stone currently accounts for 55% of the kitchen benchtop market (by volume).¹⁰ A prohibition on use of all engineered stone may drive a substantial shift in demand in the market to alternative products (e.g. natural stone, laminate or wood). It is feasible that this shift may lead to short-term price increases in these alternate products while the market adapts to changes in demand (substitution effect). The size of price increases will depend on the market power of producers relative to consumers. In turn,

¹⁰ Caesarstone submission

this is influenced by the level of competition throughout the supply chain for kitchen and bathroom benchtops and similar products.

Under Options 2 and 3, there may also be an increase in the price of lower silica engineered stone due to:

- additional costs associated with licensing arrangements (Option 3)
- these products can take longer to fabricate, and it is expected that engineered stone PCBU's would need to pass these higher production costs on to consumers
- manufacturers may seek to recoup the cost of developing these new products, and
- potentially reduced competition in the market due to a small increase in the barriers to entry. Nevertheless, there are several providers of lower silica alternatives (see section B.1.1).

This impact will depend on the level of competition throughout the supply chain for benchtops and similar products. Where price increases are driven by a higher production costs, rather than variation in demand, the increased price will likely be persistent.

4.7.3.2 Potential increased price for removal, repair or modification of previously installed engineered stone

Under the prohibition options, there may be some upward pressure on the price paid by consumers when engaging a tradesperson to undertake removal, repair or modification of engineered stone already installed in their home or workplace. This would be due to other industry PCBU's passing on the costs they incur under the licensing framework for work with legacy products (including any passed on to PCBU's by governments) and decreased competition should the number of PCBU's willing to obtain a licence to do this work decrease.

4.7.3.3 Other impacts on consumers

The prohibition options would lead to a decrease in the choice of material for kitchen and bathroom benchtops and similar products. While there are various alternatives to engineered stone, the alternatives have different properties and price points relative to engineered stone:

- Under Option 1, the prohibition on the use of all engineered stone would reduce the range of price-quality combinations for kitchen and bathroom benchtops and similar products.
- Under Option 2 and 3, a prohibition on the use of engineered stone with 40% or more crystalline silica content would reduce the choice in engineered stone products and potentially increase the price (see section 4.7.3.1). In both cases, however, there are numerous alternative products and the market is expected to continue to innovate.

4.7.4 Costs to the community

4.7.4.1 Economic growth

No negative impacts on economic growth are expected from any of the options. There may be a small positive impact on GDP if locally produced products replace imported engineered stone products.

4.7.4.2 Environmental impacts

All options may have some level of environmental impact if PCBU's are unable to sell unused engineered stone stock and must dispose of it instead.

4.8 Qualitative benefits

As discussed in Chapter 2, exposure to respirable crystalline silica (RCS) can lead to silicosis and silica-related diseases. The increased use of engineered stone in Australia coincides with an increase in silicosis diagnosis, and engineered stone workers are over-represented amongst silicosis patients. Removing engineered stone as a source of RCS from the Australian market, is expected to lead to the following benefits over the long term:

- reduced number of people living with silicosis and silica-related diseases
- reduced premature death from silicosis and silica-related diseases
- avoided hospitalisations, outpatient care and care in the home from a reduced number of cases of silicosis and silica-related diseases
- avoided mental health and quality of life effects for workers, family and friends
- improved worker productivity by reducing ill health and extending working life
- avoided workers compensation claims/legal costs driven by a reduction in the incidence of the disease, and
- avoided higher insurance premia for workers compensation.

It has not been possible to monetise these benefits for a number of reasons:

- there is a lack of available data regarding the total health system costs incurred in treating silicosis and silica-related disease
- where data is available for individual patients; occupational exposure history may not be available or may not be complete
- there is no evidence available on how engineered stone of different crystalline silica content impacts health outcomes for workers
- the time lag between exposure to RCS and symptoms of silicosis and silica-related disease, which can be as much as 30 years (Hoy, RF & Chambers, DC 2020), but may be significantly shorter in engineered stone workers (Hoy, et al. 2023), and
- this time lag makes it challenging to know when we will see a peak in silicosis cases attributable to engineered stone, or when we may expect a decline in cases following any prohibition.

4.8.1 Impact of benefits

As a significant proportion of silica cases have been identified in engineered stone workers, a prohibition on the use of engineered stone would be expected to have a significant health benefit for those workers. This would be accompanied by an indirect benefit to the wellbeing of their family, friends and community.

If realised, these health benefits for workers would also result in avoided government costs associated with hospitalisations and outpatient care, avoided PCBU costs associated with workers compensation claims and higher insurance premiums, and an increase in productivity in the relevant industry workforce.

The extent to which these benefits are realised will depend on the option implemented. A prohibition on the use of all engineered stone (Option 1) will have greater health benefits for workers compared to a prohibition on the use of engineered stone containing 40% or more crystalline silica (Options 2 and 3).

There is no evidence to demonstrate that prohibiting engineered stone with 40% or more crystalline silica (Options 2 and 3) will prevent all adverse health effects associated with exposure to dust from engineered stone.

Options 2 and 3 are expected to reduce worker risk compared to the base case, due to an assumed reduction in RCS exposure as a result of working with a lower silica product, albeit less than Option 1. However, a prohibition that is limited to higher silica content engineered stone may lead to a perverse outcome whereby PCBUs, workers and the public assume that the permitted material is safe to work with when this has not yet been demonstrated. This may result in further non-compliances with the WHS laws. If Option 2 or 3 are preferred, it will be important for clear messaging that, in accordance with WHS laws, any work with engineered stone with <40% crystalline silica still requires strict controls in place to minimise worker exposure to any dust or other emissions generated.

The licensing framework for work with legacy products (all options) and the licensing framework for work with lower silica engineered stone may only have incremental benefits over the base case, as any permitted work with engineered stone will still be subject to the prohibition on uncontrolled processing and the additional requirements for high risk crystalline silica processes (see base case).

The licensing frameworks will provide visibility to regulators of those PCBUs undertaking licensed work, and assurance to consumers and workers that PCBUs are appropriately authorised to undertake the permitted work with engineered stone.

Some industry stakeholder submissions have suggested a benefit of the licensing framework for work with lower silica engineered stone would be increased compliance. It would also provide an ability to link licensing work with training and reporting requirements recently agreed to by WHS ministers; and give WHS regulators the ability to cancel or suspend licences for PCBUs who do not meet safe work standards.

The administrative cost, for both PCBUs and governments, of managing and complying with a licence scheme may outweigh the benefits.

4.9 Breakeven analysis

Breakeven analysis estimates the number of illnesses and deaths that would need to be prevented by each prohibition option to offset the costs of the option.

4.9.1 Results of breakeven analysis

Table 16 shows the cost of each of the options over the appraisal period, and the total number of silicosis cases that are required to be prevented over this period to offset these costs. The number of cases of silicosis cases that would be needed to breakeven was determined by dividing the net present cost over the appraisal period by the \$4.9 million expected value of life saved and illness avoided (see B.9.5). A detailed description of the approach used to undertake the breakeven analysis is provided in Appendix B.

Table 16 Estimated breakeven analysis results over 10-year appraisal period

Option	Total cost (\$m)	Estimated number of cases prevented required to breakeven over the period – total	Total cost – licensing framework for work with legacy products(\$m)	Estimated number of cases prevented required to breakeven (licensing framework – legacy products)	Cost specific to each option (\$m)	Estimated number of cases prevented required to breakeven (option specific)
Option 1	\$251.1	51			\$10.6	2
Option 2	\$240.5	49	\$240.5	49	\$0	0
Option 3	\$249.7	51			\$9.2	2

*Estimated number of cases required to break even rounded to the nearest whole number.

The average number of cases that need to be prevented per year to break even (~5 cases) is likely achievable given the annual number of accepted compensation claims in recent years (Figure 1). The 49–51 cases needed to be avoided to break even is a small fraction of the 1,000 future cases of silicosis predicted to be prevented if the use of engineered stone were prohibited in Australia (Carey and Fritschi 2022).

5. Who was consulted and how was their feedback incorporated?

This Decision RIS was informed by a consultation process that ran from March–April 2023. The Agency sought feedback on a consultation paper outlining 3 options. Submissions were accepted via Safe Work Australia’s consultation platform, Engage, from 2 March 2023 to 2 April 2023. Late submissions were also accepted where requested.

5.1 Options

Feedback was sought on the following 3 options:

- **Option 1:** Prohibition on the use of all engineered stone
- **Option 2:** Prohibition on the use of engineered stone containing 40% or more crystalline silica, and
- **Option 3:** Prohibition on the use of engineered stone containing 40% or more crystalline silica and licensing of PCBUs working with engineered stone containing less than 40% crystalline silica.

The 3 options for prohibition include a licensing framework **common to all 3 options:**

- licensing framework for work with legacy products – to undertake exempt work (removal, repair, minor modifications) with engineered stone installed prior to prohibition.

As described above, Option 3 includes an additional licensing framework for work with lower silica engineered stone.

The consultation paper asked stakeholders to provide data and evidence to support their preferred options and to inform the impact analysis. Stakeholders were also asked to submit any evidence to support a “threshold” level of crystalline silica below which engineered stone can be worked with safely.

5.2 Submissions at a glance

A total of 114 submissions were received from a range of stakeholders, including:

- PCBUs working with engineered stone (60, including four engineered stone suppliers)
- other PCBUs, including law firms (11)
- industry groups (8)
- professional organisations and peak health bodies (6)
- commonwealth, state and territory government departments and agencies (6)
- unions (5), and
- individuals, including WHS and medical professionals and individuals who work with stone (18).

Some submissions represented views of individuals or small organisations, while other submissions were made by one organisation on behalf of many members and/or by organisations with unique expertise in a particular area. While all submissions were invaluable to informing the impact analysis, submissions were weighted with these considerations in mind when informing the analysis.

The majority of submissions supported a prohibition of some kind, however there was no clear preference for any of the three options. Only 16 submissions stated their lack of support for any of the prohibition options presented.

The main themes from the submissions were:

- Unions, professional organisations and peak health bodies supported Option 1 (a prohibition on the use of all engineered stone).
- Industry groups, while not necessarily supportive of a prohibition, acknowledged there is an issue with silicosis in engineered stone workers. They believe it can be addressed through regulation of high risk crystalline silica processes previously agreed by WHS ministers (Option 5a in the Silica Decision RIS).
- Some industry groups highlighted specific evidence gaps they would like to see addressed before a decision can be made to prohibit the use of engineered stone. These included:
 - Scientific evidence that crystalline silica in engineered stone creates a higher level of risk than crystalline silica in natural stone and other products.
 - Evidence that risks associated with engineered stone cannot be appropriately controlled by additional regulation of high risk crystalline silica processes.
- The majority of stakeholders acknowledged there is not currently enough evidence to determine a threshold crystalline silica content at which engineered stone can be worked with safely (for example, the 40% threshold proposed in Options 2 and 3).
- Around half of PCBUs working with or supplying engineered stone supported Option 3, commenting that a licensing scheme for work with lower silica engineered stone would enhance compliance in the sector.

5.3 Information that informed the impact analysis

The consultation paper sought specific information from businesses working with engineered stone to inform the impact analysis. This included business size, workforce data, revenue and proportion of work carried out with engineered stone (with varying silica content) and natural stone products. The Agency thanks the many PCBUs working with engineered stone that provided this information in their submissions, and acknowledges the effort involved. The provided data highlight that the vast majority of these PCBUs work with both engineered stone and natural stone, which differs from the assumption made in our preliminary considerations of the impacts of a prohibition on use of engineered stone in the Silica Decision RIS.

5.4 Stakeholder views on options

5.4.1 The status quo

A small number of submissions (16) were not supportive of a prohibition but preferred to maintain the status quo – maintaining the current regulatory framework – including the recently agreed additional regulation of high-risk crystalline silica processes. This support was based on:

- a need for consistent regulatory approaches between engineered stone and other products with similar crystalline silica content (i.e., natural stone, concrete, brick and tiles)
- the significant investment already made by many PCBUs to protect their workers from the risks of respirable crystalline silica (RCS) by implementing appropriate control measures. This investment

has been in response to recent regulatory changes, including a reduction in the RCS workplace exposure standard and the prohibition on uncontrolled processing of engineered stone. The impact of these new measures should be evaluated before a prohibition is considered

- the market's recent response to concerns around RCS exposure through the development and supply of lower silica content engineered stone
- a prohibition on all engineered stone would have significant impact on small and medium-sized enterprises, with flow on impacts to the wider economy
- a lack of clarity around the cause of silicosis cases reported to date – the delay between exposure and diagnosis means it can be difficult to determine if illness is due to exposure to engineered stone, or from natural stone, and
- the impact of recent improved regulatory compliance will not be seen for some time.

5.4.2 A prohibition on the use of all engineered stone (Option 1)

There was significant support (29 submissions in total) for a prohibition on the use of all engineered stone. Unions, professional organisations, peak health bodies, individual medical practitioners, WHS professionals and some government agencies supported this option, along with some PCBUs working with engineered stone.

Support for Option 1 was based on:

- the high incidence and severity of silicosis in engineered stone workers which has resulted in these workers being over-represented as a proportion of all silicosis cases, and the likely continuation of high case numbers into the future due to the latency of disease
- a potential link between the differing disease presentation in engineered stone workers (faster onset and more rapid progression of disease) and the differing properties of the dusts generated from engineered and natural stone. This includes differences in the physical properties of RCS and the potential additional risks from other components in the in engineered stone (e.g. resin, pigments)
- a lack of evidence to support a crystalline silica “threshold” content in engineered stone that poses a lower risk profile for those working with it
- a lack of clarity around the impact of other components added to lower silica engineered stone, and the subsequent risk profile of working with this material
- a history of those in the stone bench top industry not employing safe working methods and a lack of evidence regarding current compliance with WHS Regulations including meeting the current workplace exposure standard for RCS and controlling dust generation when processing engineered stone, and
- the high rate of WHS non-compliance amongst PCBUs working with engineered stone as reported by jurisdictional regulators.

