WACA
WALL AND CEILING ALLIANCE

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January 29, 2018

Mr. Eric Berg, *Deputy Chief*
Division of Occupational Safety and Health
Department of Industrial Relations
1515 Clay Street, Suite 1901
Oakland, CA 94612

Dear Mr. Berg:

The Wall and Ceiling Alliance (WACA) is comprised of drywall and plaster contractors and associate members. WACA's contracting members make up one of the most highly skilled and experienced union work forces in Northern California and in the United States.

WACA and its members are strongly committed to worker safety and health, and from this dedication we embarked on an effort to provide the support and resources to our member contractors so they can comply with California Code of Regulations Title 8, § 1532.3.

In anticipation of the revised Respirable Crystalline Silica regulation in California taking effect, the WACA Safety committee reviewed the proposed regulation and after considerable discussion decided on a collaborative approach that would benefit all WACA members rather than individual members trying to achieve compliance on their own. The committee was supported by the Wall and Ceiling Bureau, which is a non-profit drywall, lath and plaster technical organization providing technical support to our union wall and ceiling contractors.

Since Table 1 in the regulation does not contain construction work tasks performed by WACA members, we identified thirty-one (31) tasks common to our contractors and obtained air sampling data that, we believe, constitutes *objective data.* Sampling for these tasks was performed by member's worker compensation insurance companies, The Cohen Group, or other qualified professionals.

Attached is our model program – "Respirable Crystalline Silica Program" which provides a framework for our contractor members. Note that this document is copyrighted as described on page one.

Key elements include:

- Purpose
- Scope
- Responsibilities
- Definitions
- Requirements
- Alternative Exposure Control Methods
- Control Methods
- Respiratory Protection
- Housekeeping
- Written Exposure Plan
- Medical Surveillance
- Hazard Communication
- Recordkeeping
- Program Evaluation

Please note that Appendix A (The Cohen Group's Report of Findings) is attached to the program, while Appendix B (Silica Written Exposure Control Plan) is contained in the body of the program.

We appreciate the commitment you made to our safety consultant, Chris Lee, in late August to have our model program reviewed and to provide us with the Division's assessment/feedback.

Thank you very much for assisting WACA to inform our members, and through that process foster compliance with the revised regulation.

Sincerely,

Frank E. Nunes
Chief Executive Officer

Attachment

September 2017
1st Edition

Respirable Crystalline Silica Program

WRITTEN EXPOSURE CONTROL PLAN
FOR:

WALL & CEILING CONFERENCE

WWW.WCCINFO.ORG

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Respirable Crystalline Silica Program

PURPOSE

This Respirable Crystalline Silica Program was developed to prevent employee exposure to hazardous levels of Respirable Crystalline Silica that could result through construction activities or nearby construction activities occurring on worksites. Respirable Crystalline Silica exposure at hazardous levels can lead to lung cancer, silicosis, chronic obstructive pulmonary disease, and kidney disease. It is intended to meet the requirements of the Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153) established by the Occupational Safety and Health Administration (OSHA AND CAL/OSHA). (Title 8, Division 1, Chapter 4, Section 1532.3) established by the State of California Occupational Safety and Health Administration (OSHA AND CAL/OSHA).

All work involving chipping, cutting, drilling, grinding, or similar activities on materials containing Crystalline Silica can lead to the release of respirable-sized particles of Crystalline Silica (i.e. Respirable Crystalline Silica). Crystalline Silica is a basic component of soil, sand, granite and many other minerals. Quartz is the most common form of Crystalline Silica. Many materials found on constructions sites include Crystalline Silica; including but not limited to – cement, concrete, asphalt, pre-formed structures (inlets, pipe, etc.) and others. Consequently, this program has been developed to address and control these potential exposures to prevent our employees from experiencing the effects of occupational illnesses related to Respirable Crystalline Silica exposure.

SCOPE

This Respirable Crystalline Silica Program applies to all employees who have the potential to be exposed to Respirable Crystalline Silica when covered by the OSHA AND CAL/OSHA Standard. The OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard applies to all occupational exposures to Respirable Crystalline Silica in construction work, except where employee exposure will remain below 25 micrograms of Respirable Crystalline Silica per cubic meter of air (25 $\mu g/m^3$) as an 8-hour time-weighted average (TWA) under any foreseeable conditions.

RESPONSIBILITIES

firmly believes protecting the health and safety of our employees is everyone's responsibility. This responsibility begins with upper management providing the necessary support to properly implement this program. However, all levels of the organization assume some level of responsibility for this program including the following positions.

- Conduct job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments to determine if an employee's exposure will be above 25 µg/m^3 as an 8-hour TWA under any foreseeable conditions.

- Select and implement into the project's Exposure Control Plan (ECP) the appropriate control measures (see appendix B, Site Specific ECP) in accordance with the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and technical assistance.

  NOTE: OSHA AND CAL/OSHA 's Construction Standard Table 1 is a list of 18 common construction tasks along with acceptable exposure control methods and work practices that limit exposure for those tasks.

- Ensure that the materials, tools, equipment, personal protective equipment (PPE), and other resources (such as worker training) required to fully implement and maintain this Respirable Crystalline Silica Program are in place and readily available if needed. (Also, see Appendix A for certified Industrial Hygienist test data).

- Ensure that supervisory personnel and employees are educated in the hazards of Silica exposure and trained to work safely with Silica in accordance with OSHA AND CAL/OSHA 's Respirable Crystalline Silica Construction Standard and OSHA AND CAL/OSHA 's Hazard Communication Standard. Supervisory personnel may receive more advanced training than other employees.

- Maintain written records of training (for example, proper use of respirators), ECPs, inspections (for equipment, PPE, and work methods/practices), medical surveillance (under lock and key), respirator medical clearances (under lock and key).

- Conduct an annual review (or more often if conditions change) of the effectiveness of this program and any active project ECP's that extend beyond a year. This includes a review of available dust control technologies to ensure these are selected and used when practical.

- Coordinate work with other employers and contractors to ensure a safe work environment relative to Silica exposure.

PROJECT MANAGER AND OR SUPERVISOR :

- Ensure all applicable elements of this Respirable Crystalline Silica Program are implemented on the project including the selection of a Competent Person.

- Assist the Safety Department in conducting job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.

- Assist in the selection and implementation of the appropriate control measures in accordance with the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and technical assistance.

- Ensure that employees using respirators have been properly trained, medically cleared, and fit-tested in accordance with the company's Respiratory Protection Program. This process will be documented.

- Ensure that work is conducted in a manner that minimizes and adequately controls the risk to workers and others. This includes ensuring that workers use appropriate engineering controls, work practices, and wear the necessary PPE.

- Where there is risk of exposure to Silica dust, verify employees are properly trained on the applicable contents of this program, the project-specific ECP, and the applicable OSHA AND CAL/OSHA Standards (such as Hazard Communication). Ensure employees are provided appropriate PPE when conducting such work.

COMPETENT PERSON AND/OR SITE MANAGER (SUPERINTENDENT, FOREMAN, ETC.)

- Make frequent and regular inspections of job sites, materials, and equipment to implement the written ECP.

- Identify existing and foreseeable Respirable Crystalline Silica hazards in the workplace and take prompt corrective measures to eliminate or minimize them.

- Notify the Project Manager and/or Safety Department of any deficiencies identified during inspections in order to coordinate and facilitate prompt corrective action.

- Assist the Project Manager and Safety Department in conducting job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.

EMPLOYEES:

- Follow recognized work procedures (such as the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1) as established in the project's ECP and this program.
- Use the assigned PPE in an effective and safe manner.
- Participate in Respirable Crystalline Silica exposure monitoring and the medical surveillance program if applicable.
- Report any unsafe conditions or acts to the Site Manager and/or Competent Person immediately.
- Report any exposure incidents or any signs or symptoms of Silica illness immediately.

DEFINITIONS

If a definition is not listed in this section, please contact your supervisor. If your supervisor is unaware of what the term means, please contact the Competent Person or your Safety Department.

- Action Level means a concentration of airborne Respirable Crystalline Silica of 25 µg/m^3, calculated as an 8-hour time weighted average (TWA).
- Competent Person means an individual who is capable of identifying existing and foreseeable Respirable Crystalline Silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.
- Employee Exposure means the exposure to airborne Respirable Crystalline Silica that would occur if the employee were not using an approved respirator.
- High-Efficiency Particulate Air (HEPA) Filter means a filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 micrometers in diameter.
- 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 (See appendix A). 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.

- Permissible Exposure Limit (PEL) means the employer shall ensure that no employee is exposed to an airborne concentration of Respirable Crystalline Silica in excess of 50 µg/m^3, calculated as an 8-hour TWA.
- Physician or Other Licensed Health Care Professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by the Medical Surveillance Section of the OSHA AND CAL/OSHA Respirable Crystalline Silica Standard.
- Respirable Crystalline Silica means Quartz, Cristobalite, and/or Tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality-Particle Size Fraction Definitions for Health-Related Sampling.
- Specialist means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

REQUIREMENTS

SPECIFIED EXPOSURE CONTROL METHODS

When possible and applicable, will conduct activities with potential Silica exposure to be consistent with OSHA AND CAL/OSHA 's Construction Standard Table 1. Supervisors will ensure each employee under their supervision and engaged in a task identified on OSHA AND CAL/OSHA 's Construction Standard Table 1 have fully and properly implemented the engineering controls, work practices, and respiratory protection specified for the task on Table 1 (unless has assessed and limited the exposure of the employee to Respirable Crystalline Silica in accordance with the Alternative Exposure Control Methods Section of this program).

Activity:

Hand held rotary hammer drills used to penetrate concrete.

The Northwest Wall and Ceiling Bureau (NWCB), in conjunction with the Technical Services Information Bureau (TSIB) of Southern California, the Wall and Ceiling Bureau (WCB) of Northern California and the Washington State Department of Labor & Industries (L&I), who collectively make up the Wall and Ceiling Conference (WCC), have conducted air monitoring sampling of the following activity.

Air monitoring of Rotary hammer or Roto-hammer activities into concrete surfaces were performed with and without a vacuum or dust collection system.
Air monitoring without the vacuum assist determined that the Permissible Exposure Limit (PEL) for dust exceeded the 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica exceeded 25 µg/m³ as an 8-hour time-weighted average (TWA).
Air monitoring with the vacuum assist determined that the Permissible Exposure Limit (PEL) for dust was below 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica was below 25 µg/m³ as an 8-hour time-weighted average (TWA).

Roto-hammer activities will be performed in compliance with Table 1 Item #7

Equipment/Task:

Handheld and stand-mounted drills (including impact and rotary hammer drills)

Engineering and Work Practice Control Methods:

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.

Required respiratory Protection and Minimum Assigned Protection Factor (APF)

≤ 4 hours/shift	***≥ 4 hours/shift***
None	*None*

(SEE APPENDIX A)

Table 1: Specified Exposure Control Methods When

Working With Materials Containing Crystalline Silica

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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
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	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	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	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	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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
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	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.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
		• 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.		
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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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 air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None	None
14	Small drivable milling machines (less than half-lane)	• Use a machine equipped with supplemental water sprays designed to suppress dust. • Water must be combined with a surfactant. • Operate and maintain machine to minimize dust emissions.	None	None
15a	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
15b	Large drivable milling machines (half-lane and larger) 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
15c	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	• 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
16	Crushing machines	• 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). • Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. • Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.	None	None

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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	• Operate equipment from within an enclosed cab.	None	None
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	• When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18a	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.	None	None
18b	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	• When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

When implementing the control measures specified in Table 1, shall:

- 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 and or negative pressure maintained through continuous delivery of fresh air, depending on the task;
    - Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
    - Has heating and cooling capabilities.

- Where an employee performs more than one task included on OSHA AND CAL/OSHA ’s Construction Standard Table 1 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 Table 1 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.

ALTERNATIVE EXPOSURE CONTROL METHODS

Alternative Exposure Control Methods apply for tasks not listed in OSHA AND CAL/OSHA ’s Construction Standard Table 1, including test data in Appendix A, where cannot not fully and properly implement the engineering controls, work practices, and respiratory protection described in Table 1 and test data in Appendix A.

First, will 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 in accordance with either the Performance Option or the Scheduled Monitoring Option.

- **Performance Option** – will assess 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.

- **Scheduled Monitoring Option:**

  - will perform 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, and in each work area. Where several employees perform the same tasks on the same shift and in the same work area, will plan to monitor a representative fraction of these employees. When using representative monitoring, will sample the employee(s) who are expected to have the highest exposure to Respirable Crystalline Silica.

  - If initial monitoring indicates that employee exposures are below the Action Level, will probably discontinue monitoring for those employees whose exposures are represented by such monitoring. The data will be added to Appendix A at the time of the annual review and documented.

  - Where the most recent exposure monitoring indicates that employee exposures are at or above the Action Level but at or below the PEL, will repeat such monitoring within six months of the most recent monitoring.

  - Where the most recent exposure monitoring indicates that employee exposures are above the PEL,
  - will repeat such monitoring within three months of the most recent monitoring.

  - Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the Action Level, will repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the Action Level, at which time will probably discontinue monitoring for those employees whose exposures are represented by such monitoring, except when a reassessment is required. will 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 at or above the Action Level, or when has any reason to believe that new or additional exposures at or above the Action Level have occurred.

will ensure that all Respirable Crystalline Silica samples taken to satisfy the monitoring requirements of this program and OSHA AND CAL/OSHA are collected by a qualified individual (i.e. a Certified Industrial Hygienist) and the samples are evaluated by a qualified laboratory (i.e. 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).

Within five working days after completing an exposure assessment, will individually notify each affected 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, will describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL, documented in the site specific ECP.

Where air monitoring is performed, will provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to Respirable Crystalline Silica. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard, will provide the observer with protective clothing and equipment at no cost and shall ensure that the observer uses such clothing and equipment.

Once air monitoring has been performed, will determine its method of compliance based on the monitoring data and the hierarchy of controls. will use engineering and work practice controls to reduce and maintain employee exposure to Respirable Crystalline Silica to or below the PEL, unless can demonstrate that such controls are not feasible. Wherever such feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, will nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them with the use of respiratory protection.

In addition to the requirements of this program, will comply with other programs and OSHA (such as 29 CFR 1926.57 [Ventilation]), AND CAL/OSHA standards (T8 Subchapter 4, Article 4 SS 1530.1) when applicable where abrasive blasting is conducted using Crystalline Silica-containing blasting agents, or where abrasive blasting is conducted on substrates that contain Crystalline Silica.

Alternate Exposure Control Method, Air Monitoring:

The Northwest Wall and Ceiling Bureau (NWCB), in conjunction with the Washington State Department of Labor & Industries (L&I), the Wall and Ceiling Bureau(WCB) of Northern California and the Technical Services Information Bureau (TSIB) of Southern California who collectively make up the Wall and Ceiling Conference (WCC) have conducted air monitoring sampling of the following activities. Air monitoring results of these activities have determined that the Permissible Exposure Limit (PEL) for dust was below 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica was below 25 µg/m³ as an 8-hour time-weighted average (TWA). Air monitoring conducted by the NWCB, the Department of Labor & Industries, WCB and TSIB is permissible data as allowed by OSHA AND CAL/OSHA Objective Data. OBJECTIVE *DATA is verifiable 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. OSHA Chapter 1926.1153(d)(2)(iii)(B), AND CAL/OSHA Title* 8, Division 1, Chapter 4, Section 1532.3 *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.*

Activities:

- Power chop-saws used to cut light gauge metal framing members.
- Installation of gypsum board, including the use of screw-guns.
- Handheld routers for cutting gypsum board.
- Mudding and/or taping activities.
- Hand, pole or vacuum sanding of gypsum board surfaces.
- Housekeeping or sweeping of floors with sweeping compounds.
- Mixing and spraying of fireproofing

(SEE APPENDIX A)

CONTROL METHODS

will provide control methods that are either consistent with Table 1 or otherwise minimize worker exposures to Silica. These exposure control methods can include engineering controls, work practices, and respiratory protection. Listed below are control methods to be used when Table 1 is not followed **(LIST AND DISCUSS CONTROL METHODS BELOW, for example:** HEPA-vacuum, air scrubbers with HEPA filter, etc.):

EXAMPLES:

RESPIRATORY PROTECTION

Where respiratory protection is required by this program, will provide each employee an appropriate respirator that complies with the requirements of the company's Respiratory Protection Program and the OSHA Standard (29 CFR 1910.134) and CAL/OSHA (Subchapter 7. Group 16. Article 107. §5144.)

