Technical Safety Bulletin: PROTECTION AGAINST CRYSTALLINE SILICA

Risks of Secondary Inhalation

Workers using coveralls that meet the EN 13982-1 Type 5 Standard may be unaware that up to 15% of the hazardous fine particles may be entering inside the suit. If appropriate decontamination procedures are not implemented, this can lead to secondary inhalation of silica particles by the worker and family members, if contaminated garments worn under the disposable coveralls are worn home.

Australian Workplace Exposure Standard for Airborne Contaminants revised December, 2019

Work Health and Safety (WHS) Ministers have agreed by the requisite majority to change the workplace exposure standards (WES) for Respirable Crystalline Silica. As such, the maximum exposure for Crystalline Silica will be reduced by 50%, to a TWA of 0.05 mg/m^3.

Crystalline Silica

Silica is Silicon Dioxide, which is a naturally occurring mineral that forms the major part of many rocks and soils (granite, shale, sandstone, sand). It's also used to make concrete, mortar and composite stones. Composite stones are often used to manufacture benchtops for kitchens and bathrooms, as well as other products.

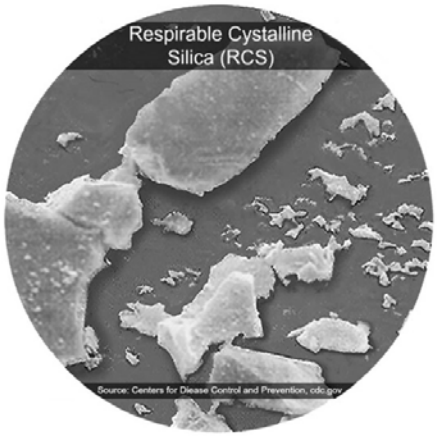
When workers fabricate these products (cut, saw, grind, drill, polish, etc.), very small silica dust particles are generated, and become airborne.

How particle sizes affect compliance efforts

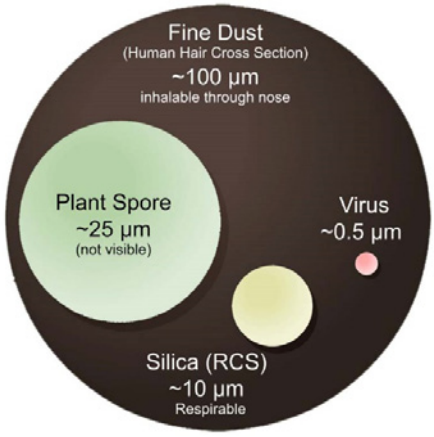
One of the more dangerous traits of respirable crystalline silica is the extremely small particle size, which allows them to flow when airborne, and travel on air turbulence (even indoors), for long periods of time.

According to the National Institute of Environmental Health Services, the size of dust emissions from silica-containing substances varies from 0.01µm (micrometers) to 100µm in diameter. For perspective, the diameter of the average human hair is about 70-100µm. Depending on their weight, dust particles must typically be 200µm or smaller to become airborne and linger, while 50µm and smaller particles are invisible to the naked eye.

Particulate matter of ≤10µm (PM10) is the approximate size threshold for particles to be able to penetrate the body's natural defences (mucus membranes, cilia, etc.) and reach deep into the lungs, potentially causing serious health issues such as silicosis.



Silica dust ranges in size and is characterized by its jagged crystalline form.



Some of the most harmful airborne particles are too small to see, which complicates silica dust compliance efforts.

Managing Risks and Worker Exposures to Silica - Using the hierarchy of controls

According to the "Model WHS Regulations", managing risks and worker exposures to silica can be achieved by selecting and implementing measures using hierarchy of controls. More than one control will normally be required to adequately protect workers, and these are as follows;

- **Substitution** such as sourcing composite stone benchtops with a lower percentage of silica
- **Isolation** of the hazard – using principles of safe work design to designate areas for tasks that generate dust and appropriate worker positioning during these tasks, using enclosures and automation to conduct dust generating tasks
- **Engineering controls** that minimise the risk of exposure to generated dust, for example, local exhaust ventilation, water suppression (wet cutting) or using tools with dust collection attachments
- **Administrative Controls**, including good housekeeping policies, shift rotations and modifying cutting sequences
- **Personal Protective Equipment** including appropriate respiratory equipment and work clothing that does not collect dust. You should also consult with an occupational health and safety professional to ensure that you select the the appropriate PPE for your specific environment.

Implementing a strong "Last Line of Defence" at your work site – Work Clothing that does not collect Dust

Regulations require that disposable protective coveralls for handling hazardous particles meet the EN 13982-1 Type 5 standard. However, as the Total Inward Leakage (TIL_A) allowed under this standard is very high (15% in 8 out of 10 suits tested); the more stringent standard of EN 1073-2 Class 2 is desirable, as this requires the Average TIL_A to be less than 2% for 6 suits tested.

The Tyvek® barrier fabric from DuPont is a proprietary non-woven material. Tyvek® is formed from High Density Polyethylene (HDPE) ultrafine continuous fibres which are laid down into a tough, light, homogeneous fabric with inherent vapour breathability characteristics on account of its microscopic lattice structure. This inherent ability to evacuate body moisture, whilst still providing excellent particle holdout, provides the ideal balance of comfort and protection against silica, asbestos and other fine particle hazards.

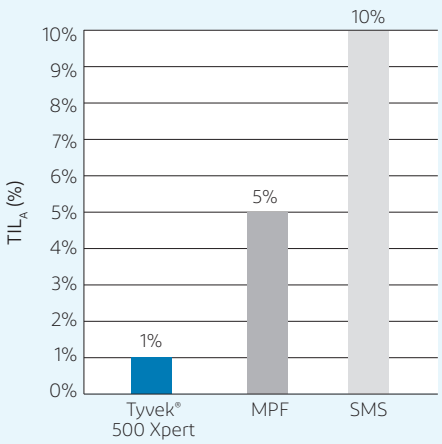
Average Total Inward Leakage (Particle Holdout)

When comparing the barrier performance of Tyvek® 500 Xpert Type 5 coveralls with other Type 5 suits made of MPF (Microporous Film) or SMS (Spunbond/Meltblown/Spunbond) fabrics, Tyvek® 500 Xpert shows a significantly lower Average Total Inward Leakage (TIL_A) according to EN ISO 13982-2, with an average value of less than 1%.

As such, Tyvek® 500 Xpert Coveralls provide protection against hazardous fine particles which is 15 times better than the Type 5 Standard, allowing only 1% inward leakage.

Workers can reduce the risk of exposure to Silica by wearing disposable coveralls that have a lower Average TIL_A, as shown in the opposite chart.

***Total Inward Leakage (TIL_A) testing protocol**: Average of the 10 suits and all activities EN ISO 13982 - (1 and 2). Dry particles Sodium Chloride NaCl 0,6 µm.*



The suits were tested with a full face mask, boots and gloves taped at mask, cuffs, ankles and flap.

Source: Independent Institute.

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Sources:
Model Work Health and Safety Regulations (released by Safe Work Australia, Jan 15th, 2019), Workplace Exposure Standards for Airborne Contaminants (released by Safe Work Australia, Dec 16th, 2019), NIOSH CDC: Centers for Disease Control and Prevention, National Institute of Environmental Health Services