5.4.3 A prohibition on the use of engineered stone containing 40% or more crystalline (Options 2 and 3)

Overall, 57 stakeholders supported a prohibition on the use of engineered stone containing 40% or more crystalline silica (Options 2 and 3). This included the majority of those PCBUs working with engineered stone who made a submission to this consultation, some industry groups, professional organisations, and government agencies.

Many submissions predicated their support for either Option 2 or 3 on the belief that lower silica engineered stone can be worked with safely. This was based on:

- the availability of engineered stone products with less than 40% crystalline silica
- a perceived lower risk of RCS exposure from processing engineered stone with lower silica
- an assumption that RCS levels generated from processing lower silica engineered stone would be comparable to that generated from natural products (e.g. granite and sandstone) with a similar silica content, and can therefore be worked with safely
- a lack of evidence that dust generated from processing engineered stone, while qualitatively different from natural stone dust, causes more harm, and
- these options presenting less overall disruption to the market and industry.

5.4.3.1 Setting a crystalline silica content threshold

Many submissions commented on whether 40% silica content was the appropriate demarcation point between lower and higher risk engineered stone products. The majority of submissions agreed there is insufficient evidence to support this percentage.

WorkSafe Victoria submitted that the 40% threshold used to define engineered stone in the Victorian Occupational Health and Safety (OHS) Regulations is not health based and may not be the most appropriate percentage to define a prohibition. The definition of engineered stone used for their licensing scheme, (where a PCBU must be licensed to work with engineered stone with 40% or more crystalline silica content), was designed to capture the majority of engineered stone available in the market at that time.

While the AIOH supports a complete prohibition on work with all engineered stone; their submission outlined that, if this was not agreed and a threshold was to be set, work with engineered stone should only be permitted where the product has a silica content below 10%. This was based on an analysis of reported RCS exposure data from Australian workplaces processing engineered stone and evidence in international studies. The Lung Foundation Australia, the Public Health Association of Australia, the Royal Australian College of Physicians, and Cancer Council Australia submissions were consistent with that of the AIOH – supporting a complete prohibition but if a threshold was to be set, it should be silica content below 10%.

5.4.4 A licensing framework for working with lower silica engineered stone (Option 3)

Of the 57 submissions who supported continued work with lower silica engineered stone, 38 submissions supported a licensing framework for work with lower silica engineered stone, as outlined in Option 3. Approximately 80% of those submissions were from PCBUs working with engineered stone or individual stonemasons, and the remainder were from industry groups, professional organisations and government agencies. Support for licensing was based on:

- improved regulator visibility of PCBUs working with engineered stone
- the ability to link licensing with training and reporting requirements recently agreed by WHS ministers for all high risk silica work (Option 5a)
- strengthening regulatory controls through the ability to cancel or suspend licences for PCBUs who do not meet safe work standards, and

- ensuring that there is continued focus on managing ongoing risks of working with lower silica engineered stone to avoid complacency amongst PCBUs.

Some submissions also provided feedback on the structure of the proposed licensing framework for lower silica stone, including that there should be:

- a publicly available database of licence holders, and
- a prohibition on consumers purchasing products from unlicensed PCBUs (i.e. unlicensed suppliers, fabricators and installers).

Some groups indicated that, should WHS ministers not agree to a complete prohibition of engineered stone, any work with lower silica stone must involve a licensing scheme. For example, the ACTU are strongly in favour of a prohibition of all engineered stone. In the case that this does not occur, the ACTU have proposed any use of lower silica engineered stone should be accompanied by a tripartite licensing regime for importers, suppliers and fabricators of engineered stone with significant penalties for non-compliance. They also suggested a 'fit and proper' person test that considers general WHS compliance history of the PCBU.

Some submissions argued that a licensing scheme was not required:

- licensing offers no additional benefit to workers than the further regulation (Option 5a) already agreed by WHS ministers, and
- the additional cost of a licence scheme will be a further burden to PCBUs.

5.4.5 A licensing framework for work with legacy engineered stone

The consultation paper outlined a licensing scheme for exempt uses of engineered stone already installed (licensing framework for work with legacy products), that applies to each of the prohibition options. Several peak health bodies supported basing the licensing framework for work with legacy products on asbestos licensing in the model WHS Regulations, whereas industry groups raised concerns about doing so as engineered stone presents a fundamentally different risk profile to that of asbestos. Other submissions highlighted that some processes currently proposed to be covered by such a framework are low risk (e.g., minor repair and modification) and commented that regulation should be commensurate with risk. Licensing lower-risk activities may result in over regulation and present an unnecessary burden on both PCBUs and regulators.

Submissions suggest that a licensing framework for work with legacy products should:

- not unintentionally capture businesses that undertake minor and infrequent work
- be risk based – i.e. focus on higher-risk activities, and have exceptions for very minor tasks or occasional work that is unlikely to lead to significant RCS exposure, and
- not impose stricter requirements than work with non-friable asbestos.

The Australian Chamber of Commerce and Industry, the Housing Industry Association and others suggested exemptions from licensing should be included for trades performing low duration and low exposure activities. Specifically, they proposed that a PCBU would require a licence to undertake (otherwise prohibited) work with engineered stone already installed, unless:

- the work does not exceed 10 minutes in total per day, and
- the total time the exempt work is performed by an individual worker in any period of 7 days does not exceed one hour.

The Agency will continue to liaise with Members, who represent governments, workers and industry, to determine the exact parameters of the licensing framework, including whether exemptions to the licence requirement should apply for very minor and/or occasional work.

5.4.6 Stakeholder feedback on operating dual licensing schemes

The consultation paper specifically sought information about operating dual licensing schemes (one for work with legacy products and one for work with lower silica engineered stone). Very few submissions addressed this question. Those that did emphasised the need for careful communication with industry to avoid confusion, and noted that two licences are currently in place for the removal of asbestos without issue.

6. What is the best option?

6.1 Recommendation

Recommended options

On the basis of evidence review, impact analysis and stakeholder feedback, it is recommended that WHS ministers prohibit the use of all engineered stone, and implement a licensing scheme for certain work with engineered stone previously installed (Option 1).

Each option was considered in the context of available evidence, consultation feedback, workshop outcomes, and an economic analysis.

Engineered stone workers are dramatically over-represented amongst workers diagnosed with silicosis – the vast majority of silicosis cases identified in recent years are in engineered stone workers, yet they make up only 2% of those exposed to RCS at work. Exposure to RCS from engineered stone causes silicosis typified by a faster onset and more rapid progression than that caused by RCS from other sources, including natural stone. This has resulted in debilitating disease in young engineered stone workers, the majority of which are under 35.

When engineered stone is processed, the dust generated contains higher levels of RCS, and that RCS has different physical and chemical properties that likely contribute to the more rapid and severe disease. There is also evidence to suggest that other components of engineered stone may contribute to the toxic effects of engineered stone dust, either alone or by exacerbating the effects of RCS.

There is no scientific evidence for a 'safe' threshold of crystalline silica content in engineered stone. Further, the risks of the materials used in place of crystalline silica in lower silica engineered stone is largely unknown. Given this, a precautionary approach is the most appropriate policy response.

In addition to the inherent properties of engineered stone and RCS, the re-emergence of silicosis in engineered stone workers is also due to a failure of compliance with existing WHS laws. Importers, manufacturers and suppliers in the engineered stone industry have not provided adequate information on the risks posed by engineered stone. There is little consistency in the information provided by importers, manufacturers and suppliers about the hazardous properties of their products. This is likely to cause confusion and uncertainty on the part of PCBUs about the nature and extent of the health and safety risks to their workers.

PCBUs have not done all that is reasonably practicable to eliminate or minimise those risks, and workers have not taken reasonable care for their own health and safety and that of others. Finally, there has been insufficient compliance and enforcement actions by WHS regulators to drive behaviour change in the sector.

The increased risks posed by RCS from engineered stone, increased rate of silicosis diagnosis amongst engineered stone workers, and the faster and more severe disease progression amongst this group, combined with a multi-faceted failure of this industry to comply with the model WHS laws means that continued work with engineered stone poses an unacceptable risk to workers. The use of all engineered stone should be prohibited.

6.2 Why are other options not preferred?

A lower silica content engineered stone is not expected to result in improvements in compliance. The features of the sector that have contributed to the current levels of non-compliance remain – the sector is

comprised of mostly small businesses with few barriers to entry and a lower understanding of WHS obligations. In fact, permitting work with lower silica engineered stone may encourage even greater non-compliance with WHS laws as there may be an incorrect perception that these products are 'safer'.

There is no evidence that lower silica engineered stone poses less risk to worker health and safety than higher silica engineered stone. There is no toxicological evidence for a 'safe' threshold of crystalline silica content, or that the other components of lower silica engineered stone products (e.g. amorphous silica from recycled glass and feldspar) do not pose additional risks to worker health. Manufacturers have not yet established (through independent scientific evidence) that these products are without risks to the health and safety of persons, as required by the model WHS laws.

Given the increased rates of silicosis diagnosis in engineered stone workers, and a lack of any evidence that a lower silica content engineered stone is safe to work with, it is not possible to support the continued use of any engineered stone products. Further, it is imperative that government and industry continue to consider and assess safety risks of new engineered stone-like products as they come to market.

7. Implementation and evaluation

7.1 Implementation

Should WHS ministers agree to the preferred option in this Decision RIS (Option 1), the model WHS Regulations will be amended to introduce a prohibition on the use of all engineered stone, with exemptions for certain work on previously installed stone.

Amendments to the model WHS Regulations will be drafted by the Australasian Parliamentary Counsel's Committee (PCC) and once made, published on the Safe Work Australia website. For the amendments to the model WHS Regulations to apply, each jurisdiction will need to implement them separately through amendments to their jurisdictional WHS Regulations.

To avoid asynchronous implementation of the changes across jurisdictions, WHS ministers may wish to consider setting an implementation date, noting that this date will need to allow sufficient time for PCC to draft the amendments to the model WHS Regulations, and for jurisdictions to amend their legislation.

A transitional period for industry beyond that required to draft changes to the model WHS Regulations and implementation in jurisdictions is not recommended. A prohibition on engineered stone has been recommended due to the devastating impact that exposure to RCS from engineered stone can have on workers; and it is not appropriate to delay action. The time period between WHS ministers' decision and implementation of changes in jurisdictional WHS laws will act as a notification period for PCBU's, workers and consumers.

As is usual practice for Safe Work Australia, communications and guidance materials will be developed to assist stakeholders to understand how the amendments to the model WHS Regulations affect them. These materials could be developed prior to the amendments being finalised, to assist stakeholders in their preparations.

7.2 Evaluation

Evaluation will be undertaken by Safe Work Australia to assess the impact of the preferred option on reducing exposure to RCS from engineered stone and eliminating silicosis and other silica-related diseases in engineered stone workers.

7.2.1 Reducing exposure to RCS in engineered stone workers

Under the preferred option, former fabricators and installers of engineered stone will no longer be exposed to RCS. The only work permitted to be undertaken with engineered stone will be for the repair, modification or removal of engineered stone already installed.

Following the decision by WHS ministers in February 2023 to introduce additional regulations of high risk crystalline silica processes, including requirements for air and health monitoring, RCS exposures in these workers will be measured by reviewing the air and health monitoring data provided to WHS regulators. RCS exposures in these workers will also be measured by reviewing relevant jurisdictional compliance and enforcement data.

7.2.2 Silicosis cases

Currently, there are several data sources for silicosis cases – accepted workers' compensation claims, jurisdictional health screening programs, and state-based dust disease registers. These will continue to be monitored to evaluate the impact of the preferred option on reducing silicosis cases. Once

operational, the National Occupational Respiratory Disease Register, which will mandate the reporting of all diagnosed silicosis cases in Australia, will be relied upon in place of the state dust disease registries. However, due to the latency from exposure to disease for silicosis (10-30 years), the impacts of the preferred option may take considerable time to be reflected in the number of reported silicosis cases. There are currently no available data sets to monitor for the impacts of the preferred option on other silica-related diseases. However, should these data become available, they will also be included in the evaluation.

7.2.3 Continued review of emerging products

Safe Work Australia will continue to review and assess the risk profile of emerging products. This includes products not currently covered by the definition of engineered stone, such as porcelain, ceramic, and engineered stone-like products that contain amorphous silica (recycled glass), feldspar or other products in place of crystalline silica. As appropriate, Safe Work Australia will make recommendations to WHS ministers on effective ways to manage risks posed by these products.

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Appendix A: Legislative and regulatory framework for crystalline silica under the model WHS laws

What are the duties of PCBU's?

Under the model WHS laws, a PCBU has a primary duty of care to ensure the health and safety of workers while they are at work in the business or undertaking and that the health and safety of others is not put at risk from work carried out by the business or undertaking.

A PCBU is often an employer. However, the concept of PCBU's also captures modern work relationships outside of the traditional contract of employment. For example, it includes principal and subcontractor relationships, host employers in a labour hire arrangement.

