The 2016 OSHA Silica Standards
- Origins and Controversies -

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Disclosures

- Dr. Papanek currently works as Public Health Medical Officer for Cal/OSHA
- Previously worked for Kaiser Permanente
- No identified conflicts of interest

This presentation represents Dr. Papanek's personal views, and does not represent official policy of the State of California.

Outline for today's talk

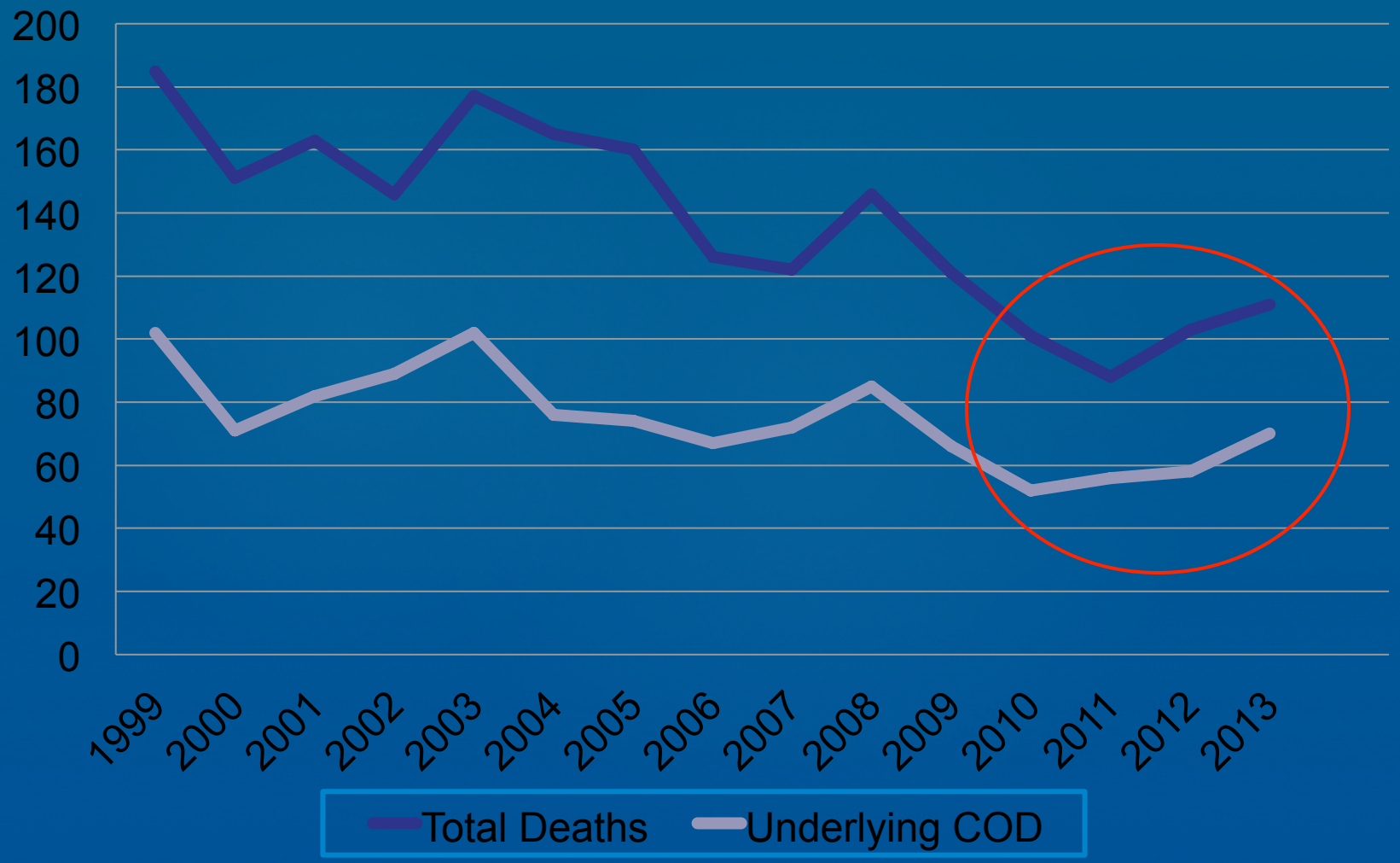
- **Overview of silica's toxicity**
- **Previous silica regulations**
  - USDOL, 1931
  - Federal OSHA standard, 1971
  - NIOSH Criteria Document, 1974
  - New Jersey, California and Washington state standards (2000's)
  - New OSHA standards, 2016
- **Overview of the new OSHA silica standards**
- **Lawsuits to block the standard**

