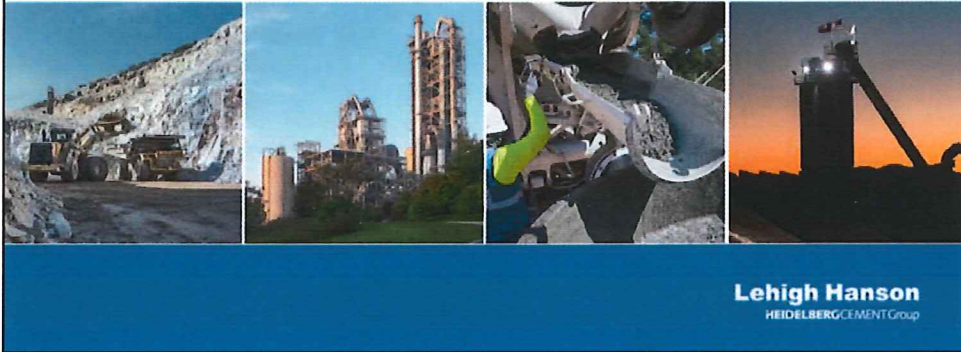


Controlling Silica Exposures

CalCIMA Spring Thaw • Ontario & Sacramento, CA • February 26 & March 20, 2019

Meghan Neal, Area Safety Manager

trust earned daily



Lehigh Hanson
HEIDELBERGCEMENT Group

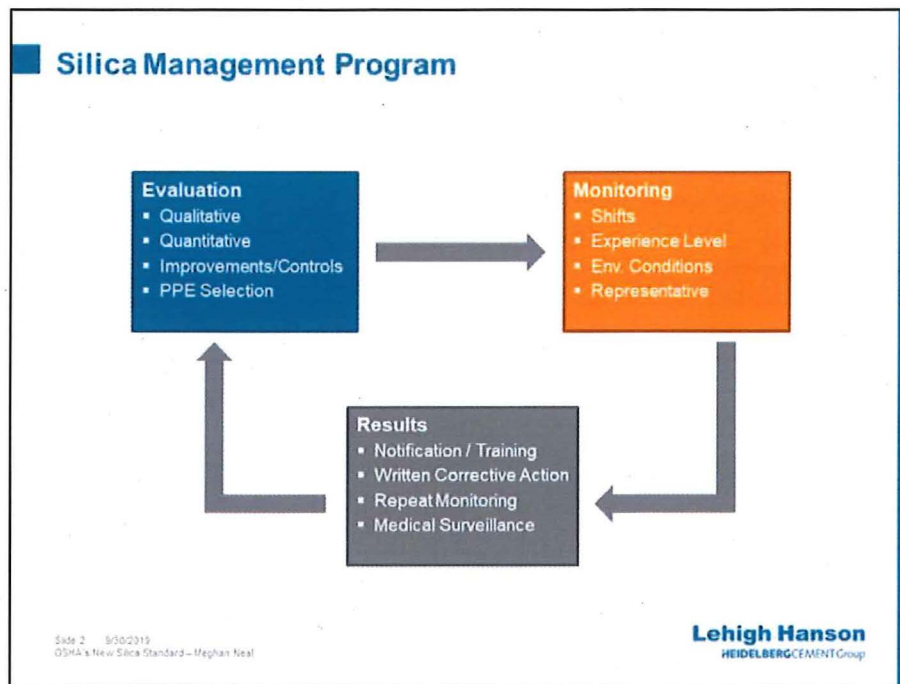
How many here are Ready Mix? How many Aggregate? How many Construction industry?

Industrial Hygienists on staff?

Wholistic IH program

Fed OSHA observes different OELs than MSHA & Corporate may be more stringent (ACGIH), internally determined exposure bands

AB36-COMM-4



PDCA

The process is “supposed” to work such that you evaluate your operations and potential exposures, determine what those exposures actually are and let the data inform your decisions on how best to control those exposures, then re-evaluate.

Re-evaluation after improvement in technology has to be done under the same operational and environmental conditions in order to make an accurate valid comparison. Then

Evaluation / Controls

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Prohibited Practices

- Use of Compressed Air
 - Unless used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air
- Dry sweeping and Dry brushing are prohibited
 - Where such activity could contribute to employee exposure to silica unless wet sweeping, HEPA filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible



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Housekeeping



Slide 5 9/20/2019
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Dry sweeping increased a workers exposure from 0.03 ug to .17 mg when someone was dry sweeping on the floor below them
Performed at the end of the shift

HEPA Vacuums



792 x 615
Dustless HEPA Certified Contract...
evacuatore.com



HEPA Pack Backpack Vacuum...
homedepot.com



Pulman Holt HEPA Canister...
spycoc.com



HEPA Vacuum Cleaners | All...
allergybuyersclub.com



Aramco - Syclone HEPA Vacuum...
aramco.com



HEPA-Vacuums...
vacuumcleaners.com



Industrial HEPA Vacuum...
vacuum.com



HEPA Vacuums | Pneumatic, Electric...
vacuumcleaners.com

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HEPA is 99.97% of particles down to 0.3 microns in size. These came up from a goggle search. They are widely available.