It is the PCBU's responsibility to eliminate so far as is reasonably practicable, risks arising from exposure to RCS or, where elimination is not reasonably practicable¹¹, minimise the risks so far as is reasonably practicable to workers and other persons¹². This includes the provision and maintenance of the workplace environment without risks to health and safety, as well as the provision of any information, training, instruction, or supervision necessary to protect people from risks to their health and safety.¹³ PCBU's must also, so far as is reasonably practicable, consult with workers who carry out work for the business or undertaking who are or are likely to be directly affected by a WHS matter.¹⁴ PCBU's must also consult with the workers' HSRs on WHS matters.¹⁵ For PCBU's working with RCS, examples of when consultation must occur include when preparing risk assessments and safe work method statements (SWMS), developing a silica dust control plan, deciding on control measures and selecting the medical practitioner to undertake health monitoring.¹⁶

Where there is more than one person that has a duty in relation to the same WHS matter, each person with the duty must discharge their duty to the extent that they have the capacity to influence and control the matter¹⁷ and must consult, cooperate and coordinate activities with all other persons who also owe a duty in relation to the same matter.¹⁸ A duty cannot be transferred to another person.¹⁹

Managing the risks of RCS as a hazardous chemical

A PCBU must manage the risks to health and safety associated with handling or generating RCS (a hazardous chemical) at a workplace in accordance with Part 3.1 of the model WHS Regulations²⁰. Part 3.1 requires, for example, that the PCBU identify hazards that could give rise to risks to health and safety and apply the hierarchy of controls to minimise the risks to health and safety if it is not reasonably

¹¹ Safe Work Australia has published an interpretive guideline on the meaning of reasonably practicable (Safe Work Australia 2011).

¹² model Work Health and Safety Act s17 (WHS Act); model Work Health and Safety Regulations r35 (WHS Regulations).

¹³ model WHS Act s19 and s20; model WHS Regulations r39.

¹⁴ model WHS Act s47.

¹⁵ model WHS Act s70.

¹⁶ model WHS Act s47; model WHS Regulations r299 and r369.

¹⁷ model WHS Act s16(3).

¹⁸ model WHS Act s46.

¹⁹ model WHS Act s14.

²⁰ model WHS Regulations r351.

practicable to eliminate the risks. Failure to comply with regulation 351 is a breach of the PCBU's primary duty of care in section 19 of the model WHS Act.

As with all health and safety duties in the model WHS law, the duty on a PCBU to manage the risks to health and safety from RCS at a workplace are not transferrable²¹.

Workplace exposure standard for RCS

A PCBU must ensure that no person at the workplace is exposed to a substance or mixture in an airborne concentration that exceeds the exposure standard for the substance or mixture.²² The duty to ensure the WES is not exceeded is absolute and not qualified by so far as is reasonably practicable. A WES must not be adjusted upwards, even for shifts of less than eight hours (Safe Work Australia 2021a).

This means that a PCBU must ensure that no person at the workplace is exposed to RCS at a concentration above the WES, which is an eight-hour TWA of 0.05 mg/m³. An exposure standard represents the airborne concentration of a particular substance or mixture that must not be exceeded. However, it does not represent a line between a 'safe' and 'unsafe' concentration of an airborne substance or mixture. The exposure standard does not eliminate risk of disease and some people may experience adverse health effects below the exposure standard.

Air monitoring

A PCBU must undertake air monitoring in the breathing zone of workers (Safe Work Australia 2013) if there is uncertainty that the workplace exposure standard is being exceeded or if it is necessary to determine whether there is a risk to a worker's health.²³ Air monitoring records must be kept for a period of 30 years and must be readily accessible to persons in the workplace who may be exposed to RCS.²⁴ The air monitoring report should be made available to a WHS inspector on request and to a registered medical practitioner carrying out or supervising health monitoring (Safe Work Australia 2021a).

Health monitoring

PCBUs must also provide and pay for health monitoring for workers if they carry out ongoing work generating RCS, or there is a significant risk to the worker's health because of exposure.²⁵ Health monitoring must be undertaken by or under the supervision of a medical practitioner with experience in health monitoring and a record must be given to the worker as soon as practicable after receipt, be kept for a period of 30 years and given to the WHS regulator in certain circumstances.²⁶

Under Schedule 14 to the model WHS Regulations, the minimum requirements for health monitoring for crystalline silica through exposure to RCS are:

- collection of demographic, medical and occupational history
- records of personal exposure

²¹ model WHS Act s14.

²² model WHS Regulations r49.

²³ model WHS Regulations r50 and r368.

²⁴ model WHS Regulations r378.

²⁵ model WHS Regulations r370.

²⁶ model WHS Regulations rr371, 375, 378.

- standardised respiratory questionnaire
- standardised respiratory function tests, and
- chest X-Ray full posterior-anterior view.

The model WHS Regulations allow for alternative types of health monitoring if they are equal to or better than these methods and the use of that other type of monitoring is recommended by a registered medical practitioner with experience in health monitoring.²⁷ In Western Australia low dose High resolution computed tomography is explicitly required instead of chest X-Ray for health monitoring.

The PCBU is also responsible for providing information to staff about health monitoring, and for providing copies of the health monitoring report to other PCBUs who have a duty to provide health monitoring to the worker (Safe Work Australia 2021a). If a report indicates that a worker is experiencing adverse health effects or signs of illness because of exposure to RCS, control measures in the workplace must be reviewed and revised as necessary (Safe Work Australia 2021a).

High risk construction work and preparation of SWMS

Construction work is defined in the model WHS Regulations as any work carried out in connection with the construction, alteration, conversion, fitting-out, commissioning, renovation, repair, maintenance, refurbishment, demolition, decommissioning or dismantling of a structure. Regulation 291 of the model WHS Regulations sets out a list of high risk construction work for which a SWMS is required. This includes work carried out in an area that may have a contaminated or flammable atmosphere.

Construction work that involves processing silica-containing materials is high risk construction work when it generates RCS that may contaminate the workplace's atmosphere and would require a SWMS (Safe Work Australia 2021a).

The SWMS must be accessible and understandable to any individual who needs to use it.²⁸ If any high risk construction work is carried out, outside the manner stipulated in the SWMS, the PCBU must ensure that the work is stopped immediately or as soon as it is safe to do so, and only resumed in accordance with the SWMS.²⁹

Other duties for PCBUs working with engineered stone

The model WHS Regulations were amended in 2023 to remove any doubt in relation to the applicable control measures when working with engineered stone.

A PCBU must not process, or direct or allow a worker to process, engineered stone unless the processing of the stone is controlled through either a water delivery system that supplies a continuous feed of water over the stone being processed to suppress the generation of dust, an on-tool extraction system, or a local exhaust ventilation system and respiratory protective equipment. The amended model WHS Regulations also provide a definition of engineered stone as meaning an artificial product that:

- (i) contains crystalline silica, and
- (ii) is created by combining natural stone materials with other chemical constituents such as water, resins or pigments, and

²⁷ model WHS Regulations r370.

²⁸ model WHS Regulations r299

²⁹ model WHS Regulations r300

(iii) undergoes a process to become hardened.

Engineered stone does not include: concrete and cement products; bricks, pavers and other similar blocks; ceramic and porcelain wall and floor tiles; roof tiles; grout, mortar and render; and plasterboard.

The model Code of Practice: Managing the risks of respirable crystalline silica from engineered stone in the workplace (the model Code), published in October 2021, outlines specific ways in which PCBUs working with engineered stone can comply with their WHS duties and describes effective ways to identify and manage the risks from silica.

In most cases, following an approved code of practice would achieve compliance with the health and safety duties in a jurisdiction's WHS Act and Regulations. Courts may have regard to an approved code of practice as evidence of what is known about a hazard, risk, risk assessment or risk control and may rely on the code to determine what is reasonably practicable in the circumstances.

To have legal effect in a jurisdiction, a model Code must be approved as a code of practice in that jurisdiction. As of June 2022, the model Code has been implemented in New South Wales and Tasmania. In 2019, Queensland implemented a Code of Practice: Managing respirable crystalline silica dust exposure in the stone benchtop industry covering natural and engineered stone (Workplace Health and Safety Queensland 2019). WorkSafe Victoria has also implemented a Compliance Code: Managing Exposure to Crystalline Silica - Engineered Stone (WorkSafe Victoria 2020).

The model Code:

- clarifies that the on-site installation of engineered stone is considered high risk construction work if the processes used to install, modify or repair the engineered stone such as, cutting, grinding, trimming, drilling, sanding, or polishing generate RCS and contaminates the work area
- requires PCBU(s) to prepare a SWMS before any on-site installation of engineered stone that involves any processing, modification or repair of engineered stone that may generate RCS, and
- clarifies the duties for PCBUs working with engineered stone to undertake air and health monitoring.

Duties of designers, manufacturers, importers, suppliers and those who install or commission substances, plant or structures

A designer, manufacturer, importer or supplier of silica containing products must ensure, so far as is reasonably practicable, that the silica containing product they design, manufacture, import, supply or install is without risk to health and safety³⁰. This includes undertaking necessary testing and providing adequate information³¹ about the silica containing product.

Suppliers of equipment (such as hand-held water-fed power tools or RPE) should take all reasonable steps to ensure appropriate information about the safe use of the equipment is available.

A PCBU who installs, constructs or commissions structures must also ensure, so far as is reasonably practicable, all workplace activity relating to the plant or structure including its decommissioning or

³⁰ model WHS Act ss22-26.

³¹ The term 'adequate information' is not defined in the model WHS Act. A number of suppliers provide a safety data sheet (SDS) with their engineered stone products. An importer or manufacturer must prepare an SDS for a 'hazardous chemical' in accordance with reg 330. However, in a number of cases, the SDS provided states that the engineered stone product is classified as not hazardous but notes that the product when cut or machined may produce crystalline silica. In other cases, the SDS identifies the risks from RCS generated when the product is cut, grinded or machined.

dismantling is without risks to health or safety. A structure is defined as anything that is constructed, whether fixed or moveable, temporary or permanent, including buildings and underground works (such as shafts or tunnels).

Duties of principal contractors

Projects involving construction work that cost \$250,000 or more are classified as 'construction projects' under the model WHS laws. Each construction project has a 'principal contractor'. A principal contractor is also a PCBU.

In addition to the primary duties imposed on a principal contractor as a PCBU, the principal contractor has duties relating to WHS management plans, ensuring general compliance, and managing specific risks.

Duties of workers

Workers have a duty to take reasonable care for their own health and safety, and to take reasonable care to not adversely affect the health and safety of other persons.³²

Workers must also:

- comply as far as they are reasonably able with any reasonable instruction given by the PCBU to allow the PCBU to comply with the WHS Act, such as participating in health monitoring and wearing relevant personal protective equipment (PPE), and
- co-operate with any reasonable policy or procedure relating to WHS at the workplace that has been notified to them.³³

The PCBU must make workers aware of the hazards associated with the use of silica-containing materials, including the process for reporting safety incidents.

If a worker refuses to participate in health monitoring or refuses to use PPE as they have been trained and instructed, a PCBU would need to take other action to meet its duties under the model WHS laws. This could include removing the worker from the source of exposure to RCS.

Duties of officers

An officer (for example a company director) must exercise due diligence to ensure the PCBU complies with the WHS Act and WHS Regulations.³⁴ This includes taking reasonable steps to ensure the PCBU has and uses appropriate resources and processes to eliminate or minimise risks of working with silica and silica containing products. This includes:

- identifying the hazard of RCS
- controlling the risk of exposure to RCS
- conducting air monitoring, and
- providing health monitoring for workers.

³² model WHS Act s28

³³ model WHS Act s28

³⁴ model WHS Act s27

Duties of other persons at the workplace

Other persons at the workplace, like visitors, must take reasonable care for their own health and safety and must take care not to adversely affect other people's health and safety.³⁵ They must comply, so far as they are reasonably able, with reasonable instructions given by the PCBU to allow that person to comply with the WHS Act.

³⁵ model WHS Act s29

Appendix B: Impact analysis methodology

B.1 Define the market

B.1.1 The market for engineered stone

Engineered stone was first imported into Australia in the mid-late 1990s and has experienced significant growth due to popularity among home renovators and developers to become the major product in the bathroom and kitchen benchtop market. The previous dominant product was laminate.³⁶

The kitchen benchtop market was estimated to be worth about \$600 million in 2022, comprising 4.5 million square metres of benchtop. Engineered stone represents about 55% of the Australian market by volume, followed by laminate (29%), porcelain (5%), and granite (4%), with the rest of the market comprising other products.³⁷

Engineered stone is primarily used in residential dwellings for kitchen and bathroom benchtops, as well as splashbacks and wall and floor tiling.³⁸ There are an estimated 2-3 million Australian homes with installed engineered stone. The product is also used in the commercial market for benchtops, counters, floors, facades and other interiors in workplaces, retail, care facilities and leisure facilities.³⁹

Engineered stone is not manufactured in Australia but is imported from various countries such as China, Israel and the United States. Typically, engineered stone is imported by large multi-national suppliers (who are often also the manufacturer) such as Cosentino, Caesarstone and Smartstone. The imported product is processed in fabrication workshops, and sold on to builders, cabinet makers, architects, and retailers, working on behalf of their customers on residential developments, renovations and commercial fit outs. The cutting, shaping and polishing is done by engineered stone PCBUs to meet the purchased specifications.⁴⁰

The market is driven primarily by residential building and renovation activity. There have been 170,000 to 215,000 new house dwellings and unit constructions each year over the past 5 years to June 2022 (Australian Bureau of Statistics, 2022), as well as an estimated 150,000 to 160,000 home renovations.⁴¹ There is an estimated 960,000 to 1,125,000 new and renovated kitchens and bathrooms in Australia per annum.

B.1.2 The market for alternative products

There are a range of alternatives to engineered stone available at various price points as shown in the table below.