Silica exposure - adverse effects

	Projected number of annual averted deaths in US
All chronic respiratory disease	**325**
Simple silicosis	
Progressive massive fibrosis	
Chronic bronchitis	
Fatal lung cancer	**124**
Renal failure	**193**

Silicosis Mortality – US – 1999-2013

MMWR, June 19, 2015; Vol. 64, No. 23



Previous silica regulations

1938 – Secretary of Labor Frances Perkins publishes safety guidance on silica exposure

1971 – OSHA silica PEL, based on TLV

1991 – NTP declares silica a probable human carcinogen

2004 – New Jersey OSHA prohibits the dry cutting of silica-containing materials, unless worker wears full-face respirator.

2008 – Cal/OSHA passes silica Construction standard, requiring wet work or dust collection for most operations that generate silica dust.

Cal/OSHA Silica Construction Standard

2008 – Cal/OSHA silica construction standard requires dust collection if VISIBLE dust is generated from “concrete or masonry material.”* Wet NOT required.

“Material that is apparently stone-like in appearance and texture shall be presumed to be concrete or masonry material.”

Find the OSHA violation

Hand-held masonry saw, dry, no dust collection

?	Current Federal OSHA
YES	NEW Fed OSHA Silica rules
YES	Current Cal/OSHA
YES	Current New Jersey

Find the OSHA violation

Stationary masonry saw,
dry dust collection

?	Current Federal OSHA
YES	NEW Fed OSHA Silica rules
No	Current Cal/OSHA
Yes	Current New Jersey

What was wrong with the old silica standard?

1. The PEL definition was complex and confusing
2. The "de facto" PEL (238 mcg/cu meter) is insufficiently protective
3. Proving non-compliance was extremely difficult, especially in construction - Exceedances occurred at least 30% of the time!

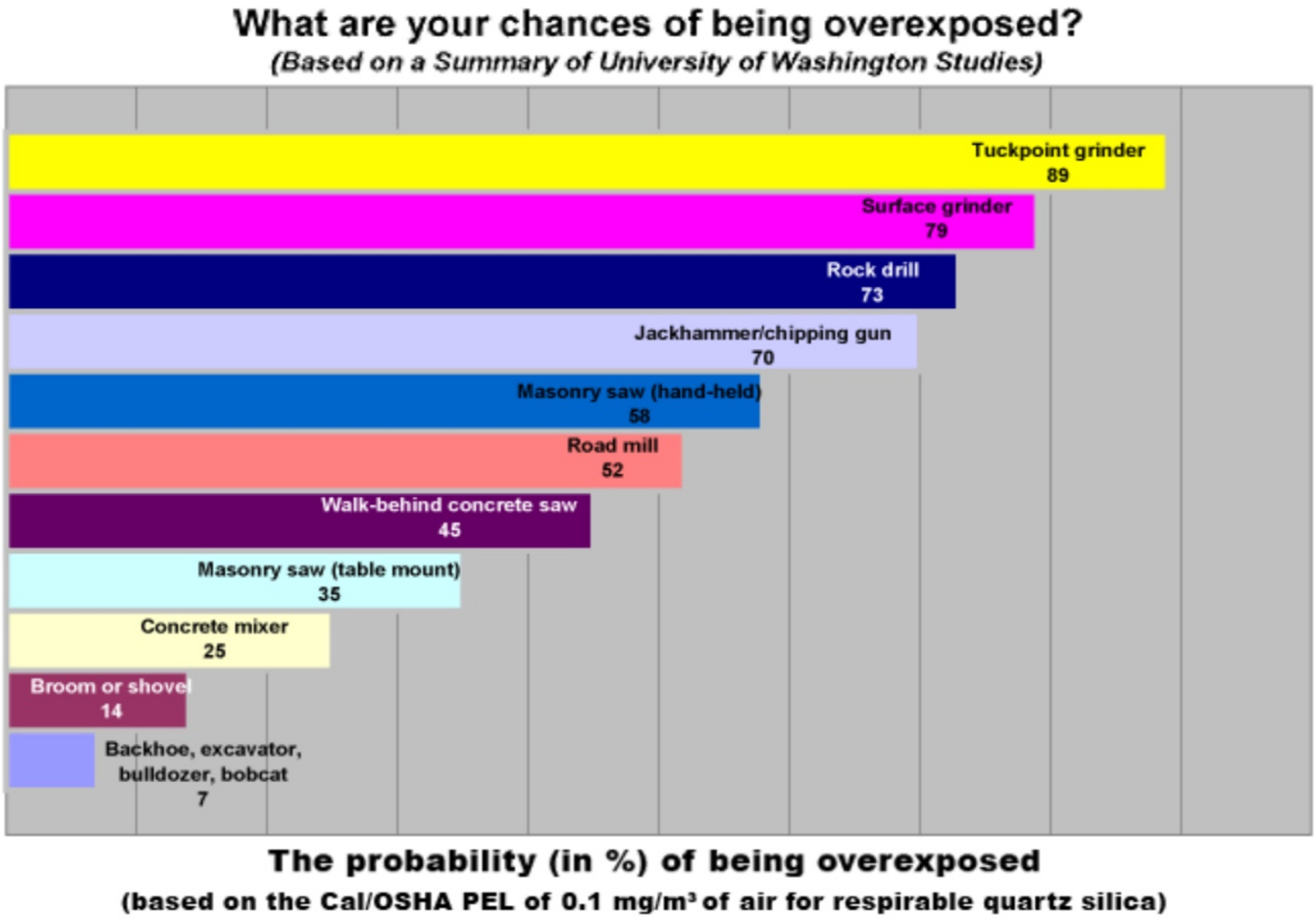
Samples for Construction and General Industry (January 1, 2003 –December 31, 2009)