Respiratory protection is required where specified by the OSHA AND CAL/OSHA Construction Standard Table 1, for tasks not listed in Table 1, or where the company has not fully and properly implemented the engineering controls, work practices, and respiratory protection described in Table 1, (and Appendix A) Situations requiring respiratory protection include:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;

- Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible; and

- During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL.

HOUSEKEEPING

does not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to Respirable Crystalline Silica unless wet sweeping, HEPA-filtered vacuuming, Sweeping compound, or other methods that minimize the likelihood of exposure are not feasible.

does not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to Respirable Crystalline Silica unless:

- The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
- No alternative method is feasible.

WRITTEN EXPOSURE CONTROL PLAN

When employee exposure on a construction project is expected to be at or above the Action Level, a Written Exposure Control Plan (ECP) will be established and implemented (*See Appendix B*). This ECP will contain at least the following elements:

- A description of the tasks in the workplace that involve exposure to Respirable Crystalline Silica;
- A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to Respirable Crystalline Silica for each task;
- A description of the housekeeping measures used to limit employee exposure to Respirable Crystalline Silica; and

- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to Respirable Crystalline Silica and their level of exposure, including exposures generated by other employers or sole proprietors.

The written ECP will designate a Competent Person to make frequent and regular inspections of job sites, materials, and equipment to ensure the ECP is implemented.

The written ECP will be reviewed at least annually to evaluate the effectiveness of it and update it as necessary. Having said this, ECP's are project specific and most project durations do not exceed a year. The written ECP will be readily available for examination and copying, upon request, to each employee covered by this program and/or ECP, their designated representatives, and OSHA AND CAL/OSHA.

MEDICAL SURVEILLANCE

Medical surveillance will be made available for each employee who will be required to use a respirator for 30 or more days per year due to their Respirable Crystalline Silica exposure. Medical surveillance (i.e. medical examinations and procedures) will be performed by a PLHCP and provided at no cost to the employee at a reasonable time and place.

will make available an initial (baseline) medical examination within 30 days after initial assignment, unless the employee has received a medical examination that meets the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard within the last three years. The examination shall consist of:

- A medical and work history, with emphasis on past, present, and anticipated exposure to Respirable Crystalline Silica, dust, and other agents affecting the respiratory system in addition to any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing), history of tuberculosis, and smoking status and history;

- A physical examination with special emphasis on the respiratory system;

- A chest X-ray (a single postero-anterior radiographic projection or radiograph of the chest at full inspiration recorded on either film [no less than 14 x 17 inches and no more than 16 x 17 inches] or digital radiography systems) interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconiosis by a NIOSH-certified B Reader;

- A pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) and FEV1/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;

- Testing for latent tuberculosis infection; and

- Any other tests deemed appropriate by the PLHCP.

will make available medical examinations that include the aforementioned procedures (except testing for latent tuberculosis infection) at least every three years. If recommended by the PLHCP, periodic examinations can be more frequently than every three years.

will ensure that the examining PLHCP has a copy of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard, this program, and the following information:

- A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to Respirable Crystalline Silica;

- The employee's former, current, and anticipated levels of occupational exposure to Respirable Crystalline Silica;

- A description of any personal protective equipment (PPE) used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of .

will ensure that the PLHCP explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical examination performed. The written report shall contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;

- Any recommended limitations on the employee's use of respirators;

- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and;

- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

will also obtain a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion shall contain only the following in order to protect the employee's privacy:

- The date of the examination;

- A statement that the examination has met the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard; and

- Any recommended limitations on the employee's use of respirators.

If the employee provides written authorization, the written opinion shall also contain either or both of the following:

- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and/or

- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

If the PLHCP's written medical opinion indicates that an employee should be examined by a Specialist, will make available a medical examination by a Specialist within 30 days after receiving the PLHCP's written opinion. will ensure that the examining Specialist is provided with all of the information that the employer is obligated to provide to the PLHCP.

will ensure that the Specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report will contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;

- Any recommended limitations on the employee's use of respirators; and

- Any recommended limitations on the employee's exposure to respirable crystalline Silica.

In addition, will obtain a written opinion from the Specialist within 30 days of the medical examination. The written opinion shall contain the following:

- The date of the examination;

- Any recommended limitations on the employee's use of respirators; and

- If the employee provides written authorization, the written opinion shall also contain any recommended limitations on the employee's exposure to Respirable Crystalline Silica.

will include Respirable Crystalline Silica in the company's Hazard Communication Program established to comply with the OSHA AND CAL/OSHA Hazard Communication Standard (29 CFR 1910.1200). Subchapter 7. Group 16. Article 109. §5194. Hazard Communication

will ensure that each employee has access to labels on containers of Crystalline Silica and those containers respective Safety Data Sheets (SDS's).

All employees will be trained in accordance with the provisions of the OSHA AND CAL/OSHA Hazard Communication Standard and the Training Section of this program. This training will cover concerns relating to cancer, lung effects, immune system effects, and kidney effects.

will ensure that each employee with the potential to be exposed at or above the Action Level for Respirable Crystalline Silica can demonstrate knowledge and understanding of at least the following:

- The health hazards associated with exposure to Respirable Crystalline Silica;
- Specific tasks in the workplace that could result in exposure to Respirable Crystalline Silica;
- Specific measures has implemented to protect employees from exposure to Respirable Crystalline Silica, including engineering controls, work practices, and respirators to be used;
- The contents of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard;
- The identity of the Competent Person designated by ; and
- The purpose and a description of the company's Medical Surveillance Program.

will make a copy of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard readily available without cost to any employee who requests it.

RECORDKEEPING

will make and maintain an accurate record of all exposure measurements taken to assess employee exposure to Respirable Crystalline Silica (See Appendix A). This record will 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 (PPE), 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.

will ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020 and Cal-Osha Title 8, Section 5100, Recordkeeping. Exposure records will be kept for at least 30 years.

The employer shall make and maintain an accurate record of all objective data relied upon to comply with the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard. This record shall 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.

will ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020 and Cal-Osha Title 8, Section 5100, Recordkeeping. Objective data records will be kept for at least 30 years.

will make and maintain an accurate record for each employee enrolled in the Medical Surveillance portion of this program. The record shall include the following information about the employee:

- Name and social security number;

- A copy of the PLHCPs' and/or Specialists' written medical opinions; and

- A copy of the information provided to the PLHCPs and Specialists.

will ensure that medical records are maintained and made available in accordance with 29 CFR 1910.1020. and Title 8, section 3204 Medical records will be kept under lock and key for at least the duration of employment plus 30 years. It is necessary to keep these records for extended periods because Silica-related diseases such as cancer often cannot be detected until several decades after exposure. However, if an employee works for an employer for less than one year, the employer does not have to keep the medical records after employment ends, as long as the employer gives those records to the employee.

PROGRAM EVALUATION

This program will be reviewed and evaluated on an annual basis by the Safety Department unless changes to operations, the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153), (Title 8, Section 1532.3), or another applicable OSHA AND CAL/OSHA Standard require an immediate re-validation of this program.

Appendix A

(SEE ATTACHMENTS)

Appendix B

Silica Written Exposure Control Plan

Company: _____ Date: _____

Person Completing the Plan, Title: _____

Competent Person: _____

Job site/location: _____

Description of Task: _____

_____

_____

(Routine task, new task, Indoors/outdoors, task found on Table 1 and or *Appendix A*)

Engineering Controls: _____

_____

_____

Any deviation from Table 1 = air monitoring is required. Engineering controls must be used at all times!

(Wet methods, continuous water feed, local exhaust ventilation w/ HEPA filters, commercially available shrouds, commercial dust collection system, cyclone pre-separator/filter cleaning system, surfactant used, and ventilation ≥ 25 cfm/inch of wheel diameter, enclosed cab w/ fresh climate controlled air to operator, employees outside of cabs applying water/dust suppressants, equipment maintained to minimize dust emissions.)

Work Practices: _____

_____

_____

(Maintain equipment functionality – cleaned/spare filters, hoses to start; good connections; hoses with no holes, kinks, permanent bends, crushed; power source available; water source available, ensure ventilation is ≥ 25 cfm/inch of wheel diameter; water/exhaust ventilation lines safe from damage; shrouds/cowls fit correctly and not damaged; follow Manufacturer's instruction for filter cleaning/change out.)

Respiratory protection: _____

_____

(e.g. Use respirator with APF = 10 the entire time the task is being performed – See Table 1)

See Part 451 – Respiratory Protection rule (1910.134) And Title 8, Section5144 for information on selection, training and fit testing requirements, and proper use instruction for respirators (i.e., no facial hair interfering with the respirator sealing surface).

Housekeeping: _____

_____

(Dust containing silica on work surfaces/equipment must be cleaned up using wet methods or HEPA equipped vacuum, No use of compressed air or dry sweeping for removing dust and debris containing silica, dispose of used vacuum bags in a closed sealed container).

Procedures Used to Restrict Access to Work Area (Construction = required, GI = optional):

_____

_____

(Signage, barricades, enclosures, spotters, work when area is cleared of other contractors to reduce risk of exposure.)

Objective data use (Optional) – Yes or NO

Data Source: _____

_____

Data conditions from the source is equal to or more extreme than actual work conditions? Yes or No

(Conditions, equipment, process, controls, material silica %, environmental.)

Review this plan with all involved employees.

Keep a copy of this plan at the jobsite.

Provide this plan of action to the General Contractor.

Review and update annually.

Additional Notes:

WALL AND CEILING CONFERENCE (WCC)

NORTHWEST WALL AND CEILING BUREAU (NWCB)
2825 Eastlake Avenue East Suite 350, Seattle, WA 98102 (206) 524-4243
www.nwcb.org

TECHNICAL SERVICES INFORMATION BUREAU (TSIB)
1910 North Lime Street, Orange, CA 92865 (714) 221-5530
www.tsib.org

WALL AND CEILING BUREAU (WCB)
5690 Sonoma Drive, Pleasanton, CA 94566 (925) 600-0472
www.wallandceilingbureau.org

Appendix A

Environmental Health & Safety Services

THE COHEN GROUP

REPORT OF FINDINGS

AIR MONITORING FOR RESPIRABLE DUST AND SILICA

WALL & CEILING CONFERENCE
5690 SONOMA DRIVE
PLEASANTON, CALIFORNIA

Project No. 17183

Survey Dates: October 10-11, November 30, and December 23, 2016
February 26, April 21, and August 25, 2017

Report Date: September 22, 2017

Prepared For: Wall & Ceiling Conference

Prepared By: Dustin Christensen, MPH
The Cohen Group

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THE COHEN GROUP

REPORT OF FINDINGS

AIR MONITORING FOR RESPIRABLE DUST AND SILICA

WALL & CEILING CONFERENCE 5690 SONOMA DRIVE PLEASANTON, CALIFORNIA

INTRODUCTION

The Cohen Group conducted air monitoring surveys in the San Francisco Bay Area on October 10 and 11, November 30, and December 23, 2016 as well as February 26, April 21, and August 2017. The surveys were conducted by Sarah Llanes and Dustin Christensen, MPH of The Cohen Group. The purpose of the surveys were to characterize and determine the extent of employee exposures to respirable particulates and silica during various drywall and plastering work activities and tasks.

The tasks selected for monitoring to determine respirable dust and silica exposure included:

1. Overhead drilling into metal pan and concrete decking during interior framing work
2. Cutting, rasping and hanging interior drywall
3. Hand and power sanding of joint compound and drywall
4. Use of a powered chop saw to cut metal framing
5. Mixing and hand application of exterior plaster
6. Laborer activities handling trade materials and cleaning up construction debris

The air-monitoring surveys presented in this report were conducted at the construction site of a new healthcare facility in the San Francisco Bay Area. The new facility will be three floors and cover over 200,000 square feet when complete. The drywall and plaster subcontractor for the new facility gave permission to The Cohen Group to perform air-monitoring during their employees work activities and to provide the air-monitoring results to the Wall & Ceiling Conference. Sampled tasks represent typical operations and work methods employed by other drywall contractors

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LIMITATIONS

The Cohen Group has prepared this report for the exclusive use of Wall & Ceiling Conference for this particular project. This report reflects conditions in existence at the jobsite on the survey dates. The findings are based on work site conditions and work activities at the time of the surveys and on information provided by Wall & Ceiling Conference employees and member companies. Findings are limited by the accuracy and precision of the sampling and analytical methodologies and instrumentation employed, as well as by the number of samples collected and the number of measurements taken. However, to the best of our knowledge, the findings constitute a reasonable and accurate assessment of potential worker exposures to airborne concentrations of respirable particulates and silica while performing monitored activities under the conditions encountered. No other representation, warranty or guarantee, expressed or implied, is included or intended.

Measured levels of airborne contaminants will vary during the course of and between individual days of project work. Some of the factors influencing airborne contaminant levels include engineering controls (such as exhaust ventilation), environmental conditions (such as temperature, humidity, wind speed, and direction), and the location and timing of individual measurements.

DESCRIPTION OF WORK ACTIVITIES MONITORED

Overhead Drilling into Concrete Decking

Personal and area air samples were collected over two work shifts (October 10 and December 23, 2016) while an apprentice and a journeyman used rotohammers to drill into the overhead metal pan concrete decking for the installation of soffit tracks as part of interior wall framing activities. The employees monitored used cordless rotary hammers with and without vacuum attachments (local exhaust ventilation). The monitored employees drilled three-eighth inch wide and 4-inch deep holes to install three-eighth inch anchor bolts into the overhead decking. The employees held the rotohammers and impact tools overhead while standing directly beneath the holes they were drilling as well as holding the tool out at arm's length away from their bodies while drilling overhead. The employees were working from scissor lifts in order to access the overhead decking on October 10th and were working on bench walks and scaffolding on December 23rd. When not performing overhead drilling, both workers were observed adjusting the scissor lift (i.e. height, angle, and location to work in), taking measurements, and tightening soffit tracks using hand tools. The work shifts were approximately 7:00AM to 3:00PM.

Two air samples were collected from each worker on each work shift. On October 10th one sample was collected for the full work shift and a second "worst-case" sample was collected on each worker during an approximate two-hour time period when the workers did continuous overhead drilling without taking breaks. On December 23rd sampling cassettes were positioned on the right shoulder and on the left shoulder of each worker in order to observe variation in sampling results depending on sample location. The local exhaust ventilation attachment on the

overhead drilling tools was not in use for the majority of the sampling period on October 10th but were in use the entire shift of December 23rd.

Both workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest), ear plugs (with a protection factor of 28 dB), N95 disposable particulate respirators, face shields, fall protection harnesses, work gloves, long pants, and work boots.

Interior Drywall Installation

Personal monitoring was conducted on eight workers during interior drywall installation activities on November 30, 2016. Monitoring was conducted from 7:00AM to 3:30PM of which interior drywall installation activities were performed between 7:30AM and 3:00PM.

Samples were collected from four journeymen who worked in two-man teams performing interior drywall installation and from four laborers who worked throughout the jobsite (indoors and outdoors). The laborers were observed performing work as a spotter/flagger for heavy equipment operators, moving metal materials, and sweeping general construction debris with the use of a sweeping compound, vacuuming dust from the previously installed tracks (using wet/dry vac), and applying foam fireproofing. According to the SDS for the drywall, the drywall contained less than six percent silica.

The interior drywall installation process observed can be described as follows:

1) Move drywall from materials pile to rock cart
2) Measure wall and drywall sheets
3) Cut drywall with a hand saw or utility knife and rasp the cut edges
4) Carry/hang drywall to designated spot before drilling into place
5) Cutting portions of hung drywall using a drywall router
6) Securing drywall to framing members with screw fasteners

Equipment, materials, and tools used by workers during the survey included: bench walks, scissor lifts, 12 foot by 4 foot and five-eighth inch thick drywall sheets, measuring tapes, cordless drywall guns with 1¼ inch screws, cordless power drills with 1½ inch rotor baits, hand sanders, hand saws, and box cutters.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest), ear plugs (with a protection factor of 28 dB), N95 disposable particulate respirators, work gloves, long pants, and work boots.

