Technical Article

APAC REGION

Eliminating Silica Risk From Construction

A Technical Review of Exposure, Health Impacts and Material Selection for Raised Access Floors

tateglobal.com

Tate®

Respirable crystalline silica (RCS) is one of the most significant occupational health hazards in the construction industry. Generated during the processing of silica-containing materials such as concrete and cementitious panels, RCS exposure is strongly linked to severe and irreversible diseases including silicosis and lung cancer. With tightening regulations in Australia and globally, managing silica risk has become a critical concern for contractors, safety managers, and specifiers. This article examines the nature of silica hazards, associated health risks, regulatory frameworks, and the role of material selection—highlighting silica-free alternatives such as woodcore access flooring as a pathway to risk elimination.

1. Introduction

Crystalline silica is a naturally occurring mineral found in materials such as sand, stone, concrete, brick, mortar and engineered stone products.

While silica in its solid form does not present a health risk, activities such as cutting, grinding, drilling, polishing and demolition can generate respirable crystalline silica (RCS), a fine airborne dust (<10 microns) capable of penetrating deep into the lungs.

Due to its well-established health impacts, exposure to RCS is recognised as a significant workplace health and safety risk across multiple industries.

Safe Work Australia estimates that more than 600,000 Australian workers are potentially exposed to respirable crystalline silica through their work, highlighting the scale of the issue and the importance of effective risk management.

2. Mechanisms of Exposure

Exposure to respirable crystalline silica occurs when silica-containing materials are disturbed and generate airborne dust particles small enough to be inhaled into the deepest regions of the lungs.

Common construction activities that generate RCS include:

- Cutting and grinding concrete, masonry and cementitious products
- Drilling, demolition and jackhammering
- Surface preparation and abrasive finishing
- Stone cutting and fabrication

The level of worker exposure depends on several factors, including the silica content of the material, the duration and frequency of the task, environmental conditions and the effectiveness of implemented controls.

Because silica dust can remain airborne for extended periods, exposure is not limited to workers directly performing a task. Nearby workers may also inhale respirable dust, increasing the potential for secondary exposure across construction sites and manufacturing facilities.

Industry regulators increasingly emphasise elimination and substitution as the most effective controls for managing silica-related risks, reducing reliance on administrative controls and personal protective equipment alone.

3. Health Effects of Respirable Crystalline Silica

3.1 Silicosis

Silicosis is the most widely recognised disease associated with occupational exposure to respirable crystalline silica. The disease occurs when inhaled silica particles become lodged in lung tissue, causing inflammation and progressive scarring (fibrosis). Once established, silicosis is irreversible and may continue to progress even after exposure has ceased.

Three forms of silicosis are commonly recognised:

- Chronic silicosis: Typically develops following long-term exposure to lower concentrations of silica dust.
- Accelerated silicosis: May develop after several years of exposure to higher concentrations of silica dust.
- Acute silicosis: A rare but severe condition resulting from very high exposure levels over a short period.

Australian governments and workplace health and safety regulators have responded to recent increases in diagnosed silicosis cases by introducing enhanced regulatory controls, strengthening medical surveillance requirements, and increasing industry focus on exposure prevention and elimination.

3.2 Lung Cancer

Respirable crystalline silica is associated with an increased risk of lung cancer. The International Agency for Research on Cancer (IARC) classifies crystalline silica inhaled in occupational settings as a Group 1 carcinogen, meaning there is sufficient evidence that it causes cancer in humans.

Epidemiological studies have demonstrated elevated rates of lung cancer among workers with long-term occupational exposure to respirable crystalline silica, particularly where cumulative exposure levels are high.

The association between silica exposure and lung cancer reinforces the importance of minimising worker exposure through elimination, substitution and effective engineering controls.

