Managing chemical hazards

Silica on hydraulic fracturing sites - hazard assessment

PROCESS DOCUMENT **GS 409**

Enform: Your Partner in Safety
Enform is the upstream oil and gas industry's advocate and leading resource for the continuous improvement of safety performance. Our mission is to help companies achieve their safety goals by providing practices, assessment, training, support, metrics and communication. Our vision is no work-related incidents or injuries in the Canadian upstream oil and gas industry.

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.

BACKGROUND

This document is part of the Silica Exposure Control Plan (ECP) template. The template provides general silica information including details of the health effects of silica exposure. Please refer to Guidance Sheets GS 407 and GS 408 to understand the sources of exposure and controls on hydraulic fracturing sites.

WHO IS AT RISK?

Based on a review of existing industry data the following personnel are currently at risk:

- frack sand personnel e.g. blender and sand attendants
- sand truck personnel
- adjacent frack personnel e.g. chemical unit and local exhaust ventilation personnel
- adjacent non-frack personnel e.g. water storage personnel
- anyone who handles bulk silica dust (powder) e.g. in a filter or a ventilation system
- sand storage and transfer personnel e.g. sand tent and rail-loading attendants
- anyone who works in visible silica frack dust
  (hazard is invisible at the exposure level, others may be at risk)

Pneumatic in-loading may create a silica dust cloud that migrates across the site resulting in exposure risk to adjacent personnel.

EXPOSURE HAZARD ASSESSMENT

All site personnel including producers, pumping companies, truckers and third-party service providers should meet or exceed the requirements detailed below unless they have representative exposure measurement data that indicate to the contrary. The categorization of exposures into tiers is based on a review of industry data and should be protective under most circumstances; however, is not a replacement for on-going hazard assessment and exposure monitoring.

The following tables summarize acceptable control recommendations and requirements when working with frack proppant. Review the tables and look for the work site situations that are appropriate for your work site. These tables should be used by planners, supervisors, and workers.

Planners: As a planner, look for ways to move from higher Tier exposures to lower Tier exposures by adding controls or changing the design of the frack. Check the exposure categories that apply to the work site and communicate these controls to the supervisors, so that appropriate arrangements can be made for controls and personal protective equipment (PPE).

Following the implementation, conduct exposure measurements to verify that the controls are adequate. Your health and safety personnel may be able to assist in this regard. If a lot of the categories require data collection, prioritize the categories by starting at Tier III and working towards Tier 0.

Supervisors: As a supervisor, check to see that controls indicated are in place, actively used, and regularly inspected. Document the inspections. Fix any deficiencies identified. Communicate any challenges to the control strategies in use to the Planners so that subsequent jobs can be improved. Conduct periodic follow-up inspections.

Workers: Use and maintain engineering controls, follow procedures, and use PPE such as respirators. Remember, taking off your respirator in a control zone – even for only a few minutes – can result in a significant exposure, particularly for higher Tier exposure situations. Identify challenges and other exposure concerns and communicate to your supervisor.

EXPOSURE HAZARD ASSESSMENT – HYDRAULIC FRACTURING

The list of work site situations is not exhaustive; some tasks, such as equipment maintenance, are likely needed. Review the tables and look for the work site situations that are applicable to your work site. Implement the associated controls. For Tier I or higher work situations, evaluate how often the work situation occurs and conduct regular exposure measurements to ensure controls are working. If the work situation occurs 30 or more days in a calendar year, implement periodic health surveillance.

Tier 0 – No respiratory protection required

(Includes standard controls such as signs and training on the hazards of silica)

Applies on work site (check all that apply)	Tier 0 (<0.0125 mg/m^3) Based on 12-hour adjusted OEL	Other control considerations	Monitoring data collected?
☐	At least 10 meters from any emission sources, not present in visible frack dust at any time and if pneumatic in-loading is being conducted engineering controls are in use such as dust suppressants, ventilation, etc.		☐
☐	Personnel inside cab of blender that is positively pressurized with HEPA-filtered heated/cooled air and with air-tight doors and windows that remain closed	Half-face respirator required to exit cab provided you remain 3 meters from sources	☐

Tier 1 – Half-face respirator with at least N95 or better filters

(Includes standard controls such as signs, training on respirators and silica. Medically cleared to wear a respirator and fit tested)