Drywall Finishing/Sanding Joint Compound and Chopsaw Activities

Samples were collected on three workers sanding drywall joint compound and four workers performing chopsaw activities on February 16, 2017. On the date of the survey, work was

performed from 7:00AM to 3:30PM with set-up activities and safety meetings for the first 30 minutes of the day and clean-up activities taking up the last 45 minutes of the work shift. Sanding of dried joint compound on drywall walls was performed by the three tapers in 10 foot by 12-foot rooms. Sanding was continuous throughout the day. Initial sanding was performed by two of the tapers each using a pole sander and the third taper performed finish sanding using a power sander equipped with a vacuum hose attachment for local exhaust ventilation and angle sponges in areas where the power sander could not access. According to the SDS, the joint compound contained less than six percent silica.

Three journeyman framers and one apprentice worked in two-man teams to install metal framing for interior walls on the survey date. Grinder/chopsaws were used to cut metal framing. The framers were observed cutting and installing metal framing for interior walls, handling materials (i.e. passing/carrying materials to their partners) and taking measurements.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest; framers), painters' whites (i.e. shirt, jeans; tapers), N95 particulate respirators (tapers), faceshields (framers), long pants, and work boots.

Exterior Plastering

Eight workers performing exterior plastering activities were observed and monitored on April 21, 2017. In addition, upwind and downwind area samples were collected near the plastering work. The scratch coat plaster mix consisted of a fiber base stucco product and a second material used to help ease the spread of the plaster. According to the SDS for the fiber base stucco product, the material contains 40 to 70% "sand, silica, quartz." The SDS for the second material lists silica content at less than six percent. On the survey date, the workers were mixing and hand applying the exterior plaster scratch coat to the penthouse on the roof of the new facility. The plaster scratch coat is the first layer of plaster applied to the exterior of the building. The mixing of the scratch coat plaster was performed outdoors on the roof and the plaster was hand applied by plasterers working on scaffolding. The monitored work day was from 7:00AM to 3:30PM of which exterior plastering activities were performed between 7:30AM and 2:45PM. The weather conditions were clear skies with no precipitation and no measurable wind.

Three hod carriers mixed and/or carried the scratch coat plaster to the plasterers. One hod carrier was observed mixing from 7:30AM to 10:45AM and a second hod carrier was observed mixing from 10:45AM to 2:45PM. Four plasterers performed exterior plastering application by hand-troweling on the plaster. One laborer assisted in materials handling for the plastering process.

The exterior plastering process observed can be described as follows:

1) Turn on the plaster/mortar mixer
2) Each batch of the scratch coat plaster contains six to eight, 80-pound sacks of the fiber base stucco material and one, 7-pound sack of the second material (sacks were opened using a pocketknife and dumped at the top of the mixer), and water (in that order).

3) Allow the materials to mix inside the mixer for 15 minutes with intermittent misting over the mixer using a water hose.
4) Pour mixed plaster scratch coat material from mixer into wheelbarrow.
5) Hod carrier delivered the stucco mixture via a wheelbarrow to each plasterer. The hod carrier then transferred the scratch coat plaster using a shovel directly onto the mudboard or placed the plaster in a 5-gallon bucket which was then hoisted by a rope pully to upper levels of scaffolding.
6) Plasterer obtains mixture from mudboard via hawk and trowel and applies onto wall.
7) After stucco mixture has been evenly applied onto the wall, a "scratcher" is used to create grooves for the scratch coat.
8) A margin trowel is used to even the coat in tight spaces.
9) The laborer assisting in the plastering process moved sacks of stucco from the ground level to the roof.

Equipment, materials, and tools used included: plaster/mortar mixer, water hose, fiber base stucco material, second bagged material to ease the spread of stucco, shovel, pulley, 5-gallon empty bucket, wheel barrow, hawk, trowel, scratcher, margin trowel, pocket knife, and mudboard.

On August 25th three workers were performing mixing and application of the exterior scratch coat on the south exterior wall of the medical facility using the same methods as described above. The plastering work occurred from approximately 7:30AM until 2:00 PM. The plastering crew consisted of one hod carrier who mixed the plaster and carried it to the two plasterers who were working on scaffolding. The weather conditions were clear skies with no precipitation and no measurable wind.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest; hod carriers), painters' whites (i.e. shirt, jeans; plasterers), faceshield and N95 particulate respirator (worn by the hod carriers when loading materials into the mixer), long pants, and work boots.

MONITORING METHODS

Air Monitoring

Personal and area air sampling for respirable particulates/silica was conducted using three-stage, matched-weight, 37-millimeter diameter, 5 µm pore size PVC membrane filters contained in plastic sampling cassettes fitted with SKC respirable dust (size-selective) aluminum cyclones. The cyclone separates sampled dust particles according to size so that respirable particles (10 microns and smaller) in the sampled air stream will collect on the filter. The sampling media was connected with Tygon tubing to calibrated, battery-operated personal sampling pumps.

Sampling air flow rates were set prior to and checked after monitoring to ensure consistent operation. Sample air volumes were calculated from the average measured flow rate and the duration of the sampling period. The sampling pumps were calibrated at a flowrate of approximately 2.5 liters of sampled air per minute (lpm) and the flowrate was confirmed at the end of the sampling period. Calibration was conducted with a TSI mass flow meter.

During personal sampling, the filter cassettes were attached to the worker's shirt at the shoulder (in the worker's breathing zone). During area sampling, the filter cassettes were positioned at a fixed location within the work area (at approximate breathing zone level, i.e., about 4.5 to five feet above the working surface). Full-shift air monitoring was conducted. In addition, "worst case" personal air samples for respirable particulates and silica were collected for a duration of time shorter than full-shift during overhead drilling activities.

Following sampling, the filter cassettes were sealed, labeled with a unique identifier and sent by courier to an independent American Industrial Hygiene Association-accredited laboratory. The samples were analyzed by National Institute for Occupational Safety and Health (NIOSH) Method 7500 (respirable silica) and Method 0600 (respirable particulates). Silica was analyzed by x-ray diffraction (XRD) and particulates were analyzed by gravimetric means.

Average airborne concentrations were calculated for each sample using the quantity of contaminant detected by the laboratory and the air volume collected for each sample during the survey.

REGULATORY STANDARDS

Airborne Exposure Limits

Under Title 8 CCR 5155, the California Occupational Safety and Health Administration (Cal/OSHA) has established Permissible Exposure Limits (PELs) for employee exposures to airborne contaminants based on an 8-hour, time weighted average exposure. PELs are set at levels where it is believed that nearly all workers can be repeatedly exposed 8-hours a day, 40 hours per week for a working lifetime without adverse health effects.

PEL values are typically expressed as an 8-hour time-weighted average (8-hour TWA); that is, an average airborne concentration for an 8-hour work day. If exposures are found to be in excess of the Cal/OSHA PEL, then the employer is required to implement control measures to reduce the exposures.

The Cal/OSHA PEL is 5 mg/m^3 for respirable particulates (not otherwise regulated) and 0.05 mg/m^3 for the respirable fraction of crystalline silica (quartz). Cal/OSHA has established an Action Level for respirable crystalline silica (quartz) at 0.025 mg/m^3. The Cal/OSHA PELs are the same as the newly adopted Fed/OSHA PELs for Silica in Construction standard.

FINDINGS

Results of the air monitoring are shown in more detail in the tables below but are summarized as follows:

Overhead Drilling in Concrete / Interior Wall Framing

Survey Date: October 10, 2016

- The two employees monitored each wore two sampling trains with one sample on each shoulder. One sample was a full-shift sample and the other was a shorter duration worst-case sample which was collected during an approximately two-hour period when the workers did not take any breaks. The vacuum exhaust attachment for the rotohammers were not in use for most of the sampling period.
- Sample results in mg/m^3 for respirable particulates for full-shift samples were 0.82 for the journeyman and 5.5 for the apprentice. During two-hour sampling under worst-case conditions, results were 0.62 for the apprentice and 5.2 for the journeyman. The full-shift sample results for the journeyman and the worst-case sample results for the apprentice were above the applicable Cal/OSHA PEL with the other sample results below the PEL.
- Sample results in mg/m^3 for respirable silica (quartz) for full-shift samples were 0.11 for the journeyman and 0.39 for the apprentice and 0.058 for the apprentice and 0.47 for the journeyman for the worst-case samples. All sample results were above the Cal/OSHA PEL and Action Level for respirable silica (quartz).

Survey Date: December 23, 2016

- The two employees monitored each wore two sampling trains with one sample on each shoulder in order to measure the variation in airborne concentration across the workers body. In addition, two area samples were collected. The vacuum exhaust attachment for the rotohammers was in use throughout the sampling period.
- Sample results in mg/m^3 for respirable particulates ranged from <0.023 to 1.2. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.011 to 0.094. The sample results from both shoulders of apprentice #1 were above the applicable Cal/OSHA Action Level but only the sample from the right shoulder was also above the Cal/OSHA PEL. The area sample results and sample results from both shoulders of apprentice #2 were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz). The difference in sample results was likely due to the continued use of local exhaust ventilation on the rotohammers during the second sampling survey.

Interior Drywall Hanging/Installation

Survey Date: November 30, 2016

- Sample results in mg/m^3 for respirable particulates ranged from 0.15 to 1.0. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0093 to 0.018. Silica (quartz) was detected above the laboratory limit of detection in just two of eight samples. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

Sanding Joint Compound and Interior Wall Framing

Survey Date: February 16, 2017

- Sample results in mg/m^3 for respirable particulates ranged from 0.25 to 2.7. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0090 to 0.018. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

Mixing and Hand Application of Exterior Plaster

Survey Date: April 21, 2017

- Sample results in mg/m^3 for respirable particulates ranged from <0.050 to 5.4. All but one of the samples collected were below the applicable Cal/OSHA PEL for respirable particulates. The sample collected from one of the hod carriers who performed plaster mixing was above the applicable PEL, however, the second hod carrier who also performed mixing of plaster showed sample results well below the PEL.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0086 to 0.025. All samples collected were below the applicable Cal/OSHA PEL and all but one sample collected was below the Cal/OSHA Action Level for respirable silica (quartz). A sample collected from one hod carrier showed results of 0.025 or concentration at the Cal/OSHA Action Level.

Survey Date: August 25, 2017

- Sample results in mg/m^3 for respirable particulates ranged from 0.085 to 1.5. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0057 to 0.014. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

CONCLUSIONS

1) There was a significant difference in respirable particulates from the first day (October 10) of overhead drilling to the second day (December 23) of overhead drilling. The vacuum attachment on the rotohammer was used on both sampling dates, with the exception of tight spaces (i.e. in between two studs) as encountered during the first overhead drilling date. The differences in concentrations collected from the same breathing zone indicate how handedness (i.e. worker being left-handed or right-handed), position of the drill over the worker, and worst-case (in which the worker's tasks likely produces the greatest exposure) may greatly affect where the concrete debris generated from the overhead drilling falls and the concentration of dust or silica exposure which the worker may potentially experience. That is a right-handed worker would likely have greatest exposure on the right side of the body as opposed to the left.

2) Results from respirable particulate sampling demonstrate that the Cal/OSHA PEL was exceeded for workers involved in overhead drilling and for one hod carrier involved in mixing exterior plaster. However, the sample results for the other hod carrier who performed nearly equal amounts of plaster mixing on the same survey date showed result concentrations well below the PEL. In addition, follow-up sampling of plaster mixing on a second survey date showed a result concentration well below the PEL. This wide variance in sample results may possibly be due to sample placement, a change in work methods such as using less water to suppress dust or possibly sample contamination. The sampling performed on both shoulders during overhead drilling showed that sample placement on the body can result in a significant difference in result concentrations due to concrete debris falling onto the worker or sample location.

3) Results from respirable silica sampling demonstrate that the Cal/OSHA PEL and Action Level was exceeded for workers involved in overhead drilling. Results from one hod carrier mixing plaster showed results at the Cal/OSHA Action Level. However, this sample result (for the hod carrier) did not include the approximate 30 minutes at the start of the shift when the crew did stretching and safety training which, if taken into account, reduces the workers TWA exposure concentration to below the Action Level. In addition, follow-up sampling showed concentrations from mixing exterior plaster outdoors to be below the PEL and Action Level.

4) Results from our sampling survey demonstrate that workers performing interior wall framing (excluding overhead drilling), hanging and sanding of drywall and joint compound, and hand application of exterior plaster are not exposed to respirable dust above the applicable Cal/OSHA PEL or to respirable silica above the Cal/OSHA PEL or Action Level.

RECOMMENDATIONS

1) Additional engineering controls such as water-spray or local exhaust ventilation attached to the equipment should be explored in order to reduce exposures to workers performing overhead drilling with the goal of bringing exposure concentrations below applicable PELs and Action Levels.

2) Air monitoring for particulate matter (including silica) should be repeated periodically to maintain documentation of workplace conditions and whenever a change in operating conditions may result in a significant change in employee exposure levels. Workplace evaluations should be conducted to determine potential operations or tasks where elevated dust levels may be found such as maintenance activities, clean-up operations, or during other work tasks.

3) With regards to workers who exceeded the action level to the new Cal/OSHA silica standard, new requirements that need to be met include: repeat monitoring within six months of the most recent monitoring for employee exposures at or above the AL but at or below the PEL; repeat monitoring within three months of the most recent monitoring for employee exposures above the PEL; and reassess exposures whenever there is a change in the work activities. A written Silica Exposure Control plan should be prepared in order to address employees potential exposures to silica.

4) We recommend performing additional air monitoring for workers performing plaster mixing and overhead drilling into concrete in order to obtain a larger data set to better understand exposure concentrations experienced by those workers. If possible, perform air monitoring with sampling cassettes attached to both shoulders of each worker to better identify the variance in result concentrations across the workers body.

5) We recommend performing air monitoring surveys for respirable dust and silica during plaster mixing if performed indoors and plaster application when performed using a spray-gun and pump.

