Silica Update

for

General Industry and Construction

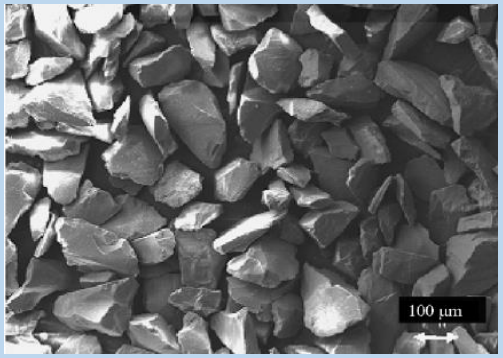
"Controls – the Good, the Bad and the Ugly"

Harvey Johnson, CIH, MIOSHA CET

Respirable Crystalline Silica

Part 690, Silica in Construction Sept. 2017

Part 590, Silica in General Industry June 2018



Contents of Training

- What is Silica?
- What are the health effects of Silica exposure?
- New Silica Standard in Construction
- New Silica Standard in Gen. Industry
- Control of Silica, Good, bad and Ugly

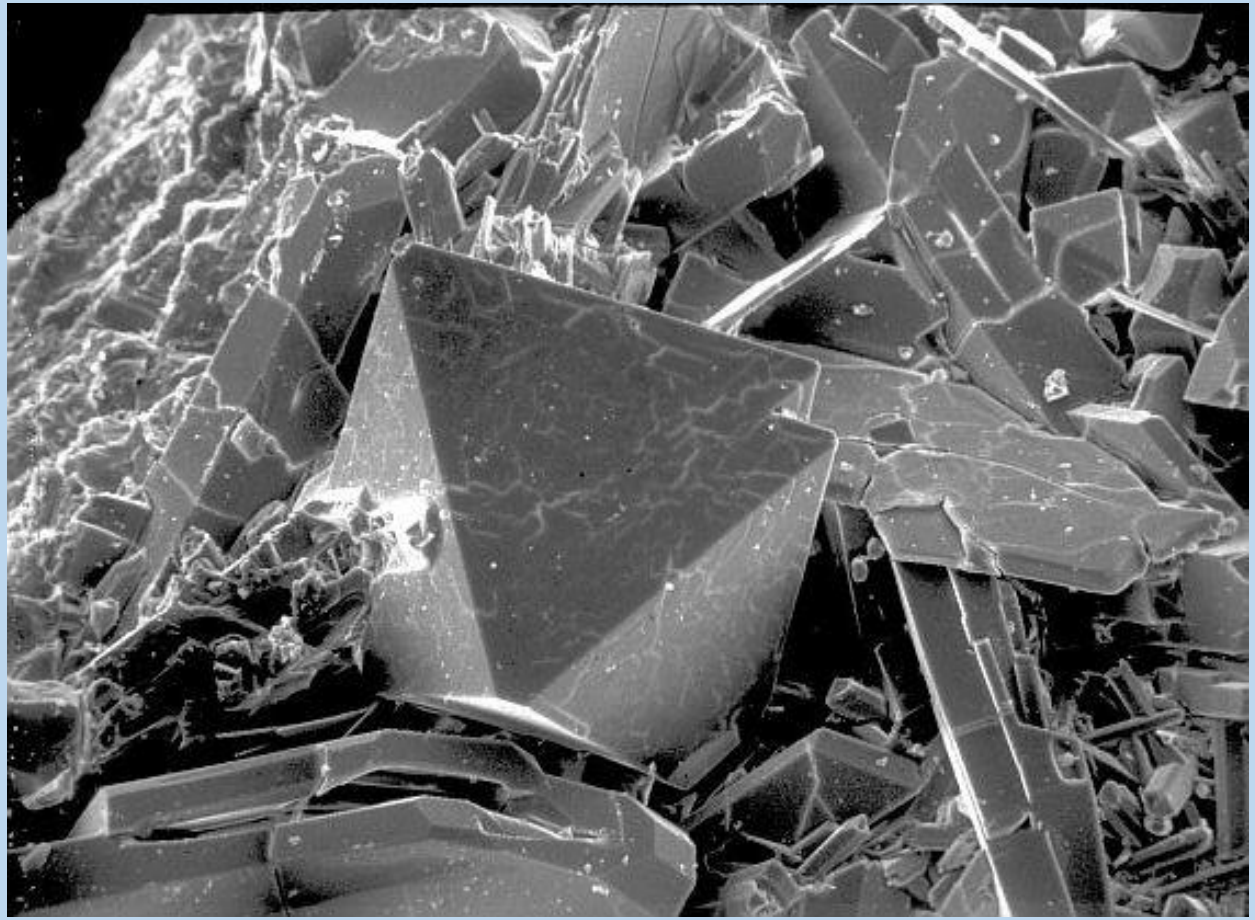
BUT FIRST LE'TS LOOK AT SILICA THE COMPOUND

Given the chemical formula for silica (SiO_2), it is interesting to note:

- **Oxygen** is the most abundant element in the Earth's crust and **silicon** is the second most abundant.
- **Quartz,** the most common form of crystalline silica, is the second most common mineral on the earth's surface.

It's no wonder that exposures to respirable crystalline silica are widespread throughout the world.

Respirable Silica is <10 µm in diameter

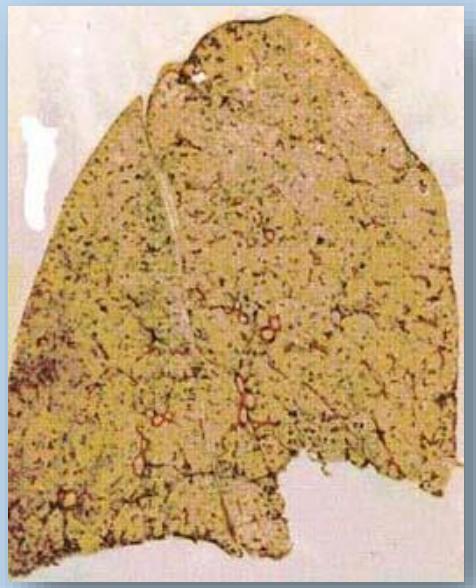


Respirable Crystalline Silica

- Where can it be found:
  - Sand
    - Concrete
    - Masonry products
    - Sandstone
    - Rock (granite, marble, basalt)
    - Paint
    - Abrasives
    - Mortar
    - Drywall
    - Plaster

Exposure and Health Risks

- OSHA estimates **more than 840,000 employees in construction** and **more than 100,000 employees in general industry** are exposed to workplace silica levels that **exceed the revised permissible exposure limit (PEL)**.
- Exposure to respirable crystalline silica has been linked to:
  - Silicosis,
  - Lung cancer,
  - Chronic obstructive pulmonary diseases (COPD), and
  - Kidney disease.