[illegible]

7



Slide 8 9/20/2019
Name of presentation - author

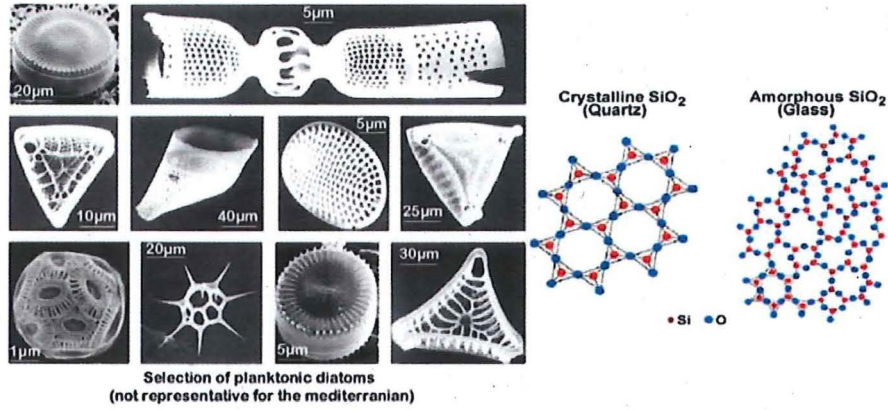
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HEIDELBERGCEMENT Group

When we do have wetting attachments or hose attachments, we need to ensure they are working, not like this example.



These units are operating appropriately with wetting or HEPA vacuum attachments.

Substitution/Elimination

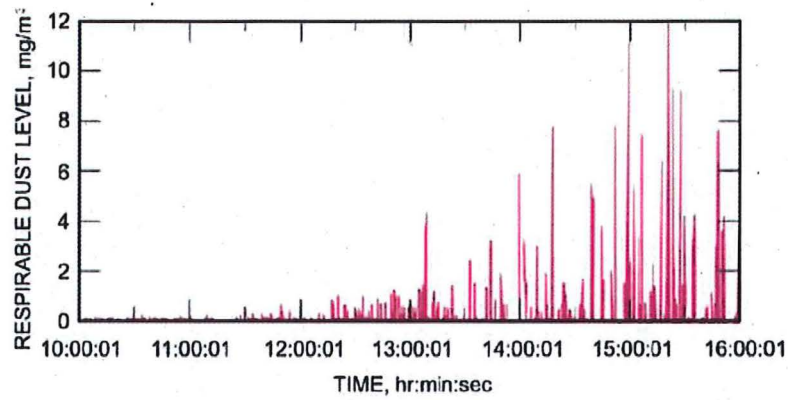


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You can eliminate crystalline silica from your cement plant by using amorphous silica sources instead, such as diatomaceous earth. Since they do not make crystals, they do not pose create the same health impacts as using crystalline silica sources.

Wet Roadways



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Name of presentation - author

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Increasing the distance between trucks
Average speed dissipates dust at 100 feet off the roadway due to ambient dilution
Properly isolated roadways also prevents exposure to pedestrians – safety too
Keeping trucks apart by 20 seconds reduces exposure to the second driver by 41-52%
Enclose the cab of the haul truck

Automation



Figure 3 - Left side shows screenshot of EVADE software of miner performing manual deployment of scraper device with high peak in dust exposure shown in the bottom of the screen; right side shows photo of new pneumatic system to eliminate worker performing the task.

ROCK
PRODUCTS

By Andrew B. Cecala and Andrew D. O'Brien

Lehigh Hanson
HEIDELBERGCEMENT Group

Slide 12 - 9/20/2019
OSHA's New Silica Standard - Meghan Neal

Originally published in Rock Products October 2014 issue

Remove wet sand before the screening process that would blind the screens. The operator used to place a diverter plate on the feed conveyor to divert material. After showing the elevated exposure levels, the operator can now automatically read the moisture content of the feed material and operate the diverter plate from the control room.

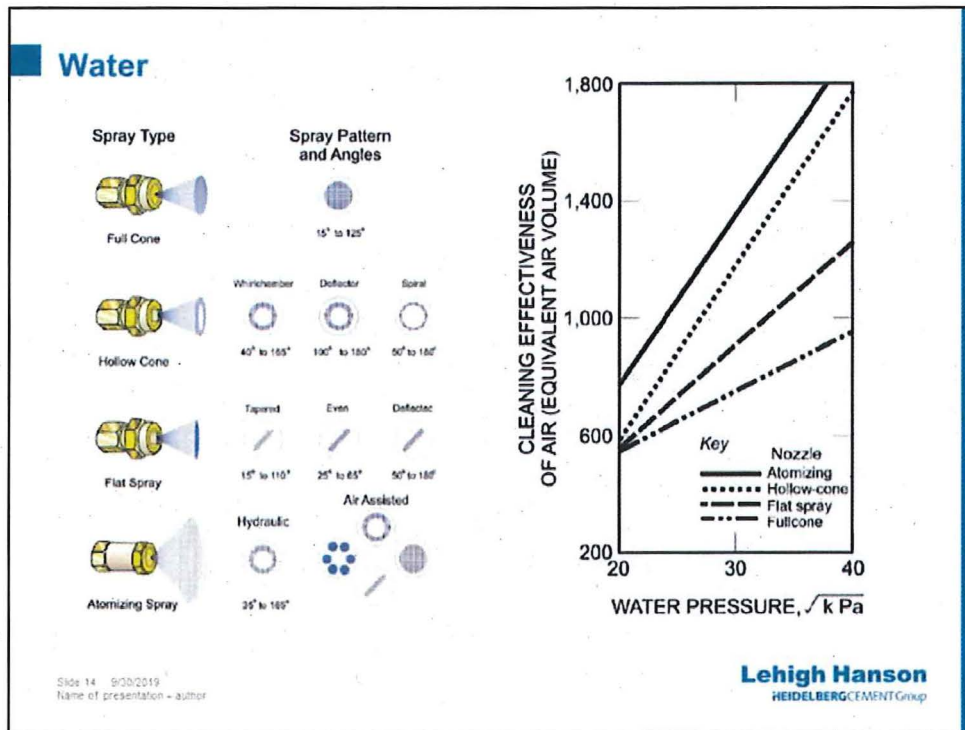
Remote Access



Slide 13: 9/30/2019
OSHA's New Silica Standard—Meghan Neal

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Any remote sensing we can add to our production will remove the operator from the hazard area. Whether it be greasing or inspection, move the worker away from the contaminated/dusty air.



