

<i>Silica Exposure Control Procedure for the Construction of the Uranium Processing Facility Project</i>
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Preparer:

Anton Panev
UPF ES&H Industrial Hygienist

10/12/18

Date

Approval:

Dave Ross
UPF Construction Manager

10/25/18

Date

Jamie Horning
UPF BNI ES&H Manager

10/09/18

Date

Gary F. Hagan
UPF ES&H Manager

10/15/18

Date

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Silica Exposure Control Procedure for the Construction of the Uranium Processing Facility Project

REVISION LOG

Revision	Description	Intent	Non Intent
1	Clarification on guidance added regarding the exposure assessment methodology for tasks listed in Attachment A. Changes made are identified in Condition Report CR 25774-000-GCA-GAM-00938, <i>Inadequate Silica Exposure Control Procedure</i> .	X	
0	Initial Issue	N/A	

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1.0 INTRODUCTION

1.1 Purpose

To establish a Silica Exposure Control Procedure (SECP) for minimizing worker exposure to respirable crystalline silica in construction work and construction-associated maintenance work.

Silica is a common mineral found in many naturally occurring materials such as soil, sand, and granite. On construction jobs, crystalline silica dust is most commonly generated while concrete or other masonry materials are being cut, drilled, chipped, scarred, jackhammered, or ground.

Crystalline silica is frequently found in common building products like mortar, concrete bricks, blocks, rocks, and stones. Exposure to breathable silica dust can cause silicosis, lung cancer, and other respiratory diseases, as well as kidney disease.

1.2 Scope

This document establishes an SECP that complies with the American Conference of Governmental Industrial Hygienists Threshold Limit Values (TLV) of 25 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air (0.025 milligrams per cubic meter of air) as required by Title 10 of the Code of Federal Regulations (CFR), Part 851, "Worker Safety and Health Program." Additionally, it meets the intent of the Occupational Safety and Health Administration (OSHA) standard set forth in 29 CFR 1926.1153, "Respirable Crystalline Silica."

It applies to construction craft and non-manual workers assigned to locations within the UPF construction site and/or support areas where exposure to silica may occur during specific construction tasks. Applicability to subcontractors is per the contract language.

2.0 RESPONSIBILITIES

2.1 Construction Manager

The Construction Manager (CM) has the responsibility for ensuring the implementation of this procedure, as well as ensuring that the best practices, as described in this SECP, are followed at the construction site. The CM will assign one or more persons to the role of Competent Person (CP) for the implementation of this procedure.

2.2 Competent Person

The CP is the Industrial Hygiene Lead or the Industrial Hygiene Specialist. In conjunction with the CM, the CP is responsible for implementing and administering the SECP. The CP or designee shall perform the following:

- Verify that measures to prevent applicable project personnel from being exposed to an airborne concentration of respirable crystalline silica in excess of $25 \mu\text{g}/\text{m}^3$ calculated as an eight-hour time-weighted average (TWA) are implemented.
- Verify that hazard controls are implemented as shown in Attachment A, *Field Guide to Silica Compliance (OSHA 29 CFR 1926.1153, Respirable Crystalline Silica)*, or other applicable work process document.
- Verify that supervisors and workers are educated and trained in the health hazards associated with silica exposure, and that they are cognizant of specific tasks in the workplace that could result in exposure to respirable crystalline silica.

- Provide applicable safety data sheets to construction workers.
- Review objective evidence and/or conduct project personnel air sampling (i.e., exposure monitoring) on tasks with a potential for crystalline silica exposure.
- Notify applicable project personnel within five working days of air sampling results.
- Evaluate crystalline silica exposures to determine compliance with regulatory requirements and to ensure that worker protection is adequate.