Healthy Lung

Silicotic Lung

Silicosis in Michigan

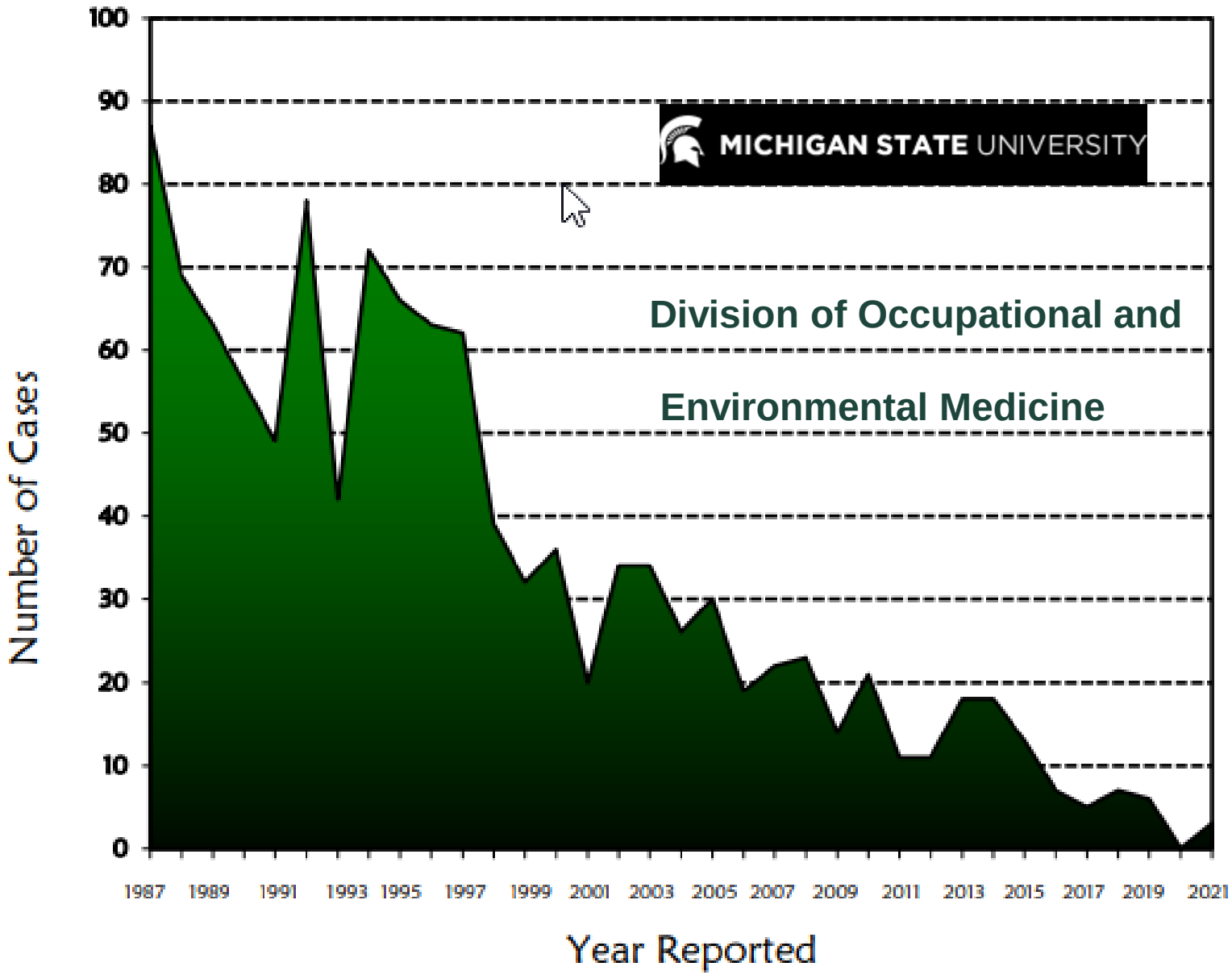
- MI has tracked silicosis cases since 1985

1,210 silicosis cases have been identified through the Michigan tracking system (MSU/NIOSH/MIOSHA)*

- MI averaged 64 reported cases per year from 1987-1997
- MI averaged 22 reported cases per year since 2000

