

## FESHM 4195: SPECIAL TOXIC HAZARDS – RESPIRABLE CRYSTALLINE SILICA

### Revision History

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## 1.0 INTRODUCTION

Silica poses a serious health hazard when it becomes airborne as respirable crystalline particulates. This program addresses techniques for mitigating respirable crystalline silica exposures from activities that occur at Fermilab including, but not limited to: sandblasting, grinding, cutting, mixing, and drilling of concrete, brick, grout, and rock; miscellaneous sand and gravel operations; and repair or removal of furnace insulation. This chapter applies to Fermilab employees, subcontractors and sub-tier contractors engaged in the activities described above, and in Technical Appendix A – Guidance for Silica Work.

## 2.0 DEFINITIONS

**Construction** - Means construction, alteration, demolition, or repair of buildings, structures or other real property. For purposes of this FESHM chapter, the activities listed in the table in Technical Appendix A – Guidance for Silica Work are considered construction activities.

**High-efficiency particulate air (HEPA) filter** – A filter that is at least 99.97 percent efficient in removing particles 0.3 micrometers in diameter.

**Respirable crystalline silica** – Quartz and/or cristobalite contained in airborne particles that are determined to be respirable by an industrial hygiene particle size selective sampler.

**Specified exposure control methods** – The engineering controls, work practices and respiratory protection specified in Technical Appendix A – Guidance for Silica Work, which shall be implemented for each employee engaged in the specified task unless monitoring data demonstrates otherwise.

**Threshold Limit Value (TLV)** – The maximum allowable concentration of airborne respirable crystalline silica of 25  $\mu\text{g}/\text{m}^3$  calculated as an 8-hour time-weighted average to which an employee may be exposed at Fermilab. This standard applies to employees, contract employees, and subcontractor employees.

## 3.0 RESPONSIBILITIES

### 3.1 Division/Section Heads; Project Managers (D/S/Ps)

D/S/Ps will ensure that the requirements of this chapter are fulfilled regarding respirable crystalline silica hazards, including notification, sampling, mitigation, and training.

### 3.2 Managers and Supervisors

- Ensure that respirable crystalline silica exposures are mitigated using control measures to prevent an exceedance of the TLV. These measures must be reflected in a Hazard Analysis ([FESHM Chapter 2060](#), Work Planning and Hazard Analysis).
- Request that ESH&Q Section Industrial Hygiene personnel conduct workplace exposure monitoring for respirable crystalline silica to provide initial and periodic exposure

evaluations that address any concerns or uncertain hazards.

- Ensure that workers are provided information and training about the hazards of respirable crystalline silica exposure and the steps that have been implemented to protect them from exposure.

### **3.3 Construction Coordinators, Task Managers and Service Coordinators**

- Ensure that the projects involving potential respirable crystalline silica exposures are addressed in specifications provided to subcontractors.
- Ensure respirable crystalline silica exposures are mitigated by using control measures to prevent exposures exceeding the TLV. These measures must be reflected in a Hazard Analysis ([FESHM Chapter 2060](#), Work Planning and Hazard Analysis).
- Ensure that proper notification is provided to other workers, residents, and the public near the work area if there is potential for airborne respirable crystalline silica.
- Ensure that subcontractors conduct work according to the requirements of this chapter, as well as Fermilab subcontractor requirements in [FESHM 7010](#) and [7020](#).
- Request that ESH&Q Section Industrial Hygiene personnel provide a workplace assessment to address any concerns or uncertain hazards.
- Ensure that subcontractor employees have been provided information and training about the hazards of respirable crystalline silica exposure and the specific measures that have been implemented to protect them from exposure as outlined in Section 4.8.

### **3.4 Chief Safety Officer and ESH&Q Section**

- Conducts exposure assessments, including workplace monitoring, in areas where airborne respirable crystalline silica is generated. Report findings of surveys to supervisors, and exposure results to supervisors and employees.
- Serve as a general support resource to managers, supervisors, Task Managers, Construction Coordinators and Service Coordinators on safe work practices for controlling respirable crystalline silica airborne exposures.
- Maintain site-wide records of exposure monitoring results.
- Communicate to the Occupational Medical Office the findings of any workplace monitoring that shows an overexposure to respirable crystalline silica.
- Oversee and provide training to Fermilab employees and contract employees that meets Section 4.8.

### **3.5 Occupational Medical Office**

The Occupational Medical Office shall provide a medical surveillance program for Fermilab employees as described in Section 4.7.

## **4.0 PROGRAM DESCRIPTION**

### **1. General Description**

For each Fermilab and subcontractor employee engaged in a task identified in Technical Appendix A – Guidance for Silica Work, the engineering controls, work practices and respirator protection specified for the task in Technical Appendix A shall be fully implemented. The exception to this requirement is when either Fermilab or the subcontractor can demonstrate with monitoring data that the TLV will not be exceeded for a particular task. The ESH&Q Section Industrial Hygiene Group shall be consulted for any task not listed in Technical Appendix A that may result in airborne respirable crystalline silica.

## 2. Exposure Assessments

- a. A task shall be evaluated for potential generation of respirable crystalline silica prior to commencement of work activities.
- b. The *Guidance for Silica Work* found in Technical Appendix A shall be followed unless airborne sampling data exists that demonstrates that the designated control method(s) and/or respiratory protection are not required.
- c. The ESH&Q Section Industrial Hygiene Group shall use their judgment, and past monitoring data if available, to determine if exposures may exceed the TLV for activities not listed in Technical Appendix A. If there is reason to believe that exposures may exceed the TLV, then the IH Group shall specify the control methods and/or respiratory protection to be used.
- d. Representative full shift personal air monitoring on Fermilab and T&M employees shall be conducted by the Industrial Hygiene Group during activities not listed in Technical Appendix A to the extent possible.
- e. Subcontractors may provide personal air monitoring data for their employees to demonstrate that the TLV will not be exceeded when the engineering controls, work practices and respiratory protection in Technical Appendix A are not fully implemented.
- f. Exposures shall be reassessed whenever there is reason to believe that employee exposures are at or above the TLV may occur.