Table 17 Product prices for engineered stone and alternatives

Product	Price range (for kitchen benchtops, excluding sink)
Laminate	<ul style="list-style-type: none">\$120 to \$350 per square metre

³⁶ Caesarstone and Smartstone submissions

³⁷ Caesarstone submission

³⁸ HIA submission

³⁹ Caesarstone and HIA submissions

⁴⁰ Caesarstone and Smartstone submissions

⁴¹ Caesarstone and Smartstone submissions

Product	Price range (for kitchen benchtops, excluding sink)
Bamboo	<ul style="list-style-type: none"> \$300 to \$400 per square metre
Hardwood timber	<ul style="list-style-type: none"> \$600 to \$1,200 per square metre
Engineered stone	<ul style="list-style-type: none"> Caesarstone benchtops range from approximately \$416 to \$1,190 per square metre, plus installation fees Sintered engineered stone \$600–\$1,400 per square metre
Porcelain	<ul style="list-style-type: none"> \$700 to \$2,500 per square metre, including installation
Granite	<ul style="list-style-type: none"> \$700 to \$2,500 per square metre, including installation
Marble	<ul style="list-style-type: none"> \$800 to \$2,200 per square metre, including installation
Stainless steel	<ul style="list-style-type: none"> \$900 to \$1,000 per square metre
Polished concrete	<ul style="list-style-type: none"> \$1,000 to \$1,750 per square metre finished/installed

Sources: Jeffery 2023, Gibson 2023, Home Beautiful 2021, Vbathroom 2020, Webeck and Mathers2022

If a prohibition were to apply to all engineered stone (Option 1), submissions have raised potential for supply constraints on alternative products. For instance, it is suggested that the supply of particle board may prevent adequate supply of laminate benchtops to meet expected demand in the absence of engineered stone.⁴² Submissions have also noted that the implementation period for any prohibition should also allow engineered stone PCBUs to fulfil current orders and to enable the industry to source and transition to natural stone or alternative products.

B.2 Industries that work with engineered stone

Two key industries work with engineered stone:

- **‘Engineered stone PCBUs’** are businesses that fabricate (cut, shape, polish) and install new engineered stone (discussed further in Section 4.2), and
- **‘Other industry PCBUs’** are builders, electricians, tilers, carpenters, and other trade businesses that predominantly work with legacy engineered stone (already installed engineered stone) in the course of their primary activities (e.g. cutting an existing benchtop to fit an electrical outlet or repair plumbing) (discussed further in Section 4.2).⁴³

Other cohorts involved in the engineered stone supply chain include:

- **Importers and wholesalers of engineered stone** – Caesarstone estimates there are about 12 importers of engineered stone in Australia including Caesarstone, Smartstone, and Cosentino. This is a concentrated market, with Caesarstone comprising about 40% of the engineered stone market in Australia.⁴⁴ This cohort would be most impacted by a total prohibition on engineered stone (Option 1). However, it is assumed that with a sufficient implementation period, suppliers could still fulfil their existing commitments, move unsold engineered stone stock and leverage existing capital, supply and

⁴² Smartstone submission

⁴³ These groupings are a simplifying assumption. Some proportion of engineered stone PCBUs will undertake engineered stone repairs and some other industry PCBUs will also undertake installation of new engineered stone.

⁴⁴ Caesarstone submission

distribution networks to transition to alternative products. Suppliers have confirmed that the impacts of Option 2 and Option 3 would be relatively more manageable. Lower silica engineered stone already accounts for a significant proportion of the market (around 40% of market activity based on data from submissions).

B.3 Defining engineered stone PCBUs

Engineered stone PCBUs predominantly fabricate (cut, shape, polish) and install new engineered stone. Workers in this industry are at the greatest risk of exposure to engineered stone RCS as they cut, polish, and grind engineered stone "slabs" into the required shape and size. This can occur either in the fabrication workshop or during installation (Australian Engineered Stone Advisory Group, 2019).

Most engineered stone workers are not required to obtain any formal qualifications or training. The requisite skills and techniques for working with engineered stone are learned through experience and "on the job training", which invariably differs between engineered stone PCBUs.⁴⁵ Engineered stone workers can use a range of equipment to process engineered stone, ranging from computer controlled cutting devices to handheld tools such as electric blades and angle grinders for cutting and "pads" for polishing and shaping the surface.⁴⁶

B.3.1 Number of engineered stone PCBUs

There are an estimated 750 to 1,250 PCBUs working with engineered stone in Australia (ASEAG, 2019). While data limitations prevent an accurate estimation of the number of PCBUs, feedback provided during consultation to inform this Decision RIS confirmed that 1,000 was a realistic estimation of the number of PCBUs working with engineered stone in Australia.⁴⁷

Victorian engineered stone PCBUs are excluded from consideration in this Decision RIS because Victoria has not adopted the model WHS laws. It is acknowledged that there is likely to be some cross border activity between Victorian engineered stone PCBUs and other states. For the purposes of this Decision RIS, we have assumed this cross border activity will cancel each other out.

No growth has been assumed for the number of engineered stone PCBUs over the appraisal period, given no historical growth rates are available and reflecting that the industry will be going through a period of change. In addition, the proposed prohibition options primarily impact existing businesses. Future businesses will be able to decide to enter the industry or not given knowledge of the regulatory environment. Similarly, no growth has been assumed for the number of workers employed by engineered stone PCBUs.

B.3.2 Size of engineered stone PCBUs

Market research commissioned by the National Dust Disease Taskforce indicates that sole traders and small businesses comprise most of the industry, while medium businesses have a smaller representation (Quantum Market Research, 2021).

For the purposes of this assessment, businesses have been classified into the categories shown in the table below, consistent with those used for the Silica Decision RIS.

⁴⁵ *ibid*

⁴⁶ *ibid*

⁴⁷ Caesarstone submission mentions 1,000 engineered stone PCBUs.

Table 18 Size of engineered stone PCBUs by employee size

Business size	Proportion of total businesses
Sole trader	44%
Small (1 – 20 employees)	42%
Medium (21 – 200 employees)	14%
Total	100%

B.3.3 Staff numbers

Research undertaken by Australian Engineered Stone Advisory Group estimates that there are between 8,000 and 10,000 people working with engineered stone in Australia (ASEAG, 2019).

Table 19 Average number of employees by business type⁴⁸

Business size	Average number of workers
Sole trader	1
Small (1 – 20 employees)	5
Medium (21 – 200 employees)	44

B.3.4 Proportion of engineered stone PBCUs that also work with natural stone

The number of PCBUs working with engineered stone has increased as the material has become more popular among home renovators and developers – engineered stone currently occupies about 55% of the Australian market by volume⁴⁹. Data received through the consultation to inform this Decision RIS indicated that 95% of engineered stone PCBUs work with both natural stone and engineered stone.

B.3.5 Proportion of business activity by crystalline silica content

Option 2 and 3 would seek to prohibit work with engineered stone containing 40% or more crystalline silica content. The impacts of these options are dependent on the availability of engineered stone with less than 40% crystalline silica content.

Research indicates that there is already a sizeable market of engineered stone with less than 40% crystalline silica content in Australia. An estimated 40% of business activity among engineered stone PCBUs is currently engineered stone with less than 40% crystalline silica content.

Moreover, the industry is increasingly offering lower silica engineered stone products, for example:

- Smartstone has launched a new product range, the Ibrido Collection, with 28% silica content. It is planning to replace its entire range by mid-2023 (Smartstone, 2023)⁵⁰

⁴⁸ Submissions from individual respondents to the consultation to inform the Prohibition Decision RIS; SafeWork NSW and Worksafe Victoria submissions

⁴⁹ Caesarstone submission

⁵⁰ Smartstone submission

- Caesarstone launched a lower silica product (less than 40% silica) in 2022 and by mid-2024 expects that all of its products sold in Australia will contain less than 40% silica⁵¹, and
- Cosentino engineered stone products Silestone Q10 and Q40 contain less than 10% and 40% crystalline silica respectively (Cosentino Global, S.L.U., 2023).

While stakeholders have indicated that engineered stone with less than 40% crystalline silica is currently more expensive, they have also indicated that they should be able to meet demand within the next 12-18 months, should higher silica content products be prohibited.

B.4 Defining other industry PCBUs

B.4.1 Other PCBUs working with engineered stone

'Other industry PCBUs' are the trades who work with engineered stone in the course of their primary activities. An example provided during consultation to inform the Prohibition Decision RIS is that of a homeowner buying a new electrical cooktop (stovetop) and requiring an electrician to rewire and fit the new cooktop, which will likely require the electrician to cut into the engineered stone benchtop to fit the new appliance. This same scenario could also apply to sinks and power points.⁵²

A licensing framework is proposed across all options for work on engineered stone already installed, where other industry PCBUs will need to obtain a licence to undertake certain activities such as removal, repair, and minor modification of pre-installed engineered stone.

B.4.2 Number of other industry PCBUs

The number of businesses within the construction sector that would handle previously installed engineered stone has been estimated using *Counts of Australian Businesses* data published by the Australian Bureau of Statistics (ABS) for June 2022. This data shows the total number of businesses at the four-digit ANZSIC industry classification level for each jurisdiction. An assessment of all four-digit ANZSIC categories was undertaken to determine which industries would work with legacy engineered stone (refer to Table 20).

As Victoria has not adopted the model WHS laws, PCBUs in Victoria have not been included in this analysis, with an acknowledgement that there will be some cross border activity.

Not all PCBUs in each industry category would work with engineered stone. Given the high degree of uncertainty about the proportion of PCBUs in each category that would work with engineered stone at some point over the time period, a very conservative 100% of businesses have been included in the analysis, to provide an indicative upper cost estimation.

There is an estimated 179,750 other industry PCBUs currently assumed to do some work with engineered stone in the course of their primary activities (Table 21). The number of PCBUs who may choose to continue to undertake work with engineered stone through a licensing framework for work with legacy products is considered in section B.7, and is expected to be a fraction of this total number.

⁵¹ Caesarstone submission

⁵² ACCI submission

Table 20 Potential total number of other industry PCBUs who may work with engineered stone

Industry category	Relevant ANZSIC categories	Total PCBUs
Construction	<ul style="list-style-type: none"> House Construction (renovation) Other Residential Building Construction (renovation) Non-Residential Building Construction (renovation) Carpentry Services (working around engineered stone) Tiling and Carpeting Services (working around engineered stone) Plumbing Services (working around engineered stone) Electrical Services (working around engineered stone) 	179,750

The business counts data used for the number of other industry PCBUs represents a point in time estimate using historical data. No analysis has been undertaken to determine the growth in the number of other industry PCBUs over the implementation period or 10-year implementation period.

ABS data (ABS, 2022) indicates that the identified ANZSIC categories are comprised of 55% sole traders, 44% small businesses (1–19 employees), and 1% of medium to large businesses (>20 employees) as shown in the following table.

Table 21 Size of other industry businesses by employee size

Business size	Proportion of total businesses	Number of total businesses
Sole trader	55%	99,205
Small (1 – 19 employees)	44%	78,569
Medium-large (20 employees or more)	1%	1,976
Total	100%	179,750

B.5 Identifying decisions and monetisable impacts to industry

This section outlines the business decisions engineered stone PCBUs and other industry PCBUs may make in response to the three prohibition options (e.g., switch to alternative products, cease trading etc.) and the respective monetisable costs of these decisions.