Two types:
 Spray the ore directly
 Knock down a dust cloud

Effectiveness is based on
 Nozzle type
 Droplet size
 Spray pressure
 Spray pattern
 Spray angle
 Spray volume
 Spray droplet velocity
 Spray droplet distribution

Evaporative vs freezing effects of water
 Not effective with clay or shale ores
 Effective at about 1 gallon per ton of material
 Install a delay so water stays on for a few moments after a dust producing event in suppression applications
 Droplet size of 100 microns does best when wetting directly
 But for knocking down the dust cloud – droplet size should be similar to the size of the particles (10-50 micron size)
 Best reductions come from wetting the ore directly and then mixing to ensure uniform

distribution

Full Cone when source is further away from nozzle

Flat spray in narrow, enclosed spaces

Air atomizing – close the source with air or hydraulic assist makes them the most expensive but have the smallest droplet size

Most effective at dust knock down followed by hollow cone

Hollow cone have large orifice and are less likely to clog

Full cone is best during the beginning of the process where amount of water added may not be critical

Water must be filtered especially if coming from a settling pond

Hydrocyclone with a built in accumulator flush

Consider wetting from both the top and bottom – material and the reducing dust from the idlers

Conveyors



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OSHA's New Silica Standard - Meghan Neal

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Enclosures or skirting are effective

Skirting found at transfer points

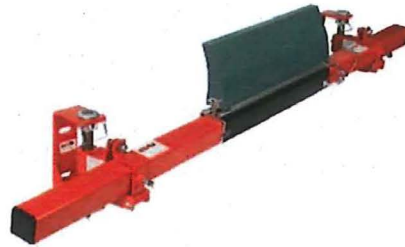
Skirting is more effective than vertical designs when angled at 30 degrees to prevent wear
It improves the loading on the belt and reduces the amount of dust generated

Enclosures at head and tail sections must be sided appropriately since entrainment of air (venturi effect) comes with the belt and you don't want to overpressurize the enclosure
Dust curtains are also effective

Collection points should be at least 6 feet from the dump point to minimize pickup of oversized particles

Air velocities should also be maintained below 500 FPM to avoid pickup of larger particles

Conveyors



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Belt scrapers reduce carry back but also reduce the particles from becoming airborne when they travel over the return rollers

Maintenance is required

Good for larger particles but small respirable sized particles can remain on the belt

Belt wash in addition to scraping has been shown to increase effectiveness by 14%

Crushing



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Dust is generated from the feed and discharge point

Jaw, gyratory, and cone crushers – primary crushing doesn't typically create a lot of dust
Impact and hammermill crushers in secondary crushing generate large volume of dust due to impact of throwing the ore against the side of the crusher to break them up
Properly designed chutes or transfer points with rubber seals between stationary and moving parts

Wet suppression or LEV systems

Spraying ore before entering the crusher is most effective

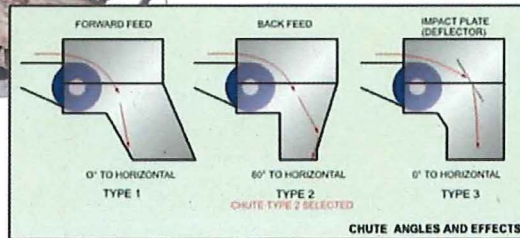
Water at the primary should be maintained below 60 psi

Select the right water spray system

LEV must be engineered to ensure the correct volume of air is drawn to keep the system negative pressure

It is largely dependent on the effectiveness of sealing the intake opening

Transfer Points



Slide 18, 9/20/2019
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- Rock boxes or sloping bottoms
- Sized appropriately without jamming or clogging
- Chute depth should be 3 times the maximum lump size
- Avoid abrupt changes in direction
- Reduce drop heights using ladders, telescoping chutes (inner cones & outer bellow to prevent dust), spiral chutes and bin lowering chutes
- Exit velocities should be kept below 500 FPM to minimize entrainment of large particles
- Tables of chute angle and effect on material impact

Baghouse Bag Changes



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This shows the spike in dust concentrations from a baghouse bag change out. Sometimes, half mask or full face respirators are not enough to reduce exposures below applicable limits. In these cases, where industrial hygiene monitoring has been done, powered air purifying respirators may be necessary.

Local Exhaust Ventilation

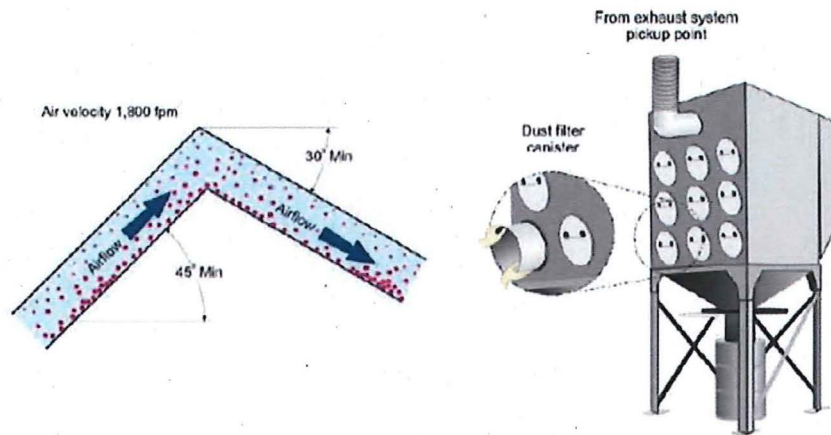


Figure 4-7. Canister-type dust collector system.

