CONTROLLING WORKER EXPOSURES TO SILICA

THROUGH ENGINEERING CONTROLS, WORK PRACTICE CONTROLS, AND PPE
OSHA’S HIERARCHY OF CONTROLS

- Engineering Controls
- Work Practice Controls
- PPE (including respirators)
All employers must protect employees from being exposed to unsafe levels of silica.

The pyramid shows OSHA’s hierarchy of controls in order of their effectiveness.

By implementing engineering controls and work practice controls, employers can reduce harmful exposure to silica and provide protection to their employees.

The Silica Standard requires employers to use engineering controls and work practice controls as a primary method to reduce exposures.

The use of respirators should be used as a secondary method and a last resort if engineering and work practice controls aren’t sufficient to reduce exposures.
ENGINEERING CONTROLS FOR SILICA

Wet Methods

Vacuum Dust Collection Systems

Isolation
WET METHODS

- Involve the use of water or a foam to keep dust down and out of the air.
- Wetting must occur with a continuous stream or spray of water at the point of contact.
- Integrated water systems must be developed specifically for the type of tool in use.
- Each integrated water system must apply water at the appropriate dust emission points based on the tool configuration.
- The integrated water system must not interfere with other tool components or safety devices.
- *Water systems designed for blade cooling also suppress dust and meet Table-1 requirements.
WET METHODS: MANUAL SPRAYING

- **Manual Spraying**: One option for applying water is to have a worker direct a stream or spray of water at the impact point.
- A portable sprayer with a nozzle can be used.
Tools that have an integrated spray nozzle aimed at the tip of tool can lower silica exposures.

Existing equipment can be retrofitted.

Must follow manufacturers’ instructions when determining the required flow rate of water for dust suppression systems on a given worksite.

The National Institute for Occupational Safety and Health (NIOSH) has developed designs for a water-spray retrofit system.

NIOSH Study [Echt et al. 2003]
HOW DO I PROPERLY DISPOSE OF SLURRY AFTER USING WET METHODS TO PREVENT EXPOSURES TO RESPIRABLE CRYSTALLINE SILICA?

- Any slurry formed as a result of using engineering controls (wet methods) to suppress dust should be cleaned to limit secondary exposure to silica dust.

When working in cold temperatures it may be required to implement additional work practices such as:

- Insulating drums
- Wrapping drums with gutter heat tape
- Adding environmentally-friendly antifreeze additives to prevent the water from freezing.

- According to OSHA’s Small Entity Compliance Guide,
  - “Slurry generated by wet methods should be cleaned up before it dries using a wet vacuum. When emptying the vacuum, the slurry will be transferred into a plastic bag and placed inside a container for disposal. The container will be sealed to prevent the release of dust back into the work space”

- Never sweep or use compressed air on dried slurry, if slurry dries, immediately wet it down and clean it up with the wet vacuum.
**VACUUM DUST COLLECTION SYSTEMS (VDCS)**

- Remove dust at the point where it is made.
- The dust collection system significantly reduces the amount of dust in the air.
- A VDCS includes:
  - A hood or shroud for the tool that is recommended by the manufacturer.
  - A vacuum meeting specs and recommended by manufacturer.
  - Dust collector equipped with a filter efficiency of 99% or greater and a filter cleaning mechanism.
  - A vacuum exhaust hose capable of providing airflow recommended by the tool manufacturer. (A 1.5” to 2” diameter vacuum exhaust hose is typically adequate.)
**VDCS OPERATION AND MAINTENANCE**

- **Keep** the vacuum hose clear and free of debris, kinks and tight bends.
- **Change** vacuum-collection bags as needed or at least as often as the manufacturer recommends. Do not over fill the bag.
- **Set** a regular schedule for maintenance and filter cleaning of the VDCS.
- **Avoid** exposure to dust when changing vacuum bags and cleaning or replacing air filters.
HOW TO DISPOSE OF THE DUST COLLECTED IN THE FILTER AND VACUUM?

- Vacuum manufacturers operator's manuals typically provide instructions for changing dust bags and filters.
  - For example, this could involve disposing of dust bags and filters in sealed, impermeable containers such as heavy-gauge plastic bags to prevent the release of dust particles into the air.
  - Additionally, NIOSH’s Mining Division has found that folding bulk or mini-bag loading collars away from you can reduce the potential for respirable dust exposure. [https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/TyingBags_DustExposureInfographics_508.pdf](https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/TyingBags_DustExposureInfographics_508.pdf)
ISOLATION

- Separates the employee from the silica dust.
- This type of control is effective for operators in the cab, but does not protect employees working outside the cab.
WORK PRACTICE CONTROLS

OSHA Hierarchy of Controls

- Engineering Controls
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Department of Labor/Shawn T Moore
WORK PRACTICE CONTROLS

- Work practice controls involve doing tasks in ways that decrease exposures.
- One way to provide protection to workers is by training them how to use effective work practices.
- One type of a work practice control is making sure that engineering controls are working properly.
- It is important to immediately address an engineering control that is not working properly.
  - If you can see levels of dust increasing, this is a sign of a problem with engineering controls.

Examples of work practice controls:

- Checking for clogged nozzles when using a tool with integrated water to ensure proper dust suppression at the point of contact.
- The use of cleaning methods, such as wet sweeping to reduce the amount of crystalline silica dust.
PPE (RESPIRATORS)

OSHA Hierarchy of Controls

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Decreasing Effectiveness
RESPIRATORS

- PPE should be used as a last resort and is at the bottom of the hierarchy of controls.
- The use of respirators is needed when engineering controls and work practices are not enough to control exposures down to a safe level.
- Even when respirators must be used, your employer must still use engineering and work practice controls to lower exposures as much as possible.
- Respiratory are only effective if they are properly selected, fitted, maintained, and worn.
- It is important to provide training to employees on how to properly use respirators.

OSHA Frequently Asked Questions (FAQs) for construction (PDF) [https://www.osha.gov/dsg/topics/silicacrystalline/construction_info_silica.html](https://www.osha.gov/dsg/topics/silicacrystalline/construction_info_silica.html)