3.3 Other Respiratory and Systemic Diseases

In addition to silicosis and lung cancer, occupational exposure to respirable crystalline silica has been associated with a range of respiratory and systemic health conditions, including:

- Chronic obstructive pulmonary disease (COPD)
- Chronic bronchitis
- Emphysema
- Chronic kidney disease
- Autoimmune disorders, including rheumatoid arthritis and scleroderma

Evidence indicates that respirable crystalline silica can contribute to chronic inflammation and progressive impairment of lung function, increasing the likelihood of long-term respiratory illness.

The breadth of recognised health outcomes highlights that silica risk management should focus not only on regulatory compliance, but on the prevention of occupational disease through exposure reduction and, where reasonably practicable, hazard elimination.

4. Regulatory Landscape in Australia

The severity of silica-related disease has led to increasingly stringent regulations in Australia.

4.1 Workplace Exposure Limits

Safe Work Australia has established a workplace exposure standard (WES) for respirable crystalline silica of 0.05 mg/m³ as an 8-hour time-weighted average, with employers required to ensure worker exposure remains as low as reasonably practicable. Ongoing regulatory review and industry consultation continue to examine opportunities to further strengthen worker protections.

4.2 Compliance Requirements

To comply with Australian work health and safety obligations, organisations are required to implement comprehensive silica risk management measures. Safe Work Australia recommends exposure risk assessments, engineering controls such as wet cutting and local exhaust ventilation, respiratory protective equipment (RPE), air monitoring and health surveillance programs where exposure risks exist.

Recent regulatory developments have also introduced requirements for silica risk control plans and strengthened controls on high-risk activities, including restrictions on dry cutting processes.

4.3 Industry Response

Australia has responded to increasing rates of silicosis through significant policy intervention. Most notably, the Australian Government implemented a national ban on engineered stone from July 2024 due to the material's high crystalline silica content and the associated risk of severe occupational disease. This development reflects a broader shift in regulatory thinking, from managing exposure to eliminating hazards wherever practicable.

5. Limitations of Traditional Control Measures

While engineering controls and respiratory protective equipment can significantly reduce exposure, they do not eliminate the underlying hazard. Key limitations include:

- Dependence on correct selection, fit and use of PPE
- Variability in site compliance and supervision
- Residual airborne dust exposure
- Ongoing monitoring and administrative requirements

Importantly, published research has reported adverse respiratory outcomes even where exposure levels remain below regulatory limits, highlighting the challenges of relying solely on exposure management strategies. As a result, regulators and occupational hygiene professionals are increasingly advocating for elimination and substitution controls as the preferred long-term approach.

6. Material Selection as a Risk Elimination Strategy

Consistent with the hierarchy of controls, the most effective method of preventing silica-related disease is the elimination of the hazard at its source.

6.1 Cementitious Materials

Traditional cement-based construction products are widely used throughout the built environment; however, many contain crystalline silica and can generate hazardous respirable dust during cutting, drilling, grinding and installation activities. As a result, their use often requires extensive risk management measures, monitoring and regulatory compliance.

6.2 Silica-Free Alternatives

The increasing focus on hazard elimination has accelerated interest in silica-free construction products.

Woodcore access flooring systems, for example:

- Contain no crystalline silica
- Eliminate the generation of respirable silica dust during cutting and installation
- Reduce the need for specialised silica monitoring and control measures

Beyond worker health benefits, silica-free alternatives may also contribute to improved installation efficiency and broader sustainability objectives, supporting a more holistic approach to project delivery.