*Data indicates under-reporting

Confirmed Silicosis Cases by Year Reported



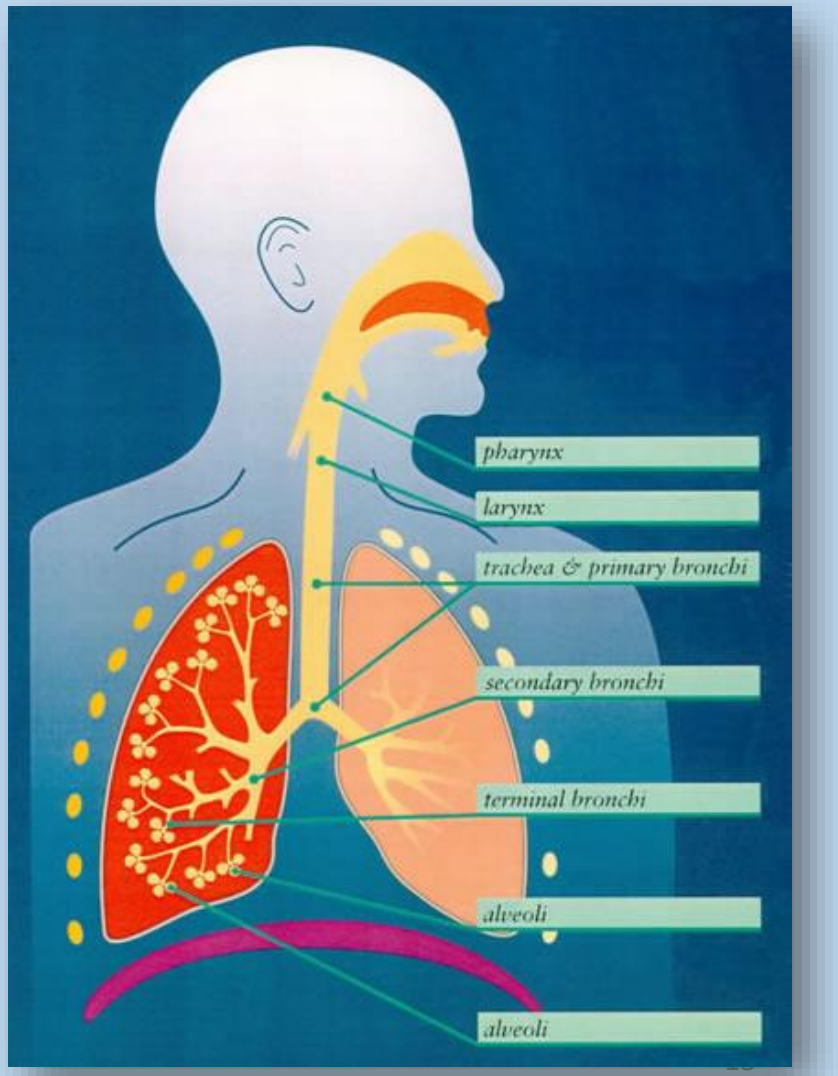
Health Effects - Silica

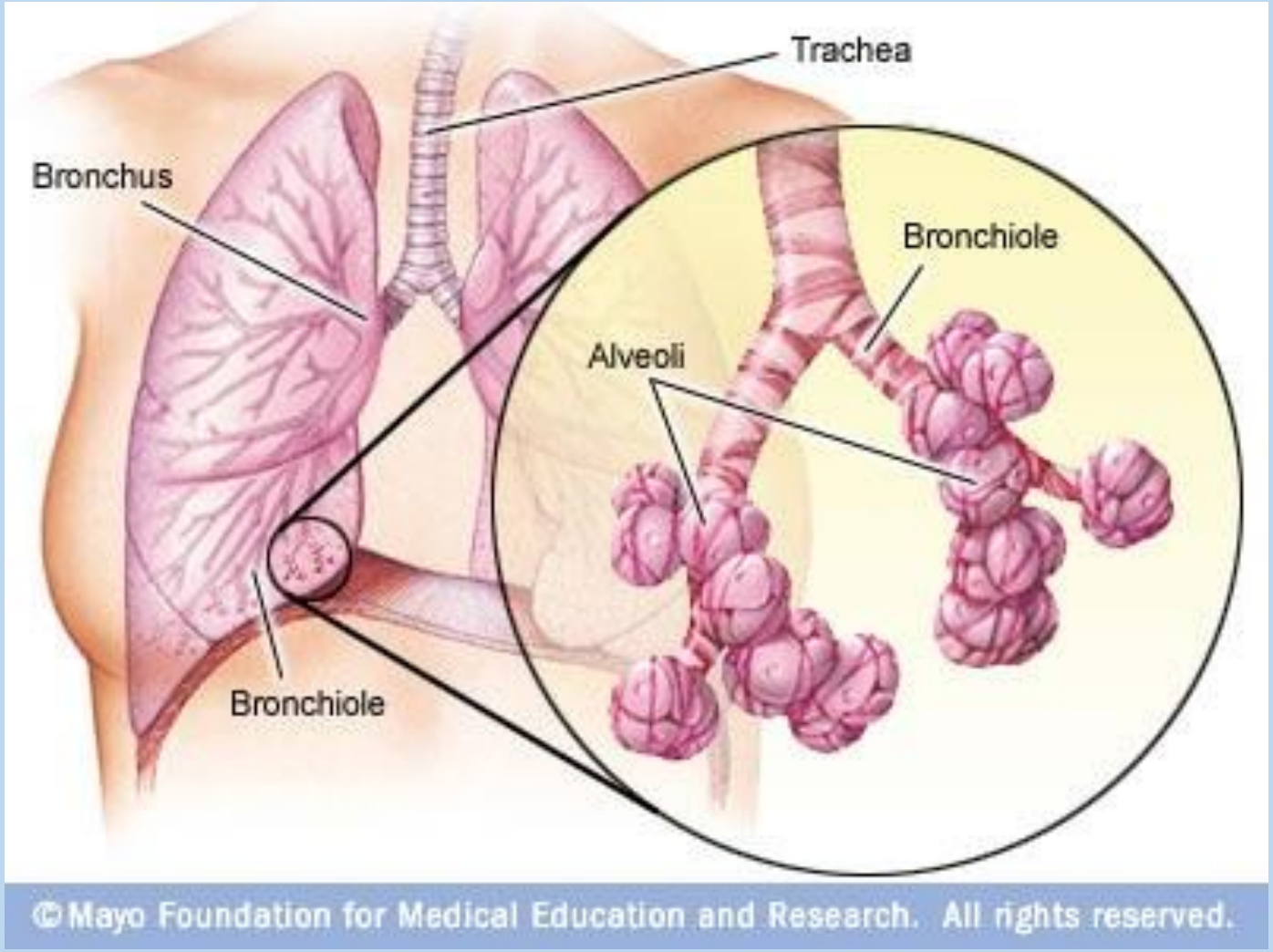
- Early stages of the disease may go unnoticed.
- Silicosis – disabling, non-reversible & sometimes fatal lung disease.
- Other non-malignant respiratory diseases, such as chronic bronchitis.
- Lung Cancer
- Kidney disease – including nephritis & end-stage renal disease (kidneys).
- May be associated with auto-immune disorders & cardiovascular disease.
- **Symptoms include**:
  - Shortness of breath
  - Severe cough
  - Chest pains
  - Weakness

Definition: Respirable Crystalline Silica

Part 690, Rule 69015 (9)

- Silica is comprised of **crystalline quartz, cristobalite, and/or tridymite**.
- The **respirable fraction** (10 microns in diameter or less) is of greatest concern as these tiny, dagger-like particles have the **potential to reach the delicate alveolar lung tissue**.

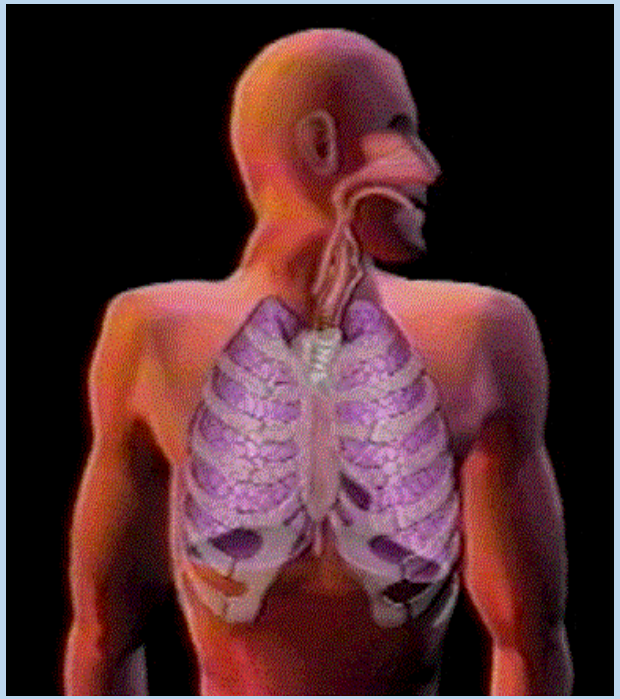




- Crystalline silica causes scar tissue inside the alveoli,
- Blocking the transfer of Oxygen and CO_2 to and from the blood.