Prepared By:

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Table 1A
Overhead Drilling into Concrete / Interior Framing
Collected/Sampled on: October 10, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal Carpenter Apprentice Full-shift	390	958.8	7.2	<0.38	<0.38	5.5	0.39	<0.021	<0.021
Personal Journeyman Full-shift	384	855.9	13.0	<2.8	<2.8	0.82	0.11	<0.023	<0.023
Personal Carpenter Apprentice Worse-case	168	427.6	9.4	<7.6	<7.6	0.62	0.058	<0.047	<0.047
Personal Journeyman Worse-case	169	423.6	9.0	<0.91	<0.91	5.2	0.47	<0.047	<0.047
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 1A Notes:

- "<" indicates "less than"
- NE indicates Not Established
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 1B
Overhead Drilling into Concrete / Interior Framing
Collected/Sampled on: October 10, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Person 1/Apprentice *5.5 hour shift* ** left lapel*	339	866.8	(6.9)	<5.3	<5.3	0.44	(0.030)	<0.023	<0.023
Person 1/Apprentice *5.5 hour shift* ** right lapel*	339	847.5	7.6	<1.9	<1.9	1.2	0.094	<0.024	<0.024
Area SE Scaffold *5.5 hour shift*	339	836.0	<35	<69	<69	0.035	<0.012	<0.024	<0.024
Person 2/Apprentice *5.5 hour shift* ** right lapel*	338	852.1	<5.1	<10	<10	0.23	<0.012	<0.023	<0.023
Personal 2/Apprentice ** left lapel*	338	847.2	<4.8	<9.7	<9.7	0.24	<0.012	<0.024	<0.024
Area NE Scaffold *5.5 hour shift*	338	869.8	NE	NE	NE	<0.023	<0.011	<0.023	<0.023
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 1A Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 2
Interior Drywall Hanging/Installation
Collected/Sampled on: November 30, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal Journeyman	414	935.0	(2.0)	<2.4	<2.4	0.90	(0.018)	<0.021	<0.021
Personal Journeyman	418	1070.7	<0.90	<1.8	<1.8	1.0	<0.0093	<0.019	<0.019
Personal Journeyman	405	1057.5	<1.2	<2.4	<2.4	0.77	<0.0095	<0.019	<0.019
Personal Journeyman	406	1007.3	<1.2	<2.3	<2.3	0.85	<0.0099	<0.020	<0.020
Personal Laborer	401	1016.9	<12	<23	<23	0.085	<0.0098	<0.020	<0.020
Personal Laborer	408	1024.7	(1.6)	<2.4	<2.4	0.81	(0.013)	<0.020	<0.020
Personal Laborer	409	1025.4	<6.5	<13	<13	0.15	<0.0098	<0.020	<0.020
Personal Laborer	409	1036.2	<3.8	<7.7	<7.7	0.25	<0.0097	<0.019	<0.019
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 2 Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 3
Drywall Finishing/Sanding Joint Compound/Cutting and Installing Interior Metal Framing
Collected/Sampled on: February 16, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal-Framer	467	1156.29	(1.9)	<2.3	<2.3	0.76	(0.015)	<0.017	<0.017
Personal-Framer	318	786.73	<4.3	<8.6	<8.6	0.29	<0.013	<0.025	<0.025
Personal-Framer	437	1115.44	<3.6	<7.3	<7.3	0.25	<0.0090	<0.018	<0.018
Personal-Apprentice Framer	431	993.02	<1.7	<3.4	<3.4	0.59	<0.010	<0.020	<0.020
Personal-Taper using power sander	351	900.84	(1.4)	<1.8	<1.8	1.2	(0.018)	<0.022	<0.022
Personal-Taper using pole sander	435	1140.35	(1.1)	<1.3	<1.3	1.4	(0.015)	<0.018	<0.018
Personal-Taper using pole sander	438	1108.58	(0.57)	<0.67	<0.67	2.7	(0.015)	<0.018	<0.018
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 3 Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 4A
Mixing and Hand Application of Exterior Plaster
Collected/Sampled on: April 21, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal -Hod Carrier (Mixed Plaster)	417	1098.38	(1.6)	<1.2	<1.2	1.5	(0.024)	<0.018	<0.018
Personal-Hod Carrier (Mixed Plaster)	458	1171.56	0.46	<0.31	<0.31	5.4	0.025	<0.017	<0.017
Personal-Hod Carrier	460	921.84	(2.3)	<3.3	<3.3	0.67	(0.015)	<0.022	<0.022
Personal-Plasterer	456	1139.77	<3.4	<6.7	<6.7	0.26	<0.0088	<0.018	<0.018
Personal-Plasterer	460	1161.04	(5.3)	<8.7	<8.7	0.20	(0.010)	<0.017	<0.017
Personal-Laborer	454	1150.21	<2.7	<5.3	<5.3	0.33	<0.0087	<0.017	<0.017
Personal-Foreman Plasterer	476	1266.87	<2.3	<4.6	<4.6	0.35	<0.0079	<0.016	<0.016
Personal-Plasterer	467	1176.37	(2.9)	<3.6	<3.6	0.47	(0.014)	<0.017	<0.017
Area - 10ft E of Mixer -Downwind	442	1088.65	<5.0	<10	<10	0.18	<0.0092	<0.018	<0.018
Area-10ft N of Mixer -Upwind	442	1161.80	<13	<27	<27	0.065	<0.0086	<0.017	<0.017
Area-10ft E of NE Wall / Moved @ 12:46PM 10ft S of S End	439	1106.28	<19	<39	<39	0.047	<0.0090	<0.018	<0.018
Area-10ft E of SE Wall	149	397.31	NA	NA	NA	<0.050	<0.025	<0.050	<0.050
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 4A Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- "NA" indicates "Not Applicable"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 4B
Mixing and Hand Application of Exterior Plaster
Collected/Sampled on: August 25, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated	Respirable Silica (Quartz)	Respirable Silica (Cristobalite)	Respirable Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal-Hod-Carrier (Mixed Plaster)	390	982.8	0.89	<0.34	<2.1	1.5	0.013	<0.0051	<0.031
Personal-Plasterer	364	928.2	1.3	<0.51	<3.1	1.1	0.014	<0.0054	<0.032
Personal-Plasterer	387	971.4	<1.0	<1.0	<6.1	0.51	<0.0051	<0.0051	<0.031
Area – 15 feet west of mixer	351	881.0	<6.7	<6.7	<40	0.085	<0.0057	<0.0057	<0.034
Area – One foot above mixer	354	881.5	1.0	<0.71	<4.3	0.80	0.0082	<0.0057	<0.034
Area – five feet east of mixer	246	620.0	<8.6	<8.6	<52	0.094	<0.0081	<0.0081	<0.048
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 4B Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Air Monitoring Strategy and Protocols
September 22, 2017
Prepared by Dustin Christensen, MPH and Tim Bormann, CIH, FAIHA of The Cohen Group

INTRODUCTION

The purpose of this appendix is to provide a brief overview of the purpose, methods and strategies of air monitoring. Air samples provide a means of estimating average airborne contaminant concentrations during the monitored period. There are two basic approaches to air monitoring: personal and area sampling. In personal sampling, the sample collection media is attached to the worker and positioned in the person's breathing zone (e.g., attached to clothing at the shoulder). In area sampling, the sample collection media is positioned at a fixed location within the work area (generally at approximate breathing zone level, i.e., about 4.5 feet above the working surface. Personal samples allow estimation of average personal exposure during the sampled interval, while area samples allow estimation of the average concentration in a given location during the sampled interval. Both personal (at the shoulder) and area (fixed location) air samples are helpful in assessing employee exposures, however, Cal/OSHA requires that personal sampling be conducted to evaluate potential worker exposures to airborne contaminants such as silica. Cal/OSHA regulates occupational exposures to respirable silica in construction in Title 8 California Code of Regulations Section 1532.3 (8 CCR 1532.3) and in dust generating activities involving concrete and masonry materials in 8 CCR 1530.1.

Cal/OSHA requires that "the employer shall ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of 0.05 milligrams per cubic meter of air (mg/m^3) based on an 8-hour time weighted average (See Regulatory Standards section below). Employers are required to assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable silica at or above the action level of 0.025 mg/m^3 by 1) assessing exposure on the basis of air monitoring data or objective data or 2) performing personal breathing zone air sampling that reflect the exposures of employees on each shift, for each job classification, and in each work area. 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.

SELECTION OF EMPLOYEES TO SAMPLE

First step in performing an air monitoring survey for silica is to identify employees or job tasks that may result in silica exposures above the action level. Employees or job tasks with the highest potential exposure risk should be placed in highest priority for sampling. Then select a representative number of employees for each job classification on each shift and in each work area. The more employees you monitor the more robust the data, however, cost and time may be prohibitive.

AIR-MONITORING METHODS

Personal and area air sampling for respirable particulates/silica is conducted using three-stage, matched-weight, 37-millimeter diameter, 5 µm pore size PVC membrane filters contained in plastic sampling cassettes fitted with SKC respirable dust (size-selective) aluminum cyclones. The cyclone separates sampled dust particles according to size so that respirable particles (10 microns and smaller) in the sampled air stream will collect on the filter. The sampling media is connected with Tygon tubing to calibrated, battery-operated personal sampling pumps (sampling train). As an alternative to aluminum cyclones, SKC has developed Parallel Particulate Impactor (PPI) samplers which are simpler to use than the traditional cyclones. PPI samplers are impaction-based filter samplers that perform precise size-selection for respirable dust.

Sampling air flow rates are set prior to and checked after monitoring to ensure consistent operation and flow rates. The sampling train and pumps should be checked regularly throughout the survey to ensure proper collection. Sample air volumes are calculated from the average measured flow rate and the duration of the sampling period. The sampling pumps must be calibrated at a flowrate of approximately 2.5 liters of sampled air per minute (lpm) when using aluminum cyclones or 2.0 lpm when using PPI samplers.

Following sampling, seal the sampling cassette and label it with a unique identifier. Samples should be hand delivered to the laboratory for analysis or sent by courier to an independent American Industrial Hygiene Association-accredited laboratory. Samples are analyzed by National Institute for Occupational Safety and Health (NIOSH) Method 7500 (respirable silica) and Method 0600 (respirable particulates). Silica is analyzed by x-ray diffraction (XRD) and particulates are analyzed by gravimetric means. Average airborne concentrations are calculated for each sample using the quantity of particulate and silica detected by the laboratory and the air volume collected for each sample during the survey.

It is important to take detailed notes on environmental (indoor vs. outdoor, weather conditions, ventilation, etc) and workplace conditions, materials used, engineering controls (such as HEPA vacuums), personal protective equipment, and any work taking place adjacent to or in the area where you are performing the survey. An air-monitoring data form is found below. The form should be filled out completely during each sampling survey.

REGULATORY STANDARDS

Airborne Exposure Limits

Under Title 8 CCR 5155, the California Occupational Safety and Health Administration (Cal/OSHA) has established Permissible Exposure Limits (PELs) for employee exposures to airborne contaminants based on an 8-hour, time weighted average exposure. In addition to the Cal/OSHA exposure limits, the American Conference of Governmental Industrial Hygienists (ACGIH) have established Threshold Limit Values (TLVs) which are recommended guidelines to assist in the control of health hazards and are not regulatory standards. Both PELs and TLVs are set at levels where it is believed that nearly all workers can be repeatedly exposed 8-hours a day, 40 hours per week for a working lifetime without adverse health effects.

TLV and PEL values are typically expressed as an 8-hour time-weighted average (8-hour TWA); that is, an average airborne concentration for an 8-hour work day. If exposures are found to be in excess of the Cal/OSHA PEL, then the employer is required to implement control measures to reduce the exposures. In addition, Cal/OSHA has established an 8-hour TWA Action Level for silica which requires to take specific actions if their employees are exposed to silica above the Action Level.

The Cal/OSHA PEL is 5 mg/m^3 for respirable particulates (not otherwise regulated) and 0.05 mg/m^3 for the respirable fraction of crystalline silica (quartz). Cal/OSHA has established an Action Level for respirable crystalline silica (quartz) at 0.025 mg/m^3. The ACGIH TLV is 3 mg/m^3 for respirable particulates and 0.025 mg/m^3 for respirable silica (quartz).

AIR MONITORING DATA FORM

Company: _____ Work Site / Project: _____ Date: _____

Contaminant(s): _____

Method(s) / Media: _____

Sample No. / Media No.	Pump No.	Calibration (lpm)			Worker / Location / Activity (Basic Information)	Time On	Time Off	Total Time (min)	Sample Volume (liters)	Sampling Notes (Pump issues, etc.)
		Pre	Post	Ave						

Sample No. / Media No.	Worker / Location / Activity (Basic Information)	Details of Activity, Conditions, Equipment, Work Practices, PPE, etc.

General notes (work site conditions, weather, etc.):

_____

_____

_____

Samples collected by: _____ _____

(print) (signature)

Current Sampling Data for Silica

September 22, 2017

Created by Dustin Christensen, MPH and Tim Bormann, CIH, FAIHA of The Cohen Group

1. Work Task: Cutting of concrete floor tile with bandsaw

   July 18, 2017 - by Forensic Analytical Consulting Services

   - Results: Simulation study of workers using band saws equipped with HEPA vacuum to cut concrete floor tile. Four workers sampled. Two of four personal samples above PEL at 0.13 and 0.24 mg/m^3. Two area samples above PEL at 0.19 and 0.35 mg/m^3.

2. Work Task: Cutting drywall

   June 3, 2014 - "Evaluation of Airborne Releases from Cutting Gypsum Drywall Using Various Cutting Methods in a Controlled Environment" by RJ Lee Group

   - Results: No measurable levels of respirable silica (126 samples). All levels were below minimum detection limits for silica. Simulation study cutting ½-inch thick gypsum based drywall obtained from seven different USG plants. Samples collected over two-hour time period. One personal sample and two area samples per cutting method. Cutting methods evaluated included score, snap and rasp, rotary saw, and circular saw.

3. Work Task: Overhead drilling into concrete decking

   October 10 and December 23, 2016 by The Cohen Group

   - Results: Two personal samples were above Action Level, PEL and TLV on first day of sampling. Local exhaust ventilation not in use for most of the survey on the first day. On second day of sampling local exhaust ventilation in use and samples collected from one worker were above the Action Limit, PEL, and TLV. On each sampling date, the two workers were fitted with two sampling cassettes. One on each shoulder. Note: Based on limited sampling data, this task may yield sampling results at or above the Cal/OSHA PEL and AL and therefore controls should be implemented.

4. Work Task: Cutting, rasping and hanging drywall

   November 20, 2016 by The Cohen Group

   - Results: Four personal samples on journeyman drywallers and four personal samples on laborers cleaning up general construction debris during the drywall work. All samples were below the PEL, Action Limit and TLV. Joint compound was Westpac brand with <5% or <2% silica as an impurity of other ingredients. Drywall was USG gypsum board.

5. Work Task: Drywall finishing, sanding joint compound, cutting and installing metal framing

February 26, 2017 by The Cohen Group

- Results: Four personal samples from workers installing framing and three tapers sanding joint compound. Two tapers were using pole sanders and one taper was using a power sander equipped with local exhaust ventilation. All sample results were below the PEL, Action Level, and TLV. Joint compound was Westpac brand with <5% or <2% silica as an impurity of other ingredients. Drywall was USG with no silica content.

6. Work Task: Hanging drywall using a router in an enclosed room

   May 24, 2017 by The Hartford

   - Results: Both personal sample results were below the PEL and Action Level. Silica content of drywall was less than 0.18%. A router was used to cut the drywall.

7. Work Task: Mixing and spraying monokote fireproofing

   May 24, 2017 by The Hartford

   - Results: Four-hour samples during mixing and spraying of monokote fireproofing inside a building. All three personal sample results were below the PEL and Action Level.

8. June 21, 2017 by The Hartford

   Work Task: Mixing and spraying monokote fireproofing

   - Results: All three personal samples were below the PEL and Action Level. Samples were collected for approximately 6.5 hours. Work was performed indoors.

Current gaps in data where additional sampling should be conducted:

1. Exterior plaster stucco application by pump and gun (no data)
2. Interior plaster mixing and application by pump and gun or by hand (no data)
3. Drilling into concrete walls or floors during wall framing (no data)
4. Mixing, application and cleanup of fireproofing
5. Cleanup of dried stucco or plaster material overspray

Additional sampling with additional controls should be conducted for the following tasks where sampling data approached or exceeded the Cal/OSHA action limit and/or permissible exposure limit:

1. Cutting concrete floor tiles
2. Overhead drilling into concrete decking
3. Hod carrier – mixing exterior plaster

Construction Task or Equipment Operation	Engineering and Work Practice Control Method or Conditions Monitored	Respirable Dust PEL Exceeded?	Respirable Silica PEL Exceeded?	Respirable Silica Action Level Exceeded?
Cutting concrete floor tiles	Bandsaw equipped with HEPA vacuum (simulation study)	Yes in 1 of 4 personal samples and 2 area samples.	Yes in 2 of 4 personal samples and two area samples	Yes
Cutting USG Drywall	Cut USG drywall using score, snap, rasp, rotary saw, and circular saw. No local exhaust ventilation	No	No – no silica detected in any of 126 samples.	No
Overhead drilling into concrete decking (interior wall framing)	Using rotohammer without local exhaust ventilation attachment for most of the work day.	Yes in 2 of 4 personal samples.	Yes in 4 of 4 personal samples.	Yes in 4 of 4 personal samples.
Overhead drilling into concrete decking (interior wall framing)	Using rotohammer with local exhaust ventilation	No	Yes in 1 of 4 personal samples.	Yes in 2 of 4 personal samples.
Cutting and hanging drywall	Hand saws and power drills	No	No	No
Laborers during interior drywall installation	Sweeping, vacuuming, cleaning up construction debris	No	No	No
Cutting and installing metal wall framing	Using a power chopsaw to cut metal framing and drywall	No	No	No
Drywall finishing / sanding joint compound	Hand sanding with pole sander and power sanding with sander equipped with local exhaust ventilation	No	No	No
Hod carrier - mixing exterior plaster	Performed outdoors using power mixer. Little to no wind.	Yes on 1 of 3 personal samples	No	Yes on 1 of 3 personal samples
Plasterer – hand application (by trowel) of scratch plaster coat	Performed outdoors with little to no wind.	No	No	No
Mixing and Spraying monokote fireproofing	Performed indoors. Workers wore N95 dust masks. Six samples were collected over two sampling days.	No	No	No

September 2017
1st Edition

Respirable Crystalline Silica Program

WRITTEN EXPOSURE CONTROL PLAN
FOR:

WALL & CEILING CONFERENCE

WWW.WCCINFO.ORG

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Respirable Crystalline Silica Program

PURPOSE

This Respirable Crystalline Silica Program was developed to prevent employee exposure to hazardous levels of Respirable Crystalline Silica that could result through construction activities or nearby construction activities occurring on worksites. Respirable Crystalline Silica exposure at hazardous levels can lead to lung cancer, silicosis, chronic obstructive pulmonary disease, and kidney disease. It is intended to meet the requirements of the Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153) established by the Occupational Safety and Health Administration (OSHA AND CAL/OSHA). (Title 8, Division 1, Chapter 4, Section 1532.3) established by the State of California Occupational Safety and Health Administration (OSHA AND CAL/OSHA).

