FACS
Forensic Analytical Consulting Services

Silica Emergency Temporary Standard Regulations – Artificial Stone Fabrication Industry

Presented By:
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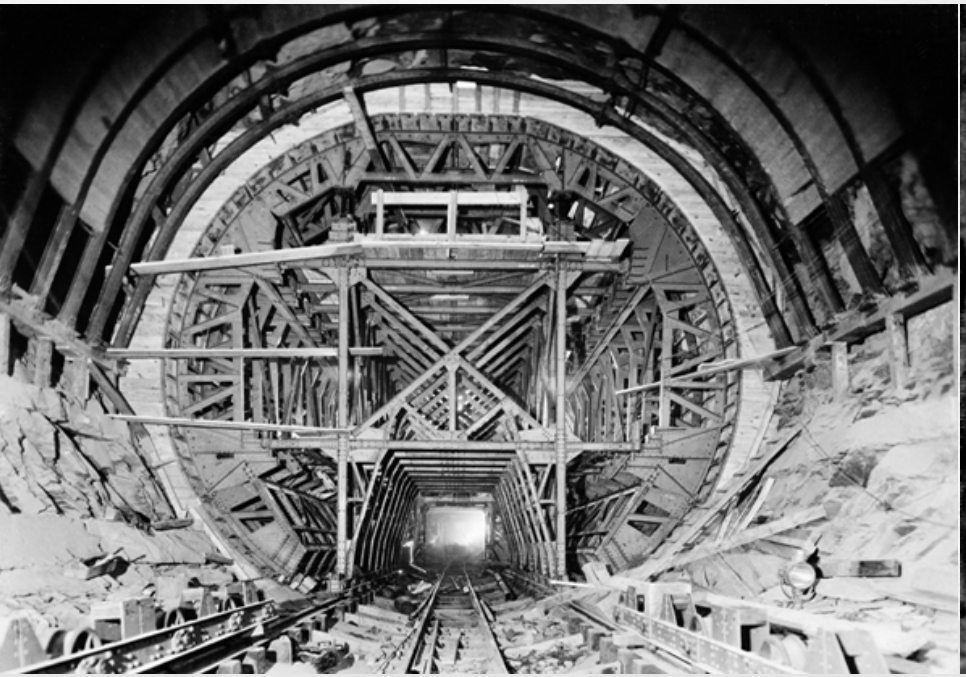
Joint Technical Symposium, 2024
Carson, California

Agenda

- Brief History & Health Effects
- Understanding the Standard
- Case Study

Hawk's Nest – Deadly Dust

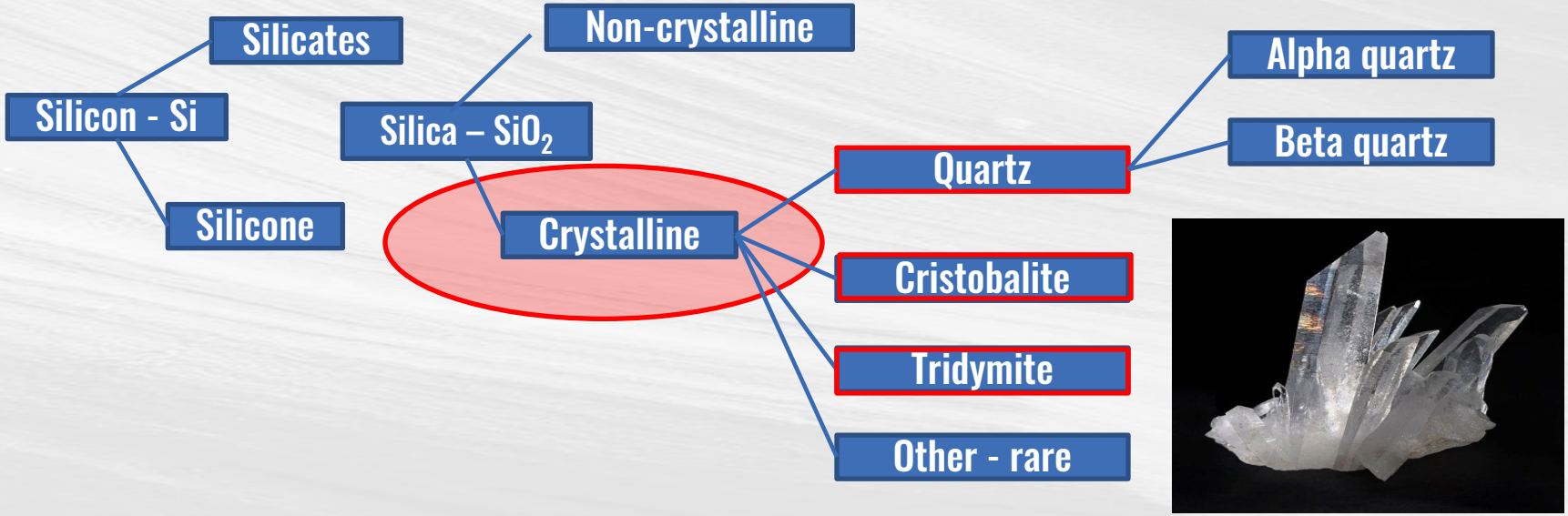


Graphic courtesy of OSHA

About 2.3 million people in the U.S. are exposed to silica at work.

Silica – What is it?