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Capture at the source and transport to a filter housing

Low Velocity Capture

Most are 3-4,000 FPM to prevent particles from settling out in the duct work and clogging the duct but with abrasive particles it causes wear at elbows and transitions

Instead a Low Velocity keeps air flows to 1,800 FPM

Sawtooth – cricket legs

Low velocity does not mean low airflow

Saves maintenance cost

Saves energy

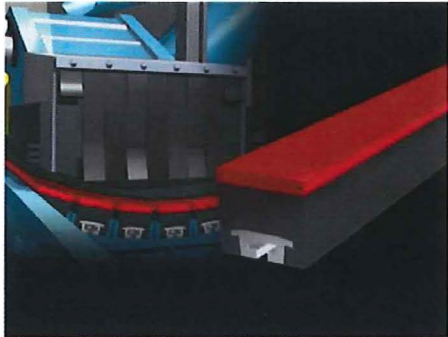
Maintains air balance more reliably than high velocity systems

Canister Type Dust Collector

Good for small particles that are difficult to capture with wet suppression techniques

Canister style filters instead of bag filters – greater surface area = greater cycle time between cleaning. Particles collected in the canister or drum are more easily transported for disposal. Reduced exposure during filter changes

Transfer Points



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Belt loading
Idea to reduce sag and vibration
Slider bar cradles or low friction bars
Add a Rock box