Exposure (severity relative to the PEL)	Construction		Other than construction	
	No. of samples	Percent	No. of samples	Percent
<1 PEL	548	75%	948	70%
1 x PEL to < 2 x PEL	49	7%	107	8%
2 x PEL to < 3 x PEL	32	4%	46	3%
≥ 3 x PEL and higher(3+)	103	14%	254	19%
Total # of samples	732		1355	

Source: OSHA Integrated Management Information System

30% of samples > PEL

What was wrong with the old silica standard?



Key elements of new silica standards

- PEL = 50 mcg/cu M
- AL = 25 mcg/ cu M
- Written plan
- Medical surveillance
- Housekeeping
- Training
- For Construction Standard, either:
  - Monitor air levels, or
  - Follow Table 1 (WET dust suppression and/or respirators

Dust control – wet vs dry?
Hand-held masonry saw

No dust control

Wet blade

Dust control – wet vs dry?
Stationary masonry saw

No dust control

Wet blade

Dust collection

Silica Standard Overview

PEL = 50 µg/m3, 8-Hour TWA

AL = 25 µg/m3, 8-Hour TWA

Scope: respirable crystalline silica

- Quartz, cristobalite, tridymite
- Chipping, cutting, sawing, drilling…concrete, brick, stone…
- Using silica-containing products (glass mfg, foundries, blasting, fracking)

Scope exemptions: Agriculture, Sorptive clay processing

Recognized Jobs and Industries where silica exposure can occur

- Construction
- Glass manufacturing
- Pottery
- Structural clay
- Concrete
- Foundries
- Dental laboratories
- Painting and coating
- Jewelry production
- Abrasive blasting (Construction, Maritime, General Industry)
- Cutting stone
- Refractory furnace installation, repair and refractory products
- Railroads
- Asphalt products
- Landscaping

Silica Medical Surveillance: Differences between General Industry/Maritime and Construction

Gen Industry/Maritime	Construction
Who's covered? Workers exposed at or above the AL for 30 or more days per year	Who's covered? Workers who will be required to wear a respirator (under the standard) for 30 or more days per year.

Everything else is the same!

New construction standard – Table 1 *(partial)*

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(i) 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
(ii) Handheld power saws (any blade diameter)	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. – When used outdoors. – When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10
(iii) 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

New construction standard – Table 1 *(partial, cont)*

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(iv) Walk-behind 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. – When used outdoors. – When used indoors or in an enclosed area.	None APF 10	None APF 10
(v) 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
(vi) 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

New construction standard – Table 1 *(partial, cont)*

Equipment / Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(vii) 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
(viii) 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.	APF 10	APF 10

Medical Surveillance

There are about 35 OSHA standards requiring Medical Surveillance; almost all have four mandatory components:

1. What the employer has to tell the PLHCP.
2. What the PLHCP has to do (H&P elements).
3. What the PLHCP has to tell the employer about the evaluation.
4. What the employer has to tell the employee.