- Relationship between the forms of Silicon



From: Special Publication - Crystalline Silica Primer, US Bureau of Mines, Washington DC, Branch of Industrial Minerals.

Crystalline Silica - Where is it?

- Sand
- Soil and rock
- Gravel
- Sandstone
- Slate
- Granite
- Clay

Silica – What Industries

- Engineered stone fabrication
- Concrete mixing and cutting
- Sandblasting
- Brick and stone cutting
- Foundry work
- Construction
- Mining (including metal, stone, aggregate and coal mining)
- Fracking (hydraulic fracturing for natural gas extraction)
- Pottery manufacturing
- Many others

California Department of PublicHealth

Silica – Stone Fabrication

- Quartz is in engineered stone
- Typical exposure to silica occurs during any mechanical work on silica containing material (dust creation)
  - e.g., grinding, sawing, cutting, chipping, drilling, polishing, crushing, etc.
  - handling of waste debris (cleaning & disposal)

Sections

Los Angeles Times

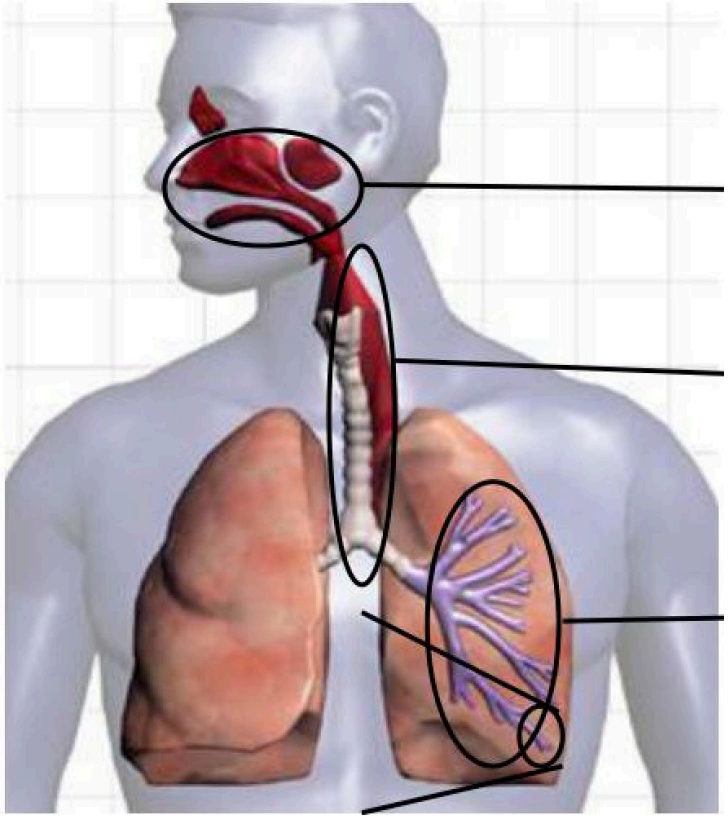
CALIFORNIA

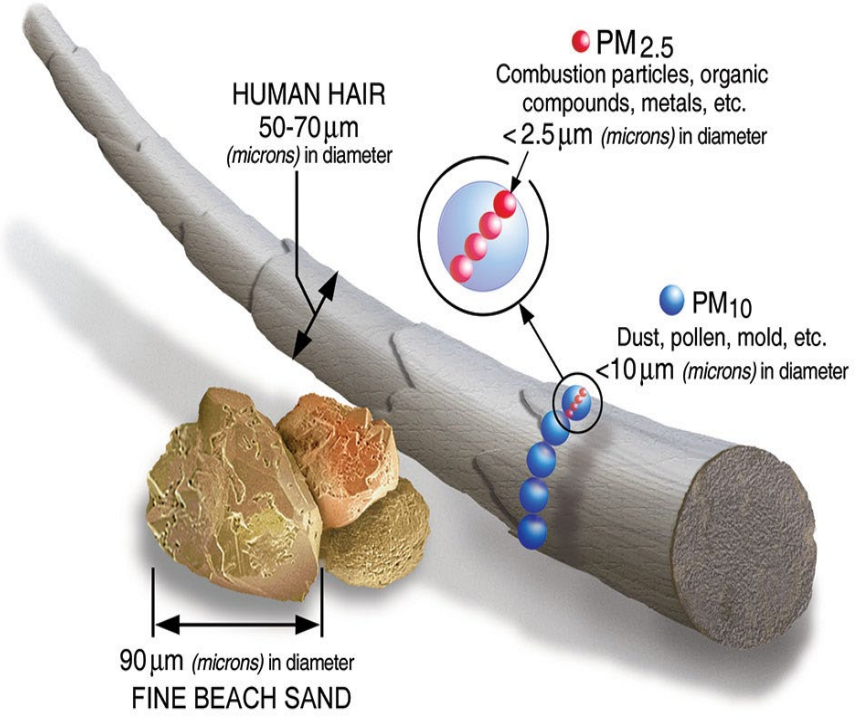
California workers who cut countertops are dying of an incurable disease

Leobardo Segura Meza, 27, of Pacoima suffers from silicosis, an incurable lung disease that has been afflicting workers who cut and polish engineered stone high in crystalline silica. (Mel Melcon / Los Angeles Times)