B.5.1 Engineered stone PBCUs

Figure 5 Decision tree – Option 1 – engineered stone PCBUs

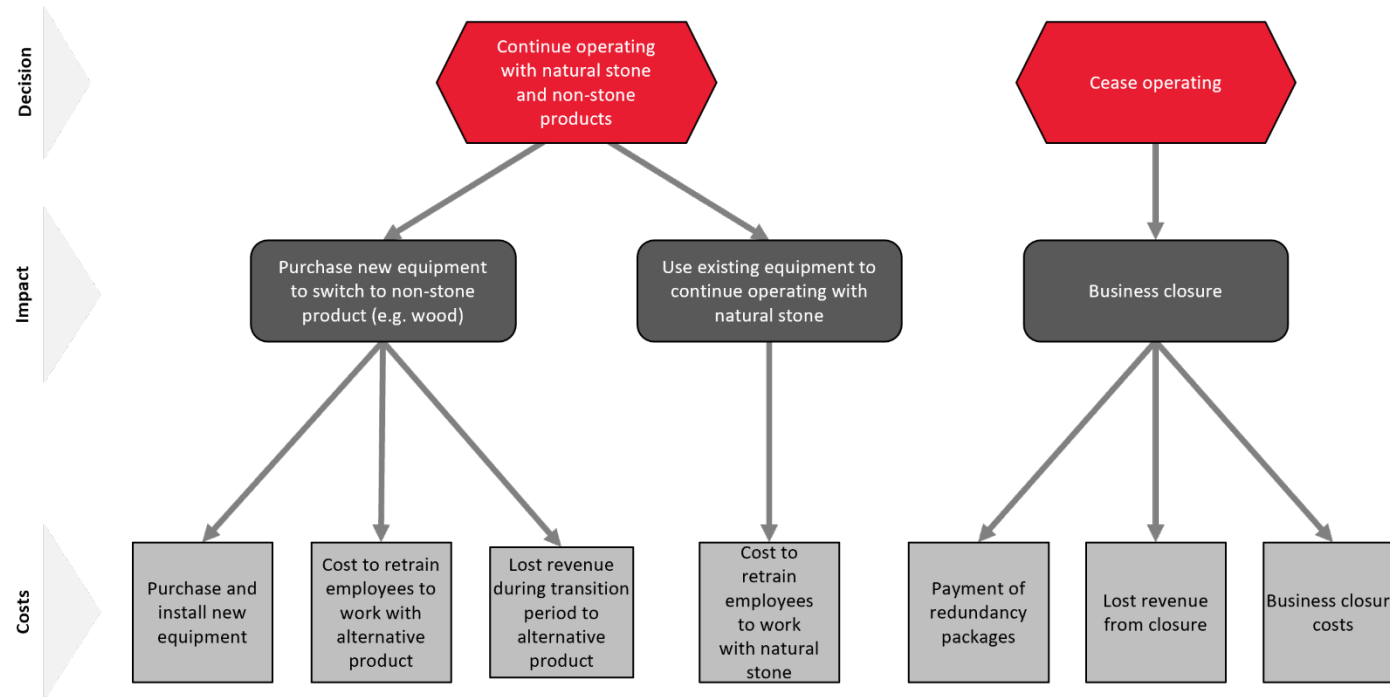


Figure 6 Decision tree – Option 2 – engineered stone PCBUs

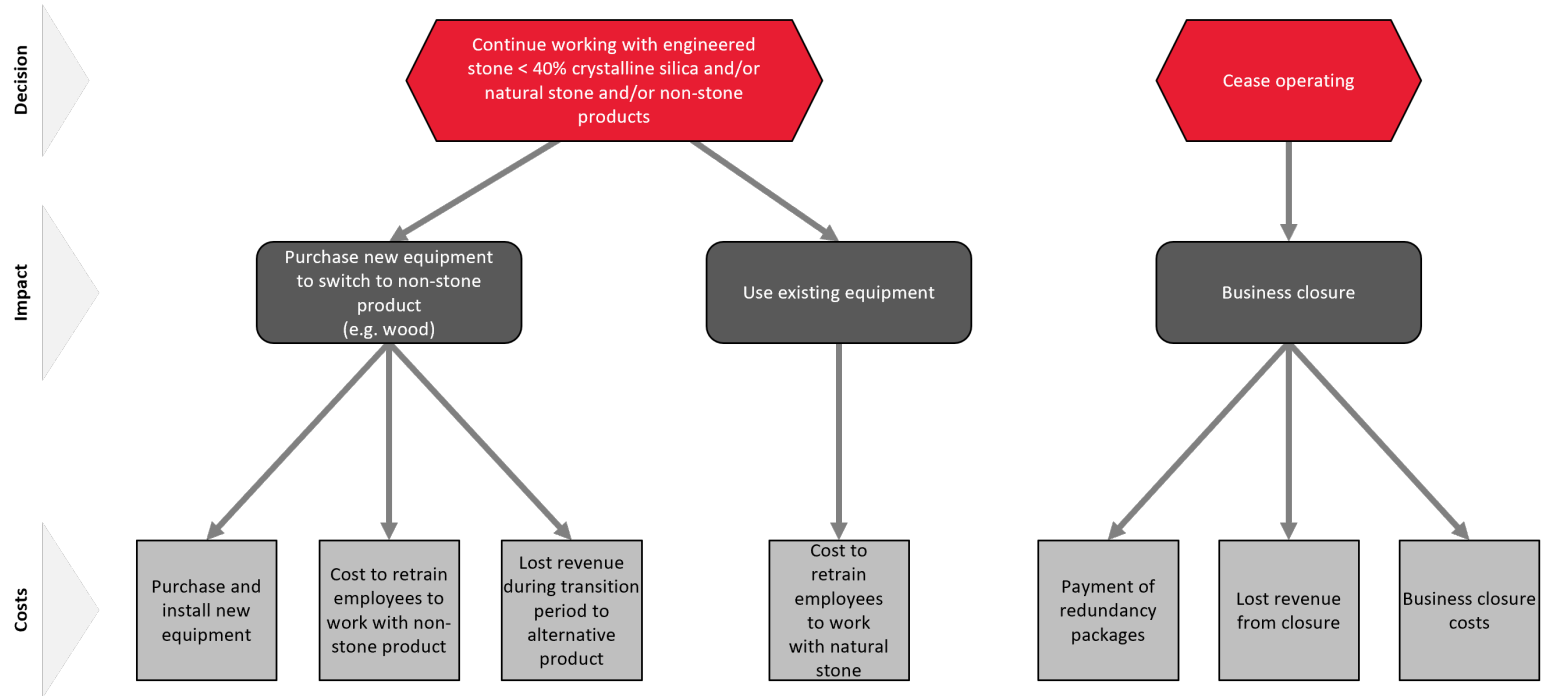
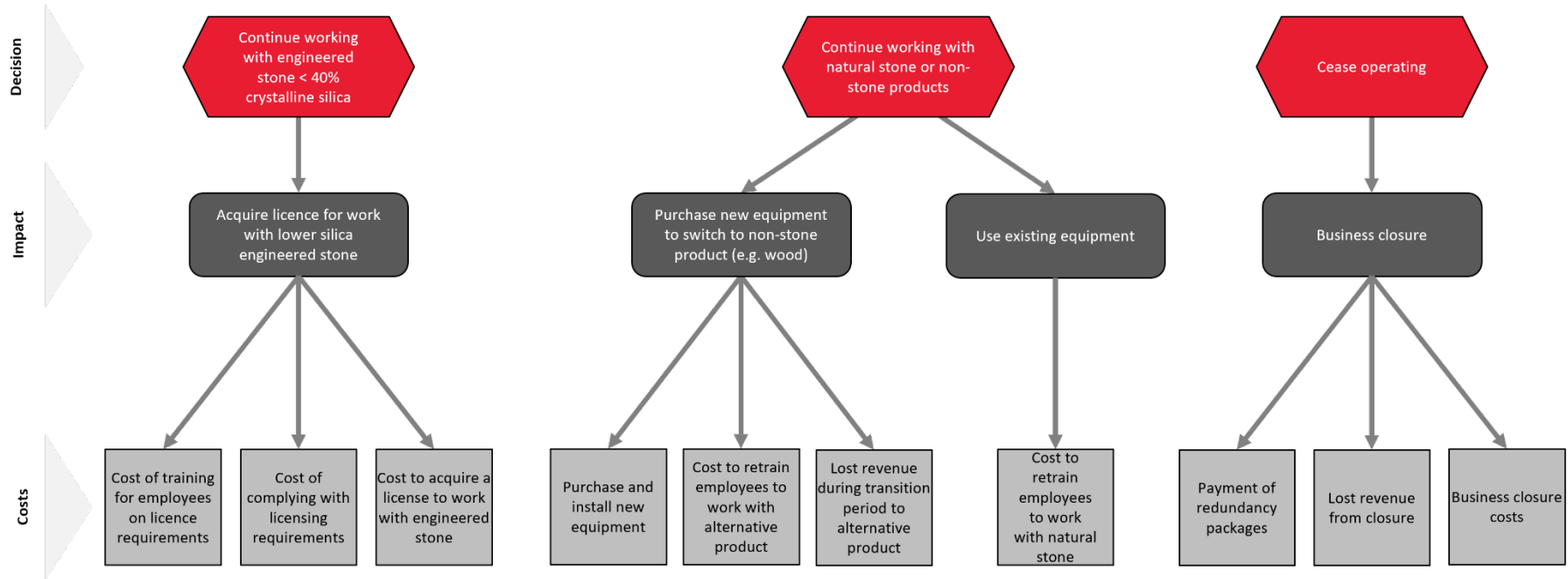
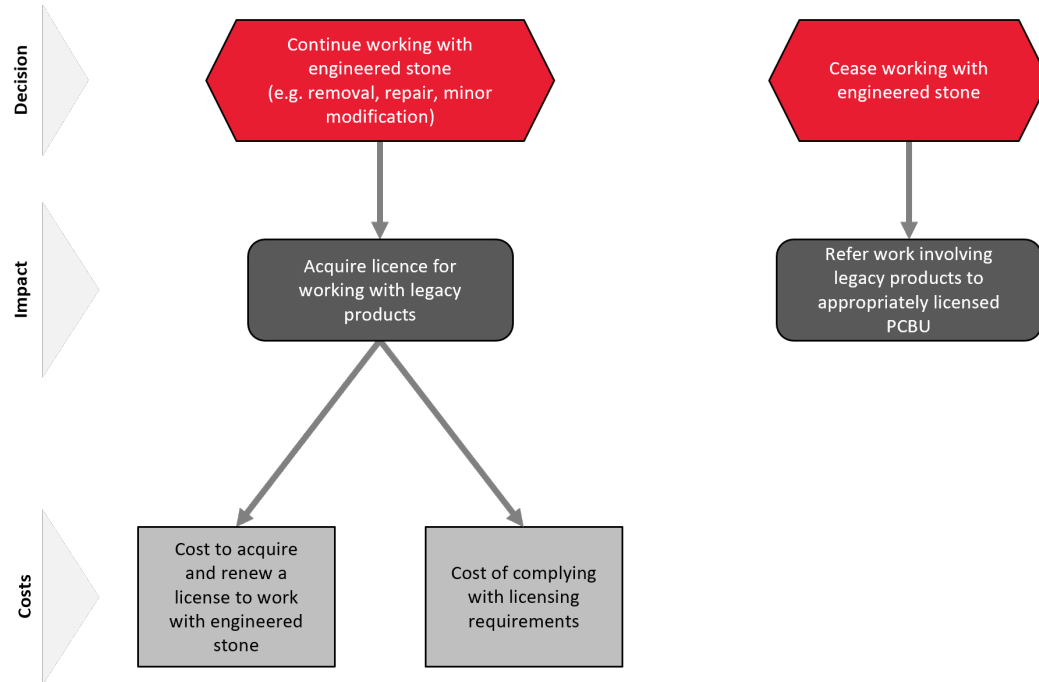


Figure 7 Decision tree – Option 3 – engineered stone PCBUs



B.5.2 Other Industry PBCUs

Figure 8 Decision tree – other industry PCBUs

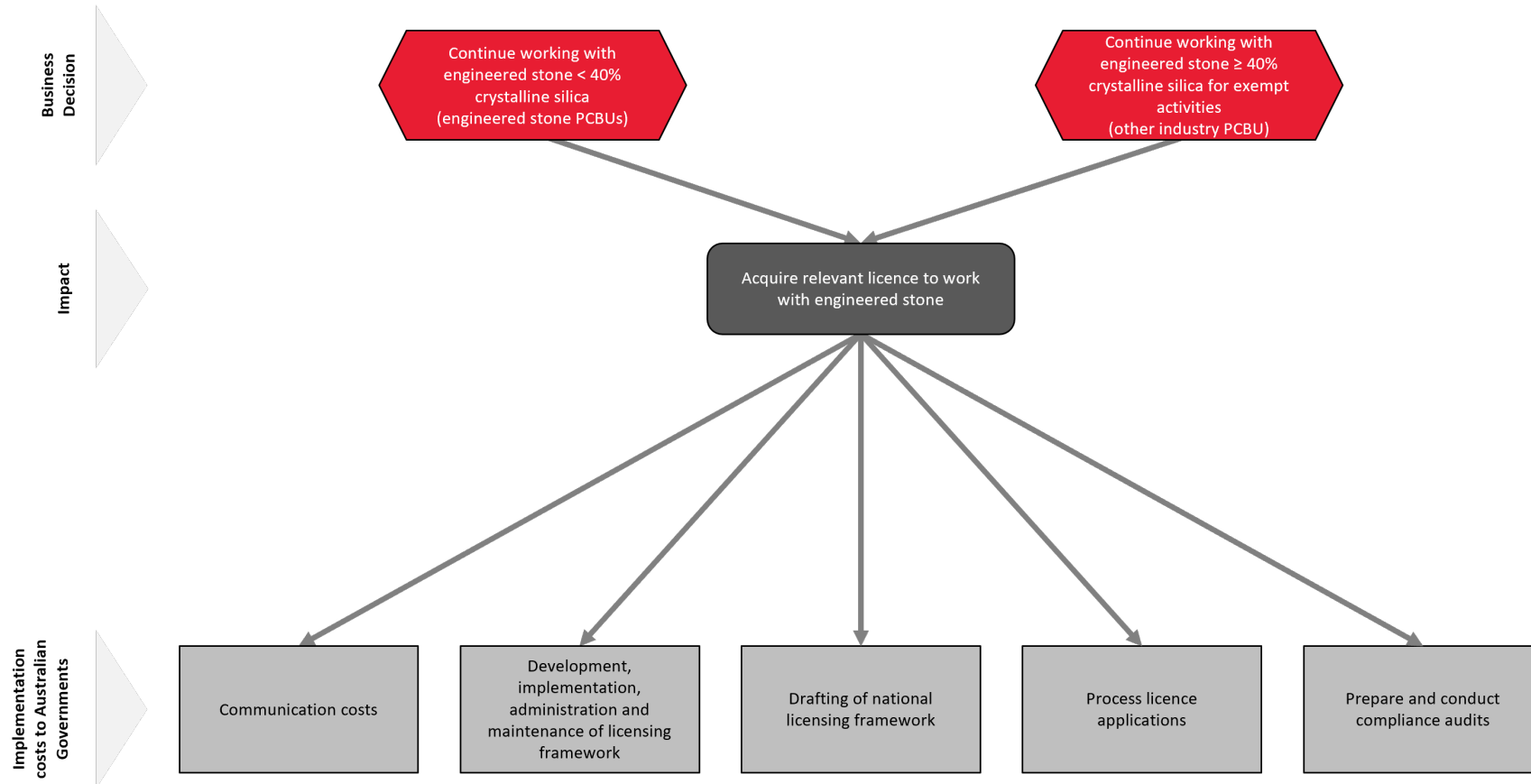


B.6 Identifying monetisable costs to government

This section outlines the likely cost to government for each option, based on decisions made by PCBUs.