Medical Surveillance
The Silica Standard

In addition to these four, the Silica Standard adds two more:

- What the employer has to tell the PLHCP.
- What the PLHCP has to do (H&P elements).
- What the PLHCP has to tell the employer about the evaluation.
- What the PLHCP has to tell the employee.
- What the employer has to tell the employee.
- Other surveillance (paid by employer), if there are positive findings.

Silica Medical Surveillance

Examinations every three years for workers who continue to be exposed above the trigger

Exam includes:

- Medical and work history,
- Physical exam with special emphasis on respiratory,
- Chest X-ray or digital radiograph
- Pulmonary function test (FVC, FEV1, FEV1/FVC)
- TB test on initial exam only

Any other tests deemed appropriate by PLHCP

Examinations may be provided more frequently if recommended by PLHCP

Chest Imaging and Pulmonary Function Tests

Chest x-ray (1-view only)

Must be read by a NIOSH-certified B-reader

Must be interpreted and classified according to ILO classification for pneumoconioses

If B-reading classifies small opacities as 1/0 or higher, refer to a board cert. pulmonary or occ med specialist.

Spirometry (FVC, FEV1, FEV/FVC)

Administered by a spirometry technician with a current certificate from a NIOSH – approved spirometry course

Medical Surveillance the Silica Standard

What must the PLHCP tell the employer? (In writing, within 30 days.)

WRITTEN MEDICAL OPINION FOR EMPLOYER

EMPLOYER: _____

EMPLOYEE NAME: _____ **DATE OF EXAMINATION:** _____

TYPE OF EXAMINATION:
[ ] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

USE OF RESPIRATOR:
[ ] No limitations on respirator use
[ ] Recommended limitations on use of respirator:_____

Dates for recommended limitations, if applicable: _____ to _____
MM/DD/YYYY MM/DD/YYYY

The employee has provided written authorization for disclosure of the following to the employer (if applicable):

[ ] This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
[ ] Recommended limitations on exposure to respirable crystalline silica:_____
_____

Dates for exposure limitations noted above: _____ to _____
MM/DD/YYYY MM/DD/YYYY

NEXT PERIODIC EVALUATION: [ ] 3 years [ ] Other: _____
MM/DD/YYYY

Examining Provider: _____ Date: _____
(signature)
Provider Name: _____ Provider's specialty:_____

Office Address: _____ Office Phone: _____

[ ] I attest that the results have been explained to the employee.

The following is required to be checked by the Physician or other Licensed Health Care Professional (PLHCP):
[ ] I attest that this medical examination has met the requirements of the medical surveillance section of the OSHA Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).

Medical Surveillance
The Silica Standard

What must the PLHCP tell the employee? (In writing, within 30 days.)

1. Overall results of the exam.
2. The presence of any medical conditions "that would place the employee at increased risk of material impairment to health" from further silica exposure.
3. The presence of any medical conditions that may require further evaluation or treatment.
4. Limitations on the use of respirators or on future silica exposures.
5. A statement that the chest x-ray *(B reading of 1/0 or higher)* has triggered a duty by the employer to pay for a specialty consult with Pulmonologist or Occupational Medicine physician.

Does the employer get this information?

NO! (unless patient signs a release)

Written Medical Report to Employee

Sample Form 1: Written Medical Report for Employee

EMPLOYEE NAME: Joe Smith **DATE OF EXAMINATION:** June 1, 2017

TYPE OF EXAMINATION:
[x] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

RESULTS OF MEDICAL EXAMINATION:

Physical Examination –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Chest X-Ray –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Breathing Test (Spirometry) –	[ ] Normal	[x] Abnormal (see below)	[ ] Not performed
Test for Tuberculosis –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Other:_____	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed

Results reported as abnormal: Breathing test (Spirometry) shows an obstructive pattern.

[x] Your health may be at increased risk from exposure to respirable crystalline silica due to the following:
Continued unprotected exposure to respirable crystalline silica may further damage your lungs.