## 3. Respiratory Protection

The use of respiratory protection as identified in Technical Appendix A shall comply as follows:

- a. Fermilab employees shall comply with [FESHM 4150](#).
  - b. Subcontractor employees, including T&M, must comply with [29 CFR 1910.134](#).
4. The use of a non-HEPA vacuum, dry sweeping or the use of compressed air for cleaning clothing or surfaces shall not be used.
  5. A written hazard analysis shall be implemented for each job or activity that may result in airborne respirable crystalline silica. ([FESHM 2060](#))
  6. The Construction Coordinator/Task Manager shall make periodic inspections of job sites and equipment to ensure that the program described in this chapter is being implemented by Fermilab subcontractors.

## 7. Medical Surveillance

- a. Medical surveillance as described in this section shall be made available to employees who are required by the *Guidance for Silica Work* in Technical Appendix A to use a respirator for 30 or more days per year.
- b. Medical surveillance shall include:
  - i. An initial examination that consists of:
    - Medical and work history
    - Physical examination with emphasis on the respiratory system.
    - Chest x-ray.
    - Pulmonary function test.
    - Testing for latent tuberculosis infection.
  - ii. Follow-up examinations at least every three years.

## 8. Employee information and training

- a. Subcontractor employees, including T&M, shall receive information and training concerning respirable crystalline silica as follows:
  - i. Health hazards associated with exposures to respirable crystalline silica.
  - ii. Specific tasks that could result in exposure to respirable crystalline silica.
  - iii. Measures that have been implemented to protect employees from respirable crystalline silica.
  - iv. Purpose and description of the medical surveillance program.
- b. It is the responsibility of the subcontractor employer to provide this training to its employees.
- c. Fermilab employees who are exposed or potentially exposed to respirable crystalline silica shall receive Silica Hazard Awareness Training (Fermilab Course # FN000547).

## 5.0 REFERENCES

10 CFR 851

29 CFR 1926.1153 – OSHA Construction Standard for Respirable Crystalline Respirable crystalline silica

29 CFR 1910.134 – OSHA Standard for Respiratory Protection

American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs®)

FESHM 2060

FESHM 4150

## 6.0 TECHNICAL APPENDIX A – Guidance for Silica Work

Type of Work	Duration/Scope	Location (general)	Required Controls*	Notes
Grout/mortar mixing	≤ 5 ft <sup>3</sup> / ≤ 7 bags	Inside or Outside	D	Keep employees upwind of dust when outdoors.
Grout/mortar mixing	> 5 ft <sup>3</sup> / > 7 bags	Inside or Outside	A, C, D	HEPA vacuum where feasible
Shoveling sand	Any	Outside	B	Keep employee upwind of dust when outdoors
Hole drilling ≤ 1/4 in diameter	< 4 holes	Inside or outside	None	Use HEPA vacuum for housekeeping (no sweeping)
Hole drilling ≤ 1/4 in diameter	> 4 holes	Inside or outside	A or B	Use HEPA vacuum for housekeeping (no sweeping)
Hole drilling > 1/4 in diameter	Any	Inside or outside	A or B	B is for horizontal surfaces only
Saw cutting - chop saw	Any	Inside or Outside	B, C, D	
Saw cutting - hand held saw	< 1 linear ft.	Outside	B, C, D	
Saw cutting - hand held saw	> 1 linear ft.	Outside	B, C, D	
Saw cutting - walk behind saw type equipment	Any	Outside	B, C, D	
Surface finish	Any	Inside or outside	A, C or B, C, & D	
Joint compound sanding	> 1 linear ft.	Inside or outside	A, C, D	Some new joint compounds are respirable crystalline silica free
Tuck Pointing/Grout repair - Hand tools	Any	Inside or outside	B, D	
Tuck Pointing/Grout repair - Power tools	Any	Inside or outside	A, B, C, D	
Jack Hammering	Any	Outside	B, C, D	
Concrete Demolition using Heavy Equipment (enclosed cab)	< 4 continuous hours	Outside	B, C	Sprayer must wear respirator or contact IH through Construction Coordinator
Concrete Demolition using Heavy Equipment (enclosed cab)	> 4 continuous hours	Outside	B, C	Sprayer and operator must wear respirator or contact IH through Construction Coordinator
*Controls - NOTE: OTHER PPE WILL BE REQUIRED FOR ADDITIONAL HAZARDS				
A = Manufacturer's local exhaust ventilation on tool or HEPA vacuum at Point of Operation				
B = Water to eliminate visible dust				
C = Respirator with P100 filter with face piece scaled for anticipated exposure				
D = First aid flush of eye contamination				

**If the work activity is not on this list, contact the Construction Coordinator, Task Manager, Division Safety Officer or the IH Group for assistance.**

Schedule to Empty Dust Recovery System  
On a Hammer Drill

Maximum Number of Holes That Can Be Drilled Before Emptying

Depth (inches)	Bit Size (inches)						
	¼ or less	3/8	½	5/8	¾	7/8	1
1	100	45	25	16	11	8	6
1.5	65	30	17	11	8	6	4
2	50	23	13	8	6	4	3
2.5	42	18	10	6	5	3	3
3	33	15	8	5	4	3	2
3.5	30	13	7	5	3	2	2
4	25	11	6	4	3	2	2

**Note:** This table was developed based on in-house observations and information provided by an exposure study conducted by Hilti. This table can be used for any hammer drill that has a dust recovery system attached to it.