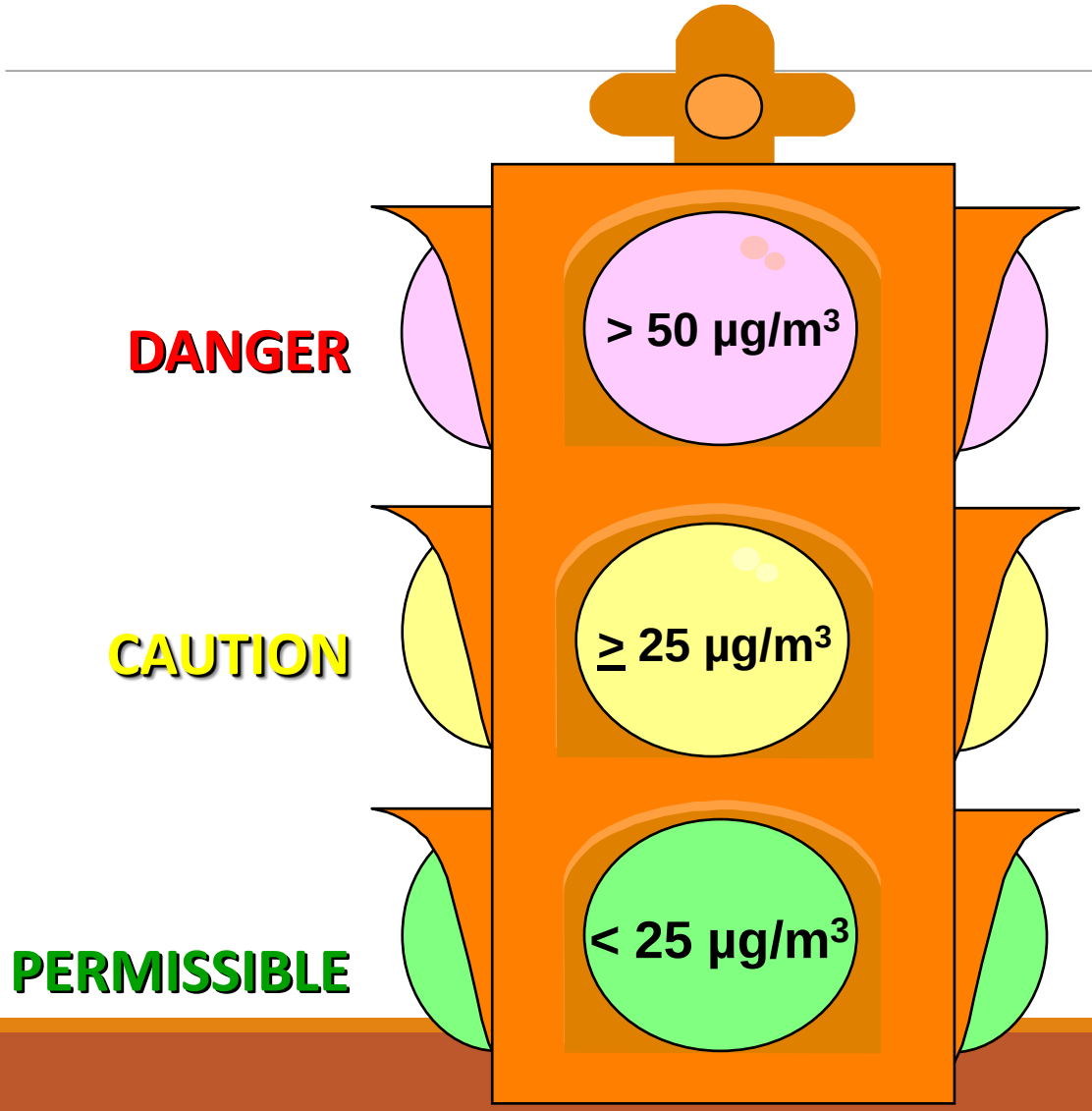
Types of Silicosis

- Chronic
  - 10 or More Years of Exposure
  - Low Exposure Concentrations
- Accelerated
  - 5 to 10 Years After Exposure
  - High Exposure Concentrations
- Acute
  - A Few Weeks to 4 or 5 Years After Exposure
  - Highest Exposure Concentrations



Silica Exposure Limits

Part 590, 1910.1053 (c) and Part 690, 1926.1153 (d)(1)



PEL: permissible exposure limit

50 µg/m³, 8-hr TWA

AL: action limit

25 µg/m³, 8-hr TWA

Silica in G.I.

MIOSHA Part 590 (adopts 29 CFR 1910.1052)

Scope and application

Definitions

Permissible exposure limit (PEL)

Exposure assessment

- <AL – done
- >AL – PEL – repeat ea. 6 months
- >PEL- repeat ea. 3 months

Regulated areas

Engineering & Work pract. CONTROLS

Respiratory protection

Housekeeping

Written exposure control plan

Medical surveillance

Communication of silica hazards

Recordkeeping

Silica in Construction

MIOSHA Part 690 (adopts 29 CFR 1926.1153)

Scope and application

Definitions

Specified exposure control methods,

(TABLE 1)

…OR…

Alternative exposure control methods:

- Permissible exposure limit (PEL)
- Exposure assessment
- Methods of compliance

Respiratory protection

Housekeeping

Written exposure control plan

Medical surveillance

Communication of silica hazards

Recordkeeping

Dates

Table 1: Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica - Construction

EQUIPMENT/TASK/CONTROL METHODS	REQUIRED RESPIRATORY PROTECTION & MINIMUM ASSIGNED PROTECTION FACTOR (APF)	
	≤ 4 hours/shift	≥ 4 hours/shift
1 - Stationary Masonry Saws		
◦ Continuous water feed to blade	None	None
2 - Handheld power saws (any blade diam)		
Continuous water feed to blade		
◦ Outdoors----------	None	APF 10
◦ Indoors/enclosed area ----------	APF 10	APF 10
3 - Handheld power saws for cutting fiber cement board (blade diameter ≤ 8 inches)		
◦ Outdoor use only		
◦ Dust collection system (commercial)		
◦ Proper tool airflow & filters (≥99%)	None	None

Gyp-Crete mixing

Gyp-Crete® is ≤5% crystalline silica quartz.

Air Sample Results

26 -52 µg/m^3 RCS during mix

8-hr TWA

11-21 µg/m^3

Below Action Limit

Objective Data

Beware of using someone elses data

Must be substantially the same conditions.

Rarely possible

RE: Air monitoring for crystalline silica during flooring installations on 22 June 2017

Dear Tom:

We evaluated employee exposure to respirable crystalline silica during flooring installations done by Floor Technologies employees on 22 June 2017. We measured the exposure of the pump operator, pump helper, the Bobcat operator, a grinder, and an applicator.

No respirable crystalline silica was detected in any of the samples. All employees' time-weighted average exposures were well below OSHA's Action Level for all three forms of respirable crystalline silica.

We measured each task for the entire time it was done that day. Sampling began before employees started mixing and applying the Gypcrete or grinding on it. It ended once employees had finished cleaning up, just before they left the site. We do not expect that they had any additional exposure that day.

	Respirable crystalline silica	
Task	**Time weighted average**	**Concentration during task**
Pump operator	Less than 4.2 µg/m^3	Less than 12 µg/m^3
Pump helper	Less than 3.0 µg/m^3	Less than 17 µg/m^3
Bobcat operator	Less than 4.2 µg/m^3	Less than 12 µg/m^3
Applicator	Less than 3.6 µg/m^3	Less than 14 µg/m^3
Grinder	Less than 1.9 µg/m^3	*See note below*
OSHA Action Level	25 µg/m^3	
OSHA PEL	50 µg/m^3	

µg/m^3 is micrograms per cubic meter of air.

Note: The time the grinder spent grinding was short, so we can state that his exposure during the actual work was below 27 µg/m^3 but we cannot be more precise than that, because of the laboratory's detection limit. The actual sampling time ranged from 74 minutes, for the grinder, to 168 minutes for the pump operator.