2.3 Construction Supervisor

The Construction Supervisor is responsible for having a thorough understanding of individual responsibilities regarding compliance with, and implementation of, this procedure, including the following:

- Ensure that construction tasks have been addressed through job brief.
- Ensure that construction workers have received training in the health hazards, tasks, and controls related to crystalline silica.
- Ensure that construction workers who wear a respirator for 30 or more days per year are enrolled in a medical surveillance program.
- Ensure that construction workers report, as required, for any medical examination scheduled by Y-12 Occupational Health Services (OHS) or equivalent provider.
- Ensure that workers have an annual respirator fit test, if applicable.
- Ensure that the materials (e.g., tools, equipment), personal protective equipment, and worker training required to implement and maintain the SECP are readily available.
- Ensure that safety controls are incorporated into planning and execution of work, and that workers are complying with this procedure and the job hazard analysis (JHA).
- Maintain good housekeeping to eliminate crystalline silica dust or debris buildup.

3.0 HAZARD IDENTIFICATION

It is anticipated that construction activities on the UPF Project will produce respirable crystalline silica dust. Appendix B, *Common Construction Activities/Tools that Generate Silica Containing Particulates* lists common construction activities and tools that may generate silica-containing particulates, along with examples of controls that reduce worker exposures to silica dust. Attachment A, *Field Guide to Silica Compliance (OSHA 29 CFR 1926.1153, Respirable Crystalline Silica)*, lists 18 silica-generating tasks along with specific engineering controls, work practice control methods, and respirator requirements. The Project shall fully and properly implement the engineering controls, work practices, and respiratory protection specified for the tasks in Attachment A, unless the Project assesses and limits the exposure of the applicable project personnel to respirable crystalline silica as indicated in Sections 5.0 and 6.0. Ultimately, task or activity hazards and controls should be documented as part of the work package process and in accordance with Y17-95-64-823, *UPF Safety Task Analysis and Risk Reduction Talk/Job Hazard Analysis Program (STARRT/JHA) Process*.

4.0 ALTERNATIVE EXPOSURE CONTROL METHOD

The CP may authorize the use of alternative exposure control methods for tasks with a potential for crystalline silica exposure. An exposure assessment will be conducted through either a *performance* option or a *scheduled monitoring* option. The purposes of conducting

applicable project personnel exposure assessments include identifying where exposures are occurring, selecting effective control methods, preventing applicable project personnel from being exposed to silica above the TLV, providing applicable project personnel with information about their exposure levels, and supplying the health provider performing medical examinations with information about applicable project personnel exposures. The CP will conduct assessments by one of the following options:

- *Performance option.* Determine the exposure for each applicable project personnel based on combination of air monitoring data or objective data.
- *Scheduled monitoring option.* Perform initial monitoring to evaluate the eight-hour TWA exposure based on one or more personal breathing zone air samples that reflect the exposures of applicable project personnel on each shift, for each job task, and in each work area.

A representative sample may be used if several applicable project personnel perform the same task. The representative sampling will include applicable project personnel who are expected to have the highest exposure to crystalline silica.

The Project must reassess exposures when a change in production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures to respirable crystalline silica at or above the TLV, or when the Project has any reason to believe that new or additional exposures at or above the TLV have occurred.

5.0 METHODS OF COMPLIANCE

The Project will primarily use the controls as specified in Attachment A for each applicable equipment/task, after verifying (via Performance option or Scheduled monitoring option) that these tasks do not contribute to exposures above the TLV. In addition, when implementing the control measures specified in Attachment A, the Project shall meet the following requirements:

- For tasks performed indoors or in enclosed areas, provide a means of exhaust as needed to minimize the accumulation of visible airborne dust.
- For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust.
- For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth
 - is maintained as free as practicable from settled dust,
 - has door seals and closing mechanisms that work properly,
 - has gaskets and seals that are in good condition and working properly,
 - is under positive pressure maintained through continuous delivery of fresh air,
 - has intake air that is filtered through a filter that is 95% efficient in the range between 0.3 and 10.0 micrometers (e.g., Minimum Efficiency Reporting Value rating of 16 or better), and
 - has heating and cooling capabilities.