BY EMILY ALPERT REYES, CINDY CARCAMO

SEPT. 24, 2023 3 AM PT

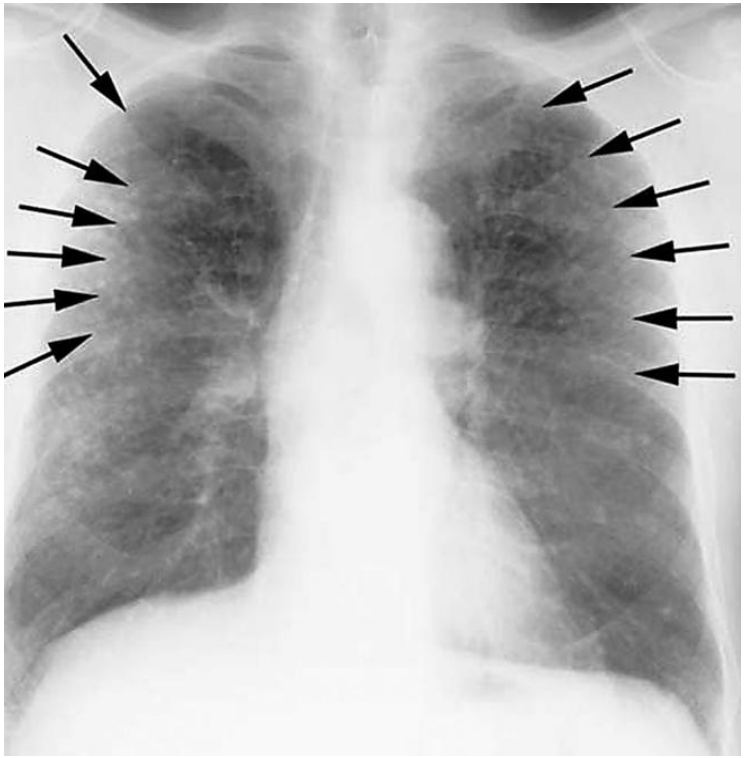




https://www.euroenvironmental.co.uk/news/item/dust

Silicosis

- **Interstitial lung disease caused by breathing of crystalline silica dust**
- **Can develop without symptoms**
- **Symptoms:**
  - Bronchitis-like symptoms (persistent cough, shortness of breath and difficulty breathing)
  - Weakness, fatigue, fever, night sweats, leg swelling and bluish discoloration of the lips
  - "scar tissue"
- **Recognized as nodules on x-rays**
- **No cure for silicosis; treatment is available**
- **Debilitating, often fatal disease**



https://www.euroenvironmental.co.uk/news/item/dust

PUBLIC HEALTH WATCH

SILICOSIS EPIDEMIC

Jury Awards $52.4M in Case Against Artificial-Stone Countertop Makers

by **Jim Morris**
August 8, 2024

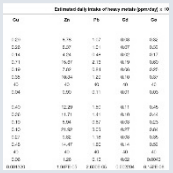
In the first case of its type to go to trial in the United States, a Los Angeles County jury handed down a $52.4 million verdict Wednesday against three artificial-stone countertop manufacturers sued by a fabrication worker who developed the lung disease silicosis.

Gustavo Reyes Gonzalez has a severe case of silicosis from cutting countertops. He says he used water to suppress the dust and wore high-quality masks, but the fine silica powder still entered his lungs. Credit: Leslie Berestein Rojas

Gustavo Reyes Gonzalez, 34, sued 34 manufacturers, claiming their products are inherently dangerous because they contain high amounts of silica, a mineral that, when pulverized, can enter the lungs and cause irreversible scarring. Twenty-nine of the manufacturers settled with Reyes, and two were granted summary judgment. The other three cases went to trial. Reyes is among dozens of workers in Southern California who developed silicosis after cutting and grinding countertops with little or no respiratory protection.

Public Health Watch and partners LAist and Univision were the first media outlets to report the existence of the silicosis cluster in December 2022. A year later, the state of California issued an emergency rule requiring employers of fabrication workers to suppress toxic silica dust with water and take other protective measures.

Standards and Regulations



AIRBORNE CONTAMINANT LIST

CONSTRUCTION

GENERAL INDUSTRY & MARITIME

Standard Objectives

The standard requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers.

https://www.dir.ca.gov/dosh/dosh_publications/emergency-silica-reg-employer-info.pdf

OSHA FactSheet

CONTROL SILICA DUST
Breathe Easier

OSHA's Respirable Crystalline Silica Standard for General Industry and Maritime

Workers who are exposed to respirable crystalline silica dust are at increased risk of developing serious silica-related diseases. OSHA's standard requires employers to take steps to protect workers from exposure to respirable crystalline silica.

What Is Respirable Crystalline Silica?

Crystalline silica is a common mineral that is found in materials such as stone, artificial stone, and sand. When workers cut, grind, or drill materials that contain crystalline silica, or use industrial sand, they can be exposed to very small silica dust particles. These tiny particles (known as "respirable" particles) can travel deep into workers' lungs and cause silicosis, an incurable and sometimes deadly lung disease. Respirable crystalline silica also causes lung cancer, other potentially debilitating respiratory diseases such as chronic obstructive pulmonary disease, and kidney disease. In most cases, these diseases occur after years of exposure to respirable crystalline silica.

How Are Workers in General Industry and Maritime Exposed to Respirable Crystalline Silica?