All work involving chipping, cutting, drilling, grinding, or similar activities on materials containing Crystalline Silica can lead to the release of respirable-sized particles of Crystalline Silica (i.e. Respirable Crystalline Silica). Crystalline Silica is a basic component of soil, sand, granite and many other minerals. Quartz is the most common form of Crystalline Silica. Many materials found on constructions sites include Crystalline Silica; including but not limited to – cement, concrete, asphalt, pre-formed structures (inlets, pipe, etc.) and others. Consequently, this program has been developed to address and control these potential exposures to prevent our employees from experiencing the effects of occupational illnesses related to Respirable Crystalline Silica exposure.

SCOPE

This Respirable Crystalline Silica Program applies to all employees who have the potential to be exposed to Respirable Crystalline Silica when covered by the OSHA AND CAL/OSHA Standard. The OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard applies to all occupational exposures to Respirable Crystalline Silica in construction work, except where employee exposure will remain below 25 micrograms of Respirable Crystalline Silica per cubic meter of air (25 $\mu g/m^3$) as an 8-hour time-weighted average (TWA) under any foreseeable conditions.

RESPONSIBILITIES

firmly believes protecting the health and safety of our employees is everyone's responsibility. This responsibility begins with upper management providing the necessary support to properly implement this program. However, all levels of the organization assume some level of responsibility for this program including the following positions.

- Conduct job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments to determine if an employee's exposure will be above 25 µg/m^3 as an 8-hour TWA under any foreseeable conditions.

- Select and implement into the project's Exposure Control Plan (ECP) the appropriate control measures (see appendix B, Site Specific ECP) in accordance with the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and technical assistance.

  NOTE: OSHA AND CAL/OSHA 's Construction Standard Table 1 is a list of 18 common construction tasks along with acceptable exposure control methods and work practices that limit exposure for those tasks.

- Ensure that the materials, tools, equipment, personal protective equipment (PPE), and other resources (such as worker training) required to fully implement and maintain this Respirable Crystalline Silica Program are in place and readily available if needed. (Also, see Appendix A for certified Industrial Hygienist test data).

- Ensure that supervisory personnel and employees are educated in the hazards of Silica exposure and trained to work safely with Silica in accordance with OSHA AND CAL/OSHA 's Respirable Crystalline Silica Construction Standard and OSHA AND CAL/OSHA 's Hazard Communication Standard. Supervisory personnel may receive more advanced training than other employees.

- Maintain written records of training (for example, proper use of respirators), ECPs, inspections (for equipment, PPE, and work methods/practices), medical surveillance (under lock and key), respirator medical clearances (under lock and key).

- Conduct an annual review (or more often if conditions change) of the effectiveness of this program and any active project ECP's that extend beyond a year. This includes a review of available dust control technologies to ensure these are selected and used when practical.

- Coordinate work with other employers and contractors to ensure a safe work environment relative to Silica exposure.

PROJECT MANAGER AND OR SUPERVISOR :

- Ensure all applicable elements of this Respirable Crystalline Silica Program are implemented on the project including the selection of a Competent Person.

- Assist the Safety Department in conducting job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.

- Assist in the selection and implementation of the appropriate control measures in accordance with the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and technical assistance.

- Ensure that employees using respirators have been properly trained, medically cleared, and fit-tested in accordance with the company's Respiratory Protection Program. This process will be documented.

- Ensure that work is conducted in a manner that minimizes and adequately controls the risk to workers and others. This includes ensuring that workers use appropriate engineering controls, work practices, and wear the necessary PPE.

- Where there is risk of exposure to Silica dust, verify employees are properly trained on the applicable contents of this program, the project-specific ECP, and the applicable OSHA AND CAL/OSHA Standards (such as Hazard Communication). Ensure employees are provided appropriate PPE when conducting such work.

COMPETENT PERSON AND/OR SITE MANAGER (SUPERINTENDENT, FOREMAN, ETC.)

- Make frequent and regular inspections of job sites, materials, and equipment to implement the written ECP.

- Identify existing and foreseeable Respirable Crystalline Silica hazards in the workplace and take prompt corrective measures to eliminate or minimize them.

- Notify the Project Manager and/or Safety Department of any deficiencies identified during inspections in order to coordinate and facilitate prompt corrective action.

- Assist the Project Manager and Safety Department in conducting job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.

EMPLOYEES:

- Follow recognized work procedures (such as the Construction Tasks identified in OSHA AND CAL/OSHA 's Construction Standard Table 1) as established in the project's ECP and this program.
- Use the assigned PPE in an effective and safe manner.
- Participate in Respirable Crystalline Silica exposure monitoring and the medical surveillance program if applicable.
- Report any unsafe conditions or acts to the Site Manager and/or Competent Person immediately.
- Report any exposure incidents or any signs or symptoms of Silica illness immediately.

DEFINITIONS

If a definition is not listed in this section, please contact your supervisor. If your supervisor is unaware of what the term means, please contact the Competent Person or your Safety Department.

- Action Level means a concentration of airborne Respirable Crystalline Silica of 25 µg/m^3, calculated as an 8-hour time weighted average (TWA).
- Competent Person means an individual who is capable of identifying existing and foreseeable Respirable Crystalline Silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.
- Employee Exposure means the exposure to airborne Respirable Crystalline Silica that would occur if the employee were not using an approved respirator.
- High-Efficiency Particulate Air (HEPA) Filter means a filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 micrometers in diameter.
- 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 (See appendix A). 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.

- Permissible Exposure Limit (PEL) means the employer shall ensure that no employee is exposed to an airborne concentration of Respirable Crystalline Silica in excess of 50 µg/m^3, calculated as an 8-hour TWA.
- Physician or Other Licensed Health Care Professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by the Medical Surveillance Section of the OSHA AND CAL/OSHA Respirable Crystalline Silica Standard.
- Respirable Crystalline Silica means Quartz, Cristobalite, and/or Tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality-Particle Size Fraction Definitions for Health-Related Sampling.
- Specialist means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

REQUIREMENTS

SPECIFIED EXPOSURE CONTROL METHODS

When possible and applicable, will conduct activities with potential Silica exposure to be consistent with OSHA AND CAL/OSHA 's Construction Standard Table 1. Supervisors will ensure each employee under their supervision and engaged in a task identified on OSHA AND CAL/OSHA 's Construction Standard Table 1 have fully and properly implemented the engineering controls, work practices, and respiratory protection specified for the task on Table 1 (unless has assessed and limited the exposure of the employee to Respirable Crystalline Silica in accordance with the Alternative Exposure Control Methods Section of this program).

Activity:

Hand held rotary hammer drills used to penetrate concrete.

The Northwest Wall and Ceiling Bureau (NWCB), in conjunction with the Technical Services Information Bureau (TSIB) of Southern California, the Wall and Ceiling Bureau (WCB) of Northern California and the Washington State Department of Labor & Industries (L&I), who collectively make up the Wall and Ceiling Conference (WCC), have conducted air monitoring sampling of the following activity.

Air monitoring of Rotary hammer or Roto-hammer activities into concrete surfaces were performed with and without a vacuum or dust collection system.
Air monitoring without the vacuum assist determined that the Permissible Exposure Limit (PEL) for dust exceeded the 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica exceeded 25 µg/m³ as an 8-hour time-weighted average (TWA).
Air monitoring with the vacuum assist determined that the Permissible Exposure Limit (PEL) for dust was below 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica was below 25 µg/m³ as an 8-hour time-weighted average (TWA).

Roto-hammer activities will be performed in compliance with Table 1 Item #7

Equipment/Task:

Handheld and stand-mounted drills (including impact and rotary hammer drills)

Engineering and Work Practice Control Methods:

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.

Required respiratory Protection and Minimum Assigned Protection Factor (APF)

≤ 4 hours/shift	***≥ 4 hours/shift***
None	*None*

(SEE APPENDIX A)

Table 1: Specified Exposure Control Methods When

Working With Materials Containing Crystalline Silica

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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
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	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	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	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	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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
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	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.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
		• 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.		
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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
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	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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 air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None	None
14	Small drivable milling machines (less than half-lane)	• Use a machine equipped with supplemental water sprays designed to suppress dust. • Water must be combined with a surfactant. • Operate and maintain machine to minimize dust emissions.	None	None
15a	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
15b	Large drivable milling machines (half-lane and larger) 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
15c	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	• 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
16	Crushing machines	• 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). • Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. • Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.	None	None

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
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	• Operate equipment from within an enclosed cab.	None	None
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	• When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18a	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.	None	None
18b	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	• When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

When implementing the control measures specified in Table 1, shall:

- 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 and or negative pressure maintained through continuous delivery of fresh air, depending on the task;
    - Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
    - Has heating and cooling capabilities.

- Where an employee performs more than one task included on OSHA AND CAL/OSHA ’s Construction Standard Table 1 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 Table 1 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.

ALTERNATIVE EXPOSURE CONTROL METHODS

Alternative Exposure Control Methods apply for tasks not listed in OSHA AND CAL/OSHA ’s Construction Standard Table 1, including test data in Appendix A, where cannot not fully and properly implement the engineering controls, work practices, and respiratory protection described in Table 1 and test data in Appendix A.

First, will 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 in accordance with either the Performance Option or the Scheduled Monitoring Option.

- **Performance Option** – will assess 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.

- **Scheduled Monitoring Option:**

  - will perform 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, and in each work area. Where several employees perform the same tasks on the same shift and in the same work area, will plan to monitor a representative fraction of these employees. When using representative monitoring, will sample the employee(s) who are expected to have the highest exposure to Respirable Crystalline Silica.

  - If initial monitoring indicates that employee exposures are below the Action Level, will probably discontinue monitoring for those employees whose exposures are represented by such monitoring. The data will be added to Appendix A at the time of the annual review and documented.

  - Where the most recent exposure monitoring indicates that employee exposures are at or above the Action Level but at or below the PEL, will repeat such monitoring within six months of the most recent monitoring.

  - Where the most recent exposure monitoring indicates that employee exposures are above the PEL,
  - will repeat such monitoring within three months of the most recent monitoring.

  - Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the Action Level, will repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the Action Level, at which time will probably discontinue monitoring for those employees whose exposures are represented by such monitoring, except when a reassessment is required. will 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 at or above the Action Level, or when has any reason to believe that new or additional exposures at or above the Action Level have occurred.

will ensure that all Respirable Crystalline Silica samples taken to satisfy the monitoring requirements of this program and OSHA AND CAL/OSHA are collected by a qualified individual (i.e. a Certified Industrial Hygienist) and the samples are evaluated by a qualified laboratory (i.e. 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).

Within five working days after completing an exposure assessment, will individually notify each affected 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, will describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL, documented in the site specific ECP.

Where air monitoring is performed, will provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to Respirable Crystalline Silica. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard, will provide the observer with protective clothing and equipment at no cost and shall ensure that the observer uses such clothing and equipment.

Once air monitoring has been performed, will determine its method of compliance based on the monitoring data and the hierarchy of controls. will use engineering and work practice controls to reduce and maintain employee exposure to Respirable Crystalline Silica to or below the PEL, unless can demonstrate that such controls are not feasible. Wherever such feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, will nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them with the use of respiratory protection.

In addition to the requirements of this program, will comply with other programs and OSHA (such as 29 CFR 1926.57 [Ventilation]), AND CAL/OSHA standards (T8 Subchapter 4, Article 4 SS 1530.1) when applicable where abrasive blasting is conducted using Crystalline Silica-containing blasting agents, or where abrasive blasting is conducted on substrates that contain Crystalline Silica.

Alternate Exposure Control Method, Air Monitoring:

The Northwest Wall and Ceiling Bureau (NWCB), in conjunction with the Washington State Department of Labor & Industries (L&I), the Wall and Ceiling Bureau(WCB) of Northern California and the Technical Services Information Bureau (TSIB) of Southern California who collectively make up the Wall and Ceiling Conference (WCC) have conducted air monitoring sampling of the following activities. Air monitoring results of these activities have determined that the Permissible Exposure Limit (PEL) for dust was below 50 µg/m³ over an 8-hour time weighted average (TWA) and Respirable Silica was below 25 µg/m³ as an 8-hour time-weighted average (TWA). Air monitoring conducted by the NWCB, the Department of Labor & Industries, WCB and TSIB is permissible data as allowed by OSHA AND CAL/OSHA Objective Data. OBJECTIVE *DATA is verifiable 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. OSHA Chapter 1926.1153(d)(2)(iii)(B), AND CAL/OSHA Title* 8, Division 1, Chapter 4, Section 1532.3 *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.*

Activities:

- Power chop-saws used to cut light gauge metal framing members.
- Installation of gypsum board, including the use of screw-guns.
- Handheld routers for cutting gypsum board.
- Mudding and/or taping activities.
- Hand, pole or vacuum sanding of gypsum board surfaces.
- Housekeeping or sweeping of floors with sweeping compounds.
- Mixing and spraying of fireproofing

(SEE APPENDIX A)

CONTROL METHODS

will provide control methods that are either consistent with Table 1 or otherwise minimize worker exposures to Silica. These exposure control methods can include engineering controls, work practices, and respiratory protection. Listed below are control methods to be used when Table 1 is not followed **(LIST AND DISCUSS CONTROL METHODS BELOW, for example:** HEPA-vacuum, air scrubbers with HEPA filter, etc.):

EXAMPLES:

RESPIRATORY PROTECTION

Where respiratory protection is required by this program, will provide each employee an appropriate respirator that complies with the requirements of the company's Respiratory Protection Program and the OSHA Standard (29 CFR 1910.134) and CAL/OSHA (Subchapter 7. Group 16. Article 107. §5144.)

Respiratory protection is required where specified by the OSHA AND CAL/OSHA Construction Standard Table 1, for tasks not listed in Table 1, or where the company has not fully and properly implemented the engineering controls, work practices, and respiratory protection described in Table 1, (and Appendix A) Situations requiring respiratory protection include:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;

- Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible; and

- During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL.

HOUSEKEEPING

does not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to Respirable Crystalline Silica unless wet sweeping, HEPA-filtered vacuuming, Sweeping compound, or other methods that minimize the likelihood of exposure are not feasible.

does not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to Respirable Crystalline Silica unless:

- The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
- No alternative method is feasible.

WRITTEN EXPOSURE CONTROL PLAN

When employee exposure on a construction project is expected to be at or above the Action Level, a Written Exposure Control Plan (ECP) will be established and implemented (*See Appendix B*). This ECP will contain at least the following elements:

- A description of the tasks in the workplace that involve exposure to Respirable Crystalline Silica;
- A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to Respirable Crystalline Silica for each task;
- A description of the housekeeping measures used to limit employee exposure to Respirable Crystalline Silica; and

- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to Respirable Crystalline Silica and their level of exposure, including exposures generated by other employers or sole proprietors.

The written ECP will designate a Competent Person to make frequent and regular inspections of job sites, materials, and equipment to ensure the ECP is implemented.

