

Voisey's Bay: Health Awareness Orientation

1. Mandatory Course: Health Hazards

1.1 *Silica & Nickel Awareness*



Silica & Nickel Awareness

VNL Labrador Operations – Mandatory Courses



1.2 Untitled Slide

- Health Hazards
- Routes of exposure
- Threshold Limit Values
- Health Effects
- Areas for potential exposure at site
- Controls
- PPE

Agenda

1.3 Health Hazards at Voisey's Bay Mine Site

Health Hazards at Voisey's Bay Mine Site

- nickel, silica
- Vapours (solvents, carbon disulphide) – Concentrator Orientation
- Fumes (welding) – only risk for welders
- Gases (sulphur dioxide) – separate presentation
- Noise (separate presentation)
- Vibration (separate MSD presentation)
- Radiation – Low risk – (Concentrator Orientation)



1.4 Health Hazard

Health Hazard

Where there is evidence that adverse health effects may occur resulting from exposure to a chemical. For example:

- eye or skin irritation
- respiratory sensitization (may cause allergy or asthma symptoms or breathing difficulties if inhaled)
- carcinogenicity (may cause cancer).



1.5 How can I be exposed to chemicals at site?

How can I be exposed to chemicals at site?

There are 3 routes of entry into the body:

1. **Skin absorption** – soaks through the skin



2. **Ingestion** – swallowing the chemical



3. **Inhalation** – breathing in the chemical



1.6 Ingestion - swallowing

Ingestion - swallowing

- Chemicals that are swallowed are absorbed in the digestive tract.
- Chemicals can rub off dirty hands and contaminate food, drinks or tobacco products.
- Chemicals in the air can settle on food or drink and be swallowed.



This route of entry is of minimal concern as it is prevented by good hygiene practices



1.7 Skin Absorption

Skin Absorption

Some chemicals can pass through the skin and be taken into the body's systems.

Solvents are examples of compounds that can be absorbed through the skin, they can also cause skin irritation. NEVER use solvents to wash your hands!



In relation to nickel exposure, this route of entry is of minimal concern as very little nickel is directly absorbed through the skin into the bloodstream; however, skin and eye contact with nickel concentrate can cause irritation and redness if contact is not prevented



1.8 Inhalation – breathed in through nose or mouth

Inhalation – breathed in through nose or mouth

The size of particles or droplets affects where the chemical settles in the respiratory tract.

Where the chemical settles in the respiratory tract determines what symptoms or diseases will develop.

- Larger particles $> 100\mu\text{m}$ get trapped in the nasal passages and are expelled.
- **Inhalable particle** $<100\mu\text{m}$ enter the respiratory tract (upper lungs and may be trapped in phlegm)
- **Very small particles i.e. respirable particles** $<10\mu\text{m}$ (e.g. Particulates/gases) get down to the air exchange passages (alveoli)



1.9 Threshold Limit Values for silica & nickel

Threshold Limit Values for silica & nickel

Chemicals, including nickel and silica have limits, above which you cannot be exposed. The limits which have been adopted by the NL Government, are called the 'Threshold Limit Values' or TLVs.

TLVs are time-weighted average concentration for a normal 8-hour workday and 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effects.

TLV for Nickel – 0.19 mg/m³ over a 12 hour shift

TLV for Silica – 0.0238 mg/m³ over a 12 hour shift

(Mg/m³ – milligrams per meter cube, is the unit of measurement used to quantify the amount of dust)



1.10 Potential health effects associated with nickel exposure

Potential health effects associated with nickel exposure

There are many different forms of nickel and each form has unique health effects.

The type of nickel at Voisey's Bay is called



Pentlandite

Main route of entry to the body is by inhalation.

Health effects include:

- In contact with skin and eye can cause irritation.
- Nickel is classified as a carcinogen which means it can cause cancer, however, research has shown that the type of nickel we have at our site does not increase the risk of cancer.



1.11 Summary of the toxicity of Nickel - PENTLANDITE

Summary of the toxicity of Nickel - PENTLANDITE

- Health risks of nickel depends on the presence of combinations of nickel species, their form, route of entry into the body, dose, length of exposure, presence of other substances such as smoking, and human susceptibility.
- There are several forms of nickel and the health effects of each are different. The mineral form of nickel mined and processed at Voisey's Bay Mine Site is an insoluble, inorganic, sulfidic ore called PENTLANDITE.
- Human toxicology studies indicates that a variety of adverse health effects have been reported for some nickel compounds, including respiratory cancer, chronic upper respiratory tract irritation, pneumoconiosis, pulmonary fibrosis, bronchial asthma, and allergic contact dermatitis.

Pentlandite and respiratory cancer

- In relation to PENTLANDITE, the 'Nickel Institute' has issued guidance which states that "although a modest lung cancer excess has been found in some miners, this excess has been consistent with that observed for other hard-rock miners of non nickel ores. This, coupled with the fact that millers have not presented with statistically significant excess respiratory cancer risks, suggests that lung cancer seen in miners is not nickel related. Furthermore, Pentlandite has not been shown to be cancer causing in animals."

Other respiratory health effects including asthma and fibrosis

- Evidence suggests that nickel induced asthma is very rare and there is limited evidence that nickel causes other respiratory effects such as fibrosis or pneumoconiosis.