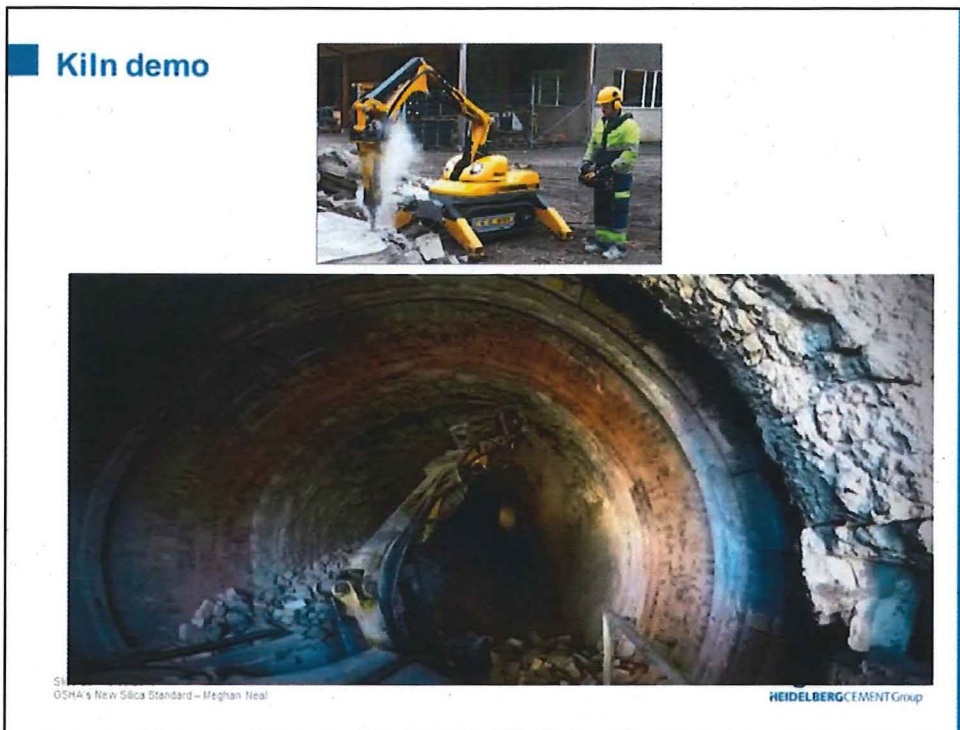
Screens



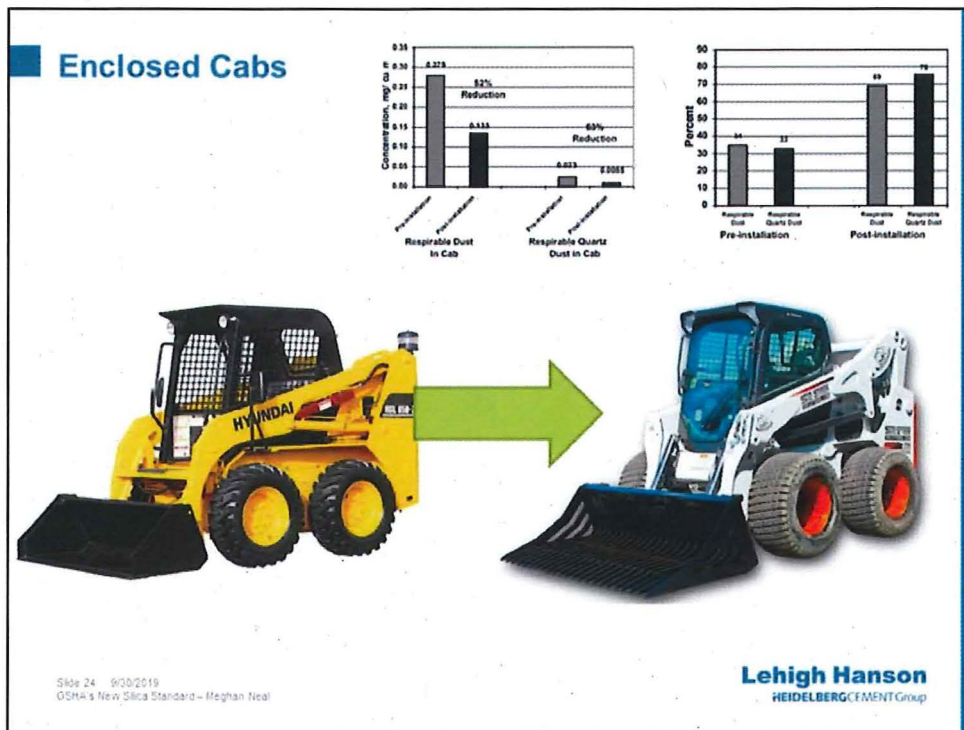
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- Screening finer material creates more dust
- New equipment manufactured today are well sealed
- Tie them to a LEV system
- Visible dust or product under the screen both indicate problems
- Check seals for leaks
- Verify the airflow at the exhaust port to ensure proper airflow and pressure



For cement plants with kiln refractory or re-bricking, remote machines can be operated from outside of the hazardous environment, which protects employees from dust exposures.

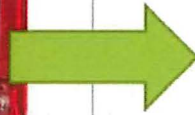


NIOSH research has shown that properly filtered/pressurized cabs can reduce concentrations 65-95% as compared to the outside levels

Maintenance is required for these systems to keep door seals in good condition, closure mechanisms working properly, filters spec'd at 95% efficiency in the 0.3-10 um range (MERV-16 or better) and changed, etc.

Also relocating the heater from the floor position on larger pieces of equipment can reduce employee exposures as they blow air across soiled cab floors into the breathing zone of employees.

Vinyl Seats

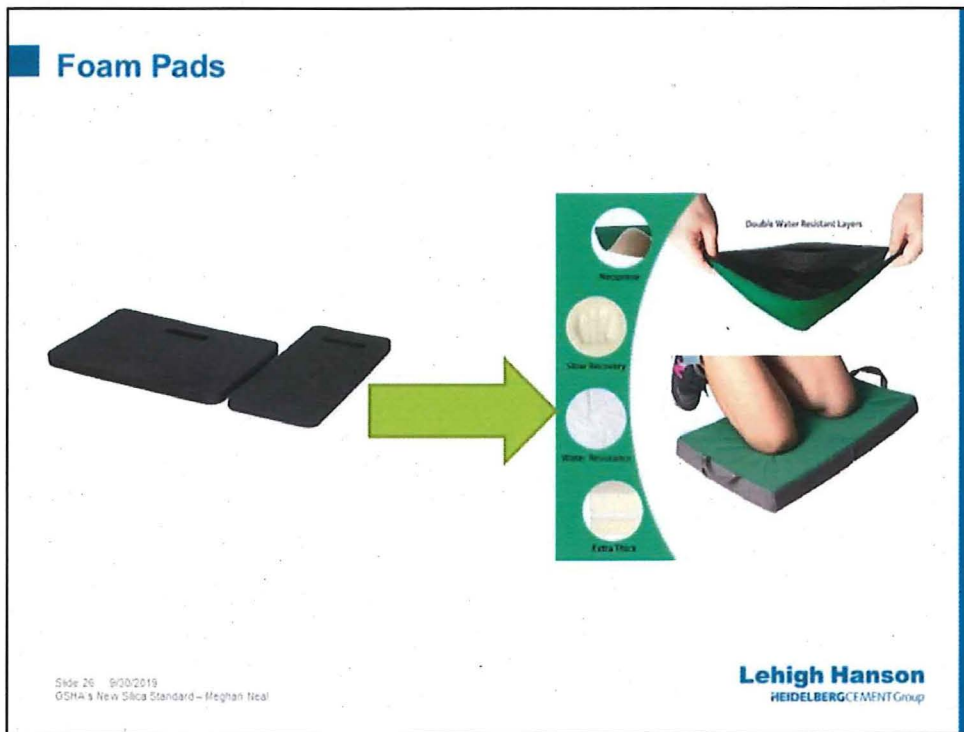


- 78% lower exposure to cleaner cab (e.J. Haas and A.B. Cecala, Min Eng. 2017 Jul; 69(7): 105-109)

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If you have to have cloth, use a vacuum to remove dust instead of compressed air – not only is it prohibited as we previously discussed,
Use a floor sweeping compound to minimize creating airborne dust



Using covers on foam pads can reduce exposures from when employees kneel on the pads, dust is released.

