

G_009 - Silica Safety Training



SILICOSIS STATISTICS

Silicosis directly causes more than **100 deaths** each year.

Many more people die each year from indirect health effects of silicosis.

In the United States there are **3,600 to 7,300** new cases of silicosis annually.

Minimal surveillance requirements (until now) mean that many silicosis cases are not reported or diagnosed.

Silicosis is not curable, but it is preventable.

The only known treatment for advanced silicosis is a lung transplant. In 2011, this high-risk surgery would have cost you **\$500,000 to \$800,000.**

Sources: silica-safe.org & transplantliving.org

**Prepared by Colleen Baker, UR EH&S 2017
Updated for LLE by D. Jacobs-Perkins**

Summary



- All LLE tasks with the potential to generate silica dust must follow a Silica Exposure Control Plan that has been approved by a designated competent person
- Silica dust is hazardous when very small (respirable) particles are inhaled
- Silica dust can penetrate deep into the lungs and cause disabling and sometimes fatal lung diseases
- OSHA has new standards to control employee exposure to silica, including a new **PEL = 50 $\mu\text{g}/\text{m}^3$**

LE has designated Competent Persons to review all silica dust generating tasks



All tasks with the potential to generate silica dust must follow a silica exposure control plan, and must be approved by a designated competent person listed below:

**Building construction,
repairs & maintenance**

John Sawyer
Craig Carnahan

OMEGA Operations

Dan Neyland

EP Operations

Corey McAtee

ME Assembly & Integration

Mark Romanofsky

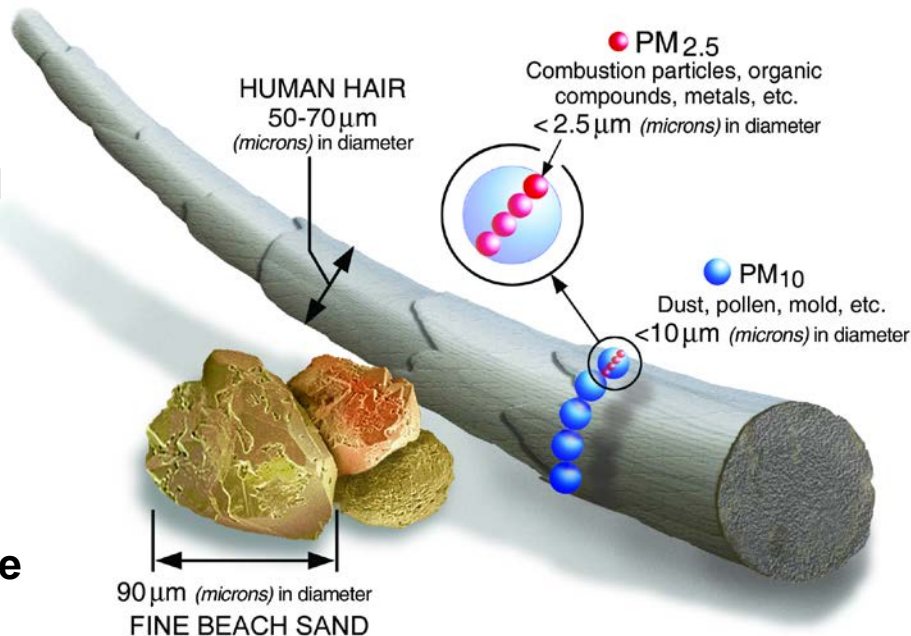
Silica Sources



- **Crystalline silica is an important industrial material found abundantly in the earth's crust.**
- **Quartz, the most common form of silica, is a component of sand, stone, rock, concrete, brick, block, and mortar.**
- **Materials containing quartz are found in a wide variety of workplaces**
- **Some other names for crystalline silica are silicon dioxide, quartz, cristobalite, and tridymite.**

Silica Health Effects

- Silica found in beach sand, glass, and construction materials is not hazardous until reduced to very small particles.
- Silica dust is hazardous when very small (respirable) particles are inhaled.
- These respirable dust particles can penetrate deep into the lungs and cause disabling and sometimes fatal lung diseases, including silicosis and lung cancer, chronic obstructive pulmonary disease (COPD) as well as kidney disease and immune system effects.



Silicosis



- **Silicosis is caused by very small particles containing crystalline silica getting inhaled deep into lung**
- **Usually resulting from long-term exposure (10 years or more) to relatively low concentrations of silica dust**
- **Usually appearing 10–30 years after first exposure**
- **Early on, patients may have no obvious signs or symptoms of disease, but abnormalities may be detected by x-ray.**
- **Chronic cough, shortness of breath, fatigue, chest pain, and bluish skin are common symptoms**

How is crystalline silica made respirable?



