Training and Education Material
FY 2019

Student Silica Exposure Hand-out
DISCLAIMER: This material was produced under grant number SH-05058-SH8 from the U.S. Department of Labor, Occupational Safety and Health Administration. It does not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government. The U.S. Government does not warrant or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed.

Trainees: Circle each task, materials and occupation that best fits your past or current experience with silica exposure. Upon completion of this assignment, the class will discuss their experiences with each other.

Industry
1. Abrasive blasting
2. pavement manufacturing
3. Blast furnaces
4. Cement manufacturing
5. Ceramics, clay, and pottery
6. Concrete mixing
7. Concrete Asphalt tunneling
8. Construction (mainly cement, concrete work)
9. Demolition
10. Electronics industry
11. Foundry industry: grinding, molding, shakeout, core room (High Risk)
12. Hand molding, casting, and forming
13. Jack hammer operations
14. Manufacturing abrasives, paints, soaps, and glass
15. Mining
16. Repair or replacement of linings of rotary kilns and cupola furnaces
17. Rolling and finishing mills
18. Sandblasting (High Risk)
19. Setting, laying, and repairing railroad track
20. Steelwork
21. Stone, brick, and concrete block cutting, blasting, chipping, grinding, and sawing
22. Tunneling operations

Materials
1. Abrasives
2. Coal Dust
3. Concrete
4. Filter Aids
5. Graphite, natural
6. Mica
7. Mineral Products
8. Paints
9. Pavement
10. Perlite
11. Plant Materials
12. Plastic Fillers
13. Polishing Compounds
14. Portland Cement
15. Sands
16. Silicates
17. Slag
18. Soapstone
19. Soil

**Occupation**

1. Brickmason / stonemason
2. Blasting/drilling
3. Construction laborer
4. Crane and tower operator
5. Crushing and grinding machine operator
6. Drywall installation
7. Furnace, kiln, non-food oven operator
8. Heavy Equipment operator
9. Grinding, abrading, buffing, and polishing machine operator
10. Hand molder/shaper (not jeweler)
11. Heavy-equipment mechanic
12. Janitor or cleaner
13. Machinist
14. Metals/plastics machine operator
15. Molding and casting machine operator
16. Mining machine operator
17. Miscellaneous material moving equipment operator
18. Millwright
19. Operating engineer
20. Painter who sandblasts (High Risk)
21. Production supervisor
22. Rock driller (High Risk)
23. Roof bolter (High Risk)
24. Sandblaster (High Risk)
25. Steelworker
Trainees will review (Table 1) standards as it relates to the specific task and materials listed above.