Where applicable project personnel performs more than one task on Attachment A during the course of a shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks on Attachment A combined is

less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

If the equipment/task is not listed or does not apply as indicated in Attachment A, then the use of engineering controls and associated work practice controls shall be considered as the primary method for controlling worker exposures to respirable silica dust. Wherever it is not feasible to reduce exposure levels to or below the TLV with engineering and associated work practice controls alone, the responsible entity must provide applicable project personnel with appropriate respiratory protection equipment and require them to use it. The responsible entity shall use engineering controls to reduce applicable project personnel exposure to the lowest achievable level and supplement those controls with respiratory protection to bring the level down to or below the TLV. The specific controls should be listed in the JHA or other applicable work control process. Consult with the CP or Industrial Hygienist for appropriate controls.

Some typical controls are outlined in the following sections.

5.1 Engineering Controls

The primary types of engineering controls for crystalline silica are (1) wet methods, and (2) local exhaust ventilation or vacuum dust collection systems.

5.1.1 Wet Methods

Wet methods include wet cutting and wet grinding, as well as spraying water during jackhammering, earthmoving, and other dust-generating activities. Wet methods are often the most effective way to reduce crystalline silica levels below the TLV. Freezing temperatures may complicate the use of wet methods. Consider heating the local work area. Drain the system when not in use.

5.1.2 Local Exhaust Ventilation or Vacuum Dust Collection Systems

When wet methods are unavailable or impractical, local exhaust ventilation or vacuum dust collection systems with acceptable filtration may be an alternative. Proper storage and disposal of collected dust must be considered.

5.2 Work Practice Controls

Typical work practice controls include the following:

- Inspect and maintain controls to prevent or fix malfunctions that could result in increased exposures.
- Confirm that nozzles spray water at the point of dust generation for wet method controls.
- Confirm that hoses are not kinked on a tool used with a dust collector.
- Moisten crystalline silica dust before sweeping, shoveling, or vacuuming.

NOTE: *Material must be continuously and thoroughly wetted at all times with no visible dust generation.*

- Schedule work so that tasks that involve high exposures are performed when no other applicable project personnel are in the area.
- When necessary, barricades and signs shall be used to control personnel access to areas to limit not only the number of applicable project personnel exposed to respirable crystalline silica but also the levels to which applicable project personnel are exposed.

Follow the applicable sections of UPF-CP-318, *Respirator Use and Issuance* and UPF-CP-214, *Barricades and Signs*.

5.3 Housekeeping

Housekeeping is a component of exposure control. Inadvertent, secondary inhalation may occur when crystalline silica dust that is present on surfaces is reintroduced into the air. The CP, or designee, shall verify the following:

- Compressed air cleaning of surfaces or clothing is **not allowed unless** this method is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air. Workers shall use a ventilation system with a high-efficiency particulate air (HEPA) filter or other approved method to clean surfaces or clothing if necessary.
- Dry sweeping or dry brushing is **prohibited** where such activity could contribute to applicable project personnel exposure to silica. Use wet sweeping or shoveling, or a HEPA-filtered vacuum cleaner.
- Concrete slurry (e.g., from dust control methods or excess water from concrete cleaning) shall be removed from work areas by wet vacuuming or other similar methods and placed into appropriate concrete washout bins, containers or other locations to prevent accumulation of silica dust on work surfaces.
- Washing facilities must be provided on site to enable worker cleansing.
- Eating, drinking, and smoking shall be restricted in barricaded or posted areas for silica exposure.

5.4 Respiratory Protection

Where engineering controls and associated safe work practices are not sufficient to reduce exposures to levels below the TLV, respiratory protection must be provided. In addition, when the Project is implementing the specified Exposure Control Methods found in Attachment A, respiratory protection is required as specified. Use of a HEPA-filtered, half-face respirator with the assigned protection factor (APF) of 10 is the minimum allowed. Other respiratory protection, such as full-face, powered air-purifying respirators, may be used if approved by the CP. Respiratory protection should be outlined in the JHA for specific work tasks.