Building Design



Side 27 9/30/2019
Name of presentation - author

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HEIDELBERGCEMENT Group

At mills:

Masonry

Open structure

Steel sided

Dilution from ambient air

Open was 4 times lower than masonry and 1,000 times lower than steel structure when normalized for production levels

Visible dust standards may prohibit open structures

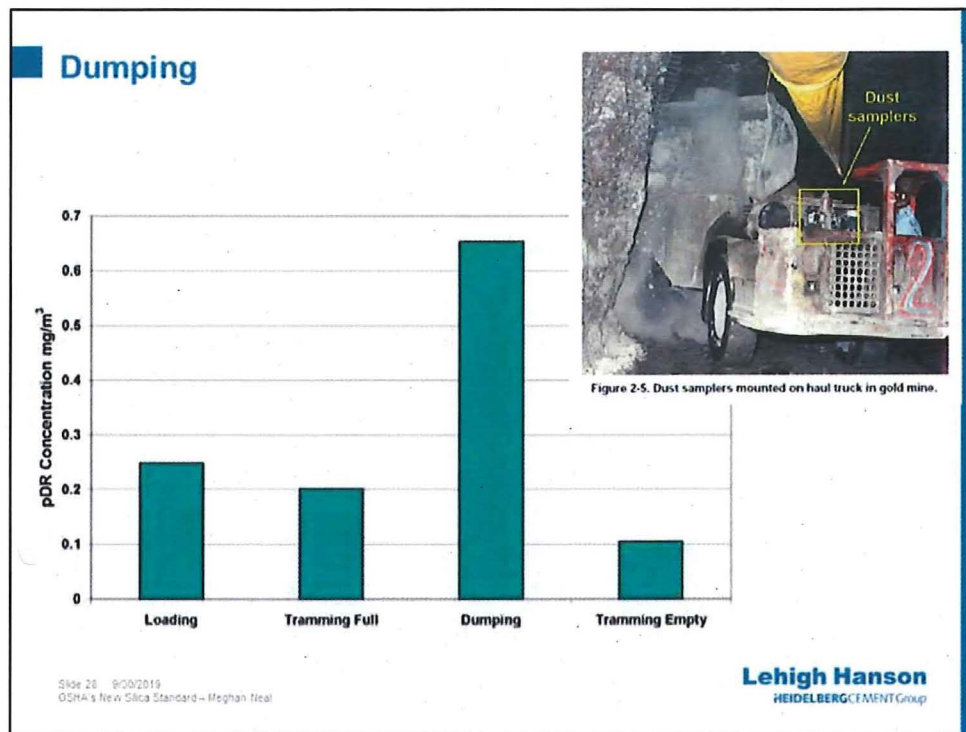
Lower materials cost for building

Considerations:

Falling objects

Protection from the elements

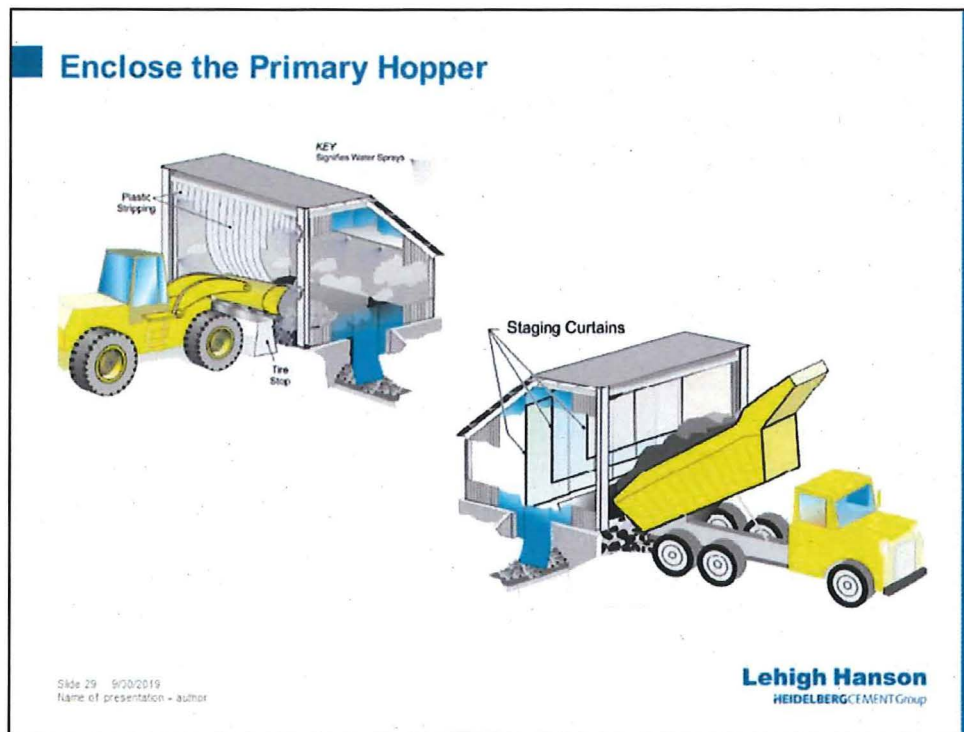
Provide sufficient overhang



This summarizes sampling they performed at an underground mine where they compared different sampling technologies on the outside of the haul trucks and found that it was during the dumping of the load either into the crusher, or stockpile that caused the highest silica concentration as a result. This strategy can help you focus your efforts on where they will have the most impact. It is also data driven – not relying on someone's speculation as to what the dirtiest job is or part of the job is to institute controls.

Dumping was found to comprise 34% of the employees exposure even though it was the shortest segment of the haulage cycle.