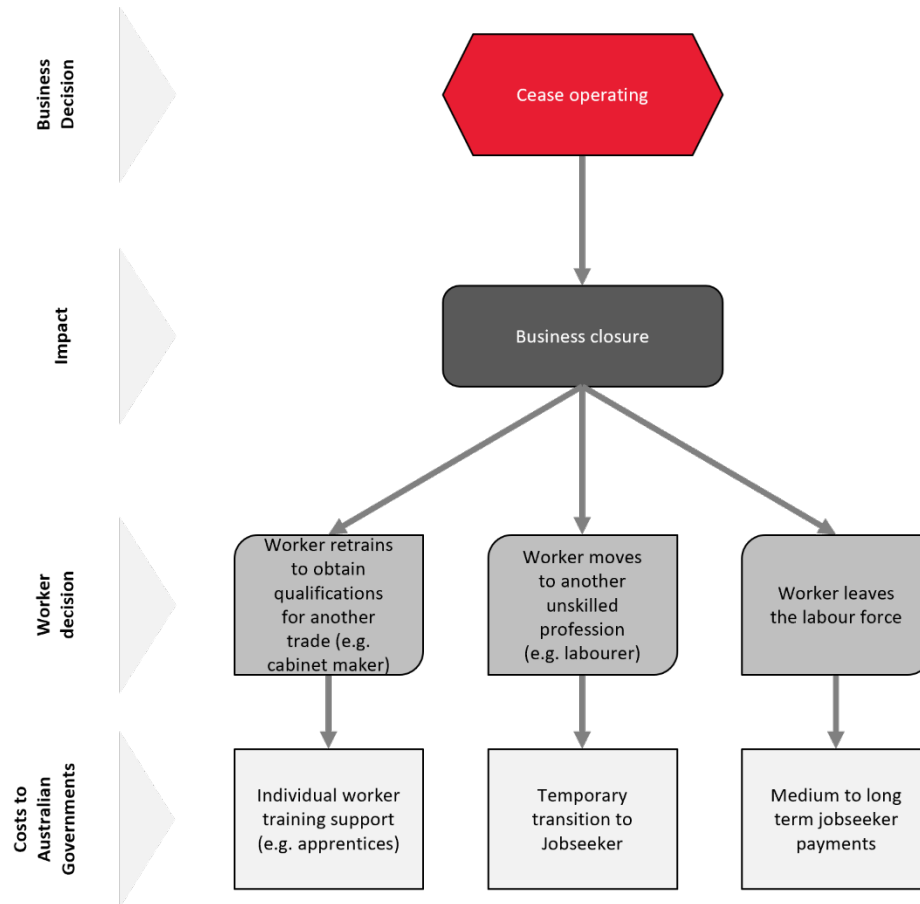
B.6.1 Implementation costs

Figure 9 Decision tree – implementation cost – government



B.6.2 Costs of displaced workers

Figure 10 Costs of displaced workers



B.7 Applying decision trees

The decision trees in Figure 5 to Figure 9 were considered in determining the number of PCBUs that may follow each option described. This informed the modelling undertaken to arrive at the costs to PCBUs, governments and workers described in this document.

This section lists key assumptions that informed this process.

B.7.1 Global assumptions

B.7.1.1 Engineered stone PCBU assumptions

- Engineered stone PCBUs are currently either working with engineered stone only or engineered stone and natural stone.
- Engineered stone PCBUs predominantly fabricate and install new engineered stone.
- For the purposes of the model, it has been assumed that a very small number of engineered stone PCBUs would remove, repair or modify previously installed engineered stone, i.e. it is assumed for this model that no engineered stone PCBUs would have need to participate in a licensing framework for work with legacy products.
- Given most engineered stone PCBUs already work with both natural stone and engineered stone, a decision to switch to natural stone is not expected to incur significant costs.
- A decision to switch to non-stone products will require investment in new equipment and processes.
- Worker displacement would only occur when PCBUs cease operating.
- Workers are expected to behave similarly, irrespective of whether they work for small, medium or large businesses.

B.7.1.2 Other industry PCBU assumptions

- For the purposes of this model it has been assumed that other industry PCBUs are not involved in the fabrication or installation of new engineered stone products.
- For the purpose of this model it is assumed that other industry PCBUs work with (remove, repair or modify) engineered stone as part of the primary activity and as such the impact on their business is solely related to how they work with legacy product.
- For these reasons it is assumed that the impact on other industry PCBUs will not be dependent on the three proposed options (but will be impacted solely by the licensing framework for work with legacy products).
- As such, it is assumed no PCBUs in this group will exit the industry or make employees redundant as a result of the prohibition options, given working with engineered stone is not their primary activity and overall demand levels have not changed for their services.
- A licence under the licensing framework for work with legacy products is expected to cover all work with previously installed engineered stone regardless of crystalline silica content.

B.7.2 Decision tree outcomes: Option 1

Table 22 Decision Tree Outcomes – Option 1 – engineered stone PCBUs

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
<i>Continue operating with alternative products</i>	Purchase new equipment to switch to non-stone product (e.g. laminate ⁵³)	0%	0%	5%	<ul style="list-style-type: none"> • Almost all engineered stone PCBUs (95%) that responded to the consultation on the Prohibition Decision RIS indicated that they worked with both engineered stone and natural stone products. For this reason, it is expected that almost all engineered stone PCBUs would transition to natural stone. • Only a small proportion of businesses are expected to switch to alternative products such as wood or laminate, as these products are typically installed by other trades such as cabinet makers and specialist kitchen companies.⁵⁴ • The decision to work with alternative products depends on the cost of the equipment and training needed to switch to alternative products relative to the demand for these products. • Medium sized businesses are likely to more easily access the capital required to invest in new equipment, processes and training. • As per the Silica Decision RIS, if sole traders and small businesses need to purchase new equipment to operate with alternative products, then it is assumed they would cease to operate.

⁵³ Caesarstone submission: within the benchtop market, engineered stone represents about 55% of the Australia market by volume and 63% by value, followed by laminate at 29% and 18% respectively, and granite at ~4-5%.

⁵⁴ As noted by Ai Group in its submission, if a business is predominantly operating as an engineered stone PCBU, it is unlikely to turn to wood as an alternative and would be more likely to continue to operate with natural stone. It is most likely that other businesses would be pick up the additional demand for alternative products. Similarly, Caesarstone considered that the prohibition of engineered stone would lead to significant business closures as consumers moved to alternatives such as laminate. However, consultation submissions indicated some engineered stone PCBUs also manufacture and install types of benchtop such as laminate.

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
	Use existing equipment to continue operating with natural stone	90%	90%	90%	<ul style="list-style-type: none"> It is expected that almost all engineered stone PCBUs will be able to continue operating with natural stone at minimal cost.
<i>Cease operating</i>	Business closure	10%	10%	5%	<ul style="list-style-type: none"> Some engineered stone PCBUs may choose to cease trading rather than move to natural stone or alternative products. There may be a number of reasons for this. For instance, because they only work with engineered stone currently and cannot afford to make the switch to alternatives.
Total		100%	100%	100%	

Table 23 Decision Tree Outcomes – Options 1, 2 and 3 – other industry PCBUs

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium-large	
<i>Continue working with engineered stone under the licensing framework for work with legacy products</i>	Acquire licence to work with legacy engineered stone	30%	35%	40%	<ul style="list-style-type: none"> Given the prevalence of engineered stone, a sizeable proportion of other industry PCBUs are expected to obtain a licence to be able to undertake exempt work. However, this is not expected to be the majority of PCBUs, nor is it expected to be the majority of any one PCBU's work. Many PCBUs in this category may decide not to apply for a licence to undertake what is currently an occasional task in their day to day work. Instead, they are expected to refer work involving legacy engineered stone to a licensed PCBU.⁵⁵ The ability to absorb licensing costs increases with increasing business size. As such, a greater proportion of small, medium and large PCBUs are expected to

⁵⁵ HIA submission

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium-large	
					remain working with legacy engineered stone relative to sole traders.
<i>Cease working with engineered stone</i>	Refer work involving legacy engineered stone to licensed PCBU	70%	65%	60%	<ul style="list-style-type: none"> With increasing awareness of risk posed by engineered stone, along with the increase in regulation and the associated costs (including licensing), it is expected that the majority of other industry PCBUs will no longer work with legacy stone and will refer this work to licensed PCBUs.
Total		100%	100%	100%	

Table 24 Decision Tree Outcomes – Option 1 and 3 –workers

Pathway	Proportion of affected population			Rationale
	Sole trader	Small	Medium	
<i>Worker is employed in the same or similar industries</i>	95%	95%	95%	<ul style="list-style-type: none"> Of those workers affected by a business closure, most are expected to find employment in related jobs, given the significant demand in the building and construction sector and tight labour market conditions.
<i>Worker retrains to obtain qualifications for another trade (e.g. cabinet maker)</i>	3%	3%	3%	<ul style="list-style-type: none"> Some workers may use the opportunity of loss of work to retrain and take up a new trade or apprenticeship.
<i>Worker leaves the labour force</i>	2%	2%	2%	<ul style="list-style-type: none"> Some workers, particularly those close to retirement, may leave the labour force.
Total	100%	100%	100%	

B.7.3 Decision tree outcomes: Option 2

The outcomes of the decision tree for engineered stone PCBUs (Figure 6) under Option 2 resulted in no closures of ES PCBUs (see Table 25 below). This is a result of the expected market availability of lower silica engineered stone. The outcome of this is that there is no expected worker displacement and no need to consider the outcomes for workers under this option.

Decision tree outcomes for other industry PCBUs were consistent across all three options and are described in Table 23.

Table 25 Decision tree outcomes – Option 2 – engineered stone PCBUs

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
<i>Continue operating by switching to alternative products</i>	Purchase new equipment to switch to non-stone product (e.g. laminate)	0%	0%	0%	<ul style="list-style-type: none"> No engineered stone PCBUs are expected to switch to alternative products given the option to continue operating with engineered stone with <40% crystalline silica. An immaterial number of businesses may switch to alternative products to cater to the cheaper end of the market (e.g. laminate and bamboo).
<i>Continue working with engineered stone with less than 40% crystalline silica (and natural stone)</i>	Use existing equipment to continue operating with engineered stone with less than 40% crystalline silica (and natural stone)	100%	100%	100%	<ul style="list-style-type: none"> All engineered stone PCBUs are expected to continue working with engineered stone, given the option to continue operating with engineered stone with <40% crystalline silica: <ul style="list-style-type: none"> It is expected that there will be sufficient supply to meet future demand for engineered stone with <40% crystalline silica.⁵⁶ Consumers are expected to continue demanding engineered stone, despite the potentially higher costs associated with engineered stone products with <40% silica.⁵⁷ Submissions to the consultation on the Prohibition Decision RIS noted that a significant portion of work

⁵⁶ Submissions from engineered stone suppliers indicate that sufficient lower silica stock will be available by mid-2024.

⁵⁷ In its submission, Smartstone noted that it has already observed an increase in the level of enquiries from engineered stone PCBUs and home builders regarding their lower silica range.

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
					(40%) for many engineered stone PCBUs is currently with lower silica stone (<40%).
<i>Cease operating</i>	Business closure	0%	0%	0%	<ul style="list-style-type: none"> A marginal/insignificant number of engineered stone PCBUs are expected to choose to cease trading rather than move to engineered stone with <40% crystalline silica (and natural stone) or alternative products, because they cannot adapt to changes in the market.
Total		100%	100%	100%	

B.7.4 Decision tree outcomes: Option 3

Decision tree outcomes for other industry PCBUs were consistent across all three options and are described in Table 23. Decision tree outcomes for workers are consistent for both Option 1 and Option 3 and are described in Table 24. Outcomes for engineered stone PCBUs under this option are described in Table 26, below.

Table 26 Decision tree outcomes – Option 3 – engineered stone PCBUs

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
<i>Continue operating by switching to alternative products</i>	Primarily purchase new equipment to switch non-stone product (e.g. laminate)	0%	0%	0%	<ul style="list-style-type: none"> As for Option 2.

Decision	Impact	Proportion of population			Rationale
		Sole trader	Small	Medium	
<i>Continue working with engineered stone with less than 40% crystalline silica (and natural stone)</i>	Acquire licence to work with lower silica engineered stone (less than 40% crystalline silica), and natural stone	95%	95%	98%	<ul style="list-style-type: none"> • Most engineered stone PCBUs are expected to continue working with engineered stone <40% crystalline silica, for the reasons stated under Option 2. • A small proportion of engineered stone PCBUs are assumed to cease operating due to the additional costs associated with operating under a licensing framework for work with lower silica stone. • A greater proportion of medium sized engineered stone PCBUs are expected to be able to absorb the cost of a licensing framework to work with lower silica engineered stone.
<i>Cease operating</i>	Business closure	5%	5%	2%	<ul style="list-style-type: none"> • A small proportion of engineered stone PCBUs are assumed to cease operating due to the additional costs of operating under the lower silica licensing framework. The highest exit rates are expected for sole traders and small businesses who cannot absorb the additional costs of the lower silica licence as well as medium sized businesses.
Total		100%	100%	100%	

B.8 Detailed assumptions and calculations for monetised costs

This section provides the detailed calculations and assumptions used to estimate monetised impacts (as per Figure 4).

B.8.1 Key model assumptions

The following tables present the key assumptions used to estimate the costs identified for workers, engineered stone PCBUs, other industry PCBUs, governments and suppliers for each prohibition option. This analysis was conducted in May 2023, and parameter assumptions were current at that point in time.

Table 27 Model specification

Input	Assumption	Source
Appraisal period	1 July 2023 – June 30 2034 (includes a 1-year implementation period and 10-year operational period)	Model assumption
Date the prohibition takes effect	1 July 2024	Model assumption
Real discount rate	7%	Office of Best Practice Regulation (Department of Prime Minister and Cabinet, 2020)
Inflation	3.3%	Average of forecast CPI at June 2024, December 2024 and June 2025; RBA forecast May 2023 (RBA, 2023)
Nominal discount rate	10.5%	Fisher formula

Table 28: Wages, redundancy and PCBU exit costs

Input	Assumption	Source
Average hours of work per week for workers	38	Australian Bureau of Statistics, 2022 Census of Population and Housing: Income and work data summary, 2021, Table 12. Hours worked by age by sex (ABS, 2022) Also these hours are the maximum hours per week permitted under National Employment Standards (Fair Work Ombudsman, no date)
APS average hours of work per week	37.5	APS positions: Australian Public Service Commission (Australian Public Service Commission, no date)

Input	Assumption	Source
APS weeks worked per year	45	4 weeks annual leave and 15 days sick leave= 45 working weeks based on APS (Department of Defence, no date)
Average weekly earnings for engineered stone PCBU and other industry PCBU workers	\$1,786.00	Australian Bureau of Statistics, Average Weekly Earnings, Australia November 2022, Average weekly ordinary time earnings, full-time adults by industry, original series; construction industry Use of this rate is a simplifying assumption given the various award rates for different types of trades and their various allowances on top of minimum hourly rates. In addition, it is a simplifying assumption that all employees are full-time employed.
Engineered stone PCBU and other industry PCBU worker average hourly wage rate	\$47.00	From average weekly earnings of \$1,786.00 and average hours per week of 38
APS 6 or equivalent average hourly rate	\$57.96	Safe Work Australia 2023 (Safe Work Australia, 2023) Annual salary of \$97,815 and average hours per week of 37.5
EL1 or equivalent average hourly rate	\$72.47	Safe Work Australia 2023 (Safe Work Australia, 2023) Annual salary of \$122,295 and average hours per week of 37.5
EL2 or equivalent average hourly rate	\$91.31	Safe Work Australia 2023 (Safe Work Australia, 2023) Annual salary of \$154,083 and average hours per week of 37.5
Average job tenure	7 years	Source: Australian Bureau of Statistics, Job mobility February 2022 (ABS, 2022) Weighted mid-point of range of duration
Fortnightly income support	\$631.20 (weekly rate of \$335.60)	Services Australia Partnered rate, 20 March 2023 (Service Australia, 2023)
Number of weeks redundancy	8 weeks	Based on the average employee tenure in Australia of just under 7 years, under the Building and Construction General On-site Award 2020 (Housing Industry Association, 2022)
Time to find new employment following redundancy	0 weeks (no lost income after redundancy payments)	Given tight labour market for tradespersons, employees who face redundancy due to the prohibition options have been assumed to find alternative employment by the end of their redundancy period.

