

CHAPTER 4 – AIR SAMPLING

GENERAL COMMENTS FOR INSTRUCTORS:

MIOSHA and OSHA require employers performing abrasive blasting with silica sand or who perform abrasive blasting on silica-containing substrates to assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level ($25 \mu\text{g}/\text{m}^3$). Employers have two options: a performance option or a scheduled monitoring option.

The performance option uses industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The main drawback of the performance option is that the data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

The scheduled monitoring option utilizes air sampling. For many employers, the best way to determine employee exposure to silica is to perform breathing zone personal air monitoring of employees performing the actual tasks.

Once the initial assessment is made, further air monitoring may be necessary if:

- the exposure is at or above the action limit
- the exposure is above the permissible exposure limit
- there is a change in the production, process, control equipment, personnel, or work practices that may reasonably be expected to result in new or additional exposures at or above the action level
- when the employer has any reason to believe that new or additional exposures at or above the action level have occurred.

Interpreting the results of air monitoring can often be confusing. Air sampling results determine worker exposure, can identify regulated areas (areas in excess of the PEL), and the selection of the appropriate respirator when engineering and/or work practice controls cannot lower the level of airborne respirable silica to the PEL. Workers performing abrasive blasting activities are required to wear Type CE continuous flow airline respirators, but other employees performing different tasks may need a different level of protection.

Workers should understand MIOSHA/OSHA air sampling methods and know why this sampling is done.

The following are questions designed to draw course participants into the material that will be covered in this section and to identify the participants' various experiences. Both the presenter and the participants should be active in applying the course material to their group and illustrating the general presentation with the specific experiences of the course members.

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- ① Has anyone ever conducted air sampling for silica?
 - a. How did you conduct the monitoring?
 - b. Who were you doing the monitoring for?
- ② Has anyone ever seen air monitoring results from an abrasive blasting job.
 - a. What did they say? Were you able to figure out what they mean?
 - b. Did anyone explain what the results mean?
- ③ Why is air monitoring done? What does it tell us?

It is important to note that the Silica standard requires that the employer ensures that all air samples taken to satisfy the silica standard's monitoring requirements are evaluated by a laboratory that analyzes air samples for respirable crystalline silica in accordance with the procedures in Appendix A of the Silica Standard.

AUDIO VISUAL AIDS:

- Air monitoring equipment presented by PPE salesman.
- Hands on demonstration of air sampling train.
- PowerPoint® Chapter 4

APPENDICES:

- Appendix IX: MIOSHA Occupational Health Standard Part 470 - Employee Medical Records and Trade Secrets.
- Appendix X: List of AIHA member industrial hygiene consultants in Michigan.

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IF YOU USE SILICA SAND AS AN ABRASIVE OR YOU PERFORM ABRASIVE BLASTING ON SILICA-CONTAINING SUBSTRATES, YOU MUST:

- ⇒ Evaluate employee exposure to crystalline silica
- ⇒ Notify workers of their monitoring results
- ⇒ Maintain air monitoring results

WHAT ARE THE LEGAL REQUIREMENTS?

It is not always easy to tell whether you or other employees are being exposed simply by looking around. Severe silicosis cases have occurred at companies that look quite clean. Remember, it is the respirable silica dust - the dust you cannot see - that enters the lung. People being affected do not know they are developing chronic silicosis until it is too late. Then the effects can be devastating for both you and the company.

Any employer using silica sand as an abrasive or performing abrasive blasting on a silica-containing substrate is required by law to assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level ($25\mu\text{g}/\text{m}^3$).

The employer may use one of two options to assess an employee's exposure to crystalline silica:

- performance option
- or
- scheduled monitoring option

- ⇒ **Performance option.** The employer assesses the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

What is Objective Data? “Objective data” means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Use Extreme Caution...if you use the performance option, this means you are going to use somebody else's exposure data. Your conditions have to be very, very similar. Did the manufacturer get the data out of a test lab/cell and you are in real world, out in the field,

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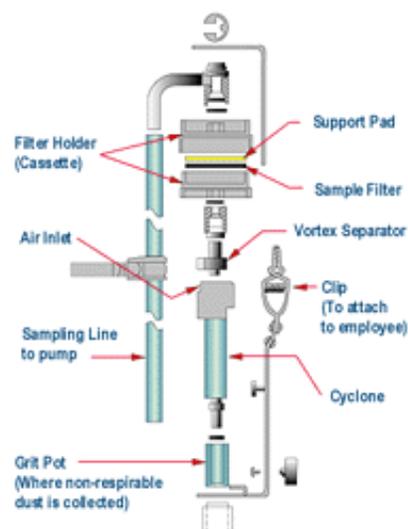
dirty hands to prove it type conditions? Then the conditions are not “closely resembling” the work place conditions of the data you are using for a comparison. You must confirm percent of silica, tools that were used, etc. What type of ventilation was used or wet methods, are these variables the same? Outside vs. inside, wind speed, environmental conditions... all of these are the variables that must match when you use objective data.