5.5 Visible Dust

Visible dust contains large particles that are easy to see. It is the tiny, respirable-sized, invisible particles (those that can get into the deep lung) containing crystalline silica which pose the greatest hazard. Most dust-generating construction activities produce a mixture of visible and respirable particles. However, visible dust can be used as a general guide for improving dust suppression efforts. If crystalline silica-containing dust is visible, the respirable portion may be too high. Measures that control tool-generated dust at the source usually reduce all types of particle emissions, including respirable particles. Nonetheless, if silica-containing dust is not visible, there still may be a silica hazard exceeding the TLV.

6.0 MEDICAL SURVEILLANCE

Medical surveillance shall be provided by Y-12 OHS or equivalent provider to all personnel who are assigned to locations within the UPF construction site and/or support areas where silica-generating tasks are performed and are required to wear respiratory protection for 30

or more days per year. They include UPF and Consolidated Nuclear Security, LLC (CNS) construction workers; Bechtel National, Inc. (BNI) non-manual personnel; and applicable project personnel.

6.1 Initial Baseline Exam

An initial baseline exam is required within 30 days after initial assignment, unless the applicable project personnel has received a medical exam within the last three years that meets the same baseline requirements. The initial baseline exam shall include the following:

- Medical and work history with emphasis on past, present, and anticipated exposure to silica, dust, and other agents affecting the respiratory system; history of respiratory system dysfunction; signs and symptoms of respiratory disease; history of tuberculosis (TB); smoking status and history;
- Physical exam with emphasis on respiratory system;
- Chest X-ray;
- Pulmonary function test;
- Testing For latent TB infection;
- Any other tests deemed appropriate by OHS.

6.2 Periodic Exams

Periodic exams should conform to the following criteria:

- Should occur at least every three years.
- TB testing not repeated
- More frequently, if recommended by the OHS.

6.3 Medical Report to Applicable Project Personnel and Project

- Written report and explanation of results shall be provided to applicable project personnel and responsible entity within 30 days of exam.
- Applicable project personnel report shall include results, conditions that place the applicable project personnel at risk or impairment, conditions requiring evaluation/treatment, limitations on respirator use, and limitations on exposures to crystalline silica.
- The responsible entity's report shall include the date of exam, statement that the exam met the requirements of the standard, recommended limitations of respirator use, and (IF applicable project personnel provides written authorization) recommended limitations on exposures to crystalline silica.

The CP will coordinate with OHS for designated applicable project personnel who are to use the services provided by the OHS staff. Subcontractors will be responsible for procuring occupational medical services for their applicable project personnel who are required to receive baseline and periodic examinations.

7.0 ANNUAL REVIEW

This SECP shall be reviewed annually, and updated as necessary, by the CP and the Project. Revisions to the SECP shall include any changes in regulatory requirements.

8.0 RECORDS

Records generated by this procedure shall be maintained in accordance with Y15-95-800, *UPF Document Management*. Record types for documents submitted to the UPF DMC are identified in ML-PS-801768-A001, *Uranium Processing Facility Project Master Document Type List*. Records must be kept for workers' crystalline silica exposure and medical surveillance. Records generated by Y-12 OHS will be maintained in accordance with Y15-101, *Records and Controlled Documents*. CNS craft personnel's personal sampling records (e.g., sampling conducted for work on the UPF Project) will be maintained by the UPF Project through the duration of the Project and then submitted to CNS for retention. BNI applicable project personnel' personal sampling records will be retained by BNI or as specified by contract. Subcontractors shall retain records as indicated in contractual documents.

Quality Type is listed as Quality-Lifetime (QA-L), Quality-Nonpermanent (QA-NP), or Non-Quality (Non-QA).

Records generated during the performance of this procedure include:

Record Number	Record Title	Record Holder	System/Location	Quality Type
Document Specific	Applicable Project Personnel Notifications	UPF ES&H	Secure files	Non-QA
Document Specific	Applicable Project Personnel Notifications	BNI	Secure files	Non-QA
Document Specific	Exposure and Sampling Records	UPF ES&H	Secure files	Non-QA
Document Specific	Exposure and Sampling Records	BNI	Secure files	Non-QA
Document Specific	Medical Surveillance Records	Y-12 OHS/Occupational Medical Provider	MOHIS	Non-QA