RECOMMENDATIONS:
[ ] No limitations on respirator use
[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator you can safely wear. A PAPR will give you higher protection from silica exposure and will decrease strain on your heart and lungs.
[x] Recommended limitations on exposure to respirable crystalline silica: Ideally, you may want to consider a position that doesn't involve exposure to substances hazardous to your lungs, such as respirable crystalline silica. If that is not possible, be sure to always wear a respirator when needed to protect your lungs.

Dates for recommended limitations, if applicable: Indefinitely unless otherwise indicated by a specialist.

[x] I recommend that you be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine

[x] Other recommendations*: See your personal physician about the mole on your neck

Your next periodic examination for silica exposure should be in: [ ] 3 years [x] Other: 1 year, June 1, 2018

Examining Provider: Dr. Jones (signature) Date: June 1, 2017
Provider Name: Dr. Jones Health Clinic
Office Address: 1111 Main Street, Washington, DC Office Phone: 123-456-7890

*These findings may not be related to respirable crystalline silica exposure or may not be work-related, and therefore may not be covered by the employer. These findings may necessitate follow-up and treatment by your personal physician.

Respirable Crystalline Silica standard (§ 1910.1053 or 1926.1153)

Sample Form 1: Written Medical Report for Employee

EMPLOYEE NAME: Joe Smith **DATE OF EXAMINATION:** June 1, 2017

TYPE OF EXAMINATION:

[x] Initial examination [ ] Periodic examination [ ] Specialist examination

[ ] Other: _____

RESULTS OF MEDICAL EXAMINATION:

Physical Examination –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Chest X-Ray –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Breathing Test (Spirometry) –	[ ] Normal	[x] Abnormal (see below)	[ ] Not performed
Test for Tuberculosis –	[x] Normal	[ ] Abnormal (see below)	[ ] Not performed
Other: _____	[ ] Normal	[ ] Abnormal (see below)	[ ] Not performed

Results reported as abnormal: Breathing test (Spirometry) shows an obstructive pattern.

[x] Your health may be at increased risk from exposure to respirable crystalline silica due to the following: Continued unprotected exposure to respirable crystalline silica may further damage your lungs.

RECOMMENDATIONS:

[ ] No limitations on respirator use

[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator you can safely wear. A PAPR will give you higher protection from silica exposure and will decrease strain on your heart and lungs.

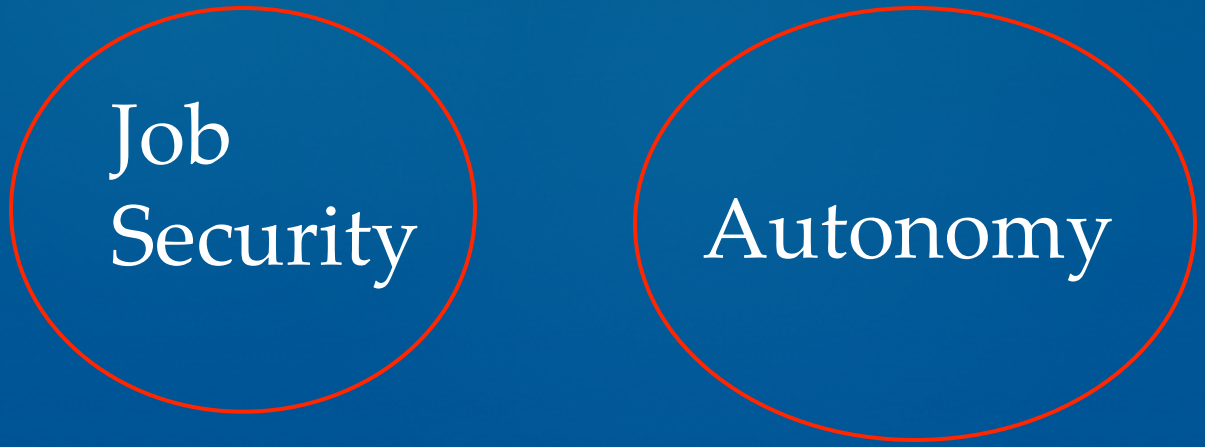
[x] Recommended limitations on exposure to respirable crystalline silica: Ideally, you may want to consider a position that doesn't involve exposure to substances hazardous to your lungs, such as respirable crystalline silica. If that is not possible, be sure to always wear a respirator when needed to protect your lungs.