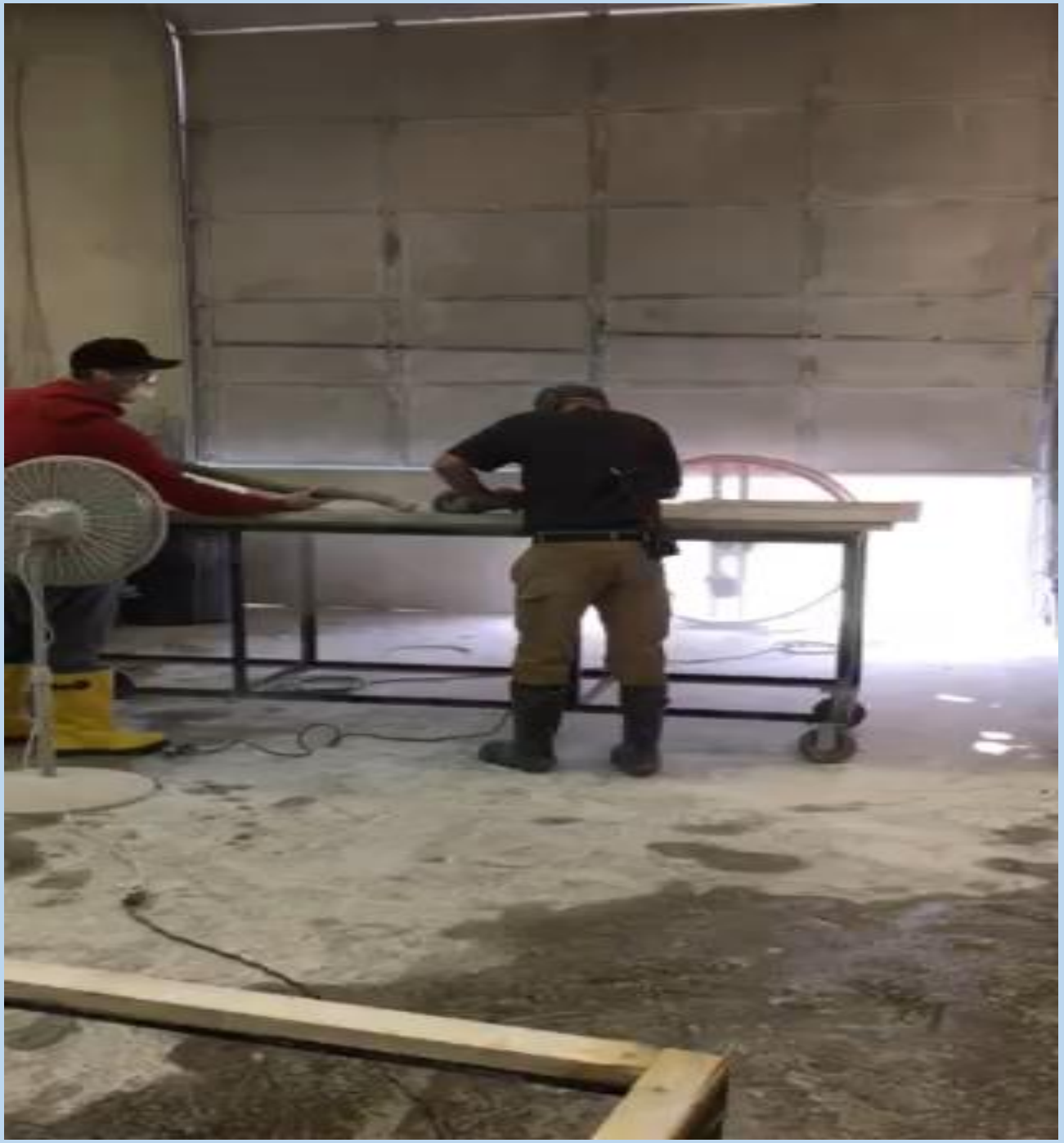
The time weighted average is for an eight hour work day. This assumes any unsampled time had no exposure. Task is the exposure level only during the sampling time

Based on these results, employees do **not** have exposure to crystalline silica.


STONE
88L527


Hi-Vac
WARNING!
LIFT HERE

Bad Control?



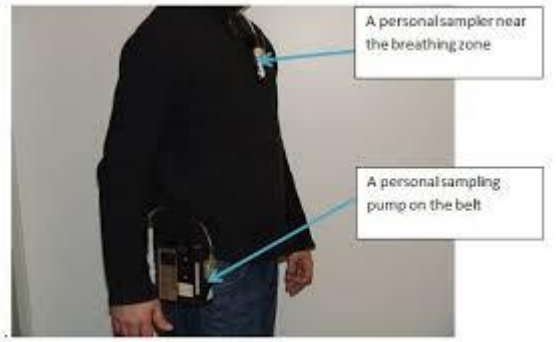
Exposure assessment – G.I.

General Industry

(d)(1) General. The employer shall 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 in paragraph (d)(2) or the scheduled monitoring option in paragraph (d)(3) of this section.

(2) Performance option. The employer shall 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.

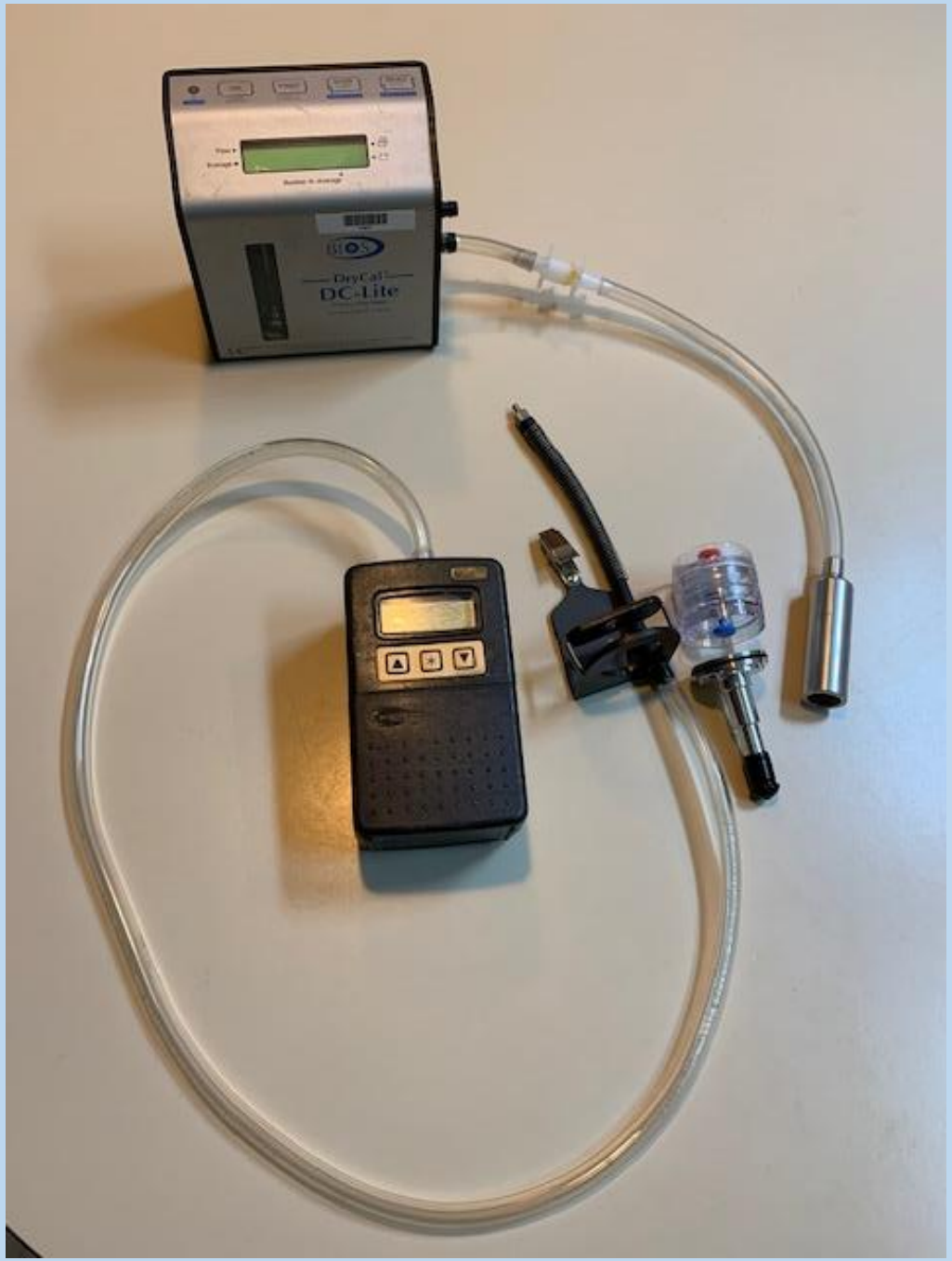
(3) Scheduled monitoring option. (i) The employer shall perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Representative sampling is acceptable, must sample employees who are expected to have the highest exposure to respirable crystalline silica.