9.0 REFERENCES

9.1 Source References

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910.1020, *Access to Employee Exposure and Medical Records*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.145, *Specifications for Accident Preventions Signs and Tags*

29 CFR 1926.16, *Rules of Construction*

29 CFR 1926.21, *Safety Training and Education*

29 CFR 1926.59, *Hazard Communication*

Bechtel ES&H Procedure No.: 2HO-EOI0-00001-001, *USA Respirable Crystalline Silica Management Procedure*

UPF-CP-200, *UPF General Safe Work Practices*

UPF-CP-202, *UPF Hazard Communication Program*

UPF-CP-205, *Personal Protective Equipment*

UPF-CP-318, *Respirator Use and Issuance*

Y17-95-64-823, *UPF Safety Task Analysis and Risk Reduction Talk/Job Hazard Analysis Program (STARRT/JHA) Process*

Y78-001, *Occupational Medicine Program*

Y78-002, *Identification of Employees Requiring Medical Certification, Qualification, or Surveillance*

9.2 Interfacing References

29 CFR 1926.1153, *Respirable Crystalline Silica*

ML-PS-801768-A001, *Uranium Processing Facility Project Master Document Type List*

UPF-CP-214, *Barricades and Signs*

UPF-CP-318, *Respirator Use and Issuance*

Y15-101, *Records and Controlled Documents*

Y15-95-800, *UPF Document Management*

Y17-95-64-823, *UPF Safety Task Analysis and Risk Reduction Talk/Job Hazard Analysis Program (STARRT/JHA) Process*

10.0 SUPPLEMENTAL INFORMATION

Appendix A, *Acronyms and Definitions*

Appendix B, *Common Construction Activities/Tools that Generate Silica Containing Particulates*

Attachment A, *Field Guide to Silica Compliance (OSHA 29 CFR 1926.1153, Respirable Crystalline Silica)*

APPENDIX A Acronyms and Definitions

ACRONYMS:

APF	assigned protection factor
BNI	Bechtel National, Inc.
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CM	Construction Manager
CNS	Consolidated Nuclear Security, LLC
CP	Competent Person
ES&H	Environment, Safety, and Health
HEPA	high-efficiency particulate air
JHA	Job Hazard Analysis
µg/m³	micrograms per cubic meter
OHS	Occupational Health Services (Y-12)
OSHA	Occupational Safety and Health Administration
SECP	Silica Exposure Control Procedure
STARRT	Safety Task Analysis and Risk Reduction Talk
TB	tuberculosis
TLV	Threshold Limit Value
TWA	time-weighted average

DEFINITIONS:

Competent Person	An individual trained to recognize hazards associated with silica and a particular task, and has the ability to mitigate those hazards.
Applicable Project Personnel exposure	The quantity of respirable crystalline silica measured in the breathing zone of the applicable project personnel, regardless of the use of a respirator.
High-efficiency particulate air (HEPA) filter	A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 micrometers in diameter.
Silica Exposure Control Procedure (SECP)	A written exposure control procedure identifies tasks associated with health hazards of silica, engineering controls, proper equipment and maintenance, respirator program, personal hygiene decontamination, housekeeping, medical surveillance, and methods used to protect workers, including procedures to restrict access to work areas where high exposure may occur.

APPENDIX B




Common Construction Activities/Tools that Generate Silica Containing Particulates