When sampling from a drill for example, consider wind direction – multiple samples may need to be taken from one process

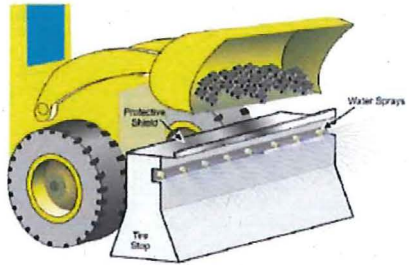


Dust is generated from both roll back from under the haul truck or front end loader and billowing from the bucket or bed during the dumping process

Billowing can be controlled three ways;

- Suppress
 - Weight of water added is equal to 1% of the processed ore
- Enclose
- Filter

Dumping



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Name of presentation - author

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Rollback can be controlled using a tire stop positioned at the forward most point of dumping at the primary hopper

Drilling & Blasting



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Dust collection at drill head from equipment manufacturers –
have some minimum specification for mobile equipment
Install a shroud around the drill deck close to the ground
90% of dust emissions are due to drill deck shroud leakage

Maintain collector to bailing airflow of 3:1

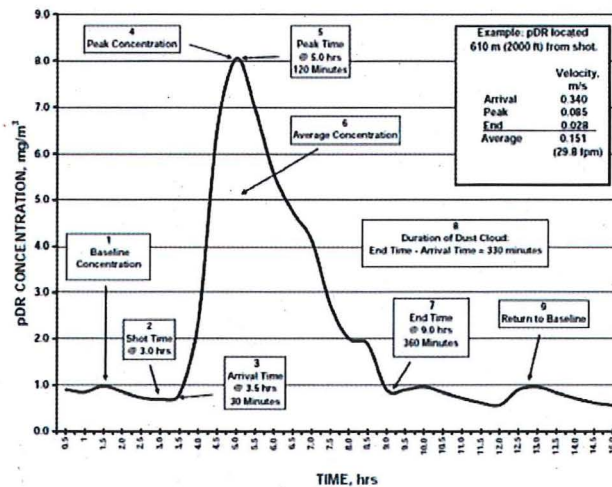
Use booster fans

Enclose, filter, and pressurize the operator cab

Add water to the bailing air

Significant dust reductions were found when water flow was increased from 0.2 to 0.6 gpm

Underground Blasting



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Name of presentation - author

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Any underground persons?

This shows the time it takes to clear the air after a production shot in an underground mine with ventilation

The baseline is 2 times the PEL in this example

Ventilation best management practices can be used to minimize exposures and increase efficiencies including 10,000 CFM at 100 feet of the face and keeping tubing within 10 feet of the dust source to adequately capture