The written ECP will be reviewed at least annually to evaluate the effectiveness of it and update it as necessary. Having said this, ECP's are project specific and most project durations do not exceed a year. The written ECP will be readily available for examination and copying, upon request, to each employee covered by this program and/or ECP, their designated representatives, and OSHA AND CAL/OSHA.

MEDICAL SURVEILLANCE

Medical surveillance will be made available for each employee who will be required to use a respirator for 30 or more days per year due to their Respirable Crystalline Silica exposure. Medical surveillance (i.e. medical examinations and procedures) will be performed by a PLHCP and provided at no cost to the employee at a reasonable time and place.

will make available an initial (baseline) medical examination within 30 days after initial assignment, unless the employee has received a medical examination that meets the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard within the last three years. The examination shall consist of:

- A medical and work history, with emphasis on past, present, and anticipated exposure to Respirable Crystalline Silica, dust, and other agents affecting the respiratory system in addition to any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing), history of tuberculosis, and smoking status and history;

- A physical examination with special emphasis on the respiratory system;

- A chest X-ray (a single postero-anterior radiographic projection or radiograph of the chest at full inspiration recorded on either film [no less than 14 x 17 inches and no more than 16 x 17 inches] or digital radiography systems) interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconiosis by a NIOSH-certified B Reader;

- A pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) and FEV1/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;

- Testing for latent tuberculosis infection; and

- Any other tests deemed appropriate by the PLHCP.

will make available medical examinations that include the aforementioned procedures (except testing for latent tuberculosis infection) at least every three years. If recommended by the PLHCP, periodic examinations can be more frequently than every three years.

will ensure that the examining PLHCP has a copy of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard, this program, and the following information:

- A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to Respirable Crystalline Silica;

- The employee's former, current, and anticipated levels of occupational exposure to Respirable Crystalline Silica;

- A description of any personal protective equipment (PPE) used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and

- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of .

will ensure that the PLHCP explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical examination performed. The written report shall contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;

- Any recommended limitations on the employee's use of respirators;

- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and;

- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

will also obtain a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion shall contain only the following in order to protect the employee's privacy:

- The date of the examination;

- A statement that the examination has met the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard; and

- Any recommended limitations on the employee's use of respirators.

If the employee provides written authorization, the written opinion shall also contain either or both of the following:

- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and/or

- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

If the PLHCP's written medical opinion indicates that an employee should be examined by a Specialist, will make available a medical examination by a Specialist within 30 days after receiving the PLHCP's written opinion. will ensure that the examining Specialist is provided with all of the information that the employer is obligated to provide to the PLHCP.

will ensure that the Specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report will contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;

- Any recommended limitations on the employee's use of respirators; and

- Any recommended limitations on the employee's exposure to respirable crystalline Silica.

In addition, will obtain a written opinion from the Specialist within 30 days of the medical examination. The written opinion shall contain the following:

- The date of the examination;

- Any recommended limitations on the employee's use of respirators; and

- If the employee provides written authorization, the written opinion shall also contain any recommended limitations on the employee's exposure to Respirable Crystalline Silica.

will include Respirable Crystalline Silica in the company's Hazard Communication Program established to comply with the OSHA AND CAL/OSHA Hazard Communication Standard (29 CFR 1910.1200). Subchapter 7. Group 16. Article 109. §5194. Hazard Communication

will ensure that each employee has access to labels on containers of Crystalline Silica and those containers respective Safety Data Sheets (SDS's).

All employees will be trained in accordance with the provisions of the OSHA AND CAL/OSHA Hazard Communication Standard and the Training Section of this program. This training will cover concerns relating to cancer, lung effects, immune system effects, and kidney effects.

will ensure that each employee with the potential to be exposed at or above the Action Level for Respirable Crystalline Silica can demonstrate knowledge and understanding of at least the following:

- The health hazards associated with exposure to Respirable Crystalline Silica;
- Specific tasks in the workplace that could result in exposure to Respirable Crystalline Silica;
- Specific measures has implemented to protect employees from exposure to Respirable Crystalline Silica, including engineering controls, work practices, and respirators to be used;
- The contents of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard;
- The identity of the Competent Person designated by ; and
- The purpose and a description of the company's Medical Surveillance Program.

will make a copy of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard readily available without cost to any employee who requests it.

RECORDKEEPING

will make and maintain an accurate record of all exposure measurements taken to assess employee exposure to Respirable Crystalline Silica (See Appendix A). This record will 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 (PPE), 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.

will ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020 and Cal-Osha Title 8, Section 5100, Recordkeeping. Exposure records will be kept for at least 30 years.

The employer shall make and maintain an accurate record of all objective data relied upon to comply with the requirements of the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard. This record shall 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.

will ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020 and Cal-Osha Title 8, Section 5100, Recordkeeping. Objective data records will be kept for at least 30 years.

will make and maintain an accurate record for each employee enrolled in the Medical Surveillance portion of this program. The record shall include the following information about the employee:

- Name and social security number;

- A copy of the PLHCPs' and/or Specialists' written medical opinions; and

- A copy of the information provided to the PLHCPs and Specialists.

will ensure that medical records are maintained and made available in accordance with 29 CFR 1910.1020. and Title 8, section 3204 Medical records will be kept under lock and key for at least the duration of employment plus 30 years. It is necessary to keep these records for extended periods because Silica-related diseases such as cancer often cannot be detected until several decades after exposure. However, if an employee works for an employer for less than one year, the employer does not have to keep the medical records after employment ends, as long as the employer gives those records to the employee.

PROGRAM EVALUATION

This program will be reviewed and evaluated on an annual basis by the Safety Department unless changes to operations, the OSHA AND CAL/OSHA Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153), (Title 8, Section 1532.3), or another applicable OSHA AND CAL/OSHA Standard require an immediate re-validation of this program.

Appendix A

(SEE ATTACHMENTS)

Appendix B

Silica Written Exposure Control Plan

Company: _____ Date: _____

Person Completing the Plan, Title: _____

Competent Person: _____

Job site/location: _____

Description of Task: _____

_____

_____

(Routine task, new task, Indoors/outdoors, task found on Table 1 and or *Appendix A*)

Engineering Controls: _____

_____

_____

Any deviation from Table 1 = air monitoring is required. Engineering controls must be used at all times!

(Wet methods, continuous water feed, local exhaust ventilation w/ HEPA filters, commercially available shrouds, commercial dust collection system, cyclone pre-separator/filter cleaning system, surfactant used, and ventilation ≥ 25 cfm/inch of wheel diameter, enclosed cab w/ fresh climate controlled air to operator, employees outside of cabs applying water/dust suppressants, equipment maintained to minimize dust emissions.)

Work Practices: _____

_____

_____

(Maintain equipment functionality – cleaned/spare filters, hoses to start; good connections; hoses with no holes, kinks, permanent bends, crushed; power source available; water source available, ensure ventilation is ≥ 25 cfm/inch of wheel diameter; water/exhaust ventilation lines safe from damage; shrouds/cowls fit correctly and not damaged; follow Manufacturer's instruction for filter cleaning/change out.)

Respiratory protection: _____

_____

(e.g. Use respirator with APF = 10 the entire time the task is being performed – See Table 1)

See Part 451 – Respiratory Protection rule (1910.134) And Title 8, Section5144 for information on selection, training and fit testing requirements, and proper use instruction for respirators (i.e., no facial hair interfering with the respirator sealing surface).

Housekeeping: _____

_____

(Dust containing silica on work surfaces/equipment must be cleaned up using wet methods or HEPA equipped vacuum, No use of compressed air or dry sweeping for removing dust and debris containing silica, dispose of used vacuum bags in a closed sealed container).

Procedures Used to Restrict Access to Work Area (Construction = required, GI = optional):

_____

_____

(Signage, barricades, enclosures, spotters, work when area is cleared of other contractors to reduce risk of exposure.)

Objective data use (Optional) – Yes or NO

Data Source: _____

_____

Data conditions from the source is equal to or more extreme than actual work conditions? Yes or No

(Conditions, equipment, process, controls, material silica %, environmental.)

Review this plan with all involved employees.

Keep a copy of this plan at the jobsite.

Provide this plan of action to the General Contractor.

Review and update annually.

Additional Notes:

WALL AND CEILING CONFERENCE (WCC)

NORTHWEST WALL AND CEILING BUREAU (NWCB)
2825 Eastlake Avenue East Suite 350, Seattle, WA 98102 (206) 524-4243
www.nwcb.org

TECHNICAL SERVICES INFORMATION BUREAU (TSIB)
1910 North Lime Street, Orange, CA 92865 (714) 221-5530
www.tsib.org

WALL AND CEILING BUREAU (WCB)
5690 Sonoma Drive, Pleasanton, CA 94566 (925) 600-0472
www.wallandceilingbureau.org

Appendix A

Environmental Health & Safety Services

THE COHEN GROUP

REPORT OF FINDINGS

AIR MONITORING FOR RESPIRABLE DUST AND SILICA

WALL & CEILING CONFERENCE
5690 SONOMA DRIVE
PLEASANTON, CALIFORNIA

Project No. 17183

Survey Dates: October 10-11, November 30, and December 23, 2016
February 26, April 21, and August 25, 2017

Report Date: September 22, 2017

Prepared For: Wall & Ceiling Conference

Prepared By: Dustin Christensen, MPH
The Cohen Group

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THE COHEN GROUP

REPORT OF FINDINGS

AIR MONITORING FOR RESPIRABLE DUST AND SILICA

WALL & CEILING CONFERENCE 5690 SONOMA DRIVE PLEASANTON, CALIFORNIA

INTRODUCTION

The Cohen Group conducted air monitoring surveys in the San Francisco Bay Area on October 10 and 11, November 30, and December 23, 2016 as well as February 26, April 21, and August 2017. The surveys were conducted by Sarah Llanes and Dustin Christensen, MPH of The Cohen Group. The purpose of the surveys were to characterize and determine the extent of employee exposures to respirable particulates and silica during various drywall and plastering work activities and tasks.

The tasks selected for monitoring to determine respirable dust and silica exposure included:

1. Overhead drilling into metal pan and concrete decking during interior framing work
2. Cutting, rasping and hanging interior drywall
3. Hand and power sanding of joint compound and drywall
4. Use of a powered chop saw to cut metal framing
5. Mixing and hand application of exterior plaster
6. Laborer activities handling trade materials and cleaning up construction debris

The air-monitoring surveys presented in this report were conducted at the construction site of a new healthcare facility in the San Francisco Bay Area. The new facility will be three floors and cover over 200,000 square feet when complete. The drywall and plaster subcontractor for the new facility gave permission to The Cohen Group to perform air-monitoring during their employees work activities and to provide the air-monitoring results to the Wall & Ceiling Conference. Sampled tasks represent typical operations and work methods employed by other drywall contractors

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LIMITATIONS

The Cohen Group has prepared this report for the exclusive use of Wall & Ceiling Conference for this particular project. This report reflects conditions in existence at the jobsite on the survey dates. The findings are based on work site conditions and work activities at the time of the surveys and on information provided by Wall & Ceiling Conference employees and member companies. Findings are limited by the accuracy and precision of the sampling and analytical methodologies and instrumentation employed, as well as by the number of samples collected and the number of measurements taken. However, to the best of our knowledge, the findings constitute a reasonable and accurate assessment of potential worker exposures to airborne concentrations of respirable particulates and silica while performing monitored activities under the conditions encountered. No other representation, warranty or guarantee, expressed or implied, is included or intended.

Measured levels of airborne contaminants will vary during the course of and between individual days of project work. Some of the factors influencing airborne contaminant levels include engineering controls (such as exhaust ventilation), environmental conditions (such as temperature, humidity, wind speed, and direction), and the location and timing of individual measurements.

DESCRIPTION OF WORK ACTIVITIES MONITORED

Overhead Drilling into Concrete Decking

Personal and area air samples were collected over two work shifts (October 10 and December 23, 2016) while an apprentice and a journeyman used rotohammers to drill into the overhead metal pan concrete decking for the installation of soffit tracks as part of interior wall framing activities. The employees monitored used cordless rotary hammers with and without vacuum attachments (local exhaust ventilation). The monitored employees drilled three-eighth inch wide and 4-inch deep holes to install three-eighth inch anchor bolts into the overhead decking. The employees held the rotohammers and impact tools overhead while standing directly beneath the holes they were drilling as well as holding the tool out at arm's length away from their bodies while drilling overhead. The employees were working from scissor lifts in order to access the overhead decking on October 10th and were working on bench walks and scaffolding on December 23rd. When not performing overhead drilling, both workers were observed adjusting the scissor lift (i.e. height, angle, and location to work in), taking measurements, and tightening soffit tracks using hand tools. The work shifts were approximately 7:00AM to 3:00PM.

Two air samples were collected from each worker on each work shift. On October 10th one sample was collected for the full work shift and a second "worst-case" sample was collected on each worker during an approximate two-hour time period when the workers did continuous overhead drilling without taking breaks. On December 23rd sampling cassettes were positioned on the right shoulder and on the left shoulder of each worker in order to observe variation in sampling results depending on sample location. The local exhaust ventilation attachment on the

overhead drilling tools was not in use for the majority of the sampling period on October 10th but were in use the entire shift of December 23rd.

Both workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest), ear plugs (with a protection factor of 28 dB), N95 disposable particulate respirators, face shields, fall protection harnesses, work gloves, long pants, and work boots.

Interior Drywall Installation

Personal monitoring was conducted on eight workers during interior drywall installation activities on November 30, 2016. Monitoring was conducted from 7:00AM to 3:30PM of which interior drywall installation activities were performed between 7:30AM and 3:00PM.

Samples were collected from four journeymen who worked in two-man teams performing interior drywall installation and from four laborers who worked throughout the jobsite (indoors and outdoors). The laborers were observed performing work as a spotter/flagger for heavy equipment operators, moving metal materials, and sweeping general construction debris with the use of a sweeping compound, vacuuming dust from the previously installed tracks (using wet/dry vac), and applying foam fireproofing. According to the SDS for the drywall, the drywall contained less than six percent silica.

The interior drywall installation process observed can be described as follows:

1) Move drywall from materials pile to rock cart
2) Measure wall and drywall sheets
3) Cut drywall with a hand saw or utility knife and rasp the cut edges
4) Carry/hang drywall to designated spot before drilling into place
5) Cutting portions of hung drywall using a drywall router
6) Securing drywall to framing members with screw fasteners

Equipment, materials, and tools used by workers during the survey included: bench walks, scissor lifts, 12 foot by 4 foot and five-eighth inch thick drywall sheets, measuring tapes, cordless drywall guns with 1¼ inch screws, cordless power drills with 1½ inch rotor baits, hand sanders, hand saws, and box cutters.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest), ear plugs (with a protection factor of 28 dB), N95 disposable particulate respirators, work gloves, long pants, and work boots.

Drywall Finishing/Sanding Joint Compound and Chopsaw Activities

Samples were collected on three workers sanding drywall joint compound and four workers performing chopsaw activities on February 16, 2017. On the date of the survey, work was

performed from 7:00AM to 3:30PM with set-up activities and safety meetings for the first 30 minutes of the day and clean-up activities taking up the last 45 minutes of the work shift. Sanding of dried joint compound on drywall walls was performed by the three tapers in 10 foot by 12-foot rooms. Sanding was continuous throughout the day. Initial sanding was performed by two of the tapers each using a pole sander and the third taper performed finish sanding using a power sander equipped with a vacuum hose attachment for local exhaust ventilation and angle sponges in areas where the power sander could not access. According to the SDS, the joint compound contained less than six percent silica.

Three journeyman framers and one apprentice worked in two-man teams to install metal framing for interior walls on the survey date. Grinder/chopsaws were used to cut metal framing. The framers were observed cutting and installing metal framing for interior walls, handling materials (i.e. passing/carrying materials to their partners) and taking measurements.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest; framers), painters' whites (i.e. shirt, jeans; tapers), N95 particulate respirators (tapers), faceshields (framers), long pants, and work boots.