Sampling Equipment

- Calibrator
- Calibrator adapter
- Sampling pump
- Tubing
- Cassette holder
- Cassette - 37 mm PVC 3 section
- Respirable sampler – aluminum cyclone

Contact MIOSHA ICM for the above equipment



Standard respirable dust sampler

Aluminum Cyclone
25 mm - Cat. No. 225-01-01
37 mm - Cat. No. 225-01-02

The SKC Aluminum Cyclone
The SKC Aluminum Cyclone is a lightweight respirable dust sampler that is used with a filter loaded into a three-piece 25 or 37-mm filter cassette.

Flow rate: 2.5 L/min to conform to the ISO 7708/CEN criteria included in the OSHA silica rule (page 16439)
Other flow rates may be used to achieve cut-points for alternate applications

Breathing zone air sample

The **breathing zone**" is defined as the **zone** within 10 inches radius of a worker's nose and mouth.

Exposure Assessment – G.I.

- (ii) If **initial monitoring < A.L.** (25 µg/m³), employer **may discontinue monitoring** of the represented employees for that exposure.
- (iii) Where the **most recent** exposure monitoring **≥ A.L. but ≤ PEL** (50 µg/m³), the employer shall **repeat** such monitoring **within six months** of the most recent monitoring.
- (iv) Where the **most recent** exposure monitoring **> PEL**, **repeat** monitoring **within 3 months** of the most recent.
- (v) Where the most recent (**non-initial**) exposure monitoring **< A.L.**, employer shall **repeat** such monitoring **within 6 months** of the most recent monitoring **until 2 consecutive** measurements, **taken 7 or more days apart, are < A.L.**, employer **may discontinue monitoring** for those employees represented by such monitoring, except as otherwise provided in paragraph (d)(4) of this section.
- **(4) Reassessment of exposures.** The employer shall 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 A.L.**, or when the employer has any reason to believe that the new or additional exposures at or above the A.L. have occurred.

Employee Notification of Assessment Results

Within 15 working days after completing an exposure assessment;

- Employer shall individually notify each affected employee in writing of the results.
- Employer can post results in appropriate location accessible to all affected employees.
- If exposures exceed the PEL, the employer shall describe in writing the corrective action being taken to reduce exposures.

- **Observation of monitoring**
  - Affected employees or their designated reps have the option to observe the air monitoring.
  - Observers must comply with the PPE requirements of the area.

Regulated Areas

Establishment – The employer shall establish a regulated area wherever an employee's exposure to airborne concentrations of respirable crystalline silica is, or can reasonably be expected to be, in excess of the PEL.

Demarcation – The employer shall demarcate areas from the rest of the workplace in a manner that minimizes the number of employees exposed to silica within the regulated area.

- The employer shall post signs at all entrances to regulated areas that bear the legend specified in paragraph (j)(2) of this section.

Access – The employer shall limit access to regulated areas to:

Persons authorized and required by work duties to be present.

Designated representatives exercising the right to observe.

Any person authorized by the Occupational Safety and Health Act

Methods of Compliance

Engineering & Work Practice Controls (by June 2021)

- The employer shall use engineering and work practice controls to reduce and maintain employee exposures to or below the PEL – unless determined to be not feasible.
- Employer **must use** engineering controls regardless of feasibility.
- Employer will supplement engineering controls with respiratory protection.

Written Exposure Control Plan

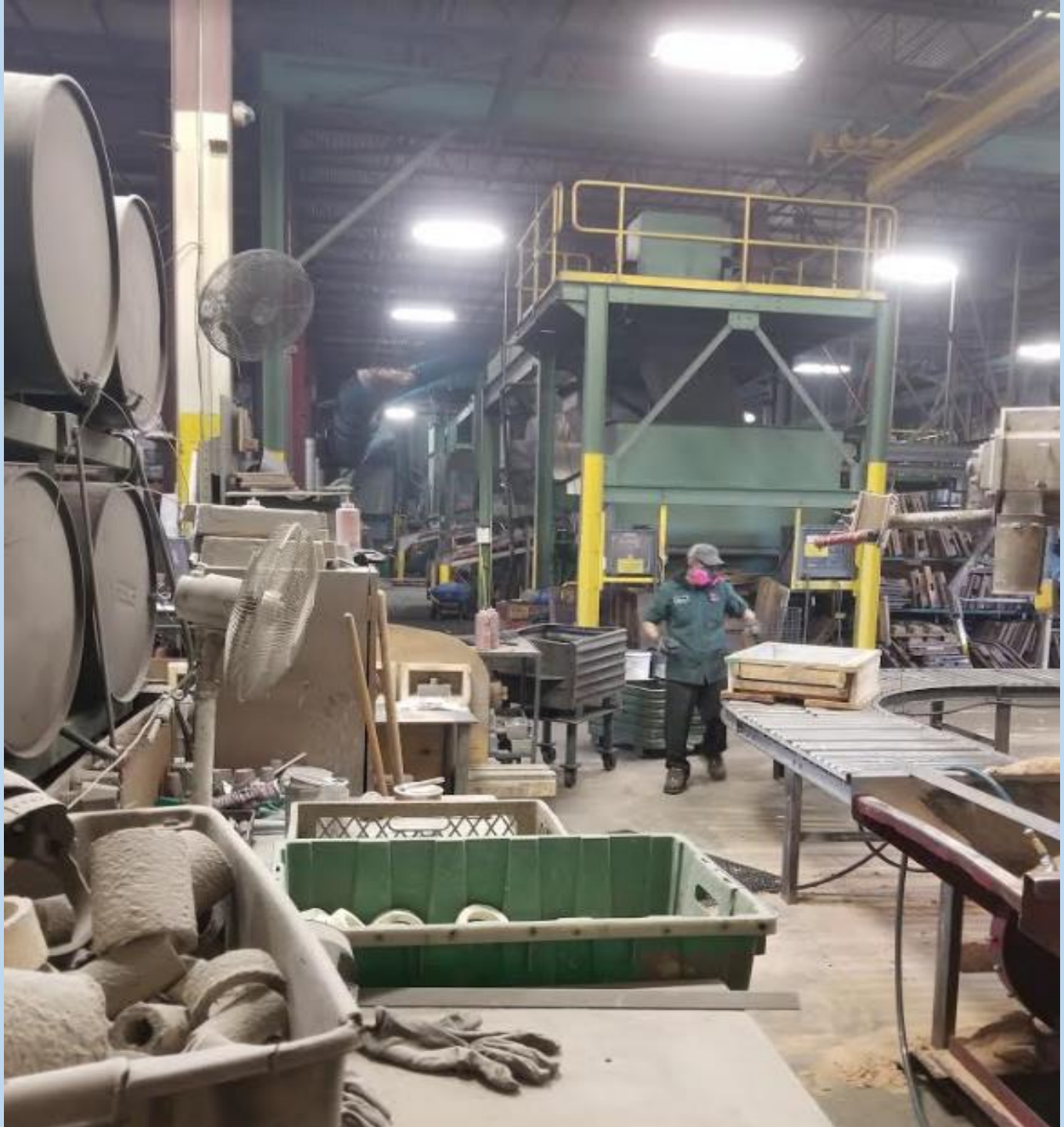
- The employer **shall establish and implement** a written exposure control plan that contains at least the following: MIOSHA Silica ECP
  - A description of the tasks in the workplace that involve exposure to respirable crystalline silica.
  - A description of engineering controls, work practices, and respiratory protection used to limit exposures to silica.
  - A description of the housekeeping measures used to limit employee exposures.
  - The Written Exposure Control Plan shall be review and evaluated annually
  - The Written Exposure Control Plan shall be readily available for review and copy.


