FESHM 4195: SPECIAL TOXIC HAZARDS – SILICA

Revision History

Author	Description of Change	Revision Date
Rich Ruthe	• Added a line for concrete coring to the chart in the TA.	September 2018
Rich Ruthe	• Revised to meet the requirements of 29 CFR 1926.1153. • Updated the definition of Competent Person. • Added references to requirements for IH sampling. • Clarified that "silica" activities at Fermilab are not expected to require a medical surveillance program but the Medical Office shall develop one if needed. • Added sections on Housekeeping, Access Restriction, and Disposal. • Added references to Silica Written Exposure Control Plans, Predictive Solutions, and Section 013100	February 2018
Rich Ruthe	• Initial Issue	June 2017

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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 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.

2.0 DEFINITIONS

Competent person – From 1926.1153(b). An individual who can identify existing and foreseeable respirable crystalline silica hazards during work activities and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in the Written Exposure Control Plan.

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 are considered construction activities, and therefore fall under OSHA standard 29 CFR 1926.1153, Construction Standards for Respirable Crystalline Silica.

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 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, which shall be implemented for each employee engaged in the specified task unless personal industrial hygiene monitoring data demonstrates otherwise.

Threshold Limit Value (TLV) – The maximum allowable concentration of airborne respirable crystalline silica of 25 $\mu g/m^3$ 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.

Written Exposure Control Plan – A document that includes the elements described in 29 CFR 1926.1153(g)(1)(i-iv). For Fermilab employees potentially exposed to airborne respirable crystalline silica, this FESHM chapter is considered the Written Exposure Control Plan.

3.0 RESPONSIBILITIES

3.1 Division/Section Heads; Project Managers

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

3.2 Managers and Supervisors

- Ensure that silica exposures are mitigated using control measures to prevent an exceedance of the TLV. These measures must be reflected in a Hazard Analysis (FESHM 2060).
- Request that ESH&Q Section Industrial Hygiene (IH) 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 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 airborne crystalline silica exposures are addressed in specifications provided to subcontractors.
- Ensure airborne 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 2060).
- Ensure that proper notification is provided to other workers, residents, and the public near the work area if there is potential for airborne crystalline silica.
- Ensure that subcontractors conduct work according to the applicable OSHA requirements (29 CFR 1926.1153), including the presence of a competent person, documented inspections, and are meeting 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 by their employer about the hazards of airborne crystalline silica exposure and the specific measures that have been implemented to protect them from exposure as outlined in Section 4.10.

3.4 Chief Safety Officer and ESH&Q Section

- Conducts exposure assessments, including workplace monitoring, for areas where airborne crystalline silica is generated. Report findings of surveys to supervisors, and exposure results to supervisors and employees. Workplace industrial hygiene monitoring will also be conducted for T&M subcontract employees.
- Serve as a general support resource to managers, supervisors, Task Managers, Construction Coordinators and Service Coordinators on safe work practices for controlling airborne crystalline silica 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 crystalline silica.
- Oversee and provide training to Fermilab employees and contract employees that meets the OSHA regulation 29 CFR 1926.1153(i).
- Reviews the subcontractor's Written Exposure Control Plan (Construction Safety Group and IH Group), which may be incorporated into the subcontractor's ES&H program.
- Enter the results from inspections at construction sites where there is potential for exposures to airborne respirable crystalline silica into Predictive Solutions.

3.5 Occupational Medical Office

The Occupational Medical Office shall provide a medical surveillance program for Fermilab employees as described in 29 CFR 1926.1153(h) when employees are required to use respiratory protection for 30 or more days annually due to airborne respirable crystalline silica exposure.

3.6 Finance Section

With the assistance of the Facilities Engineering Services Section and the ESH&Q Section, ensure that subcontractors meet the contract requirements specified in Section 013100.

4.0 PROGRAM DESCRIPTION

4.1 General Description

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

4.2 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, which lists activities that produce potential exposures to respirable crystalline silica, shall be followed unless objective airborne sampling data exists that demonstrates that the designated control method(s) and/or respiratory protection are not required.
c. Representative personal air monitoring on Fermilab and T&M employees shall be conducted by the IH Group during activities not listed in Technical Appendix A to the extent possible.
d. IH sampling and personnel notification shall be performed according to the requirements in IH-006, Industrial Hygiene Sampling for Airborne Environmental Contaminants.
e. The ESH&Q Section IH 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, the IH Group shall specify the control methods and/or respiratory protection to be used.
f. Subcontractors may provide objective 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. The data must be from an AIHA-accredited laboratory for silica analysis.
g. Exposures shall be reassessed whenever there is reason to believe that employee exposures at or above the TLV may occur.
h. The ESH&Q Section shall verify that controls are being used to prevent overexposure to airborne respirable crystalline silica.