Dates for recommended limitations, if applicable: Indefinitely unless otherwise indicated by a specialist.

[x] I recommend that you be examined by a Board Certified Specialist in Pulmonary Disease or Occupational Medicine

[x] Other recommendations*: See your personal physician about the mole on your neck

Confidentiality



Written Medical Opinion to Employer

Sample Form 2: Written Medical Opinion for Employer

EMPLOYER: John Doe Renovations

EMPLOYEE NAME: Joe Smith **DATE OF EXAMINATION:** June 1, 2017

TYPE OF EXAMINATION:
[x] Initial examination [ ] Periodic examination [ ] Specialist examination
[ ] Other: _____

USE OF RESPIRATOR:
[ ] No limitations on respirator use
[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator Mr. Smith can safely wear.

Dates for recommended limitations, if applicable: Indefinitely, unless otherwise recommended by specialist

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The employee has provided written authorization for disclosure of the following to the employer (if applicable):

[x] This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
[ ] Recommended limitations on exposure to respirable crystalline silica: _____

Dates for exposure limitations noted above: _____ (MM/DD/YYYY) to _____ (MM/DD/YYYY)

NEXT PERIODIC EVALUATION: [ ] 3 years [x] Other: 1 year, June 1, 2018

Examining Provider: Dr. Jones (signature) Date: June 1, 2017

Provider Name: Dr. Jones Health Clinic Provider's specialty: None, general practitioner

Office Address: 1111 Main Street, Washington, DC Office Phone: 123-456-7890

[x] I attest that the results have been explained to the employee.

The following is required to be checked by the Physician or other Licensed Health Care Professional (PLHCP):
[x] I attest that this medical examination has met the requirements of the medical surveillance section of the OSHA Respirable Crystalline Silica standard (§ 1910.1053(h) or 1926.1153(h)).

Written Authorization

Sample Form 3: Authorization for Crystalline Silica Opinion to Employer

This medical examination for exposure to crystalline silica could reveal a medical condition that results in recommendations for (1) limitations on respirator use, (2) limitations on exposure to crystalline silica, or (3) examination by a specialist in pulmonary disease or occupational medicine. Recommended limitations on respirator use will be included in the written opinion to the employer. If you want your employer to know about limitations on crystalline silica exposure or recommendations for a specialist examination, you will need to give authorization for the written opinion to the employer to include one or both of those recommendations.

I hereby authorize the opinion to the employer to contain the following information, if relevant (please check all that apply):

☐ Recommendations for limitations on crystalline silica exposure

☒ Recommendation for a specialist examination

OR

☐ I do not authorize the opinion to the employer to contain anything other than recommended limitations on respirator use.

Please read and initial:

X I understand that if I do not authorize my employer to receive the recommendation for specialist examination, the employer will not be responsible for arranging and covering costs of a specialist examination under the OSHA standard for respirable crystalline silica.

Joe Smith
Name (printed)

Joe Smith
Signature

June 1, 2017
Date

USE OF RESPIRATOR:
[ ] No limitations on respirator use
[x] Recommended limitations on use of respirator: A powered air purifying respirator (PAPR) is the only type of respirator Mr. Smith can safely wear.

Dates for recommended limitations, if applicable: Indefinitely, unless otherwise recommended by specialist

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The employee has provided written authorization for disclosure of the following to the employer (if applicable):

[x] This employee should be examined by an American Board Certified Specialist in Pulmonary Disease or Occupational Medicine
[ ] Recommended limitations on exposure to respirable crystalline silica:_____

NEXT PERIODIC EVALUATION: [ ] 3 years [x] Other: 1 year, June 1, 2018

I hereby authorize the opinion to the employer to contain the following information, if relevant (please check all that apply):

☐ Recommendations for limitations on crystalline silica exposure

☒ Recommendation for a specialist examination

OR

☐ I do not authorize the opinion to the employer to contain anything other than recommended limitations on respirator use.

Please read and initial:

_X_ I understand that if I do not authorize my employer to receive the recommendation for specialist examination, the employer will not be responsible for arranging and covering costs of a specialist examination under the OSHA standard for respirable crystalline silica.

When does the new silica standard take effect?