Workers can be exposed to respirable crystalline silica during the:

- Manufacture of glass, pottery, ceramic, brick, concrete, asphalt roofing, jewelry, artificial stone, dental, porcelain, or structural clay products;
- Use of industrial sand in operations such as foundry work and hydraulic fracturing; and
- Use of sand for abrasive blasting (e.g., maritime operations).

What Does the Standard Require?

The standard for general industry and maritime (29 CFR 1910.1053) requires employers to:

- **Determine the amount of silica that workers are exposed to** if it is, or may reasonably be expected to be, at or above the **action level of 25 µg/m³** (micrograms of silica per cubic meter of air), averaged over an 8-hour day;
- Protect workers from respirable crystalline silica exposures above the **permissible exposure limit (PEL) of 50 µg/m³**, averaged over an 8-hour day;
- **Limit access** to areas where workers could be exposed above the PEL;
- Use **dust controls and safer work methods** to protect workers from silica exposures above the PEL;
- Provide **respirators** to workers when dust controls and safer work methods cannot limit exposures to the PEL;
- Establish and implement a **written exposure control plan** that identifies tasks that involve exposure and methods used to protect workers;
- Restrict **housekeeping** practices that expose workers to silica, such as use of compressed air without a ventilation system to capture the dust and dry sweeping, where effective, safe alternatives are available;
- Offer **medical exams**—including chest X-rays and lung function tests—every three years to workers exposed at or above the action level for 30 or more days per year;
- **Train workers** on the health effects of silica exposure, workplace tasks that can expose them to silica, and ways to limit exposure; and
- **Keep records** of workers' silica exposure and medical exams.

A worker uses a stone grinder that applies water at the work surface to reduce silica dust levels in the air.

Occupational Exposures to Respirable Crystalline Silica

General Industry

Permissible Exposure Limit (PEL) =

50 µg/m^3 (8-hr TWA)

Action Level (AL) =

25 µg/m^3 (8-hr TWA)

Emergency Temporary Standard (ETS)

TITLE 8, DIVISION 1, CHAPTER 4

Subchapter 7. General Industry Safety Orders
Group 16. Control of Hazardous Substances
Article 110. Regulated Carcinogens

TITLE 8, DIVISION 1, CHAPTER 4

TITLE 8, DIVISION 1, CHAPTER 4

TITLE 8, DIVISION 1, CHAPTER 4

2. Wet methods or vacuum cleaners equipped with HEPA filters shall be used to collect all wastes, dusts, residues, debris, or other materials that are generated from high-exposure trigger tasks or that otherwise contain or are contaminated with respirable crystalline silica.

3. Employees engaged in housekeeping tasks shall use respirator protection in accordance with subsection (h)(3).

4. The employer shall provide readily accessible washing facilities in accordance with Section 3366 (Washing Facilities).

(C) The Division may require the employer to take additional actions to protect employees through the issuance of an Order to Take Special Action in accordance with Section 332.3.

(D) Prohibitions. The following practices are prohibited for high-exposure trigger tasks, regardless of exposure levels.

1. Any use of compressed air.

a. On waste, dust, debris, residue, or other materials that may contain crystalline silica;

b. On any surface or clothing or body surface that may contain crystalline silica; and

c. To back flush, backwash, or clean water, air, or other types of filters that may contain crystalline silica.

2. Any dry sweeping, shoveling, disturbing, or other dry clean-up of wastes, dusts, debris, or other materials that may contain crystalline silica.

3. Use of employee rotation as a means of reducing employee exposure to respirable crystalline silica.

4. Walking or moving equipment on or through dry dust, debris, residue, or other materials that may contain crystalline silica.

(32) Written exposure control plan.

(A) The employer shall establish and implement a written exposure control plan that contains at least the following elements:

1. A description of the tasks in the workplace that involve exposure to respirable crystalline silica;

California Department of Industrial Relations
Division of Occupational Safety & Health
Publications Unit

SAFETY & HEALTH | FACT SHEET

CAL OSHA

Silica Emergency Temporary Standard
Information for Employers

What is the concern?

California is experiencing a silicosis epidemic among artificial stone fabrication workers.

"Artificial Stone" is any reconstituted, artificial, synthetic, composite, engineered, or manufactured stone, porcelain, or quartz. It is commonly made by binding crushed or pulverized stone with adhesives, polymers, epoxies, resins, or other binding materials to form a slab.

Between 2010 and October of 2023, more than 90 California workers who make countertops from artificial stone have developed silicosis. Ten of these workers — and counting — have died. This is not counting unreported cases.

Silica is a natural mineral that comes in different forms. The crystalline forms are far more hazardous, especially when employees are exposed to airborne particle sizes smaller than the diameter of a human hair. This is known as "respirable" dust. Breathing too much airborne respirable crystalline silica (RCS) can cause:

- Lung cancer.
- Silicosis — an incurable lung disease — and other lung effects.
- Kidney and autoimmune disease.

In recent years, **artificial stone** has become more widely used, particularly in the manufacture of countertops. It is more hazardous to employees exposed to airborne dust since it can contain approximately 93% or greater crystalline silica — **more than double that for granite**.

Material	Percent Crystalline Silica
Artificial Stone	more than 93%
Quartzite	95%
Sandstone	60%
Granite	10 to 45%

High-exposure trigger tasks are of particular concern. These are tasks such as cutting, grinding, drilling, and polishing **artificial stone that contains more than 0.1% crystalline silica, or for natural stone that contains more than 10% crystalline silica.** This includes cleanup and handling of dust and debris created during these types of tasks.