airwash
MULTIPRO
airwash
MULTIPRO
SURFACE
NINJA GLUE

BAD

Control

BAD

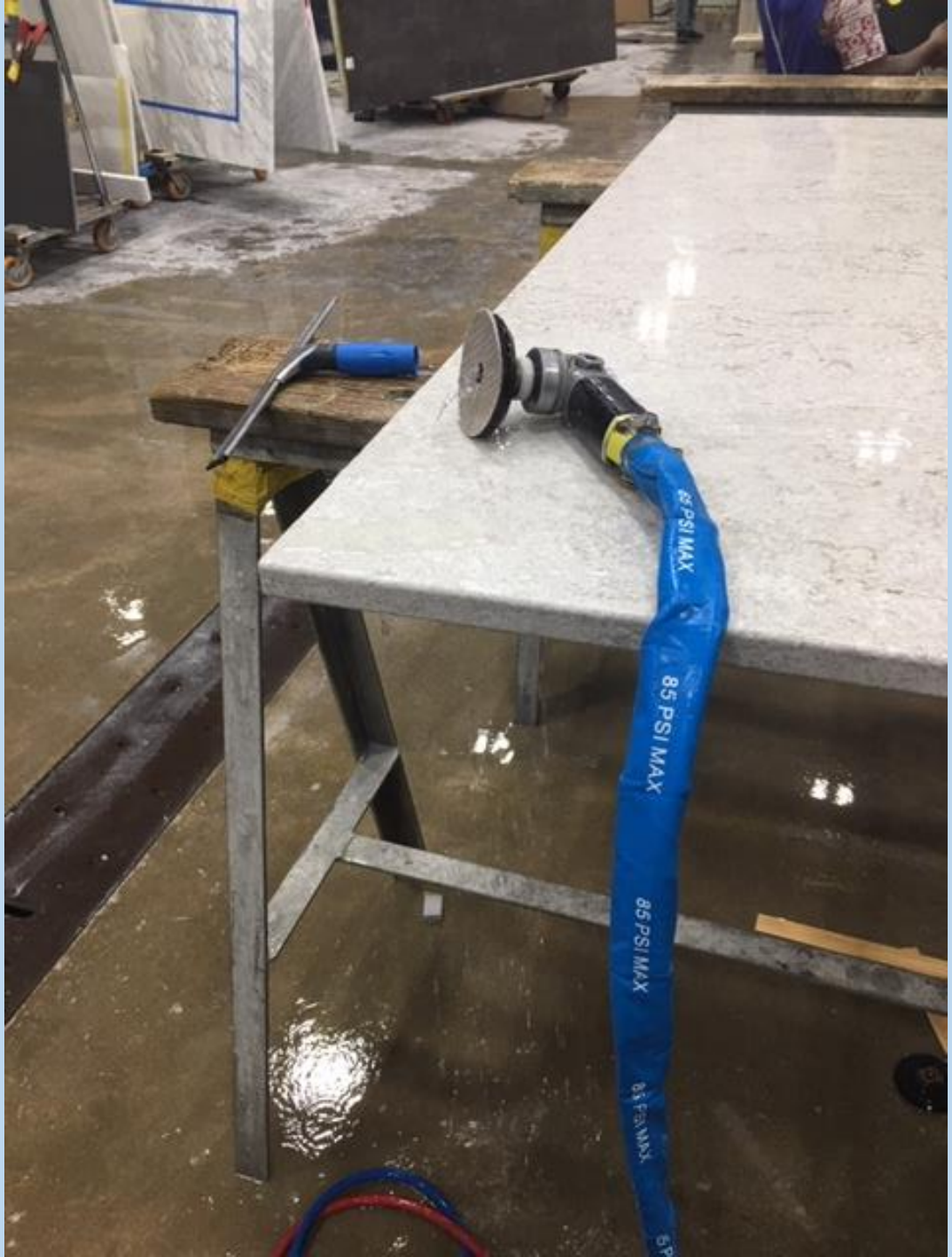


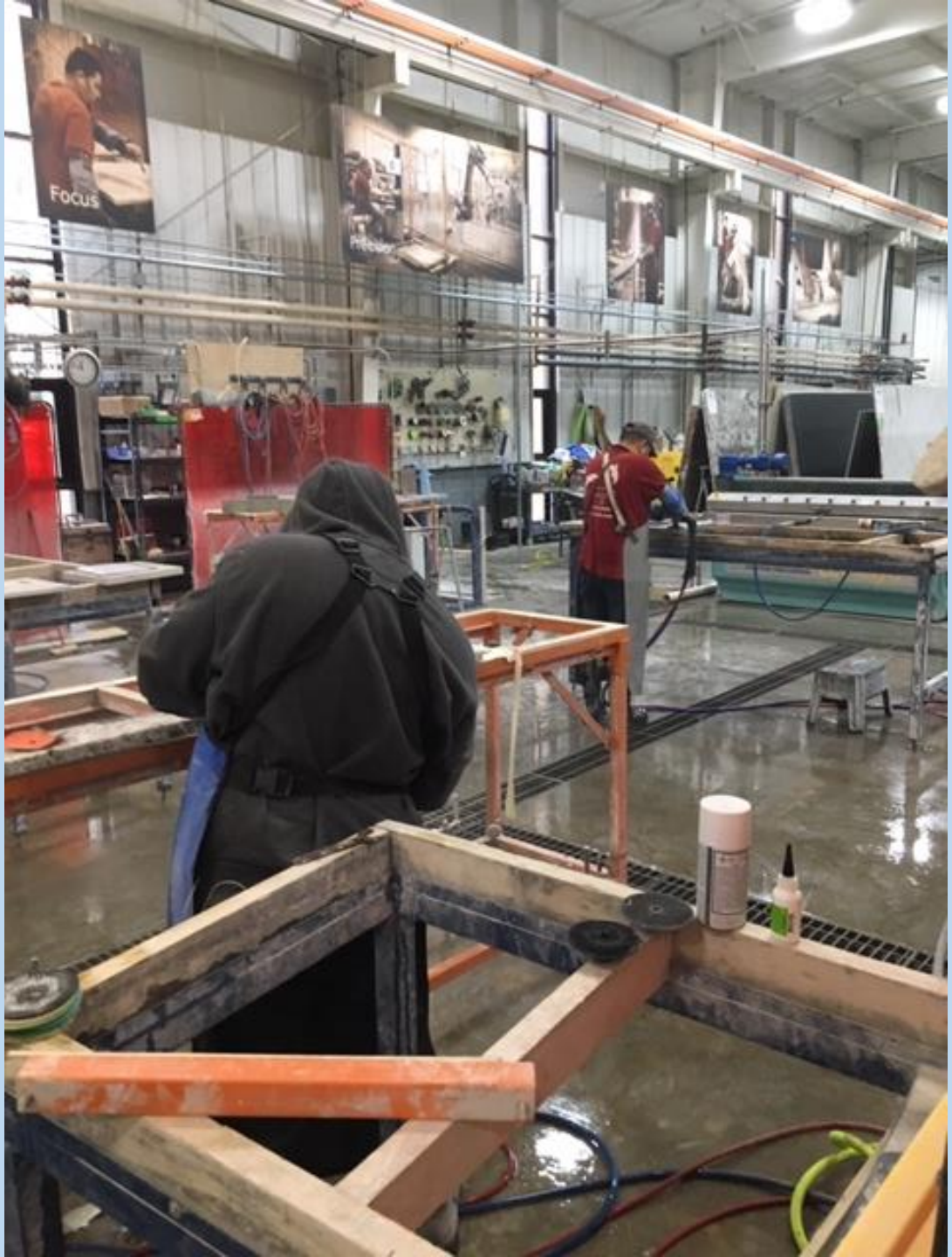

DUST

Good?
Bad?
Ugly?