Table 29 External training costs and support available to apprentices and their employers from government and internal training costs

Input	Assumption	Source
Australian Apprentice Training Support Payment	\$2,500 per annum over two years (Australian Government, no date)	Australian Government
Australian Apprentice Priority Wage Subsidy	\$6,000 per annum over two years (Australian Government, no date)	Australian Government Support for Australian Apprentices, Australian Apprenticeships Maximum subsidy available
Cost to train workers on licence requirements	No training costs have been assumed for workers to understand licence requirements as the licence is not expected to add any additional safety requirements beyond the base case.	

B.8.2 Global assumptions

- No costs to retrain workers have been assumed for engineered stone PCBUs that move into natural stone or increase the proportion of their business activity with natural stone, given most engineered stone PCBUs work with natural stone already. The main difference between working with engineered stone and natural stone is a higher level of skill to handle more brittle natural stone slabs).
- No costs to retrain workers to work with alternative products have been assumed for engineered stone PCBUs that move into alternative products or increase the proportion of their business activity with alternative products. The skills of existing workers may be transferable.
- There will be no lost revenue over the period of transition to natural stone or alternative products or business closure. It has been assumed that the implementation period will allow engineered stone PCBUs to fulfil their existing orders, to offload stocks of engineered stone and to build up their business in natural stone, alternative products or alternative business ventures.

B.8.3 Engineered stone and other industry PCBU costs

The following table presents the key assumptions and calculations used to estimate the direct and indirect costs identified for engineered stone PCBUs and other industry PCBUs for each prohibition option.

Table 30 Detailed PCBU cost assumptions and calculations

Ref#	Impact measure	Formula	Input / assumption
#1	Business closure costs (engineered stone PBCUs only)	$\begin{aligned} &\text{Business closure costs} \\ &= \\ &\text{Exit costs per business} \\ &\times \\ &\text{No. of PBCUs business closures, by size} \end{aligned}$	<p>Businesses that cease operating incur exit costs to wind up or liquidate their businesses such as deregistering their companies. While financial exit costs will be different for every PCBU, estimates have been made by size of the PCBU.</p> <p><u>Closure cost by size:</u></p> <ul style="list-style-type: none"> • Sole Traders: \$6,000 • Small: \$6,000 • Medium: \$8,000 (Australian Debt Solvers, 2021) <p>Redundancy payments have been calculated separately at Ref#2</p> <p>Number of engineered stone PCBU closures, by size (by option)⁵⁸:</p> <p><u>Option 1</u></p> <ul style="list-style-type: none"> • Sole Traders: 44 • Small: 42 • Medium: 7 <p><u>Option 2</u></p> <ul style="list-style-type: none"> • Sole Traders: 0 • Small: 0 • Medium: 0 <p><u>Option 3</u></p> <ul style="list-style-type: none"> • Sole Traders: 22 • Small: 21 • Medium: 3

⁵⁸ These populations have been estimated based on Section B.7 Assigning industry population to decision. Percentages of businesses likely to follow each decision paths available to engineered stone PBCUs and other industry PBCUs, under each prohibition option, were applied to the populations described in Sections B.3 and B.4.

Ref#	Impact measure	Formula	Input / assumption
			<p>It has been assumed that business closures would only be seen in the engineered stone PCBUs who cut and install new stone. Work with engineered stone is not a core part of business for other industry PCBUs.</p> <p>Time period: half in implementation year and half in year of prohibition taking effect.</p>
#2	Redundancy packages paid to workers (engineered stone PCBUs only)	$\begin{aligned} &\text{Total redundancy payments} \\ &= \\ &\text{No. of medium-large business closures, by size} \\ &\quad \times \\ &\text{Average no. of workers for medium-large businesses} \\ &\quad \times \\ &\text{Average wage/hour} \\ &\quad \times \\ &\text{Average hours per week} \\ &\quad \times \\ &\text{Weeks of redundancy pay} \end{aligned}$	<p>Number of medium-large engineered stone PCBUS closures (by option): See Ref #1 above</p> <p>Average number of workers for medium-large engineered stone PCBUS:</p> <ul style="list-style-type: none"> • Medium: 44 <p>Average wage per hour: \$47 (see Table 28)</p> <p>Average hours per week: 38 (see Table 28)</p> <p>Weeks of redundancy pay: 8 weeks (see Table 28)</p> <p>Time period: half in implementation year and half in year of prohibition taking effect.</p>
#3	Licence application and renewal costs (legacy stone – all options)	$\begin{aligned} &\text{Licence application costs (legacy) (for each year of} \\ &\quad \text{licence application)} \\ &= \\ &\text{Number of other industry PCBUs} \\ &\quad \times \\ &\text{Proportion applying for legacy licence} \\ &\quad \times \\ &\text{Hours to prepare application (per PCBU)} \\ &\quad \times \end{aligned}$	<p>Number of other industry PCBUs:</p> <ul style="list-style-type: none"> • Sole traders: 99,205 • Small businesses: 78,569 • Medium-large businesses: 1,976 <p>Proportion applying for a legacy licence:</p> <ul style="list-style-type: none"> • Sole traders: 30% (29,762 PCBUs) • Small businesses: 35% (27,499 PCBUs) • Medium-large businesses: 40% (790 PCBUs) • Total: 58,051

Ref#	Impact measure	Formula	Input / assumption
		Average wage per hour	<p>Frequency of licence application: 1 every 5 years⁵⁹</p> <p>Time to prepare first application (hours): 18.75 (Deloitte, 2021)</p> <p>Hours to prepare renewal application (per PBCU): 9.375⁶⁰</p> <p>Average wage per hour: \$47 (see Table 28)</p> <p>Time period</p> <p>First application: year before prohibition taking effect</p> <p>Licence renewal: five years afterwards</p>
#4	Licence application and renewal costs (Option 3 – licensing framework for work with lower silica engineered stone)	<p>Licence application costs (Option 3 - engineered stone <40%) (for each year of licence application)</p> <p>=</p> <p>Number of engineered stone PCBUs applying for licence</p> <p>×</p> <p>Hours to prepare application (per PBCU)</p> <p>×</p> <p>Average wage per hour</p>	<p>Number of engineered stone PCBUs applying for licence⁶¹:</p> <p><u>Option 3</u></p> <ul style="list-style-type: none"> • Sole trader: 418 • Small businesses: 399 • Medium businesses: 137 <p>Licence frequency: Same as Ref#3</p> <p>Hours to prepare first application (per PBCU): Same as Ref#3</p> <p>Hours to prepare renewal application (per PBCU): Same as Ref#3</p>

⁵⁹ Silica Decision RIS assumption

⁶⁰ Model assumption – expected 50% savings in preparation costs compared to first licence application

⁶¹ These populations have been estimated based on Section B.7. Percentages of businesses likely to follow each decision path available to PCBUs, under each prohibition option, were applied to the populations described in Sections B.3 and B.4.

Ref#	Impact measure	Formula	Input / assumption
			<p>Average wage per hour: \$47 (see Table 28)</p> <p>Time period:</p> <p>First application: year before prohibition taking effect</p> <p>Licence renewal: five years afterwards</p>
#5	Costs of compliance audits	<p>Total cost of compliance audits</p> <p>=</p> <p>Total number of licenses held</p> <p>×</p> <p>Frequency of compliance audits</p> <p>×</p> <p>Number of workers to participate in compliance audits</p> <p>×</p> <p>Hours per worker to participate in compliance audits</p> <p>×</p> <p>Average wage/hour”</p>	<p>Total number of licenses held: Engineered stone PCBUs</p> <ul style="list-style-type: none"> • Option 1 and 2: 0 • Option 3: As per Ref#4 <p>Other industry PCBUs: As per Ref#3</p> <p>Frequency of compliance audits:</p> <ul style="list-style-type: none"> • Engineered stone PCBUs: 1 every 3 years⁶² • Other industry PCBUs: 1 every 5 years⁶³ <p>Number of workers to participate in compliance audits</p> <ul style="list-style-type: none"> • Sole trader: 1 • Small business: 2 • Medium business: 2 (Deloitte, 2021) <p>Hours per worker to participate in compliance audits:</p> <ul style="list-style-type: none"> • Sole trader: 8 • Small business: 4 • Medium business: 4⁶⁴ <p>Average wage/hour: \$47 (see Table 28)</p> <p>Time period: annualised from the year following the prohibition taking effect</p>

⁶² Model assumption based on consultation feedback

⁶³ Model assumption based on consultation feedback

⁶⁴ Model Assumption based on consultation feedback

Ref#	Impact measure	Formula	Input / assumption
#6	New equipment purchase costs		<p>New purchase costs:</p> <ul style="list-style-type: none"> Sole trader: \$1,000 Small business: \$2,500 Medium business: 22,000⁶⁵ <p>Time period: 50% in the year before the prohibition takes effect and 50% the year the prohibition takes effect</p>

B.8.4 Government costs

The following table presents the key assumptions and calculations used to estimate the direct and indirect costs identified for government for each prohibition option.

Table 31 Detailed government cost assumptions and calculations

Ref#	Impact Measure	Formula	Input/Assumption
#7	Jobseeker payments	$\begin{aligned} &\text{Total Jobseeker payments} \\ &= \\ &\text{No. of sole trader and small business closures} \\ &\quad \times \\ &\text{Average no. of workers by business, by business size} \\ &\quad \times \\ &\text{Weekly Jobseeker payment} \\ &\quad \times \\ &\text{Number of weeks to secure alternative employment} \end{aligned}$	<p>It has been assumed that sole traders and workers and owners of the small businesses are eligible for JobSeeker.</p> <p>No. of sole trader and small business closures: Ref#1</p> <p>Average no. of workers by business, by business size:</p> <ul style="list-style-type: none"> Sole trader: 1 Small: 5 <p>See Table 19</p> <p>Weekly Jobseeker payment: \$335.60 see Table 28</p> <p>Number of weeks to secure alternative employment: 8</p>

⁶⁵ Model Assumption

Ref#	Impact Measure	Formula	Input/Assumption
			weeks see Table 28
			Time period: in the same year as business closures, assumed to half in implementation year and half in year of prohibition taking effect
#8	Worker training support cost	<p>Total cost of individual worker training support</p> <p>=</p> <p>No. of business closures, by size</p> <p>x</p> <p>Average no. of workers by business, by size</p> <p>x</p> <p>% of workers who choose to retrain in another trade</p> <p>x</p> <p>[Average government cost of Cert III in related trade</p> <p>+</p> <p>Australian Apprentice Training Support Payment</p> <p>+</p> <p>Support payments to businesses with apprentices]</p>	<p>Number of ES PBCUs closures, by size (by option): See Ref#1</p> <p>Average number of workers by engineered stone PCBUS, by size:</p> <ul style="list-style-type: none"> • Sole Traders: 1 • Small: 5 • Medium: 44 <p>See Table 19</p> <p>% of workers who choose to retrain for another trade: 3%</p> <p>We have assumed it is the same for each option across sole traders and small businesses. See Table 24</p> <p>Average government cost of Cert III in related trade: To avoid duplication with Ref#19 this has been set to zero</p> <p>Australian Apprentice Training Support Payment: \$5,000 (\$2,500 per annum for first 2 years of apprenticeship) (Australian Government, no date)</p> <p>Support payments to businesses with apprentices in occupations on the Australian Apprenticeships Priority List: \$6,000 p.a. for year 1 and 2 (Australian Government, no date)</p> <p>Time period: based on when engineered stone PCBUs cease operating and considering it is two years of training.</p>

Ref#	Impact Measure	Formula	Input/Assumption
			Requires a simplifying assumption that workers are displaced at the start of the financial year so they can go directly into training courses.
#9	Drafting of national licensing framework/regulation	$\begin{aligned} &\text{Total drafting costs} = \\ &\text{Number of staff (by level)} \\ &\quad \times \\ &\quad \text{Hours of work} \\ &\quad \times \\ &\quad \text{Average wage/hour} \end{aligned}$	<p>Number of staff (by level):</p> <ul style="list-style-type: none"> Option 1 and 2: 1 APS6, 1 EL1 and 1 EL2⁶⁶ Option 3: Multiplied by 2 schemes <p>Hours of work: Half a year⁶⁷</p> <p>Average wage/hour (\$): \$57.96, \$72.47 and \$91.31 respectively (see Table 28)</p> <p>Time period: FY2024</p>
#10	Development, implementation, administration and maintenance of a system for administration of licensing framework	$\begin{aligned} &\text{Total cost of implementing licence system} = \\ &\text{CAPEX costs to implement system (per jurisdiction)} \\ &\quad + \\ &\quad \text{OPEX costs to operate system} \end{aligned}$	<p>CAPEX costs: \$750,000 x 7 jurisdictions⁶⁸ (e.g. procurement costs, ICT costs, cost of project management to implement licence system, system integration, implementation costs)</p> <p>OPEX costs: \$80,000 x 7 jurisdictions⁶⁹ per annum (e.g. cost of change management to implement licence system such as training of staff and cost of annual operation of licensing platform such as IT staff to manage it and costs of any annual licence fees)</p> <p>Time period: year before prohibition takes effect</p>
#11	Processing of licences	$\begin{aligned} &\text{Total cost to process licence applications per annum} \\ &= \\ &\text{Number of engineered stone and other industry PCBU} \\ &\quad \text{applying for licence} \end{aligned}$	<p>Number of engineered stone and other industry PCBU applying for licence: See Ref#3 and 4 [Assumption that all license applicants are successful, to be conservative in estimation of costs]</p>