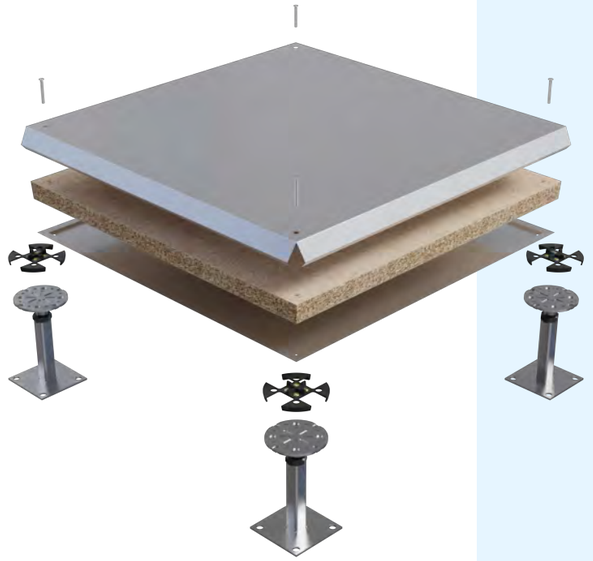
7. Discussion

The construction industry is experiencing a fundamental shift in its approach to silica risk management. Historically, silica hazards have been managed through personal protective equipment, engineering controls and administrative procedures. However, increasing awareness of silica-related disease and tightening regulatory expectations are driving greater emphasis on hazard elimination through design and specification decisions.

The adoption of silica-free materials offers several potential advantages:

- A transition from compliance-driven safety to safety by design
- Reduced long-term regulatory and liability exposure Improved worker health outcomes
- Greater alignment with the hierarchy of controls

As Safe Work Australia, health authorities and occupational hygiene experts continue to emphasise the serious and irreversible nature of silica-related disease, the case for eliminating exposure at source becomes increasingly compelling



8. Conclusion

According to Safe Work Australia, respirable crystalline silica remains a significant occupational health hazard across multiple industries, particularly construction, manufacturing and mining. Exposure has been linked to serious diseases including silicosis, lung cancer, COPD and kidney disease.

While exposure controls and personal protective equipment remain important risk management tools, they cannot completely remove the hazard. Consistent with the hierarchy of controls promoted by workplace health and safety regulators, the most effective approach is to eliminate the source of risk wherever practicable.

Silica-free alternatives, such as woodcore access flooring systems, demonstrate that it is possible to remove the hazard entirely, helping organisations reduce compliance burden, support worker health and safety, and align with evolving industry and regulatory expectations.

References

Regulatory & Government Sources (Australia)

• Safe Work Australia (2023–2026), Workplace exposure standard for respirable crystalline silica. Available at: <https://www.safeworkaustralia.gov.au>

• SafeWork NSW (2023), Crystalline silica – technical fact sheet. Available at: <https://www.safework.nsw.gov.au>

• Safe Work Australia (2024), Engineered stone ban. Available at: <https://www.safeworkaustralia.gov.au>

• Department of Employment and Workplace Relations (2024), Prohibition on the use of engineered stone. Australian Government. Available at <https://www.dewr.gov.au/>

Health & Medical Sources

• Centers for Disease Control and Prevention (CDC) (2024), Silica and Worker Health. Available at: <https://www.cdc.gov/niosh/silica>

• Centers for Disease Control and Prevention (CDC) (2024), Symptoms and Medical Monitoring for Silica Exposure. Available at <https://www.cdc.gov/index.html>

• American Lung Association (2020), Silicosis: Learn About Silicosis. Available at <https://www.lung.org/>

• California Department of Public Health (n.d.), Silicosis and silica dust exposure. Available at <https://www.cdph.ca.gov/>

Scientific & International Bodies

• International Agency for Research on Cancer (IARC) (1997), Silica, Some Silicates, Coal Dust and Para-Aramid Fibrils (Volume 68). Available at <https://inchem.org/>

• IARC (2012, reaffirmed in later reviews), Crystalline silica classified as Group 1 carcinogen (carcinogenic to humans). Available at <https://inchem.org/>

• Agency for Toxic Substances and Disease Registry (ATSDR) (2018), Toxicological Profile for Silica. Available at <https://www.atsdr.cdc.gov/>

Technical & Industry Sources

• Occupational Hygiene Australia (2026), Respirable crystalline silica monitoring guide. Available at <https://occhygiene.com.au/respirable-crystalline-silica-monitoring-australia/>

• Nova Group Pacific (2025–2026), Silica dust regulation in Australia: compliance guide. Available at <https://www.novagroup.net.au/>

• Occupational Safety Solutions (2026), Silica Dust Code of Practice 2025. Available at <https://www.occupational-safety.com.au/>