GOOD

GOOD




Focus

Bad

> AL < PEL


US SILICA
ENGINEERED PERFORMANCE MATERIALS
MADE IN U.S.A.
SIL-CO-SIL
QUALITY GROUND SILICA
50 LBS. NET WT. (22.68 KG)
US SILICA
ENGINEERED PERFORMANCE MATERIALS
MADE IN U.S.A.
SIL-CO-SIL
QUALITY GROUND SILICA
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US SILICA
ENGINEERED PERFORMANCE MATERIALS
MADE IN U.S.A.
SIL-CO-SIL
QUALITY GROUND SILICA
50 LBS. NET WT. (22.68 KG)


MINSPAR 200
MINSPAR 200
MINSPAR 200
MINSPAR 200

Good ?


Zr
BRUTE
shop-vac

Respiratory Protection

Use of respiratory protection must comply with 29 CFR 1910.134 Respiratory Protection Standard.

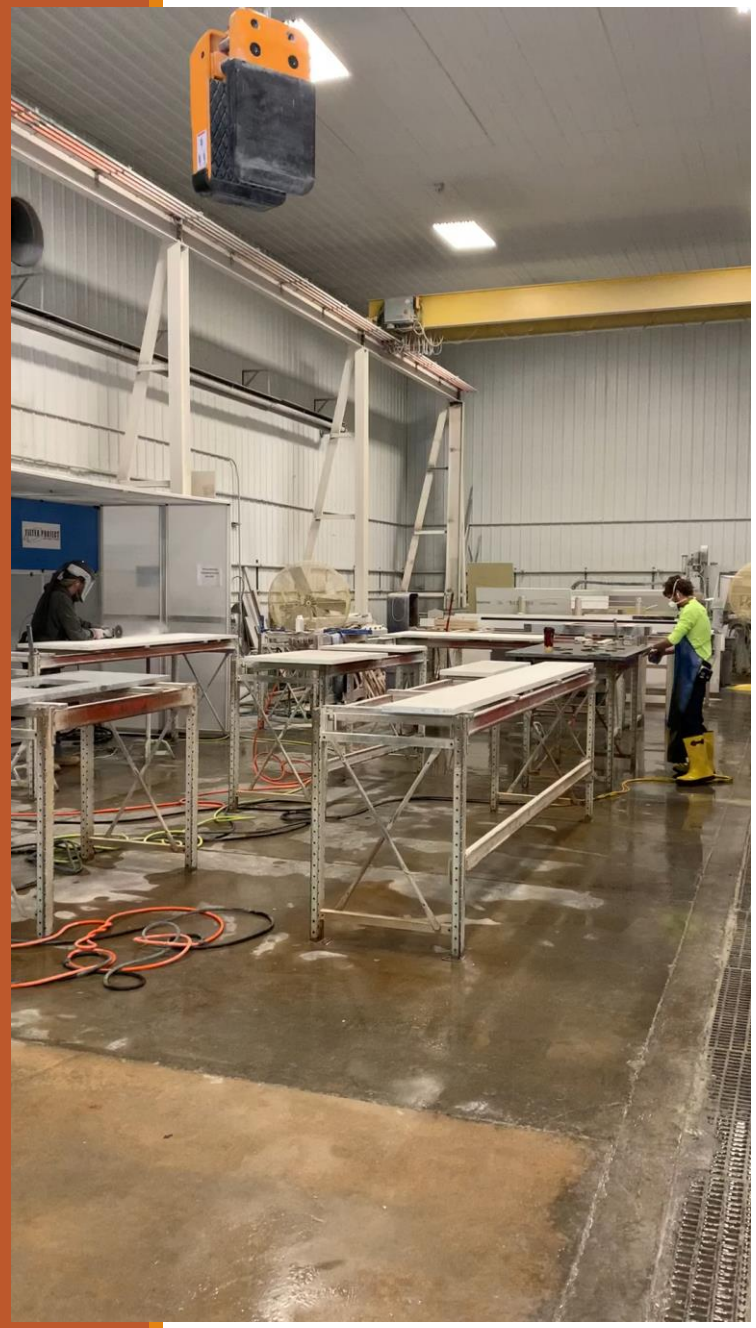
Respiratory Protection is required:

- 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.
- 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.
- During periods when the employee is in a regulated area.

Bad

Good control

Bad use



Housekeeping

The employer shall not allow dry sweeping or dry brushing where such activity could contribute to employee exposure unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure is not feasible.

- The employer shall not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposures 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.

Medical Surveillance

General – The employer **shall** make medical surveillance available at no cost, at a reasonable time and place, for each employee who will be occupationally exposed to silica **at or above the action level for 30 days or more per year.**

- Performed by a PLHCP.
- Initial exam within 30 days of assignment or last 3 years if the exams were the same requirements.

- **The exam will consist of:**
  - In-depth medical and work history (past, present, anticipated – silica exposures, other respiratory agents, respiratory dysfunction, TB and smoking history).
  - Physical exam – special emphasis on the respiratory system.
  - Chest x-rays – specific requirements see std.
  - Pulmonary function test
  - Testing for latent TB infection.
  - Any other tests deemed appropriate by the PLHCP.

Signs

The employer shall post signs at all entrances to regulated areas that bear the following legend:

Danger

Respirable Crystalline Silica

Causes Damage to Lungs

Wear Respiratory Protection In This Area

Authorized Personnel Only

Employee Information & Training

The employer shall ensure that each employee covered by this section can demonstrate knowledge and understanding of at least the following:

- Health hazards associated with silica exposure.
- Specific tasks in the workplace that could result in silica exposure.
- Specific measures the employer has implemented to protect employees from silica exposures.
  - Engineering Control
  - Work Practices
  - Respiratory Protection Used
- The contents of this section of the silica standard.
- The purpose and a description of the medical surveillance program required.
- The employer shall make a copy of this section readily available without cost to each employee covered.

Good Silica Control - Review

- Use water or exhaust controls as specified by Part 690 Silica in Construction or Part 590 Silica in General Industry
- Capture dust at the source
- Seek out new control technologies
- Maintain equipment as designed.
- Document employee exposures with air sampling
- Don’t be the Bad Silica dust controller

MIOSHA Resources

- Silica - State Emphasis Program (SEP)
- Crystalline Silica Exposure in Construction and General Industry
- Silica Outreach Training PowerPoint
- Sample Written Silica Exposure Control Plan

QUESTIONS?

Harvey Johnson
MIOSHA Onsite Consultation
johnsonh4@Michigan.gov
517-256-9112