4.3 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 have a program that complies with 29 CFR 1910.134, and it is the employer's responsibility to ensure that the required respirators are available to its employees.

4.4 Written Hazard Analysis

A written hazard analysis shall be implemented for each job or activity that may result in airborne respirable crystalline silica. (FESHM 2060)

4.5 Inspections

A competent person shall make frequent and regular documented inspections of job sites and equipment to ensure that this program is being implemented. Inspections by the subcontractor's competent person shall be made available to the Construction Coordinator/Task Manager/Service Coordinator and ESH&Q Section personnel for verification. The ESH&Q Section shall document their inspections and observations per established Section procedures.

4.6 Housekeeping

To minimize the generation of silica dust:

a. Dry sweeping or dry brushing shall not be allowed.
b. Compressed air shall not be used to clean clothing or surfaces.
c. The use of non-HEPA vacuums is not allowed.

4.7 Access Restrictions

When necessary, access to worksites shall be restricted with the use of construction barriers and/or signs when there are other employees or members of the public in the area that could potentially be exposed to airborne respirable crystalline silica.

4.8 Disposal

Care must be taken when emptying HEPA vacuums and tool on-board dust recovery systems to prevent exposure to airborne respirable crystalline silica. Collected dust shall be placed in a plastic bag, tied off and placed in a regular trash dumpster. Concrete slurry that is collected, e.g. using a HEPA vacuum, shall be absorbed with oil dry or kitty litter, placed in a plastic bag, tied off and placed in a regular trash dumpster.

4.9 Medical Surveillance

A medical surveillance program must be implemented when employees are required to wear respirators for 30 or more days per year as a result of meeting the requirements in Appendix A of

this FESHM Chapter. Based on the limited "silica" activity that occurs on site by Fermilab employees, and the use of engineering controls described in Appendix A, it is not expected that Fermilab will require a medical surveillance program for its employees involved in these activities. However, if needed in the future, it will be structured as follows.

a. Medical surveillance performed per 29 CFR 1926.1153(h) 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 annually.
b. Medical surveillance shall include those items listed in 29 CFR 1926.1153(h)(2).
c. Medical surveillance as described in 29 CFR 1926.1153(3) shall be repeated at least every three years.
d. A copy of 29 CFR 1926.1153 shall be provided to the physician or other licensed health care professional performing the medical surveillance.

The requirement for medical surveillance as described above, i.e. the use of respirators for 30 or more days annually, applies to subcontractor employees including T&M, and shall be provided by their employer. The medical surveillance program shall be described in the subcontractor's Written Exposure Control Plan (which may be incorporated into their overall ES&H program).

4.10 Employee Information and Training

a. Subcontractor employees, including T&M, shall receive information and training concerning respirable crystalline silica per the requirements in 29 CFR 1926.1153(i). It is the responsibility of the subcontractor employer to provide this training to its employees.
b. Fermilab employees who are exposed or potentially exposed to respirable crystalline silica shall receive Silica Hazard Awareness Training (Fermilab Course # FN000547).

4.11 Evaluation

This program shall be reviewed and evaluated for effectiveness at least annually, updating it as necessary.

5.0 REFERENCES

10 CFR 851
29 CFR 1926.1153 – OSHA Construction Standard for Respirable Crystalline Silica
29 CFR 1910.134 – OSHA Standard for Respiratory Protection
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs®) – 2017
FESHM 2060
FESHM 4150
FESHM 7010
FESHM 7020
Section 013100

6.0 TECHNICAL APPENDIX A – Guidance for Silica Work

(If the work activity is not on this list, contact the IH Group for assistance.)

Type of Work	Duration/Scope	Location (general)	Required Controls*	Notes
Grout/mortar mixing	≤ 7 bags	Inside or Outside	D	Keep employees upwind of dust when outdoors.
Grout/mortar mixing	> 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 (Refer to table below)	< 4 holes	Inside or outside	None	Use HEPA vacuum for housekeeping (no sweeping)
Hole drilling ≤ 1/4 in diameter (Refer to table below)	> 4 holes	Inside or outside	A or B	Use HEPA vacuum for housekeeping (no sweeping)
Hole drilling > 1/4 in diameter (Refer to table below.	Any	Inside or outside	A or B	B is for horizontal surfaces only
Coring	Any	Inside or Outside	B	Respirator required if using HEPA vacuum
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 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, 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				

Schedule to Empty Dust Recovery Systems On a Hammer Drill

Maximum Number of Holes That Can Be Drilled Before Emptying

	Bit Size (inches)						
Depth (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.