Cal/OSHA inspections of the artificial stone fabrication industry in 2019-2020 found widespread non-compliance with Title 8, California Code of Regulations, **section 5204, Occupational Exposure to Respirable Crystalline Silica. The Emergency Temporary Standard (ETS) changes to section 5204 go into effect beginning December 29, 2023 to better address this silicosis epidemic in the workplace.**

What must employers do?

Effectively implement section 5204 — **including all the ETS requirements** — in their workplaces if the work their employees are performing meets the scope and application of this standard. This fact sheet only provides an overview. Employers must refer to section 5204 for details on all the requirements and definitions.

Summary of the ETS changes

- **Where there is any employee exposure to airborne RCS**, Employers must:
  - Promptly (within 24 hours) report any confirmed RCS exposure-related silicosis or cancer case to the California Department of Health and Cal/OSHA.
  - Communicate RCS exposure hazards to employees in a language they understand and appropriate for their level education and literacy. This includes:
    - The exposure symptoms, such as cough, difficulty breathing, fatigue, shortness of breathing, weakness, fever, chest pain, or unexpected weight loss.

(Continued on Next Page)

CCR § 5204(9). Occupational Exposures to Respirable Crystalline Silica

- **"High-Exposure Trigger Task"** means machining, crushing, cutting, drilling, abrading, abrasive blasting, grinding, chiseling, carving, gouging, polishing, buffing, fracturing, intentional breaking, or intentional chipping of artificial stone that contains more than **0.1 %** by weight crystalline silica, or natural stone that contains more than **10 %** percent by weight crystalline silica. High-exposure trigger tasks also includes clean up, disturbing, or handling of wastes, dusts, residues, debris, or other materials created during the above listed tasks

CCR § 5204 Occupational Exposures to Respirable Crystalline Silica

- Exceptions:
  - Geologic field research is not considered a high-exposure trigger task.
  - Outdoor work at quarries or open pit mines is not considered a high-exposure trigger task.
  - Fabrication or finishing of natural stone tombstones, monuments, memorials, burial vaults, sculptures, or related items is not considered a high-exposure trigger task.

https://www.geologyin.com/2014/11/geological-field-equipment-and-safety


https://www.europages.co.uk/companies/funerary

Exposure assessment

- **Performance Option**
  - Combination of air monitoring data and objective data
- **Scheduled Monitoring Option**
  - Initial air monitoring (representative)
    - If > PEL; repeat every 3 months
    - If > AL; repeat every 6 months
    - If < AL; discontinue
  - Re-assessment air monitoring
    - Whenever there are changes

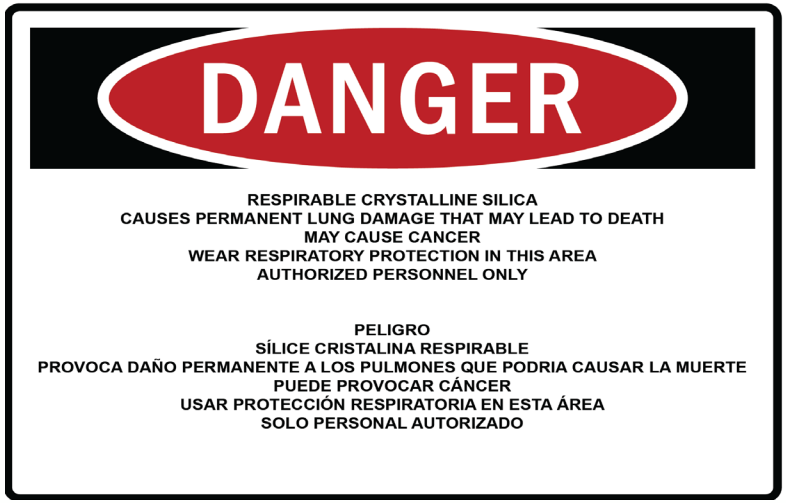
Exposure assessment

High-Exposure Trigger Tasks

- Regardless of exposures or expected exposures, all high-exposure trigger tasks shall be assessed by scheduled monitoring.
- At least every 12 months or more frequently as required.
- Where most recent exposure monitoring indicates exposures below the AL, monitoring shall not be discontinued for high-exposure trigger tasks, which shall be monitored at least every 12 months or more frequently as required.

Controls

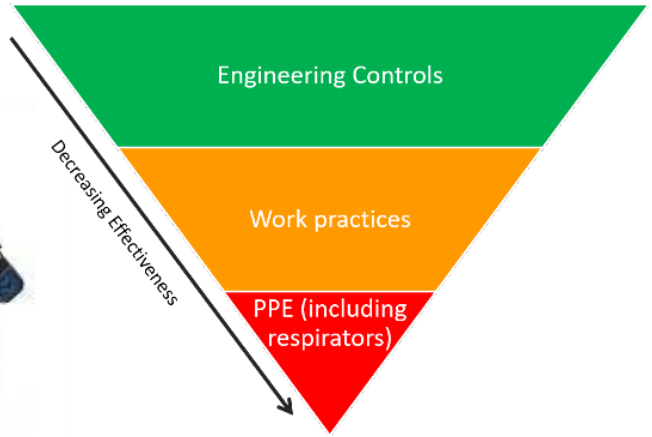
- **Regulated Areas**
  - Signage in English & Spanish



All high-exposure trigger tasks shall be conducted within a regulated work areas regardless of employee exposures, exposure assessments, or other objective data.