⁶⁶ Model assumption, increased from Silica Decision RIS model assumption

⁶⁷ Model assumption, increased from Silica Decision RIS model assumption of a quarter of a year

⁶⁸ Silica Decision RIS model assumption

⁶⁹ About 10% of total cost of capex – Model assumption

Ref#	Impact Measure	Formula	Input/Assumption
		$\begin{aligned} & \times \\ & \text{Number of workers to assess applications p.a.} \\ & \times \\ & \text{Hours to assess applications p.a.} \\ & \times \\ & \text{Average wage/hour (\$)} \\ & \times \\ & \text{Number of jurisdictions} \end{aligned}$	<p>Number of workers to assess applications per annum: 1 APS6 per jurisdiction⁷⁰</p> <p>Hours to assess applications per annum: 2⁷¹</p> <p>Average wage/hour (\\$): \$57.96 (see Table 28)</p> <p>Number of jurisdictions: 7 (Excludes Victoria)</p> <p>Time period: same years as licence applications, see Ref#6</p>
#12	Prepare and conduct compliance audits	$\begin{aligned} & \text{Total cost of compliance audits per annum} \\ & = \\ & \text{Number of compliance audits p.a.} \\ & \times \\ & \text{Number and type of employees required per compliance} \\ & \text{audit} \\ & \times \\ & \text{Hours per employee to participate in compliance audits} \\ & \times \\ & \text{Average wage/hour (\$)} \end{aligned}$	<p>Number of compliance audits per annum per licence holder per annum: Engineered stone PCBUs: 0.33 per annum x number of licence holders (i.e. one audit every three years per licence holder); for licence holders see Ref#8 Other industry PCBUs: 0.2 x number of licence holders (i.e. one audit every five years per licence holder) ; for licence holders see Ref#8</p> <p>Number of employees required per compliance audit: 2 (one APS6 and one EL1)⁷²</p> <p>Hours per employee to participate in compliance audits: 8 hours⁷³</p> <p>Average wage/hour (\\$): \$57.96 and \$72.47 respectively</p>

⁷⁰ Silica Decision RIS model assumption

⁷¹ Model assumption

⁷² Silica Decision RIS model assumption

⁷³ Model assumption, increased from Silica Decision RIS model assumption of 4 hours to take into account travel times and reporting paperwork

Ref#	Impact Measure	Formula	Input/Assumption
			(see Table 28)
			Time period: per annum from the year following the prohibition taking effect
#13	Communications cost for government to liaise with stakeholders	<p style="text-align: center;">Total cost of communications</p> <p style="text-align: center;">=</p> <p style="text-align: center;">Number of government workers for communication p.a. (per jurisdiction)</p> <p style="text-align: center;">×</p> <p style="text-align: center;">Hours p.a. for communications with regulated PCBUs, workers and other stakeholders</p> <p style="text-align: center;">×</p> <p style="text-align: center;">Average wage/hour (\$)</p> <p style="text-align: center;">×</p> <p style="text-align: center;">Number of jurisdictions</p> <p style="text-align: center;">+</p> <p style="text-align: center;">Advertising costs for prohibition</p> <p style="text-align: center;">×</p> <p style="text-align: center;">Number of jurisdictions</p>	<p>Number of government workers for communication (per jurisdiction): 1 APS6 employee</p> <p>Hours per annum for communications with regulated PCBUs, workers and other stakeholders: 200⁷⁴</p> <p>Average wage/hour (\$): \$57.96 (see Table 28)</p> <p>Number of jurisdictions: 7 (Excludes Victoria)</p> <p>Advertising costs for prohibition: \$120,000⁷⁵</p> <p>Number of jurisdictions: 7 (Excludes Victoria)</p> <p>Time period: full appraisal period (see Table 28)</p>

⁷⁴ Model assumption

⁷⁵ Silica Decision RIS model assumption for Option 2

B.8.5 Worker costs

The following table presents the key assumptions and calculations used to estimate the direct and indirect costs identified for workers for each prohibition option.

Table 32 Detailed worker cost assumptions and calculations

Ref#	Impact Measure	Formula	Input/Assumption
#14	Lost income over period of unemployment (net of JobSeeker payments)	Lost income over the period (sole traders and small business)	Assessing the period of unemployment is difficult. Given tight labour market conditions for the construction sector and shortages of workers with these skills, the analysis has assumed:
		=	a. The majority of workers who choose to remain in the sector, would find alternative employment relatively quickly.
		No. of business closures for sole traders and small businesses (no redundancy assumed for these PCBUs)	b. A redundancy package of 8 weeks would offset the loss of income incurred while looking for another job for medium businesses.
		x	c. Sole traders and owners and workers in small businesses receive 8 weeks of Jobseeker before finding alternative employment. This assumption reflects the potential that these PCBUs will not be able to or are not required to provide a redundancy payment.
		Average no. of workers by business, by size	
		x	
		[Average weekly earnings	
		-	
		Jobseeker payment per week]	
		x	Number of engineered stone sole traders and small businesses that cease operating (by option): See Ref#1
		Number of weeks without work	Average number of workers by engineered stone PCBUS, by size: see Table 19
			Average weekly earnings: \$1786.00 (see Table 28)

Ref#	Impact Measure	Formula	Input/Assumption
			<p>Jobseeker payment per week: \$335.60 (see Table 28)</p> <p>Number of weeks without work: 8 weeks (see Table 28)</p> <p>Time period: half in implementation year and half in year of prohibition taking effect</p>
#15	Out-of-pocket costs for retraining to other trade	<p>Retraining costs for other trade (per redundancy)</p> <p>=</p> <p>No. of business closures, by size</p> <p>x</p> <p>Average no. of workers by business, by size</p> <p>x</p> <p>% of workers who choose to retrain in another trade</p> <p>x</p> <p>Cost of training</p>	<p>Number of ES PBCUs closures, by size (by option): See Ref#1</p> <p>Average number of workers by engineered stone PCBUS, by size: (see Table 19)</p> <p>% of workers who choose to retrain for another trade: 3%</p> <p>We have assumed it is the same for each option across sole traders and small businesses. (see Table 24)</p> <p>Cost of training: \$13,079 (Australian Government, no date) (\$6,539.50 p.a. over 2 years)</p> <ul style="list-style-type: none"> This is the average cost of Cert III for Civil Construction, Cabinet Making, Tiling and Fabrication Trade. Both the fee and subsidy component. <p>Time period: based on when engineered stone PCBUs cease operating and considering it is two years of training. Requires a simplifying assumption that workers are displaced at the start of the financial year so they can go directly into training courses.</p>

B.9 Breakeven analysis

B.9.1 Assessing the avoided costs of silicosis and silica-related disease

The economic impact associated with a worker developing silicosis or a silica-related disease would occur across many years, from the time the disease is diagnosed through to the end of the worker's life. In most cases, silicosis and silica-related diseases will worsen over time.

Avoided health costs are typically estimated through the quantification of value of lives saved and illness avoided. This is an accepted economic method for analysing and comparing policy options for reducing fatalities and illness. The following section outlines the key concepts underpinning this analysis.

B.9.2 Value of lives saved and illness avoided

The value of lives saved and illness avoided is estimated by comparing the duration an individual life with silicosis or silica-related disease and the number of years lost due to premature death before the average life expectancy. These concepts are outlined below.

B.9.2.1 Value of a statistical life

A key concept used to measure the value of lives saved is the value of a statistical life which is an estimate of the value society places on reducing the risk of dying. The value of a statistical life is most appropriately measured by estimating how much society is willing to pay to reduce the risk of death. Based on empirical domestic and international research, Office of Impact Analysis (OIA) guidance indicates that the value of a statistical life is \$5.3 million in 2022 dollars and the value of a statistical life year is \$227,000 (Office of Impact Analysis, 2023).

B.9.2.2 Value of a disability adjusted life year (DALY)

Regulatory and non-regulatory changes can have the benefit of reducing the risk of injury, disease or disability. A method to value these benefits is to adjust the value of statistical life year (which could be interpreted as the value of a year of life free of injury, disease and disability) by a factor that accounts for the type of injury, disease or disability.

The value of an individual living with the disease is measured using a disability adjusted life year (DALY) factor, representing the loss of one year of full health. Using the disability weighting for chronic obstructive lung disease (0.43) provided by the Australian Institute of Health and Welfare, the value of a DALY is \$96,462 per annum (Office of Impact Analysis 2023).

Key assumptions used in the Victorian Occupational Health and Safety Amendment (Crystalline Silica) Regulations 2021 Regulatory Impact Statement commissioned by WorkSafe Victoria (Deloitte 2021) have been used to estimate average value of life saved and illness avoided per person as presented below.

B.9.3 Average value of life saved

The average value of life saved is calculated in three steps as presented below.

Step 1: Estimate the average age of death due to silicosis or silica-related disease

The approach used to estimate the average age of death due to silicosis or silica-related disease is presented below, with key assumptions underpinning the estimated outlined in Table 33.

$$\begin{aligned}
 & \textbf{Estimated average age of death due to silicosis or silica-related disease} \\
 & = \\
 & \textit{Average age of diagnosis with silicosis or silica-related disease} \\
 & + \\
 & \textit{Average time between diagnosis of silicosis or silica-related disease and death}
 \end{aligned}$$

Table 33 Estimated average age of death due to silicosis or silica-related disease

Assumption	Value
Average age of diagnosis with silicosis or silica-related disease	43.30 years (Deloitte 2021)
Average time between diagnosis of silicosis or silica-related disease and death	9.30 years (Deloitte 2021)
Estimated average age of death due to silicosis or silicate related disease	52.6 years

Step 2: Weighted average life expectancy of people with silicosis or silica-related disease

The approach used to estimate the weighted average life expectancy of people with silicosis or silica-related disease is presented below, with key assumptions underpinning the estimated outlined in Table 34.

$$\begin{aligned}
 & \textbf{Weighted average life expectancy of people with silicosis or silica-related disease} \\
 & = \\
 & \textit{(Proportion of silica-related diagnoses that led to a fatality x estimated average life expectancy of an} \\
 & \quad \textit{Australian with silicosis or silica-related disease)} \\
 & + \\
 & \textit{(Proportion of silicosis or silica-related diagnoses that did not lead to a fatality x Average life expectancy} \\
 & \quad \textit{of an Australian)}
 \end{aligned}$$

Table 34 Weighted average life expectancy of people with silicosis or silica-related disease

Assumption	Value
Proportion of silicosis or silica-related diagnoses that led to a fatality	28% (Deloitte 2021)
Estimated average age of death due to silicosis or silica-related disease	52.6 years
Proportion of silicosis or silica-related diagnoses that do not lead to a fatality	72% (Deloitte 2021)
Average life expectancy of an Australian	82.30 years (Australian Institute of Health and Welfare 2022)
Weighted average life expectancy of people with a silicosis or silica-related disease	74.0 years

Step 3: Estimate the average value of life saved

The approach used to estimate the average value of life saved for people with silicosis or a silica-related disease is presented in the formula below, with key assumptions underpinning the estimated outlined in Table 35.

$$\begin{aligned}
 & \textbf{Estimated average value of life saved} \\
 & = \\
 & \text{Value of a statistical life year} \\
 & \times \\
 & \text{(Average life expectancy of an Australian - Weighted average life expectancy)}
 \end{aligned}$$

Table 35 Average value of life saved

Assumption	Value
Value of a statistical life year	\$227,000 (Office of Impact Analysis 2023)
Average life expectancy of an Australian	82.30 years (Australian Institute of Health and Welfare 2022)
Weighted average life expectancy of people with silicosis or a silica-related disease	74.0 years
Estimated average value of life saved	\$1.9 million

B.9.4 Average value of illness avoid from silica-related disease

The approach used to estimate the average value of illness avoided due to silicosis or silica-related disease is presented in the formula below, with key assumptions underpinning the estimated outlined in Table 36.

$$\begin{aligned}
 & \textbf{Value of illness avoided} \\
 & = \\
 & \text{Value of Disability adjusted life year (DALY)} \\
 & \times \\
 & \text{(Weighted average life expectancy of people with silicosis or silica-related disease - Average age of diagnosis with silica-related disease)}
 \end{aligned}$$

Table 36 Average value of illness avoided from silica-related disease

Assumption	Value
Value of Disability adjusted life year (DALY)	\$96,462 (Office of Impact Analysis 2023)
Weighted average life expectancy of people with silicosis or silica-related disease	74.0 years
Average age of diagnosis with silica-related disease	43.30 years (Deloitte 2021)
Estimated average value of illness avoided	\$3.0m

B.9.5 The estimated expected value of a life saved and illness avoided

Summing the components, the expected value of life saved and illness avoided is \$4.9 million.

Table 37 Estimated expected value of life saved and illness avoided

Assumption	Value (\$m)
Estimated average value of life saved	\$1.9m
Estimated average value of illness avoided	\$3.0m
Estimated expected value of life saved and illness avoided	\$4.9m