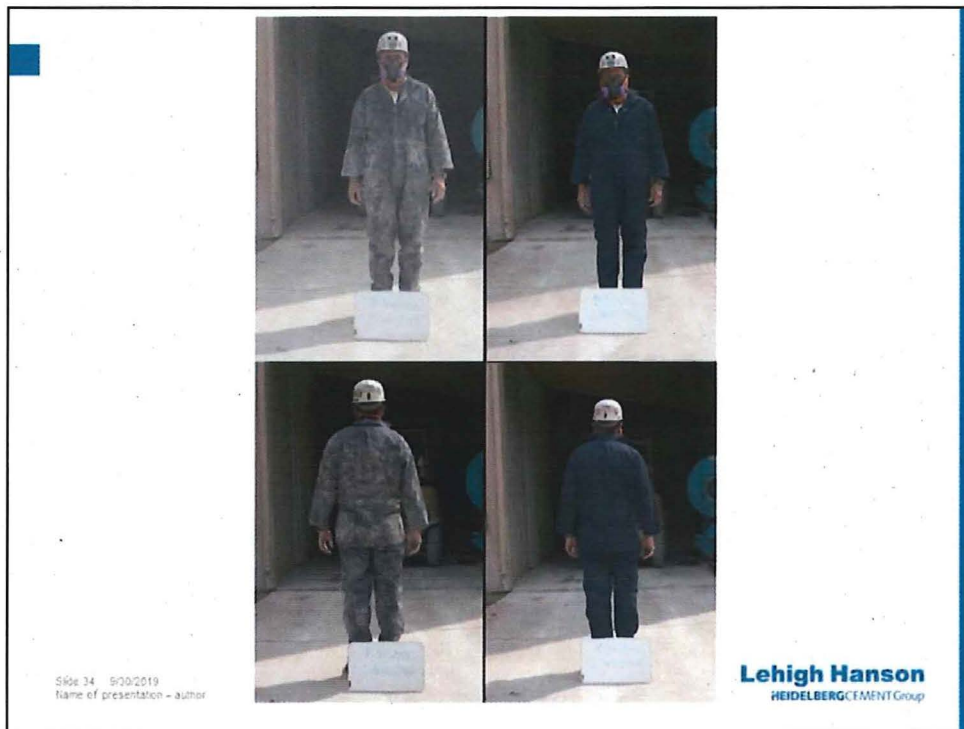
Clothes Cleaning Booth



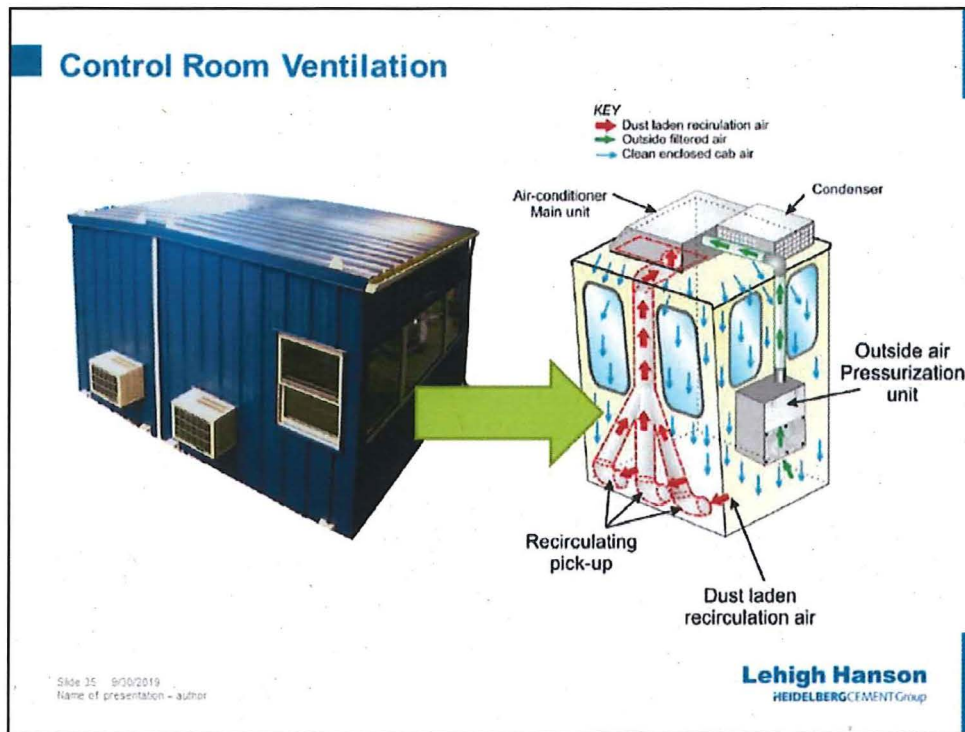
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The clothes cleaning booth, although using compressed air to clean, is approved by MSHA. I've heard employees love how well they clean, that they put parts in them too!



Here are before and after photos from using a clothes cleaning booth.



We treat our MCC rooms better than our employee control rooms

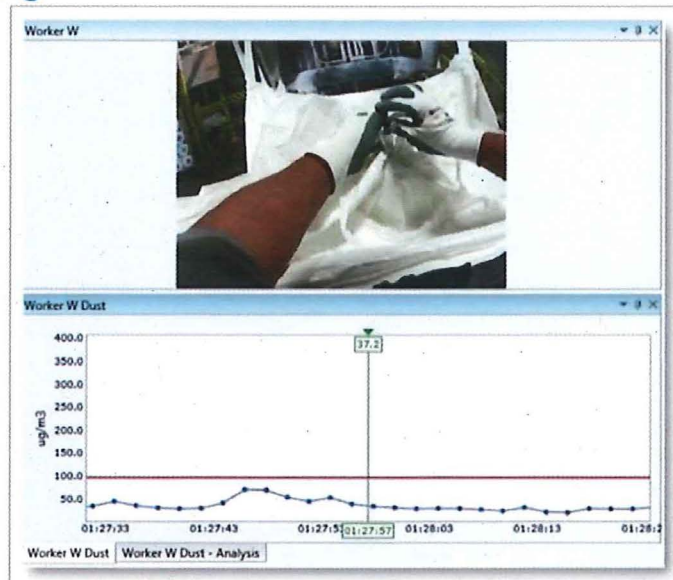
You can get a protection factor of the room itself by comparing the negative pressure 0.01 inches water column (0.02 inches for asbestos abatement)

Order of magnitude greater protection when using a efficiency of 95% vs 38% filters

Adding filtration to recirculated air – an additional order of magnitude protection using recirculation filters at an 85% to 95% efficiency. In addition the time it takes for stabilization of the interior air was cut in half once the door is closed when equipped with a recirculation filter

Make up air must be from a clean source or else secondary contaminated air is introduced into the work environment

Bagging



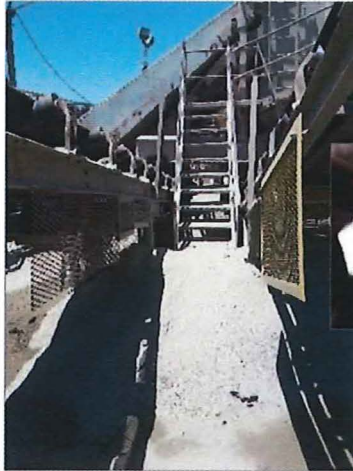
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Folding the bag over away from the worker showed a decrease in exposures
Keeping the bag on the fill spout for a few seconds longer reduced dust from the rooster tail from the valve and fill nozzle as the bag was being removed

Crimping the bag closed near the fill spout as they transferred them to the conveyor belt
Work practices between two baggers showed a 70% reduction from one to the other by using gentler means of moving bags than the more aggressive worker who was rough and careless

Clapping/Climbing



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A control to think about for workpractices is not to have employees slide their hand down handrails or clap their hands. Both of these practices put high levels of dust in the employee's breathing zone. I hover my hand above hand rails and wash my hands to minimize my exposure to dust.

Water



Reduce your dust exposure
Spraying or hosing cleanup

▶ Did you know?

Starting with a forceful stream of water during housekeeping (e.g., hosing down equipment, walls, beams, and the floor) can **elevate dust exposure**

During housekeeping, begin with a wide spray to wet everything down



Then use a narrow, forceful stream



NIOSH

Findings based on NIOSH field studies. To learn more, visit [gsu.edu/gsu/nihsa](https://www.gsu.edu/gsu/nihsa)

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Thank You

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PUBLIC SUBMISSION

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Respirable Crystalline Silica

Comment On: MSHA-2016-0013-0001
Respirable Silica (Quartz) - Request for Information

Document: MSHA-2016-0013-0042
Comment from Charles Rea,

Submitter Information

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General Comment

Please find attached a presentation from the CalCIMA 2019 Spring Thaw that focuses on measures to control respirable silica. The presentation is by Meghan Neal, Area Safety Manager, for Lehigh Hanson. It shows many common mining situations, and options and technology to control exposures.

Attachments

Y19_MSHA RFI_Controlling Silica Exposures