- **Construction** - ~~June 23, 2017~~ Sept 23, 2017 (including California)
- **General Industry and Maritime**
  - If > PEL - June 23, 2018
  - If > AL – June 23, 2020
- **Hydraulic Fracturing** - June 23, 2018 – *all provisions except Engineering Controls, which have a compliance date of June 23, 2021.*
- **Note - the new lower PEL** (50 mcg/cu m) already went into effect in California on October 17, 2016.

Lawsuit to block the silica standards

In 2016, many employers and trade groups in multiple jurisdictions sued OSHA to block implementation of the silica standards. Those lawsuits were consolidated into one lawsuit, under the 3rd Circuit.

Oral arguments before the Court expected May, 2017.

Final decision expected: ? Late 2017

Scenario

45 year old man presents with shortness of breath. He works at a countertop manufacturing plant. Chest radiograph is read as showing “p” and “q” size opacities in the upper lung fields in a 1/0 profusion.

What do you think? What would you recommend?

The worker does not want to sign the written authorization as he has a family to support and is afraid that his employer will fire him if he is put on work restrictions or sent for a specialist opinion.

Now what do you want to do?

It's one year later and the worker comes back in complaining of fatigue, shortness of breath, fever, weight loss and productive cough. Has been working a lot of overtime and can't do it anymore.

What do you do now?

Scenario #2

50 year old Hispanic construction worker presents for a silica medical surveillance exam. His TB skin test is positive. He has been working in agriculture and construction in the US for 2 years. He believes he had a shot for TB back in Mexico when he was a child.

What do you want to do?

And does the company have to pay for it?

Also, you take a detailed past occupational history and find out he was a sandblaster in Mexico. Oh, yes, and he is a 2-pack per day smoker.

Want to do a low dose CT scan to screen for lung cancer?

Does the company have to pay for it?

References

Cohen RA et.al. Lung pathology in US coal workers with rapidly progressive pneumoconiosis implicates silica and silicates. Am J Respir Crit Care Med, 2016; 193:673.

Fagan KM et.al. Case cluster of pneumoconiosis at a coal slag processing facility. Am J Ind Med, 2015; 58:568.

Friedman GK et.al. Silicosis in a countertop fabricator-Texas 2014. MMWR, February 13, 2015; 64:129.

Graber JM. Respiratory disease mortality among US coal miners; results after 37 years of follow-up. Occ Env Med, 2014; 71:30.

Kramer MR et.al. Artificial stone silicosis: disease resurgence among artificial stone workers. CHEST, 2012; 142:419.

Lewinsohn DM et.al. Official ATS/IDSA/CDC Clinical practice guidelines: Diagnosis of TB in adults and children. Clin Inf Dis, 2017; 64:111.

Liu Y et.al. Exposure-response analysis and risk assessment for lung cancer in relationship: A 44-year cohort study of 34,018 workers. Am J Epi, 2013; 178:1424-1433.

Mazurek JM et.al. Update: Silicosis mortality-US, 1999-2013. MMWR, 2015; 64(23): 653-4.

Resources

ILO Guidelines and standard digital images:
http://www.ilo.org/safework/info/publications/WCMS_168337/lang--en/index.htm

NIOSH B–reader Program:
http://www.cdc.gov/niosh/topics/chestradiography/breader.html

NIOSH Guidance on reading of digital radiographs for classification for pneumoconioses:
http://www.cdc.gov/niosh/topics/chestradiography/digital-imaging-updates.html

OSHA webpage on new Silica Standard: https://www.osha.gov/silica/index.html (Appendix B; FAQs; Compliance Guide for Construction and lots more)

OSHA, 2013. Spirometry Testing in Occupational Health Programs-Best Practices for Healthcare Professionals.
https://www.osha.gov/Publications/OSHA3637.pdf

OSHA-NIOSH Hazard Alert- Worker exposure to silica during hydraulic fracturing:
https://www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html

Thank you!


HAWK'S NEST TUNNEL DISASTER
Construction of nearby tunnel, diverting waters of New R. through Gauley Mt. for hydroelectric power, resulted in state's worst industrial disaster. Silica rock dust caused 109 admitted deaths in mostly black, migrant underground work force of 3,000. Congressional hearing placed toll at 476 for 1930-35. Tragedy brought recognition of acute silicosis as occupational lung disease and compensation legislation to protect workers.
West Virginia Department
FA 1
of Culture and History