- **Work on concrete material that generates dust you can breathe**
- **Cutting, sawing, drilling, and crushing of concrete, brick, ceramic tiles, rock, and stone products**
- **Masonry saws, Grinders, Drills, Jackhammers**
- **Handheld powered chipping tools**
- **Processing or using large quantities of sand, such as foundries and the glass, pottery and concrete products industries**

New OSHA Standards on Silica



- **For Construction, the new standard became effective Sept. 2017**
 - [29CFR 1910.1153](#)
- **For General Industry, the new standard became effective June 2018**
 - [29CFR 1910.1053](#)

OSHA Standard requirements



- Limit worker exposure to respirable crystalline silica
- The new OSHA Permissible Exposure Limit **(PEL) for silica is $50\mu\text{g}/\text{m}^3$**
- Can use control methods listed in 29CFR 1910.1153 Table 1, or measure workers exposure to control exposure below the exposure limit
- Standard does not apply where exposures will remain low, such as mixing mortar, pouring concrete and removing concrete framework

OSHA Standard requirements continued...



- **Written exposure control plan**
- **Competent person to implement exposure control plan**
- **Medical exam required every 3 years for those workers required to wear a respirator for >30 days per year, which includes chest x-ray, lung function test and physical exam**
- **Train workers on work operations that results in silica exposure and ways to limit exposure**
- **Keep records of air monitoring data, “objective data” taken to assess exposure, medical surveillance (contact Karen Cera or Doug Jacobs-Perkins for assistance)**

Silica Sources at UR



- **Masonry work**
- **Work on concrete material that generates dust you can breathe (i.e. using masonry saws, grinders, drills, jackhammers, handheld powered chipping tools)**
- **Cutting, sawing, drilling, and crushing of concrete, brick, ceramic tiles, rock, and stone products**
- **Drywall work**
- **If you think silica could be present, use methods that minimize dust generation and tools designed to capture silica dust**

How to protect workers from silica dust exposure



- Use engineering controls listed in Table 1 (handout)
- Integrated water delivery system
- Shroud and dust collection system
- Respirators required when dust controls can not limit exposures to below the PEL or if mandated in Table 1 of OSHA Construction Standard
- Select materials (e.g. spackling compound) with low silica /quartz content

Review product SDS's



Example: Compare silica/quartz content in two spackling pastes:

- **United Galsonite Labs, 222 Spackling Paste, Quartz= 40-70%**
- **DAP Spackling Paste, Quartz= <1%**
- **Which one would you use?**

Table 1 Example: Handheld masonry saw without dust controls creates silica dust while cutting cinder blocks



- **Workers are required to wear a respirator in this situation**
- **General population must be excluded from the affected areas**



Photo courtesy of New Jersey Department of Health

Table 1 Example: Handheld masonry saw using water for dust control while cutting cinder blocks

- If this work is performed outdoors for <4 hours, respiratory protection is not required
- If this work is performed indoors, or for >4 hours, respiratory protection is required



Photo courtesy of New Jersey Department of Health

Users must inspect and maintain equipment before use



- Check that all hoses (water, vacuum, etc.) are securely connected and are not cracked or broken
- Adjust nozzles so that water floods the cutting area and cools the blade
- Maintain saws and dust-control equipment based on the manufacturer's recommendations and maintenance schedule
- Follow recommended filter change out schedule for dust collectors and HEPA vacuum

Do NOT use deficient equipment!
Return it to the responsible supervisor for repair or replacement.

Respiratory Protection



- **APF= Assigned Protection Factor**
- **Amount the type of respirator is expected to reduce your exposure**
- **For example, APF=10 indicates concentration inside respirator is 10X lower than concentration outside the respirator**
- **Persons required to wear a respirator MUST have a medical evaluation and fit-test before using any respirator (See G_002, LLE Safety Zone)**
 - **Tight-fitting (sealing) respirators also require the wearer to be clean-shaven and have a fit-test**
 - **A Powered Air-Purifying Respirator (PAPR) may be used in situations where a respirator can't form a proper seal**

Respiratory Protection

Table I: Assigned Protection Factors⁵

Type of Respirator ^{1, 2}	Quarter mask	Half mask	Full facepiece	Helmet/Hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	10 ³	50	—	—
2. Powered Air-Purifying Respirator (PAPR)	—	50	1,000	25/1,000 ⁴	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	—	10	50	—	—
• Continuous flow mode	—	50	1,000	25/1,000 ⁴	25
• Pressure-demand or other positive-pressure mode	—	50	1,000	—	—
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	—	10	50	50	—
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	—	—	10,000	10,000	—

APF=10

An annual medical evaluation is required for all UR/LLE personnel who are required to wear any kind of respirator to protect against respirable particulate



Half mask/Dust mask
APF=10
Needs to be fit tested



Half mask (Elastomeric)
APF=10
Needs to be fit tested

Illustration by Attilis and Associates

OSHA Table 1 Example



Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(i) Stationary masonry saws	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p>	None	None
(ii) Handheld power saws (any blade diameter)	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <ul style="list-style-type: none"> – When used outdoors. – When used indoors or in an enclosed area. 	<p>None</p> <p>APF 10</p>	<p>APF 10</p> <p>APF 10</p>