If you rely on objective data and the conditions and variables do not match, you most likely be issued a citation by MIOSHA enforcement personnel if an enforcement inspection is performed.

Best Practice: Develop your own data for the work that you do and use your own data on your other jobs that do “closely resemble” your previously sampled work conditions and environment.

⇒ **Scheduled monitoring option.** The employer performs initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Most frequently, personal breathing zone samples are obtained by using a cyclone assembly and sample pump.

- Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, the employer must sample the employee(s) who are expected to have the highest exposure to respirable crystalline silica.



Cyclone filter assembly

If initial monitoring indicates that employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

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WHEN IS ADDITIONAL EXPOSURE MONITORING REQUIRED?

- Employee exposures are \geq AL ($25\mu\text{g}/\text{m}^3$) and \leq PEL ($50\mu\text{g}/\text{m}^3$), repeat monitoring within six months of the most recent monitoring
- Employee exposures are $>$ PEL ($50\mu\text{g}/\text{m}^3$), repeat monitoring within three months of the most recent monitoring
- Most recent (non-initial) exposure monitoring: employee exposures $<$ AL ($25\mu\text{g}/\text{m}^3$), repeat monitoring within 6 months of the most recent monitoring until 2 consecutive measurements, taken 7 or more days apart, are $<$ AL ($25\mu\text{g}/\text{m}^3$), at which time the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring

⇒ **Employers must reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures \geq AL ($25\mu\text{g}/\text{m}^3$), or when the employer has any reason to believe that new or additional exposures at or above the action level have occurred.**

CAN ANY LABORATORY CONDUCT THE SAMPLE ANALYSIS?

NO. Only laboratories that analyze air samples for respirable crystalline silica using the procedures in Appendix A of the silica standard (A copy of Appendix A is at the end of this chapter) may be used. The **employer must ensure** that the samples are analyzed by a laboratory meeting this requirement.

EMPLOYEE NOTIFICATION OF EXPOSURE ASSESSMENT IS REQUIRED.

Within 15 working days after completing a silica exposure assessment, the employer must individually notify each employee in writing of the results of that assessment or post the results in an appropriate location accessible to all affected employees.

Whenever an exposure assessment indicates that employee exposure is above the PEL, the employer must also describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

Such information must be made available to any employee or their authorized representative (e.g., their physician, union rep, etc.).

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WHAT RECORDS DO I NEED TO KEEP REGARDING EXPOSURE ASSESSMENT?

The employer must keep records of air monitoring data, and if using objective data to assess employee exposure, specific records relating to that decision.

⇒ **Air monitoring data.** The employer is required to make and maintain an accurate record of all exposure measurements taken to assess employee exposure to respirable crystalline silica. The record must include at least the following information:

- The date of measurement for each sample taken;
- The task monitored;
- Sampling and analytical methods used;
- Number, duration, and results of samples taken;
- Identity of the laboratory that performed the analysis;
- Type of personal protective equipment, such as respirators, worn by the employees monitored; and
- Name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.
- Maintain and make available exposure records in accordance with 29 CFR 1910.1020. (i.e., MIOSHA Occupational Health Standard, Part 470 - Employee Medical Records and Trade Secrets).

⇒ **Objective data.** The employer is required to make and maintain an accurate record of all objective data relied upon when used to perform an initial assessment of an employee's exposure to respirable crystalline silica. The record must include at least the following information:

- The crystalline silica-containing material in question;
- The source of the objective data;
- The testing protocol and results of testing;
- A description of the process, task, or activity on which the objective data were based; and
- Other data relevant to the process, task, activity, material, or exposures on which the objective data were based.
- Maintain and make available objective data records in accordance with 29 CFR 1910.1020. (i.e., MIOSHA Occupational Health Standard, Part 470 - Employee Medical Records and Trade Secrets).

Both OSHA 29 CFR 1910.1020 and MIOSHA Occupational Health Standard, Part 470 - Employee Medical Records and Trade Secrets require that all employee exposure records be maintained for at least 30 years. See **Appendix IX**.

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WHERE CAN I FIND SOMEONE TO PERFORM AIR SAMPLING?

The basic choices are: MIOSHA Onsite Consultation Division, private industrial hygiene consultants, or your workers' compensation provider.

The American Industrial Hygiene Association (AIHA) is an international organization that serves the needs of occupational and environmental health professionals practicing industrial hygiene in industry, government, labor, academic institutions, and independent organizations.