Exterior Plastering

Eight workers performing exterior plastering activities were observed and monitored on April 21, 2017. In addition, upwind and downwind area samples were collected near the plastering work. The scratch coat plaster mix consisted of a fiber base stucco product and a second material used to help ease the spread of the plaster. According to the SDS for the fiber base stucco product, the material contains 40 to 70% "sand, silica, quartz." The SDS for the second material lists silica content at less than six percent. On the survey date, the workers were mixing and hand applying the exterior plaster scratch coat to the penthouse on the roof of the new facility. The plaster scratch coat is the first layer of plaster applied to the exterior of the building. The mixing of the scratch coat plaster was performed outdoors on the roof and the plaster was hand applied by plasterers working on scaffolding. The monitored work day was from 7:00AM to 3:30PM of which exterior plastering activities were performed between 7:30AM and 2:45PM. The weather conditions were clear skies with no precipitation and no measurable wind.

Three hod carriers mixed and/or carried the scratch coat plaster to the plasterers. One hod carrier was observed mixing from 7:30AM to 10:45AM and a second hod carrier was observed mixing from 10:45AM to 2:45PM. Four plasterers performed exterior plastering application by hand-troweling on the plaster. One laborer assisted in materials handling for the plastering process.

The exterior plastering process observed can be described as follows:

1) Turn on the plaster/mortar mixer
2) Each batch of the scratch coat plaster contains six to eight, 80-pound sacks of the fiber base stucco material and one, 7-pound sack of the second material (sacks were opened using a pocketknife and dumped at the top of the mixer), and water (in that order).

3) Allow the materials to mix inside the mixer for 15 minutes with intermittent misting over the mixer using a water hose.
4) Pour mixed plaster scratch coat material from mixer into wheelbarrow.
5) Hod carrier delivered the stucco mixture via a wheelbarrow to each plasterer. The hod carrier then transferred the scratch coat plaster using a shovel directly onto the mudboard or placed the plaster in a 5-gallon bucket which was then hoisted by a rope pully to upper levels of scaffolding.
6) Plasterer obtains mixture from mudboard via hawk and trowel and applies onto wall.
7) After stucco mixture has been evenly applied onto the wall, a "scratcher" is used to create grooves for the scratch coat.
8) A margin trowel is used to even the coat in tight spaces.
9) The laborer assisting in the plastering process moved sacks of stucco from the ground level to the roof.

Equipment, materials, and tools used included: plaster/mortar mixer, water hose, fiber base stucco material, second bagged material to ease the spread of stucco, shovel, pulley, 5-gallon empty bucket, wheel barrow, hawk, trowel, scratcher, margin trowel, pocket knife, and mudboard.

On August 25th three workers were performing mixing and application of the exterior scratch coat on the south exterior wall of the medical facility using the same methods as described above. The plastering work occurred from approximately 7:30AM until 2:00 PM. The plastering crew consisted of one hod carrier who mixed the plaster and carried it to the two plasterers who were working on scaffolding. The weather conditions were clear skies with no precipitation and no measurable wind.

Workers were observed wearing the following personal protective equipment: hard hat, safety glasses, safety colored clothing (i.e. vest; hod carriers), painters' whites (i.e. shirt, jeans; plasterers), faceshield and N95 particulate respirator (worn by the hod carriers when loading materials into the mixer), long pants, and work boots.

MONITORING METHODS

Air Monitoring

Personal and area air sampling for respirable particulates/silica was conducted using three-stage, matched-weight, 37-millimeter diameter, 5 µm pore size PVC membrane filters contained in plastic sampling cassettes fitted with SKC respirable dust (size-selective) aluminum cyclones. The cyclone separates sampled dust particles according to size so that respirable particles (10 microns and smaller) in the sampled air stream will collect on the filter. The sampling media was connected with Tygon tubing to calibrated, battery-operated personal sampling pumps.

Sampling air flow rates were set prior to and checked after monitoring to ensure consistent operation. Sample air volumes were calculated from the average measured flow rate and the duration of the sampling period. The sampling pumps were calibrated at a flowrate of approximately 2.5 liters of sampled air per minute (lpm) and the flowrate was confirmed at the end of the sampling period. Calibration was conducted with a TSI mass flow meter.

During personal sampling, the filter cassettes were attached to the worker's shirt at the shoulder (in the worker's breathing zone). During area sampling, the filter cassettes were positioned at a fixed location within the work area (at approximate breathing zone level, i.e., about 4.5 to five feet above the working surface). Full-shift air monitoring was conducted. In addition, "worst case" personal air samples for respirable particulates and silica were collected for a duration of time shorter than full-shift during overhead drilling activities.

Following sampling, the filter cassettes were sealed, labeled with a unique identifier and sent by courier to an independent American Industrial Hygiene Association-accredited laboratory. The samples were analyzed by National Institute for Occupational Safety and Health (NIOSH) Method 7500 (respirable silica) and Method 0600 (respirable particulates). Silica was analyzed by x-ray diffraction (XRD) and particulates were analyzed by gravimetric means.

Average airborne concentrations were calculated for each sample using the quantity of contaminant detected by the laboratory and the air volume collected for each sample during the survey.

REGULATORY STANDARDS

Airborne Exposure Limits

Under Title 8 CCR 5155, the California Occupational Safety and Health Administration (Cal/OSHA) has established Permissible Exposure Limits (PELs) for employee exposures to airborne contaminants based on an 8-hour, time weighted average exposure. PELs are set at levels where it is believed that nearly all workers can be repeatedly exposed 8-hours a day, 40 hours per week for a working lifetime without adverse health effects.

PEL values are typically expressed as an 8-hour time-weighted average (8-hour TWA); that is, an average airborne concentration for an 8-hour work day. If exposures are found to be in excess of the Cal/OSHA PEL, then the employer is required to implement control measures to reduce the exposures.

The Cal/OSHA PEL is 5 mg/m^3 for respirable particulates (not otherwise regulated) and 0.05 mg/m^3 for the respirable fraction of crystalline silica (quartz). Cal/OSHA has established an Action Level for respirable crystalline silica (quartz) at 0.025 mg/m^3. The Cal/OSHA PELs are the same as the newly adopted Fed/OSHA PELs for Silica in Construction standard.

FINDINGS

Results of the air monitoring are shown in more detail in the tables below but are summarized as follows:

Overhead Drilling in Concrete / Interior Wall Framing

Survey Date: October 10, 2016

- The two employees monitored each wore two sampling trains with one sample on each shoulder. One sample was a full-shift sample and the other was a shorter duration worst-case sample which was collected during an approximately two-hour period when the workers did not take any breaks. The vacuum exhaust attachment for the rotohammers were not in use for most of the sampling period.
- Sample results in mg/m^3 for respirable particulates for full-shift samples were 0.82 for the journeyman and 5.5 for the apprentice. During two-hour sampling under worst-case conditions, results were 0.62 for the apprentice and 5.2 for the journeyman. The full-shift sample results for the journeyman and the worst-case sample results for the apprentice were above the applicable Cal/OSHA PEL with the other sample results below the PEL.
- Sample results in mg/m^3 for respirable silica (quartz) for full-shift samples were 0.11 for the journeyman and 0.39 for the apprentice and 0.058 for the apprentice and 0.47 for the journeyman for the worst-case samples. All sample results were above the Cal/OSHA PEL and Action Level for respirable silica (quartz).

Survey Date: December 23, 2016

- The two employees monitored each wore two sampling trains with one sample on each shoulder in order to measure the variation in airborne concentration across the workers body. In addition, two area samples were collected. The vacuum exhaust attachment for the rotohammers was in use throughout the sampling period.
- Sample results in mg/m^3 for respirable particulates ranged from <0.023 to 1.2. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.011 to 0.094. The sample results from both shoulders of apprentice #1 were above the applicable Cal/OSHA Action Level but only the sample from the right shoulder was also above the Cal/OSHA PEL. The area sample results and sample results from both shoulders of apprentice #2 were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz). The difference in sample results was likely due to the continued use of local exhaust ventilation on the rotohammers during the second sampling survey.

Interior Drywall Hanging/Installation

Survey Date: November 30, 2016

- Sample results in mg/m^3 for respirable particulates ranged from 0.15 to 1.0. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0093 to 0.018. Silica (quartz) was detected above the laboratory limit of detection in just two of eight samples. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

Sanding Joint Compound and Interior Wall Framing

Survey Date: February 16, 2017

- Sample results in mg/m^3 for respirable particulates ranged from 0.25 to 2.7. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0090 to 0.018. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

Mixing and Hand Application of Exterior Plaster

Survey Date: April 21, 2017

- Sample results in mg/m^3 for respirable particulates ranged from <0.050 to 5.4. All but one of the samples collected were below the applicable Cal/OSHA PEL for respirable particulates. The sample collected from one of the hod carriers who performed plaster mixing was above the applicable PEL, however, the second hod carrier who also performed mixing of plaster showed sample results well below the PEL.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0086 to 0.025. All samples collected were below the applicable Cal/OSHA PEL and all but one sample collected was below the Cal/OSHA Action Level for respirable silica (quartz). A sample collected from one hod carrier showed results of 0.025 or concentration at the Cal/OSHA Action Level.

Survey Date: August 25, 2017

- Sample results in mg/m^3 for respirable particulates ranged from 0.085 to 1.5. All samples collected were below the applicable Cal/OSHA PEL for respirable particulates.
- Sample results in mg/m^3 for respirable silica (quartz) ranged from <0.0057 to 0.014. All samples collected were below the applicable Cal/OSHA PEL and Action Level for respirable silica (quartz).

CONCLUSIONS

1) There was a significant difference in respirable particulates from the first day (October 10) of overhead drilling to the second day (December 23) of overhead drilling. The vacuum attachment on the rotohammer was used on both sampling dates, with the exception of tight spaces (i.e. in between two studs) as encountered during the first overhead drilling date. The differences in concentrations collected from the same breathing zone indicate how handedness (i.e. worker being left-handed or right-handed), position of the drill over the worker, and worst-case (in which the worker's tasks likely produces the greatest exposure) may greatly affect where the concrete debris generated from the overhead drilling falls and the concentration of dust or silica exposure which the worker may potentially experience. That is a right-handed worker would likely have greatest exposure on the right side of the body as opposed to the left.

2) Results from respirable particulate sampling demonstrate that the Cal/OSHA PEL was exceeded for workers involved in overhead drilling and for one hod carrier involved in mixing exterior plaster. However, the sample results for the other hod carrier who performed nearly equal amounts of plaster mixing on the same survey date showed result concentrations well below the PEL. In addition, follow-up sampling of plaster mixing on a second survey date showed a result concentration well below the PEL. This wide variance in sample results may possibly be due to sample placement, a change in work methods such as using less water to suppress dust or possibly sample contamination. The sampling performed on both shoulders during overhead drilling showed that sample placement on the body can result in a significant difference in result concentrations due to concrete debris falling onto the worker or sample location.

3) Results from respirable silica sampling demonstrate that the Cal/OSHA PEL and Action Level was exceeded for workers involved in overhead drilling. Results from one hod carrier mixing plaster showed results at the Cal/OSHA Action Level. However, this sample result (for the hod carrier) did not include the approximate 30 minutes at the start of the shift when the crew did stretching and safety training which, if taken into account, reduces the workers TWA exposure concentration to below the Action Level. In addition, follow-up sampling showed concentrations from mixing exterior plaster outdoors to be below the PEL and Action Level.

4) Results from our sampling survey demonstrate that workers performing interior wall framing (excluding overhead drilling), hanging and sanding of drywall and joint compound, and hand application of exterior plaster are not exposed to respirable dust above the applicable Cal/OSHA PEL or to respirable silica above the Cal/OSHA PEL or Action Level.

RECOMMENDATIONS

1) Additional engineering controls such as water-spray or local exhaust ventilation attached to the equipment should be explored in order to reduce exposures to workers performing overhead drilling with the goal of bringing exposure concentrations below applicable PELs and Action Levels.

2) Air monitoring for particulate matter (including silica) should be repeated periodically to maintain documentation of workplace conditions and whenever a change in operating conditions may result in a significant change in employee exposure levels. Workplace evaluations should be conducted to determine potential operations or tasks where elevated dust levels may be found such as maintenance activities, clean-up operations, or during other work tasks.

3) With regards to workers who exceeded the action level to the new Cal/OSHA silica standard, new requirements that need to be met include: repeat monitoring within six months of the most recent monitoring for employee exposures at or above the AL but at or below the PEL; repeat monitoring within three months of the most recent monitoring for employee exposures above the PEL; and reassess exposures whenever there is a change in the work activities. A written Silica Exposure Control plan should be prepared in order to address employees potential exposures to silica.

4) We recommend performing additional air monitoring for workers performing plaster mixing and overhead drilling into concrete in order to obtain a larger data set to better understand exposure concentrations experienced by those workers. If possible, perform air monitoring with sampling cassettes attached to both shoulders of each worker to better identify the variance in result concentrations across the workers body.

5) We recommend performing air monitoring surveys for respirable dust and silica during plaster mixing if performed indoors and plaster application when performed using a spray-gun and pump.

Prepared By:

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Table 1A
Overhead Drilling into Concrete / Interior Framing
Collected/Sampled on: October 10, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal Carpenter Apprentice Full-shift	390	958.8	7.2	<0.38	<0.38	5.5	0.39	<0.021	<0.021
Personal Journeyman Full-shift	384	855.9	13.0	<2.8	<2.8	0.82	0.11	<0.023	<0.023
Personal Carpenter Apprentice Worse-case	168	427.6	9.4	<7.6	<7.6	0.62	0.058	<0.047	<0.047
Personal Journeyman Worse-case	169	423.6	9.0	<0.91	<0.91	5.2	0.47	<0.047	<0.047
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 1A Notes:

- "<" indicates "less than"
- NE indicates Not Established
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 1B
Overhead Drilling into Concrete / Interior Framing
Collected/Sampled on: October 10, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Person 1/Apprentice *5.5 hour shift* ** left lapel*	339	866.8	(6.9)	<5.3	<5.3	0.44	(0.030)	<0.023	<0.023
Person 1/Apprentice *5.5 hour shift* ** right lapel*	339	847.5	7.6	<1.9	<1.9	1.2	0.094	<0.024	<0.024
Area SE Scaffold *5.5 hour shift*	339	836.0	<35	<69	<69	0.035	<0.012	<0.024	<0.024
Person 2/Apprentice *5.5 hour shift* ** right lapel*	338	852.1	<5.1	<10	<10	0.23	<0.012	<0.023	<0.023
Personal 2/Apprentice ** left lapel*	338	847.2	<4.8	<9.7	<9.7	0.24	<0.012	<0.024	<0.024
Area NE Scaffold *5.5 hour shift*	338	869.8	NE	NE	NE	<0.023	<0.011	<0.023	<0.023
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 1A Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 2
Interior Drywall Hanging/Installation
Collected/Sampled on: November 30, 2016