Controls

- Engineering and work practice controls



Wet methods for all high-exposure trigger tasks

https://www.dir.ca.gov/dosh/dosh_publications/emergency-silica-reg-employer-info.pdf

Housekeeping

https://atrix.com/product/hazardous-particulate-d4-6-hepa-vacuum/

Wastes, dusts, residues, debris, or other materials that are generated from high-exposure trigger tasks or that otherwise contain or are contaminated with respirable crystalline silica shall be promptly and properly cleaned up and placed into leak-tight containers, bags, or equivalent. At a minimum, all such wastes, dusts, residues, debris, or other materials shall be cleaned up at the end of each shift or more frequently as needed to ensure there is no visible dust build-up in the workplace

Employees engaged in housekeeping tasks shall use respirator protection

Housekeeping

- **Prohibited Practices regardless of exposure levels**
  - Use of compressed air
  - Dry sweeping or shoveling of materials
  - Employee rotation to reduce employee exposure
  - Walking/moving equipment through dry dust debris

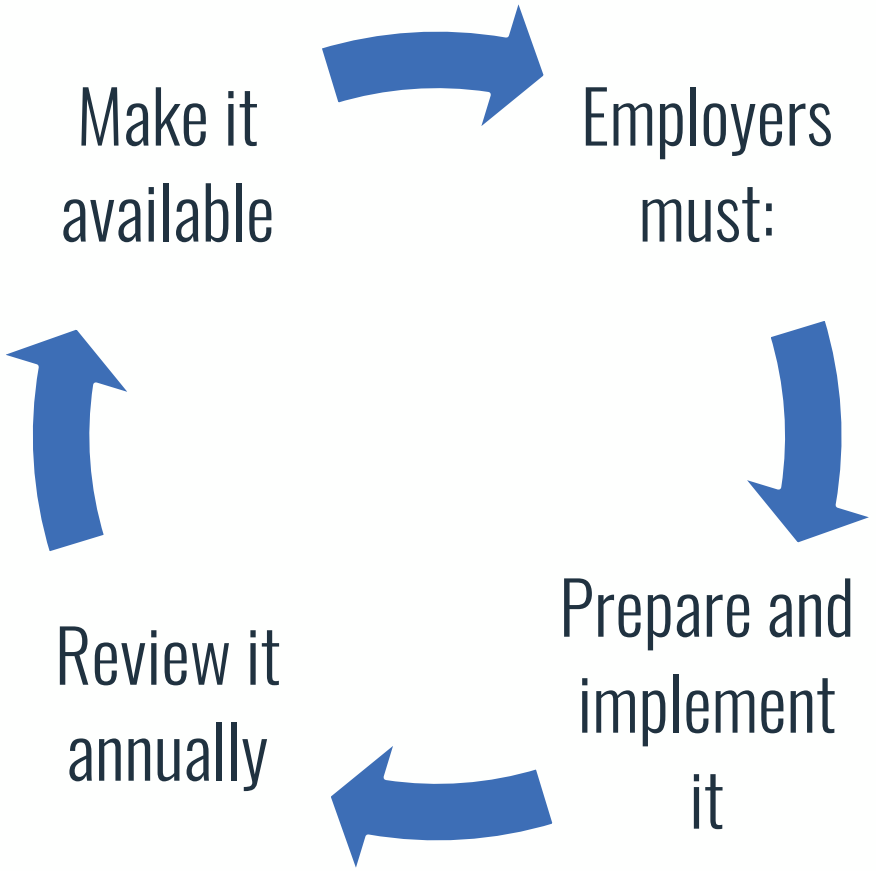
Written Exposure Control Plan

Tasks with Exposure:

Controls (Engineering/Work Practice) :

Respiratory Protection:

Housekeeping:



Written Exposure Control Plan

High-Exposure Trigger Tasks

- Air monitoring records
- PPE donning and doffing procedures
- Reporting documentation
- Training records

Respiratory Protection

- **Non-high-exposure trigger tasks = Air Data > PEL**
  - APF Dependent on exposure
- **High-exposure trigger tasks = Always**
  - A full face, tight-fitting powered-air purifying respirator (PAPR) or;
  - Respirator with equal or greater protection equipped with a HEPA, N100, R100, or P100 filter
  - Exception:
    - Loose-fitting PAPR (APF of 25);
    - Full face air-purifying respirator (APF 50);
    - Half face PAPR (APF of 50) or;
    - other respirator with equal or greater protection if exposures are continuously maintained below the AL (air sample data)

MEDICAL SURVEILLANCE

- **Offered:**
  - Initial Examination - Within 30 days of employment
  - Every 3 years
- **Medical and Work History**
- **Physical Exam**
- **Chest X-Ray**
- **Pulmonary Function Test**
- **Testing for latent tuberculosis infection**

Recordkeeping and Reporting

AIR MONITORING DATA

OBJECTIVE DATA

MEDICAL SURVEILLANCE

Reporting of Silicosis: Within 24 hours of receiving information regarding confined silicosis case or lung cancer related to RSC exposure. Report to OSHA and CDPH.