Applies on work site (check all that apply)	Tier I (0.0125 - <0.125 mg/m^3) Based on 12-hour adjusted OEL	Other control considerations	Monitoring data collected?
☐	Hopper attendant on frack site or sand tent where proppant is dumped from an end dump truck directly into hopper		☐
☐	Between 3 and 10 meters from any emission sources and present in visible frack dust occasionally	Use engineering controls, as adjacent personnel on site may be at risk of overexposure	☐
☐	Personnel inside cab of blender that is NOT positively pressurized with HEPA-filtered heated/cooled air and with air-tight doors or when dust suppressant not in use	Half-face respirator required to exit cab	☐
☐	Trucking personnel conducting loading or unloading	Consider keeping truckers restricted to cab of truck for conveyor or auger loading/unloading	☐
☐	Personnel within 1-3 meters of hopper or conveyor junctions with dust suppressant or ceramic proppant in use	Keep personnel at least 1 meter away from edge of source equipment to manage excursion limits	☐
☐	Personnel within 3 meters of Vertical Sand Storage discharged directly (no drop) into Hopper with dust suppressant or ceramic proppant in use		☐
☐	Personnel handling used silica-contaminated coveralls or HEPA vacuuming contaminated buildings etc.	Vacuum must be HEPA-filtered, consider wetting coveralls prior to handling	☐

ARE YOU AT RISK?

Conduct a hazard assessment in the design of work, in the implementation of the work and in the execution of the work

PLANNER?

- ☐ Design the site and equipment so that exposures are minimized
- ☐ Communicate your control strategies to site supervisor
- ☐ Organize exposure monitoring to verify

SUPERVISOR?

- ☐ Conduct a hazard assessment of site and implement controls
- ☐ Check that controls are being used and effective and make changes if required
- ☐ Communicate learnings back to the planners

WORKER?

- ☐ Properly use controls provided
- ☐ Stay as far away from silica sources as practical
- ☐ Communicate concerns to supervisor

Further Reading and References

1. Enform's Silica Exposure Control Plan
2. Enform's Silica Information website: Enform.ca

Tier II – Full-face respirator with P100 filters

(Includes standard controls such as signs, training on respirators and silica. Medically cleared to wear a respirator and fit tested)

Applies on work site (check all that apply)	Tier II (0.125 – <0.625 mg/m³) Based on 12-hour adjusted OEL	Other control considerations	Monitoring data collected?
☐	Personnel on-top of Horizontal Sand Storage during in-loading by conveyor with no engineering controls	Keep personnel at least 1 meter away from source equipment to manage excursion limits	☐
☐	Personnel within 3 meters of Vertical Sand Storage discharged directly (no drop) into Hopper or within > 1-3 meters of hopper or conveyor junctions	Providing that if pneumatic in-loading is conducted, engineering controls are present	☐
☐	Pressure washing bulk silica frack dust from equipment such as pumper radiators	Keep adjacent unprotected personnel back 10 meters, use a Rubber Apron	☐
☐	Personnel handling ≤ 1 kg of free bulk silica frack dust (powder)	Disposable coveralls. Collected materials should be stored in an airtight container that has WHMIS labels	☐
☐	Personnel in sand storage tents during loading or unloading of sand or when visible dust is present	Consider ventilation fans >10 air changes per hour with dust capture	☐
☐	Personnel conducting dry sweeping of sand or silica dust in an enclosed setting (change room)	Consider wet methods or HEPA vacuuming	☐

Tier III – Supply Air or full-face tightfitting PAPR

(Includes standard controls such as signs, training on respirators and silica. The use of disposable coveralls is highly recommended for Tier III exposures. Medically cleared to wear a respirator and fit tested.)

Applies on work site (check all that apply)	Tier III (≥0.625 mg/m³) Based on 12-hour adjusted OEL	Other control considerations	Monitoring data collected?
☐	Personnel immediately adjacent (≤1 meter) to conveyor junctions, conveyor-hopper junction or Horizontal Sand Storage thief hatch (during pneumatic in-loading) for frack with no engineering controls	Implement engineering controls. Keep workers at least 1 meter away from source equipment.	☐
☐	Pneumatic in-loading with personnel adjacent (≤1 meter) to uncovered fill nozzles and down tube vents (vertical sand storage) with no engineering controls	Implement engineering controls. Unacceptable risk to adjacent personnel	☐
☐	Personnel viewing the sand levels with breathing zone at thief hatch during active pneumatic in-loading	Other ways to estimate bin volume should be engineered	☐
☐	Personnel emptying silica frack dust sock filters or handling > 1 kg of free bulk silica frack dust (powder)	Collected materials should be stored in an airtight container that has WHMIS labels.	☐
☐	Personnel underneath a tarp covering hopper or conveyor	Working alone requirements	☐

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