Skin contact - sensitisation

- Very little nickel is directly absorbed through the skin into the bloodstream; however, skin and eye contact with Voisey's Bay nickel concentrate can cause sensitisation, irritation and redness if contact is not prevented



1.12 Silica

Silica

The NL OHS has published the 'Silica Code of Practice'. Employers must comply with the elements of the code and provide training relating to:

- Health hazards and potential risks of silica exposure
- Nature of silica exposure (tasks, procedures, equipment, processes and areas which could result in / contribute to silica exposure)
- Method of assessing and evaluating silica exposure
- Control of silica hazards, including engineering, administrative and PPE
- Safe work procedures for the handling, use, or release of silica
- Personal hygiene procedures
- Overview of Silica Management Program and its subcomponents
- Administrative process related to medicals, handling of confidential information, communication, and follow-up.



1.13 Potential health effects associated with silica exposure

Potential health effects associated with silica exposure

Silicosis - a lung disease caused by inhaling damaging amounts of silica, causing inflammation and scarring in areas of the lungs. Silicosis can be characterized into 3 categories:



- **Acute silicosis** - develops after massive exposure to very high air concentrations
- **Accelerated silicosis** - develops after 5 to 10 years of exposure to elevated air concentrations,
- **Chronic silicosis** - usually develops after 10 or more years of prolonged exposure silica, often at relatively low concentrations

Lung cancer - uncontrolled growth of abnormal cells in the lung.

Connective tissue disorders (i.e. scleroderma) - chronic hardening and contraction of the skin and connective tissue. (very rare)



1.14 Contributory factors associated with the development of silicosis

Contributory factors associated with the development of silicosis

- Airborne concentration and % of silica in the dust
- Form of silica
- Size of particles inhaled
- Duration of exposure
- Resistance of the individual
- Presence or absence of complicating process such as infection
- Lifestyle (smoking, exercise) – smoking and working with nickel or silica increases your risk of developing a health effect)



1.15 Where silica exists at our site

Where silica exists at our site

Silica is a component of most rock and ore. Through personal exposure and area monitoring at site, we have accumulated substantial data that enables us to identify tasks/areas where there is a potential for silica exposure. In the event that there is the potential for exposure, procedures dictate required controls including mandatory use of respirator.

- Ore – 0.47% – 2.65% silica
- Clean Rock and PAG – 12% silica
- Concentrate – <0.50 % silica

Activities that can potentially cause silica to become airborne and contribute to exposure include:

- Crushing – Mandatory respirator area
- Welding – Mandatory respirator use
- Core cutting – Mandatory respirator use



1.16 Workplace Personal Monitoring

Workplace Personal Monitoring

- Allows us to assess personal exposure and compare results with the TLVs
- Sampling equipment is worn by the worker. The sampling head must remain within their breathing zone for the duration of their shift.
- Sampling media is sent for analysis and the results are returned within 4 weeks.



Substantial monitoring data for both silica and nickel indicates low level of risk of exposure to silica and nickel, providing control measures are adhered to.



1.17 Controls

Controls

Engineering controls

- Ventilation, Enclosure/isolation, Dust Suppression

Administrative

- Training on hazards recognition, safe work & hygiene practices, Maintaining adequate hygiene facilities (hand washing and showering, Medical Surveillance, and SOP's

PPE

- always the last resort



1.18 PPE

PPE

Suitable PPE should be worn as required by a given task or work environment. e.g. disposable coveralls, rubber boots, rubber gloves, respirators in mandatory respirator area where there is potential of exposure to eg. silica or nickel.

- **Gloves** – refer to the glove board outside the warehouse or ask your supervisor
- **Disposable coveralls** – if the task is going to result in your work wear getting heavily contaminated with concentrate, grease or oils – use disposable coveralls for extra protection.

Ensuring you have the correct PPE for the task is essential in preventing exposure and adverse health effects. If you are not sure of the correct PPE –
ASK YOUR SUPERVISOR



1.19 Respiratory Protection

Respiratory Protection



The type of respirator is based on concentration of the contaminant and TLV

A. Half mask respirator

< = to 10 x TLV

B) Full Face mask respirator with quantitative assessment

< = to 50 x TLV

Respirator fit testing is done through the site training department

Refer to the Respirator Protection Program for additional information



1.20 Work and hygiene practices

Work and hygiene practices

Some of the things you can do to protect your health:

Follow adequate controls (ie. wearing PPE, vacuum vs. dry sweep, wet vs. dry)

Keep your work area clean – daily housekeeping

Eat, drink only in designated areas

TIP.

When removing disposable coveralls, open zip and roll the coveralls down on themselves trapping any dust and preventing the dust from becoming airborne



1.21 Health Surveillance

Health Surveillance

Objectives are to:

- Identify workers with conditions which may be aggravated by exposure and establish a baseline measure for determining change in health
- Evaluate the effect of silica, nickel or any other agent on workers
- Enable remedial action to be taken when necessary
- Provide health education
- Periodic medicals – frequency depends of several factors including pre-existing medical conditions, age, area of work
- All medical information is confidential
- Report health effects to your supervisor/clinic