Case Study – Artificial Stone Fabrication

- **Purpose:**
  - Evaluate silica exposures of employees
  - Evaluate effectiveness of engineering controls
- **Work Tasks:**
  - Cutting, grinding, and polishing of marble and granite benchtops
  - Dry and wet methods
- **Controls:**
  - LEV
  - Respiratory

Exposure Assessment Results

Table 1 – Sample Results Table, February 26, 2021 Respirable Crystalline Silica [redacted]					
Employee / Sample ID	Sample duration (min)	Result TWA			
		Respirable Quartz (mg/m^3)	Respirable Cristobalite (mg/m^3)	Respirable Tridymite (mg/m^3)	RCS (mg/m^3)
[redacted]	501	0.11	<0.004	<0.016	0.11
[redacted]	488	0.11	<0.0041	<0.016	0.11
[redacted]	456	0.012	<0.0044	<0.018	0.012
Cal/OSHA Permissible Exposure Limit (PEL) – 8-hour TWA		**0.05**	**0.05**	**0.05**	**0.05**
Cal/OSHA Action Level		**0.025**	**0.025**	**0.025**	**0.025**

Notes:
mg/m^3 (milligrams per cubic meter); PEL – permissible exposure limit; TWA – time-weighted average
The symbol "<" means "less than" and the value following indicates the laboratory reporting limit for the analytical method and sample volume.
RCS = Respirable Crystalline Silica; includes all three forms added together (quartz, cristobalite, & tridymite)

Conclusions and Recommendations

1. Full shift sampling results were above the regulatory Cal/OSHA PEL and Action Level for the two employees monitored working on dry side operations.
2. Use of respiratory protection is required during dry side tasks monitored with APF of 50 or greater.
3. Comply with silica standard requirements.
    1. Develop written exposure control plans
    2. Establishment and demarcation of regulated areas
    3. Repeated exposure monitoring every quarter.
    4. Install or implement feasible engineering and work practice controls
    5. Improvement of housekeeping measures
    6. Medical surveillance
    7. Recordkeeping

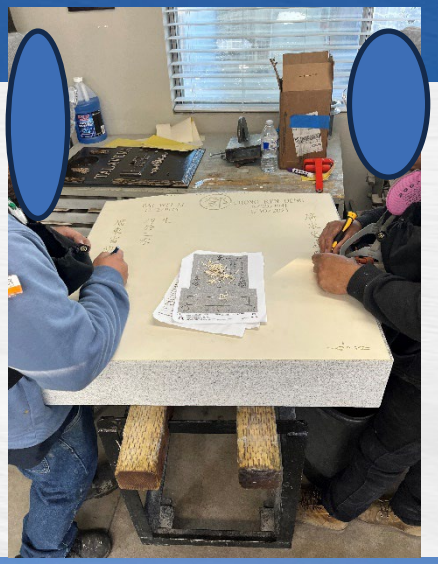
Updated Conclusions and Recommendations – In accordance with ETS

- Exceeded PEL; therefore, repeat monitoring every 3 months
- Use of respiratory protection is required for all employees performing high-exposure trigger tasks regardless of exposure levels (e.g. dry & wet side operations).
  - Full face tight-fitting PAPR (APF of 1000), or a respirator providing equal or greater protection equipped with a HEPA, N100, R100, or P100 filter.
- Conduct subsequent surveys at least once every 6 months. If monitoring results remain less than AL, can use:
  - loose-fitting PAPR (APF of 25), or
  - full facepiece APR (APF of 50), or
  - Other with equal or greater protection
- Use of dry methods prohibited
- Additional information requirements in the written exposure plan

Case Study – Natural Stone Tombstones

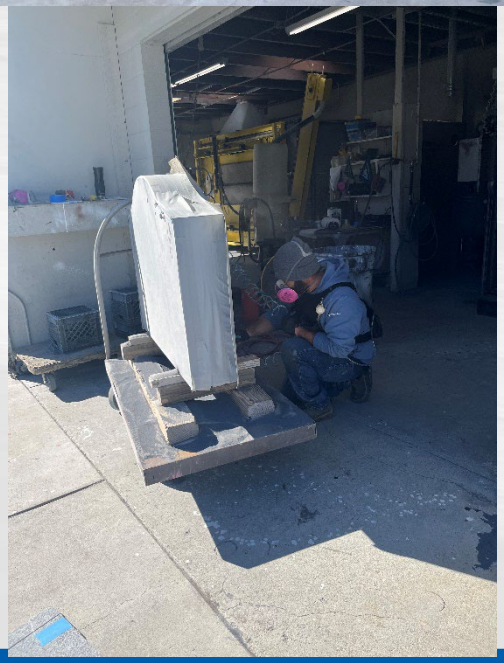
- **Purpose:**
  - Survey performed in March 2024
  - Evaluate silica exposure of employees to meet requirements of the ETS
  - Assess effectiveness of engineering controls
- **Work Tasks:**
  - Inscription, cutting, grinding, polishing, sandblasting of natural stone monument slabs
  - Considered a “high-exposure trigger tasks”


WED




TK


TOYOTA




HAYWARD / 581-5833

Exposure Assessment Results

Table 1 – Sample Results Table, March 19, 2024 Respirable Crystalline Silica [redacted]					
Employee / Sample ID	Sample duration (min)	Calculated 8-hr TWA[1]			
		Respirable Quartz (mg/m^3)	Respirable Cristobalite (mg/m^3)	Respirable Tridymite (mg/m^3)	RCS (mg/m^3)
[redacted] *Sandblaster Operator* (1)	518	0.016	<0.0048	<0.019	0.016
[redacted] *Jet Saw Operator* (2)	506	<0.0049	<0.0049	<0.020	<0.0049
Cal/OSHA Permissible Exposure Limit (PEL) – 8-hour TWA		**0.05**	**0.05**	**0.05**	**0.05**
Cal/OSHA Action Level		**0.025**	**0.025**	**0.025**	**0.025**

Notes: mg/m^3 (milligrams per cubic meter); PEL – permissible exposure limit; TWA – time-weighted average

The symbol "<" means "less than" and the value following indicates the laboratory reporting limit for the analytical method and sample volume.