OSHA Table 1 Example

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(x) Jackhammers and handheld powered chipping tools	<p>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.</p> <ul style="list-style-type: none"> – When used outdoors. – When used indoors or in an enclosed area. <p>OR</p> <p>Use tool equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p>	<p>None</p> <p>APF 10</p>	<p>APF 10</p> <p>APF 10</p>
	<ul style="list-style-type: none"> – When used outdoors. – When used indoors or in an enclosed area. 	<p>None</p> <p>APF 10</p>	<p>APF 10</p> <p>APF 10</p>

Exposure Control Plan



- Review [UR Silica Exposure Control Plan](#) (LLE Safety Zone Training, G_009 Related links)
- No dry sweeping or use of compressed air for cleanup. Use wet methods** and/or HEPA vacuum.
- Work area must have restricted access and partitions to control dust.

**** Wet methods – e.g., wet-sweep or wet-vacuum slurry before it dries; wash affected areas with water hose, wipe surfaces with wet rag**

UR Tasks



Equipment/Task	Control Method	Required Respirator	
		≤ 4 hours/shift	> 4 hours/shift
Stationary masonry saws	Integrated Water Delivery System	None	None
Handheld power saws	Integrated Water Delivery System -when used outdoors -when used indoors or enclosed area	None APF 10	APF 10 APF 10
Rig-mounted core saws or drills	Integrated water delivery system	None	None
Handheld and stand-mounted drills	Shroud with dust collection system	None	None
Dowel drilling rigs for concrete	Shroud with dust collection system. Use HEPA vacuum for cleaning holes.	APF 10	APF 10

UR Tasks cont.



Equipment/Task	Control Method	Required Respirator	
		≤ 4 hours/shift	> 4 hours/shift
Jackhammer and handheld chipping tools	Shroud and dust collection system -when used outdoors -when used indoors or enclosed area	None APF 10	APF 10 APF 10
Handheld grinders for mortar removal	Shroud with dust collection system (min 25 cfm per inch of wheel diameter)	APF 10	APF 25
Handheld grinders for uses other than mortar removal	Integrated water delivery system	None	None
Demolition of block wall with sledge hammer*	Wet methods	APF 10	APF 10

How to dispose of silica dust?



- **Purchase and use disposable liner/bag for vacuums, if available**
- **If using a liner,**
 - **Remove liner and disposable filter (if necessary)**
 - **Place filter in liner**
 - **Gently expel excess air from liner and tie-wrap or tape closed**
 - **Discard liner in regular trash**
- **Reassemble the vacuum with a new liner and filter**
 - **Wipe the outer surfaces with a damp paper towel to remove dust**
 - **Discard paper towels in regular trash**

Wear a respirator when emptying vacuums and handling equipment contaminated with silica

How to dispose of silica dust? (con't)



- If vacuum does not have a liner, select a heavy-duty plastic trash bag large enough to completely cover the vacuum collection tank opening
 - Place the bag on the collection tank opening. Tape the bag to the tank to hold in place if necessary
 - Invert the tank and empty into the bag, allow time for dust to settle
 - Remove the disposable filter (if necessary) and place into the bag
 - Gently expel excess air from bag and tie-wrap or tape closed
 - Discard bag in regular trash
- Reassemble the vacuum with a new liner and filter
 - Wipe the outer surfaces with a damp paper towel to remove dust
 - Discard paper towels in regular trash

Wear a respirator when emptying vacuums and handling equipment contaminated with silica

How to dispose of water-borne silica?



- If large volumes of water-borne sediment will be generated, discuss the disposal plan with John Sawyer before starting work
- Collect slurry in buckets,
 - Allow sediment to settle for 24 hours
 - Pour off clear liquid from buckets after settling, and dispose in drain designated by Sawyer
 - Place lid on bucket(s) containing remaining sediment and dispose in regular trash

Never sweep or used compressed air on dried slurry; if slurry dries, immediately wet it down and clean it up with the wet vacuum

LLE has equipment available for silica dust control



Click [this link](#) to see available equipment

Summary



- **All LLE tasks with the potential to generate silica dust must follow a Silica Exposure Control Plan that has been approved by a designated competent person**
- **Silica dust is hazardous when very small (respirable) particles are inhaled.**
- **OSHA has new standards to control employee exposure to silica, including a new **PEL = 50 $\mu\text{g}/\text{m}^3$****
- **The UR Exposure Control Plan summarizes tasks and controls, including water delivery systems and dust collectors. Be sure to check Table 1 or the ECP to determine respirator requirement.**

For more information



- OSHA [Small Entity Compliance Guide for the Respirable Crystalline Silica Standard for Construction](#) (includes sample exposure control plans)
- OSHA Standards for Silica
 - [29 CFR 1910.1153](#) (Construction)
 - [29 CFR 1910.1053](#) (General Industry)
- Speak with one of LLE's Competent Persons (see slide 3)
- EH&S (275-3241)