Managing chemical hazards

Silica on hydraulic fracturing sites – controls

PROCESS DOCUMENT **GS 408**

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An Industry Product
This guidance sheet was developed by industry for industry! Working collaboratively, Enform led cross-industry representatives in developing a guidance sheet that meets the industry's needs. Canada's leading oil and gas industry trade associations support the use of guidance sheets to help companies of all sizes improve performance.

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BACKGROUND

This document is part of the Silica Exposure Control Plan (ECP) template. The template provides general silica information. Please refer to Guidance Sheets GS 407 and GS 409 to understand sources of exposure and conduct a hazard assessment on hydraulic fracturing sites.

ELIMINATION

Eliminate the use of proppant that contains silica. Some formations do not need proppant.

SUBSTITUTION

Use sand that is clean of dust whenever possible. Substitute out higher energy equipment for lower energy equipment: examples include lower energy belts, conveyor or auger in-loading instead of pneumatic conveyance, etc.

ENGINEERING CONTROLS

The following preventative engineering controls are available below:

- Minimize vertical drop height at conveyor junctions and into the hopper.
- Use equipment that minimizes the amount of energy put into the proppant. For example, wider, deeper belts with lower belt speeds generate less dust. Tie conveyor belt speed to hopper auger speed to avoid using unnecessary speed and spilling of proppant.
- Enclose junction points such as with tarps to minimize dust. (Do not put workers under tarps).
- Positively pressurize with HEPA-filtered air in the cabs of adjacent occupied vehicles, such as the blender on a frack site or a front-end loader in a sand tent.
- Use dust suppressants where compatibility and chemical risk management allows.
- Use filter bags/socks, water filtration systems, and local exhaust ventilation to capture dust emissions from pneumatic in-loading.
- Minimize the pneumatic air pressure used during pneumatic in-loading.
- Use HEPA-filtered vacuum cleaners (DOP tested) or wet mopping to decontaminate indoor workspaces.
- Use temporary ground covers such as matting, ground wetting and wind barriers like noise walls in order to minimize soil and clay dust generation.
- Install remote monitoring equipment such as video cameras so that workers are not required to be in close proximity to emission sources on an ongoing basis.

The use of pneumatic in-loading in the absence of engineering controls such as dust suppressants or local exhaust ventilation is not recommended because of the risk to adjacent personnel.

Dust suppressants: Dust suppressants are now available that can help reduce the formation of new fractures in proppant and the resulting dust by 10 or more times, depending on the suppressant and its application. Dust suppressants have another advantage; they can reduce exposures at various points along the supply chain if they are applied, for example, at the mine site. Dust suppressants must be chemically compatible and meet or exceed responsible chemical product programs. Dust suppressants, combined with other controls, may be able to decrease the number of people that have to wear a respirator.

Collected dust must be contained. It is not permitted to be discharged or dumped onto the ground.

Local exhaust ventilation: In order for it to be effective it should be set up as follows:

- 16 inch ducts should be used from the system, and should branch to 8 to 10 inch ducts to the tops of the sand storage. Use of smaller diameter lines before branching will dramatically reduce suction.
- Smooth-bore (internal surface) flexible ducting is required to reduce turbulence and increase suction rather than corrugated ducts.
- Use long sweep-style elbows rather than 90 degree angle branches to minimize turbulent flow.
- Branches should have blast gates or throttle valves so that ducts that are not in use can be closed.
- Setup ducting to minimize the length of ducting so that significant pressure drops do not occur.
- One 20,000 CFM unit is sufficient for 3 to 6 trucks pneumatically in-loading at a time. Reduce in-loading pneumatic pressure where feasible to align with ventilation unit capacity.
- Ventilation controls must discharge dust into impervious air-tight bags or containers that have WHMIS labels.
- Ventilation controls at the hopper can be effective provided they are combined with an air-tight enclosure.

ADMINISTRATIVE CONTROLS

Activity-specific procedures that must be in place to minimize exposure include:

- Handling dust filters or collected bulk silica dust (powder)
- Conducting maintenance of ventilation units
- Opening and closing blast gates on ventilation units in accordance with the bins that are being filled
- The prevention and clean-up of sand following a screen-off

Signage: Signage indicating that a respiratory hazard is present must be located at least 10 meters[4] from frack silica sources. Proppant storage equipment should include WHMIS workplace labels.

Time and distance: Maintain as much distance as possible between workers and silica sources and minimize the time workers spend in those areas. Rotate workers in and out of the work areas particularly when the work conditions are demanding (high exertion, temperature extremes, etc.). Design site equipment and site layout so sand personnel are not required to be directly adjacent to hopper. Alternatively, install transparent wall barriers between sources and workers. Design site layout so that adjacent personnel are kept upwind at least 10 meters from silica sources and farther in the absence of engineering controls or as site conditions dictate such as wind.

Other controls: Wait for the conveyor arm to completely lower prior to moving sand into the hopper and minimize belt speeds where feasible. When feasible, conduct in-loading when fewer personnel are in the vicinity of the sand moving equipment. This could be in the early morning or evening when less people are on site. Instead of sweeping conduct wet mopping or HEPA vacuuming of occupied interior equipment structures like lunch rooms, as well as of adjacent vehicles or equipment.

Training: Any person who comes to a frack site or proppant storage site must be made aware of the potential silica hazard. A review of the Silica ECP and these guidance sheets can meet this requirement. This must be included in the site orientation. The orientation should address where personnel can and cannot go. It should also detail which form of personal protective equipment, including respirators, is required in each of those areas.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory protection is required when present in visible frack dust or within 10 meters of silica frack dust sources. Full-face respirators are required at least when within 3 meters of silica dust sources. Disposable coveralls are highly recommended for Tier III exposures and for those handling uncontained bulk silica frack dust (powder). Please refer to the Silica ECP for more information on respirators.

SUBSTITUTION:

- ☐ Use low dust proppants.
- ☐ Substitute out high energy equipment.

ENGINEERING CONTROLS:

- ☐ Use dust suppressants.
- ☐ Use ventilation or filter controls when pneumatically in-loading.
- ☐ Use HEPA-filtered ventilation for vehicle cabs.
- ☐ Enclose junction points. (Do not put workers under enclosures).

ADMINISTRATIVE CONTROLS:

- ☐ Train workers on the hazards of silica dust.
- ☐ Maximize distance from silica sources; stay at least one meter away from silica sources at all times.
- ☐ Keep upwind of dust clouds.
- ☐ Reduce time in dusty areas.
- ☐ Install silica signs at least 10 meters from major sources.

PPE CONTROLS:

- ☐ Properly use controls provided.
- ☐ Wear respirators consistently when present in silica frack dust.

Further Reading and References

1. Enform's Silica Exposure Control Plan
2. Enform's Silica Information website: Enform.ca
3. Photograph courtesy of Industrial Vacuum Equipment Corp.
4. The selection of 1 meter, 3 meter and 10 meter distances are based on exponential dust reductions as a function of distance from source combined with a pragmatic approach. 10 meters is the approximate length of horizontal sand storage equipment.