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal Journeyman	414	935.0	(2.0)	<2.4	<2.4	0.90	(0.018)	<0.021	<0.021
Personal Journeyman	418	1070.7	<0.90	<1.8	<1.8	1.0	<0.0093	<0.019	<0.019
Personal Journeyman	405	1057.5	<1.2	<2.4	<2.4	0.77	<0.0095	<0.019	<0.019
Personal Journeyman	406	1007.3	<1.2	<2.3	<2.3	0.85	<0.0099	<0.020	<0.020
Personal Laborer	401	1016.9	<12	<23	<23	0.085	<0.0098	<0.020	<0.020
Personal Laborer	408	1024.7	(1.6)	<2.4	<2.4	0.81	(0.013)	<0.020	<0.020
Personal Laborer	409	1025.4	<6.5	<13	<13	0.15	<0.0098	<0.020	<0.020
Personal Laborer	409	1036.2	<3.8	<7.7	<7.7	0.25	<0.0097	<0.019	<0.019
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 2 Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 3
Drywall Finishing/Sanding Joint Compound/Cutting and Installing Interior Metal Framing
Collected/Sampled on: February 16, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal-Framer	467	1156.29	(1.9)	<2.3	<2.3	0.76	(0.015)	<0.017	<0.017
Personal-Framer	318	786.73	<4.3	<8.6	<8.6	0.29	<0.013	<0.025	<0.025
Personal-Framer	437	1115.44	<3.6	<7.3	<7.3	0.25	<0.0090	<0.018	<0.018
Personal-Apprentice Framer	431	993.02	<1.7	<3.4	<3.4	0.59	<0.010	<0.020	<0.020
Personal-Taper using power sander	351	900.84	(1.4)	<1.8	<1.8	1.2	(0.018)	<0.022	<0.022
Personal-Taper using pole sander	435	1140.35	(1.1)	<1.3	<1.3	1.4	(0.015)	<0.018	<0.018
Personal-Taper using pole sander	438	1108.58	(0.57)	<0.67	<0.67	2.7	(0.015)	<0.018	<0.018
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 3 Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 4A
Mixing and Hand Application of Exterior Plaster
Collected/Sampled on: April 21, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated)	Respirable Crystalline Silica (Quartz)	Respirable Crystalline Silica (Cristobalite)	Respirable Crystalline Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal -Hod Carrier (Mixed Plaster)	417	1098.38	(1.6)	<1.2	<1.2	1.5	(0.024)	<0.018	<0.018
Personal-Hod Carrier (Mixed Plaster)	458	1171.56	0.46	<0.31	<0.31	5.4	0.025	<0.017	<0.017
Personal-Hod Carrier	460	921.84	(2.3)	<3.3	<3.3	0.67	(0.015)	<0.022	<0.022
Personal-Plasterer	456	1139.77	<3.4	<6.7	<6.7	0.26	<0.0088	<0.018	<0.018
Personal-Plasterer	460	1161.04	(5.3)	<8.7	<8.7	0.20	(0.010)	<0.017	<0.017
Personal-Laborer	454	1150.21	<2.7	<5.3	<5.3	0.33	<0.0087	<0.017	<0.017
Personal-Foreman Plasterer	476	1266.87	<2.3	<4.6	<4.6	0.35	<0.0079	<0.016	<0.016
Personal-Plasterer	467	1176.37	(2.9)	<3.6	<3.6	0.47	(0.014)	<0.017	<0.017
Area - 10ft E of Mixer -Downwind	442	1088.65	<5.0	<10	<10	0.18	<0.0092	<0.018	<0.018
Area-10ft N of Mixer -Upwind	442	1161.80	<13	<27	<27	0.065	<0.0086	<0.017	<0.017
Area-10ft E of NE Wall / Moved @ 12:46PM 10ft S of S End	439	1106.28	<19	<39	<39	0.047	<0.0090	<0.018	<0.018
Area-10ft E of SE Wall	149	397.31	NA	NA	NA	<0.050	<0.025	<0.050	<0.050
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 4A Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- "NA" indicates "Not Applicable"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Table 4B
Mixing and Hand Application of Exterior Plaster
Collected/Sampled on: August 25, 2017

Sample Location	Duration (minutes)	Volume (liters)	Percent Quartz	Percent Cristobalite	Percent Tridymite	Respirable Particulates (not otherwise regulated	Respirable Silica (Quartz)	Respirable Silica (Cristobalite)	Respirable Silica (Tridymite)
						Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)	Concentration (mg/m^3)
Personal-Hod-Carrier (Mixed Plaster)	390	982.8	0.89	<0.34	<2.1	1.5	0.013	<0.0051	<0.031
Personal-Plasterer	364	928.2	1.3	<0.51	<3.1	1.1	0.014	<0.0054	<0.032
Personal-Plasterer	387	971.4	<1.0	<1.0	<6.1	0.51	<0.0051	<0.0051	<0.031
Area – 15 feet west of mixer	351	881.0	<6.7	<6.7	<40	0.085	<0.0057	<0.0057	<0.034
Area – One foot above mixer	354	881.5	1.0	<0.71	<4.3	0.80	0.0082	<0.0057	<0.034
Area – five feet east of mixer	246	620.0	<8.6	<8.6	<52	0.094	<0.0081	<0.0081	<0.048
Cal/OSHA 8-Hour TWA Permissible Exposure Limits						5	0.05	0.05	0.05
Cal/OSHA Action Level						NE	0.025	NE	NE

Table 4B Notes:

- "<" indicates "less than"
- "( )" indicates this testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.
- "NE" indicates "Not Established"
- Representative field blank samples were submitted to the lab with results below the laboratory limit of detection.

Air Monitoring Strategy and Protocols
September 22, 2017
Prepared by Dustin Christensen, MPH and Tim Bormann, CIH, FAIHA of The Cohen Group

INTRODUCTION

The purpose of this appendix is to provide a brief overview of the purpose, methods and strategies of air monitoring. Air samples provide a means of estimating average airborne contaminant concentrations during the monitored period. There are two basic approaches to air monitoring: personal and area sampling. In personal sampling, the sample collection media is attached to the worker and positioned in the person's breathing zone (e.g., attached to clothing at the shoulder). In area sampling, the sample collection media is positioned at a fixed location within the work area (generally at approximate breathing zone level, i.e., about 4.5 feet above the working surface. Personal samples allow estimation of average personal exposure during the sampled interval, while area samples allow estimation of the average concentration in a given location during the sampled interval. Both personal (at the shoulder) and area (fixed location) air samples are helpful in assessing employee exposures, however, Cal/OSHA requires that personal sampling be conducted to evaluate potential worker exposures to airborne contaminants such as silica. Cal/OSHA regulates occupational exposures to respirable silica in construction in Title 8 California Code of Regulations Section 1532.3 (8 CCR 1532.3) and in dust generating activities involving concrete and masonry materials in 8 CCR 1530.1.

Cal/OSHA requires that "the employer shall ensure that no employee is exposed to an airborne concentration of respirable crystalline silica in excess of 0.05 milligrams per cubic meter of air (mg/m^3) based on an 8-hour time weighted average (See Regulatory Standards section below). Employers are required to assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable silica at or above the action level of 0.025 mg/m^3 by 1) assessing exposure on the basis of air monitoring data or objective data or 2) performing personal breathing zone air sampling that reflect the exposures of employees on each shift, for each job classification, and in each work area. 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.

SELECTION OF EMPLOYEES TO SAMPLE

First step in performing an air monitoring survey for silica is to identify employees or job tasks that may result in silica exposures above the action level. Employees or job tasks with the highest potential exposure risk should be placed in highest priority for sampling. Then select a representative number of employees for each job classification on each shift and in each work area. The more employees you monitor the more robust the data, however, cost and time may be prohibitive.

AIR-MONITORING METHODS

Personal and area air sampling for respirable particulates/silica is conducted using three-stage, matched-weight, 37-millimeter diameter, 5 µm pore size PVC membrane filters contained in plastic sampling cassettes fitted with SKC respirable dust (size-selective) aluminum cyclones. The cyclone separates sampled dust particles according to size so that respirable particles (10 microns and smaller) in the sampled air stream will collect on the filter. The sampling media is connected with Tygon tubing to calibrated, battery-operated personal sampling pumps (sampling train). As an alternative to aluminum cyclones, SKC has developed Parallel Particulate Impactor (PPI) samplers which are simpler to use than the traditional cyclones. PPI samplers are impaction-based filter samplers that perform precise size-selection for respirable dust.

Sampling air flow rates are set prior to and checked after monitoring to ensure consistent operation and flow rates. The sampling train and pumps should be checked regularly throughout the survey to ensure proper collection. Sample air volumes are calculated from the average measured flow rate and the duration of the sampling period. The sampling pumps must be calibrated at a flowrate of approximately 2.5 liters of sampled air per minute (lpm) when using aluminum cyclones or 2.0 lpm when using PPI samplers.

Following sampling, seal the sampling cassette and label it with a unique identifier. Samples should be hand delivered to the laboratory for analysis or sent by courier to an independent American Industrial Hygiene Association-accredited laboratory. Samples are analyzed by National Institute for Occupational Safety and Health (NIOSH) Method 7500 (respirable silica) and Method 0600 (respirable particulates). Silica is analyzed by x-ray diffraction (XRD) and particulates are analyzed by gravimetric means. Average airborne concentrations are calculated for each sample using the quantity of particulate and silica detected by the laboratory and the air volume collected for each sample during the survey.

It is important to take detailed notes on environmental (indoor vs. outdoor, weather conditions, ventilation, etc) and workplace conditions, materials used, engineering controls (such as HEPA vacuums), personal protective equipment, and any work taking place adjacent to or in the area where you are performing the survey. An air-monitoring data form is found below. The form should be filled out completely during each sampling survey.

REGULATORY STANDARDS

Airborne Exposure Limits

Under Title 8 CCR 5155, the California Occupational Safety and Health Administration (Cal/OSHA) has established Permissible Exposure Limits (PELs) for employee exposures to airborne contaminants based on an 8-hour, time weighted average exposure. In addition to the Cal/OSHA exposure limits, the American Conference of Governmental Industrial Hygienists (ACGIH) have established Threshold Limit Values (TLVs) which are recommended guidelines to assist in the control of health hazards and are not regulatory standards. Both PELs and TLVs are set at levels where it is believed that nearly all workers can be repeatedly exposed 8-hours a day, 40 hours per week for a working lifetime without adverse health effects.

TLV and PEL values are typically expressed as an 8-hour time-weighted average (8-hour TWA); that is, an average airborne concentration for an 8-hour work day. If exposures are found to be in excess of the Cal/OSHA PEL, then the employer is required to implement control measures to reduce the exposures. In addition, Cal/OSHA has established an 8-hour TWA Action Level for silica which requires to take specific actions if their employees are exposed to silica above the Action Level.

The Cal/OSHA PEL is 5 mg/m^3 for respirable particulates (not otherwise regulated) and 0.05 mg/m^3 for the respirable fraction of crystalline silica (quartz). Cal/OSHA has established an Action Level for respirable crystalline silica (quartz) at 0.025 mg/m^3. The ACGIH TLV is 3 mg/m^3 for respirable particulates and 0.025 mg/m^3 for respirable silica (quartz).

AIR MONITORING DATA FORM

Company: _____ Work Site / Project: _____ Date: _____

Contaminant(s): _____

Method(s) / Media: _____

Sample No. / Media No.	Pump No.	Calibration (lpm)			Worker / Location / Activity (Basic Information)	Time On	Time Off	Total Time (min)	Sample Volume (liters)	Sampling Notes (Pump issues, etc.)
		Pre	Post	Ave						

Sample No. / Media No.	Worker / Location / Activity (Basic Information)	Details of Activity, Conditions, Equipment, Work Practices, PPE, etc.

General notes (work site conditions, weather, etc.):

_____

_____

_____

Samples collected by: _____ _____

(print) (signature)

Current Sampling Data for Silica

September 22, 2017

Created by Dustin Christensen, MPH and Tim Bormann, CIH, FAIHA of The Cohen Group

1. Work Task: Cutting of concrete floor tile with bandsaw

   July 18, 2017 - by Forensic Analytical Consulting Services

   - Results: Simulation study of workers using band saws equipped with HEPA vacuum to cut concrete floor tile. Four workers sampled. Two of four personal samples above PEL at 0.13 and 0.24 mg/m^3. Two area samples above PEL at 0.19 and 0.35 mg/m^3.

2. Work Task: Cutting drywall

   June 3, 2014 - "Evaluation of Airborne Releases from Cutting Gypsum Drywall Using Various Cutting Methods in a Controlled Environment" by RJ Lee Group

   - Results: No measurable levels of respirable silica (126 samples). All levels were below minimum detection limits for silica. Simulation study cutting ½-inch thick gypsum based drywall obtained from seven different USG plants. Samples collected over two-hour time period. One personal sample and two area samples per cutting method. Cutting methods evaluated included score, snap and rasp, rotary saw, and circular saw.

3. Work Task: Overhead drilling into concrete decking

   October 10 and December 23, 2016 by The Cohen Group

   - Results: Two personal samples were above Action Level, PEL and TLV on first day of sampling. Local exhaust ventilation not in use for most of the survey on the first day. On second day of sampling local exhaust ventilation in use and samples collected from one worker were above the Action Limit, PEL, and TLV. On each sampling date, the two workers were fitted with two sampling cassettes. One on each shoulder. Note: Based on limited sampling data, this task may yield sampling results at or above the Cal/OSHA PEL and AL and therefore controls should be implemented.

4. Work Task: Cutting, rasping and hanging drywall

   November 20, 2016 by The Cohen Group

   - Results: Four personal samples on journeyman drywallers and four personal samples on laborers cleaning up general construction debris during the drywall work. All samples were below the PEL, Action Limit and TLV. Joint compound was Westpac brand with <5% or <2% silica as an impurity of other ingredients. Drywall was USG gypsum board.

5. Work Task: Drywall finishing, sanding joint compound, cutting and installing metal framing

February 26, 2017 by The Cohen Group

- Results: Four personal samples from workers installing framing and three tapers sanding joint compound. Two tapers were using pole sanders and one taper was using a power sander equipped with local exhaust ventilation. All sample results were below the PEL, Action Level, and TLV. Joint compound was Westpac brand with <5% or <2% silica as an impurity of other ingredients. Drywall was USG with no silica content.

6. Work Task: Hanging drywall using a router in an enclosed room

   May 24, 2017 by The Hartford

   - Results: Both personal sample results were below the PEL and Action Level. Silica content of drywall was less than 0.18%. A router was used to cut the drywall.

7. Work Task: Mixing and spraying monokote fireproofing

   May 24, 2017 by The Hartford

   - Results: Four-hour samples during mixing and spraying of monokote fireproofing inside a building. All three personal sample results were below the PEL and Action Level.

8. June 21, 2017 by The Hartford

   Work Task: Mixing and spraying monokote fireproofing

   - Results: All three personal samples were below the PEL and Action Level. Samples were collected for approximately 6.5 hours. Work was performed indoors.

Current gaps in data where additional sampling should be conducted:

1. Exterior plaster stucco application by pump and gun (no data)
2. Interior plaster mixing and application by pump and gun or by hand (no data)
3. Drilling into concrete walls or floors during wall framing (no data)
4. Mixing, application and cleanup of fireproofing
5. Cleanup of dried stucco or plaster material overspray

Additional sampling with additional controls should be conducted for the following tasks where sampling data approached or exceeded the Cal/OSHA action limit and/or permissible exposure limit:

1. Cutting concrete floor tiles
2. Overhead drilling into concrete decking
3. Hod carrier – mixing exterior plaster

Construction Task or Equipment Operation	Engineering and Work Practice Control Method or Conditions Monitored	Respirable Dust PEL Exceeded?	Respirable Silica PEL Exceeded?	Respirable Silica Action Level Exceeded?
Cutting concrete floor tiles	Bandsaw equipped with HEPA vacuum (simulation study)	Yes in 1 of 4 personal samples and 2 area samples.	Yes in 2 of 4 personal samples and two area samples	Yes
Cutting USG Drywall	Cut USG drywall using score, snap, rasp, rotary saw, and circular saw. No local exhaust ventilation	No	No – no silica detected in any of 126 samples.	No
Overhead drilling into concrete decking (interior wall framing)	Using rotohammer without local exhaust ventilation attachment for most of the work day.	Yes in 2 of 4 personal samples.	Yes in 4 of 4 personal samples.	Yes in 4 of 4 personal samples.
Overhead drilling into concrete decking (interior wall framing)	Using rotohammer with local exhaust ventilation	No	Yes in 1 of 4 personal samples.	Yes in 2 of 4 personal samples.
Cutting and hanging drywall	Hand saws and power drills	No	No	No
Laborers during interior drywall installation	Sweeping, vacuuming, cleaning up construction debris	No	No	No
Cutting and installing metal wall framing	Using a power chopsaw to cut metal framing and drywall	No	No	No
Drywall finishing / sanding joint compound	Hand sanding with pole sander and power sanding with sander equipped with local exhaust ventilation	No	No	No
Hod carrier - mixing exterior plaster	Performed outdoors using power mixer. Little to no wind.	Yes on 1 of 3 personal samples	No	Yes on 1 of 3 personal samples
Plasterer – hand application (by trowel) of scratch plaster coat	Performed outdoors with little to no wind.	No	No	No
Mixing and Spraying monokote fireproofing	Performed indoors. Workers wore N95 dust masks. Six samples were collected over two sampling days.	No	No	No