RCS = Respirable Crystalline Silica; includes all three forms added together (quartz, cristobalite, & tridymite)

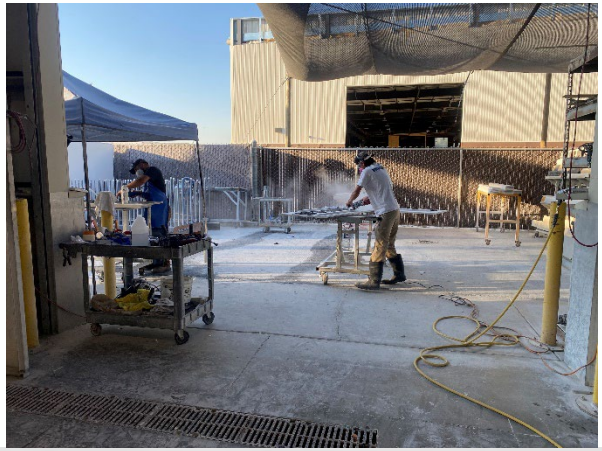
Conclusions and Recommendations

- All work tasks assessed at the facility were considered "high-exposure trigger task" as defined by the Cal/OSHA ETS.
- All requirements of the ETS are applicable to all employees performing similar work tasks assessed, *regardless of exposure data*.
- Annual scheduled monitoring regardless of the exposure levels.
- Use of full face tight-fitting PAPR (APF of 1000), or a respirator providing equal or greater protection equipped with a HEPA, N100, R100, or P100 filter.
- Implementation of control methods to effectively suppress dust – wet methods only per the ETS

Case Study – Natural & Artificial Stone Fabrication

- **Purpose:**
  - Survey performed in July 2024
  - Evaluate silica exposure of employees to meet requirements of the ETS
  - Assess effectiveness of engineering controls
  - Assess PPE

- **Work Tasks:**
  - Cutting, grinding, and polishing of natural and engineered stone slabs
  - Considered “high-exposure trigger tasks”
  - Use of compressed air to clean work areas



Exposure Assessment Results

Sample ID	Work Task / Employee	Sample Duration (min.)	Sample Volume (L)	Respirable Quartz (mg/m^3)	Respirable Cristobalite (mg/m^3)	Respirable Tridymite (mg/m^3)	Calculated TWA[1] Total Silica (mg/m^3)
P01	Grinding Operator - [redacted]	454	1112.3 L	**0.14**	< 0.023	< 0.018	**0.13**
P02	Fabrication Operator – [redacted]	438	1086.2 L	0.0085	< 0.0046	< 0.018	0.0078
P03	Saw Cutting Operator [redacted]	433	1078.2 L	<0.019	< 0.0046	< 0.019	<0.019
P04	Polishing Operator – [redacted]	427	1084.6 L	**0.066**	< 0.0046	< 0.018	**0.059**
P05	Grinding Operator – [redacted]	338	838.24 L	**0.051**	< 0.0072	< 0.0024	**0.036**
P06	Blank	-	-	-	-	-	-
Cal/OSHA PEL (8-hour TWA)				**0.050**	**0.050**	**0.050**	**0.050**
Cal/OSHA Action Limit (8-hour TWA)				**0.025**	**0.025**	**0.025**	**0.025**

[1] Calculated TWA assuming zero exposure to respirable crystalline silica during the remaining 8 hour work shift.
Cal/OSHA = California Division of Occupational Safety and Health; PEL = Permissible Exposure Limit
NA = no current exposure limits/guidelines available; AL = Action Level
BOLD = values greater than regulatory (Cal/OSHA) PEL or AL

Conclusions and Recommendations

- Respiratory protection worn by employees was inadequate based on the Cal/OSHA ETS requirements.
- All work tasks assessed at the facility were considered "high-exposure trigger task" as defined by the Cal/OSHA ETS.
- All requirements of the ETS are applicable to all employees performing similar work tasks assessed.
- Repeat monitoring within 3 months for exposures that exceeded the PEL.
- Annual scheduled monitoring for employees below the AL.

Conclusions and Recommendations

- Use of full face tight-fitting PAPR (APF of 1000), or a respirator providing equal or greater protection equipped with a HEPA, N100, R100, or P100 filter for employees who exceeded the AL.
- Use of full loose-fitting PAPR, a full facepiece air-purifying respirator, a half-face PAPR, or another respirator providing equal or greater protection for employees who were below the AL.
- Implementation of control methods to effectively suppress dust – wet methods only per the ETS.
- Use of air compressor, dry sweeping & brushing is prohibited.
- Implement controls using wet-methods only.

In Conclusion

Thank You!

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Right People.

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