As described on the AIHA website, “*Industrial Hygiene: Science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among citizens of the community.*”

AIHA further describes an industrial hygienist: Industrial hygienists are scientists and engineers committed to protecting the health and safety of people in the workplace and the community.

Appendix X contains a list of AIHA member companies in Michigan who perform air sampling, including contact information. You can also access the information by accessing the [AIHA webpage](#). Select:

- ⇒ Specialty: Asbestos, Lead, Dust,
- ⇒ State: Michigan,
- ⇒ Service Type: Commercial.

The full webpage Internet Address: [https://www.aiha.org/publications-and-resources/Pages/New-Consultants-Listing.aspx?k=AIHACLServiceTypes:%2228.%20Safety%22%20AND%20AIHACLStateIDName:%22MI%22%20AND%20\(AIHACLLocationName:%22B%22%20OR%20AIHACLLocationName:%22C%22%20OR%20AIHACLLocationName:%22R%22\)%20&Loc=B](https://www.aiha.org/publications-and-resources/Pages/New-Consultants-Listing.aspx?k=AIHACLServiceTypes:%2228.%20Safety%22%20AND%20AIHACLStateIDName:%22MI%22%20AND%20(AIHACLLocationName:%22B%22%20OR%20AIHACLLocationName:%22C%22%20OR%20AIHACLLocationName:%22R%22)%20&Loc=B)

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	AIR SAMPLING	WHAT TO DO
1	Choose whom you want to conduct the air sampling.	<p>Contact the industrial hygienist and set a meeting date for consultation. Obtain quote for services (if required).</p> <p>Ensure contracted laboratory meets the requirements of Appendix A.</p> <p>A list of Michigan industrial hygiene consultants is provided in Appendix X.</p>
2	Meet with the industrial hygienist and your H&S Committee to plan your air sampling strategy.	Make sure everyone understands what services will be expected and what the cost will be.
3	With everyone involved, make a list of the jobs, work areas and people to be included in the air sampling program.	Include all employees who are or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level (25 µg/m ³).
4	While the air sampling is being performed, help out with any on-site assistance.	Talk with your fellow employees about the importance of cooperating with the industrial hygienist during the air sampling.
5	Review the results. Do not discuss or share individual employee exposure results with other employees.	<p>Make sure the industrial hygienist provides a complete written report.</p> <p>Ask about any information that is unclear to you.</p> <p>Within 15 days, provide written notification of exposure results, and if necessary, identify engineering controls to the employee(s).</p>
6	If the results are higher than the current Permissible Exposure Limit (PEL), additional control measures are required.	These measures might include establishing a regulated area(s), alternative blasting medias, engineering controls, revised housekeeping, personal hygiene, and work practices.
7	File the sampling results, the industrial hygienist's written report and your notes so you can find them.	OSHA and MIOSHA require that this information be kept on file and available for 30 years.

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Notes

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SILICA STANDARD

APPENDIX A METHODS OF SAMPLE ANALYSIS

This appendix specifies the procedures for analyzing air samples for respirable crystalline silica, as well as the quality control procedures that employers must ensure that laboratories use when performing an analysis required under 29 CFR 1910.1053 (d)(5). Employers must ensure that such a laboratory:

1. Evaluates all samples using the procedures specified in one of the following analytical methods: OSHA ID-142; NMAM 7500; NMAM 7602; NMAM 7603; MSHA P-2; or MSHA P-7;
2. Is accredited to ANS/ISO/IEC Standard 17025:2005 with respect to crystalline silica analyses by a body that is compliant with ISO/IEC Standard 17011:2004 for implementation of quality assessment programs;
3. Uses the most current National Institute of Standards and Technology (NIST) or NIST traceable standards for instrument calibration or instrument calibration verification;
4. Implements an internal quality control (QC) program that evaluates analytical uncertainty and provides employers with estimates of sampling and analytical error;
5. Characterizes the sample material by identifying polymorphs of respirable crystalline silica present, identifies the presence of any interfering compounds that might affect the analysis, and makes any corrections necessary in order to obtain accurate sample analysis; and
6. Analyzes quantitatively for crystalline silica only after confirming that the sample matrix is free of uncorrectable analytical interferences, corrects for analytical interferences, and uses a method that meets the following performance specifications:
 - 6.1 Each day that samples are analyzed, performs instrument calibration checks with standards that bracket the sample concentrations;
 - 6.2 Uses five or more calibration standard levels to prepare calibration curves and ensures that standards are distributed through the calibration range in a manner that accurately reflects the underlying calibration curve; and
 - 6.3 Optimizes methods and instruments to obtain a quantitative limit of detection that represents a value no higher than 25 percent of the PEL based on sample air volume.