	Activities/Tools	Examples of Controls
Activities	Concrete cutting, grinding, drilling, chipping, jackhammering, chipping, scabbling, blasting, etc.	Wetting from spray can, watering truck, or hose Wetting integrated into tools (add-on or built-in) Vacuum attachments for tools
	Mixing powder/pouring	Local ventilation Ventilated enclosures
	Abrasive blasting	Substitute for sand Blasting agents with dust suppression additives Wetting
	Rock drilling crushing, loading, hauling, and dumping	Wetting Operator isolation/remote control devices Dust collection as appropriate
	Housekeeping	HEPA vacuums Wet sweeping
	Work on refractory ceramic fibers that have been subjected to high temperatures	Wetting Enclosure Local exhaust ventilation
	Earthmoving machine and heavy equipment operations	Enclosed, ventilated cab with filtration Wetting
	Demolition of concrete and masonry structures	Wetting
	Roadway dust	Wetting and dust suppression chemicals
Tools	Stationary masonry saws	Wet cutting (most effective) Vacuum dust collection systems Ventilated booths
	Handheld masonry saws	Wet cutting (most effective) Vacuum dust collection systems
	Hand-operated grinders	Vacuum dust collection systems Wet grinding Adjustments in work methods and equipment
	Tuck-pointing/mortar removal	Vacuum dust collection systems Work practice controls
	Jackhammers	Wet methods (manual or semi-automated water-feed device)
	Rotary hammers	Dust collection systems (add-on or built-in)
	Vehicle-mounted rock-drilling rigs	Dust collection systems Wet methods Operator isolation (enclosed cabs with filtered ventilation)

ATTACHMENT A

Field Guide to Silica Compliance (OSHA 29 CFR 1926.1153, Respirable Crystalline Silica)




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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
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
Handheld power saws (any blade diameter) 	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: When used outdoors When used indoor or in an enclosed area	None APF 10	None APF 10
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 airflow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None	None

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
Walk-behind 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: When used outdoors When used indoor or in an enclosed area	None APF 10	None APF 10
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
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

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
<p>Handheld and stand-mounted drills (including impact and rotary hammer drills)</p> 	<p>Use drill equipped with commercially available shroud or cowling with 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 airflow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <p>Use a HEPA-filtered vacuum when cleaning holes.</p>	None	None
<p>Dowel drilling rigs for concrete</p> 	<p>For tasks performed outdoors only:</p> <p>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.</p> <p>Use a HEPA-filtered vacuum when cleaning holes.</p>	APF 10	APF 10

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
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. OR Operate from within an enclosed cab and use water for dust suppression on drill bit.	None None	None None
Jackhammers and handheld powered chipping tools 	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact: When used outdoors When used indoors or in an enclosed area OR 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 airflow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism: When used outdoors When used indoors or in an enclosed area	None APF 10 None APF 10	APF 10 APF 10 APF 10 APF 10

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
Handheld grinders for mortar removal (i.e., tuck pointing) 	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.	APF 10	APF 25

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
<p>Handheld grinders (for uses other than mortar removal)</p> 	<p>For tasks performed outdoors only:</p> <p>Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>OR</p> <p>Use grinder 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 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:</p> <p style="padding-left: 40px;">When used outdoors</p> <p style="padding-left: 40px;">When used indoors or in an enclosed area</p>	<p>None</p> <p>None</p>	<p>None</p> <p>None</p> <p>APF 10</p>

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
<p>Walk-behind milling machines and floor grinders</p> 	<p>Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>OR</p> <p>Use machine equipped with dust collection system recommended by the manufacturer.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>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.</p> <p>When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.</p>	None	None
<p>Small drivable milling machines (less than half-lane)</p> 	<p>Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant.</p> <p>Operate and maintain machine to minimize dust emissions.</p>	None	None



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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
Large drivable milling machines (half-lane and larger) 	For cuts of any depth on asphalt only: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. Operate and maintain machine to minimize dust emissions.	None	None
	For cuts of four inches in depth or less on any substrate: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. Operate and maintain machine to minimize dust emissions.	None	None
	OR Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.	None	None


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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
<p>Crushing machines</p> 	<p>Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyors, sieves/sizing or vibrating components, and discharge points).</p> <p>Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.</p>	None	None
<p>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</p> 	<p>Operate equipment from within an enclosed cab.</p> <p>When applicable project personnel outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</p>	None	None

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Equipment/Task	Engineering and Work Practice Control Methods	Respirator Requirements and Minimum Assigned Protection Factor (APF) for	
		≤4 hours/shift	>4 hours/shift
Heavy equipment and utility vehicles (for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials) 	Apply water and/or dust suppressants as necessary to minimize dust emissions. OR When the equipment operator is the only person engaged in the task, operate equipment from within an enclosed cab.	None	None
		None	None