### 29 CFR 1926 Respirable crystalline silica (Table 1) for exposure controls

Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica

<table>
<thead>
<tr>
<th>Construction Task or Equipment Operation</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>≤ 4 hours/shift</td>
</tr>
</tbody>
</table>
| 1 Stationary masonry saws                | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None | None |
| 2a Handheld power saws (any blade diameter) when used outdoors | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 2b Handheld power saws (any blade diameter) when used indoors or in an enclosed area | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 3 Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) for tasks performed outdoors only | • Use saw equipped with commercially available dust collection system.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.  
• Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency. | None | None |
| 4a Walk-behind saws when used outdoors | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None | None |
| 4b Walk-behind saws when used indoors or in an enclosed area | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 5 Drivable saws for tasks performed outdoors only | • Use saw equipped with integrated water delivery system that continuously feeds water to the blade.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None | None |
| 6 Rig-mounted core saws or drills | • Use tool equipped with integrated water delivery system that supplies water to cutting surface.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None | None |
<table>
<thead>
<tr>
<th>Construction Task or Equipment Operation</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection ≤ 4 hours/shift &gt;4 hours/shift</th>
</tr>
</thead>
</table>
| 7 Handheld and stand-mounted drills (including impact and rotary hammer drills) | • Use drill equipped with commercially available shroud or cowling with dust collection system.  
• Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.  
• 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.  
• Use a HEPA-filtered vacuum when cleaning holes. | None |
| 8 Dowel drilling rigs for concrete for tasks performed outdoors only | • Use shroud around drill bit with a dust collection system.  
• Dust collector must have a filter with 99% or greater efficiency and a filter cleaning mechanism.  
• Use a HEPA-filtered vacuum when cleaning holes. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 9a Vehicle-mounted drilling rigs for rock and concrete | • Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector. | None |
| 9b Vehicle-mounted drilling rigs for rock and concrete | • Operate from within an enclosed cab and use water for dust suppression on drill bit. | None |
| 10a Jackhammers and handheld powered chipping tools when used outdoors | • Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact. | None |
| 10b Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area | • Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 10c Jackhammers and handheld powered chipping tools when used outdoors | • Use tool equipped with commercially available shroud and dust collection system.  
• Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.  
• 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. | None |
| 10d Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area | • Use tool equipped with commercially available shroud and dust collection system.  
• Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.  
• 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. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
<table>
<thead>
<tr>
<th>Construction Task or Equipment Operation</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Task or Equipment Operation</td>
<td>Engineering and Work Practice Control Methods</td>
<td>≤ 4 hours/shift &gt;4 hours/shift</td>
</tr>
</tbody>
</table>
| 11 Handheld grinders for mortar removal (i.e., tuckpointing) | • Use grinder equipped with commercially available shroud and dust collection system.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.  
• Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism. | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask  
Powered Air-Purifying Respirator (PAPR) with P100 Filters |
| 12a Handheld grinders for uses other than mortar removal for tasks performed outdoors only | • Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None None |
| 12b Handheld grinders for uses other than mortar removal when used outdoors | • Use grinder equipped with commercially available shroud and dust collection system.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.  
• Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism. | None None |
| 12c Handheld grinders for uses other than mortar removal when used indoors or in an enclosed area | • Use grinder equipped with commercially available shroud and dust collection system.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.  
• Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism. | None None |
| 13a Walk-behind milling machines and floor grinders | • Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions. | None None |
| 13b Walk-behind milling machines and floor grinders | • Use machine equipped with dust collection system recommended by the manufacturer.  
• Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.  
• Dust collector must provide the airflow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. | None None |
<table>
<thead>
<tr>
<th>Construction Task or Equipment Operation</th>
<th>Engineering and Work Practice Control Methods</th>
<th>Required Respiratory Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust between passes.</td>
<td>≤ 4 hours/shift &gt;4 hours/shift</td>
</tr>
<tr>
<td>14 Small drivable milling machines (less than half-lane)</td>
<td>• Use a machine equipped with supplemental water sprays designed to suppress dust.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Water must be combined with a surfactant.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain machine to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td>15a Large drivable milling machines (half-lane and larger) for cuts of any depth on asphalt only</td>
<td>• Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>suppress dust.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain machine to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td>15b Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate</td>
<td>• Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>suppress dust.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain machine to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td>15c Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate</td>
<td>• Use a machine equipped with supplemental water spray designed to suppress dust.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Water must be combined with a surfactant.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain machine to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td>16 Crushing machines</td>
<td>• Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points).</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.</td>
<td>None</td>
</tr>
<tr>
<td>17a Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials</td>
<td>• Operate equipment from within an enclosed cab.</td>
<td>None</td>
</tr>
<tr>
<td>17b Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials</td>
<td>• When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</td>
<td>None</td>
</tr>
<tr>
<td>Construction Task or Equipment Operation</td>
<td>Engineering and Work Practice Control Methods</td>
<td>Required Respiratory Protection</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>18a Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials</td>
<td>• Apply water and/or dust suppressants as necessary to minimize dust emissions.</td>
<td>≤ 4 hours/shift: None &gt; 4 hours/shift: None</td>
</tr>
<tr>
<td>18b Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials</td>
<td>• When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.</td>
<td>None None</td>
</tr>
</tbody>
</table>