Health & Safety Standard

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Version	Description
1.1	Updates include aligning the Noise and NORM guidelines to applicable legislation limits and the humidex values have been adopted for Temperature Extremes.

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1 Purpose

This Industrial Hygiene Technical Standard defines Cenovus's industrial hygiene requirements necessary to ensure that Cenovus employees, contractors and visitors accessing Cenovus workplaces are protected from present and future occupational health-related illnesses and injuries (COIMS Requirement).

The intended audience for this standard is Cenovus leaders, entity representatives, workers and others who have responsibilities for the anticipation, recognition, assessment, and control of occupational health and hygiene hazards and risks.

2 Application

This technical standard applies to all employees, contractors and visitors accessing Cenovus workplaces including, but not limited to, Cenovus owned and operated or leased facilities, operations, and various Entities.

3 Requirements

3.1 Roles and responsibilities

3.1.1 Health and Safety

The Health and Safety Group shall:

- Provide qualified resources to implement the requirements defined in this standard.
- Provide direction and support to the Entities to implement this standard throughout Cenovus workplaces
- Ensure that a supportive and collaborative environment is maintained within Cenovus and the Entities for implementation of this standard.
- Establish performance criteria and monitor implementation activities of this standard.
- Ensure that appropriate training, technical and professional development is available to the IH&OH group.

3.1.2 Industrial Hygiene & Occupational Health group

The IH&OH Group serves as the primary resource for the development and implementation of this standard.

The IH&OH Group shall:

- Set clear requirements for managing IH related risks for safe, compliant, reliable, and efficient operations.
- Intervene and escalate if risks are deemed unacceptable and resolution cannot be readily achieved.
- Develop and maintain a practice document used to outline and define the professional standards for the IH&OH program services and activities.
- Maintain and provide an independent view of IH related risks and how they are managed.
- Ensure compliance of this standard with regulatory and Cenovus requirements.

- Provide support and services consistent with recognized industrial hygiene professional practice.
- Develop long and short-term implementation strategies to support the objectives of this standard.
- Maintain, administer, and retain the official data record for exposure assessment, hazard and risk information associated with the requirements of this standard.
- Manage qualified resources (personnel, equipment, service providers and contractors) to support the implementation of this standard.
- Provide reporting to Cenovus leadership, Corporate H&S and the entity on the implementation and status of defined objectives associated with this standard.

3.1.3 Entities

Operating Areas and/or Entities shall:

- Ensure that adequate resources are allocated to support the implementation of this standard within their workplaces.
- Facilitate the implementation of this standard by engaging their employees.
- Complete self-assessments of the implementation of the requirements of this standard.
- Notify the IH&OH group of health hazard related issues or concerns and actions taken to control the hazards.
- Notify the IH&OH group of any process or material changes that may impact employee exposure (consistent with Management of Change processes).
- In consultation with the IH&OH Team, review exposure and workplace assessment reports and implement exposure control plans.
- Keep and maintain applicable records and documentation in compliance with established practice.

3.1.4 Employees

Employees shall:

- Maintain an awareness of the health hazards of their workplace, work processes and the materials they use.
- Properly apply and utilize exposure controls provided.
- Disclose personal issues or concerns that may limit or prevent the effectiveness of controls or may impact fitness for duty.
- Provide information to the IH&OH group to support an understanding of the workplace conditions.
- Participate constructively in the activities of this standard.
- Alert their line supervisor of any exposure risks, concerns or incidents affecting the employee or their co-workers.
- Provide feedback for improvement, where needed as it pertains to the requirements of this standard.

3.1.5 Service Providers

Service Providers shall:

- Maintain programs that meet the requirements of this standard.
- Maintain an awareness of the health hazards of the workplace, work processes and the materials they use.

- Disclose personal issues or concerns that may limit or prevent the effectiveness of controls or may impact fitness for duty.
- Provide information to the IH&OH group to support an understanding of the workplace conditions.
- Participate constructively in the activities of this standard.
- Alert their line supervisor of any exposure risks, concerns or incidents affecting the employee or their co-workers.

3.2 Governance

3.2.1 Industrial Hygiene & Occupational Health Objectives

The Industrial Hygiene Technical Standard provides a framework consisting of processes, tools and methods used to ensure that occupational exposures to chemical, physical, and biological agents are understood and applicable control measures are applied at Cenovus workplaces. The objectives are achieved by managing defined practice areas and by developing and maintaining procedures to address specific hazards both at corporate and entity levels. The requirements are delivered by H&S and the IH&OH group, in collaboration with entity staff as illustrated in Fig 1 below.

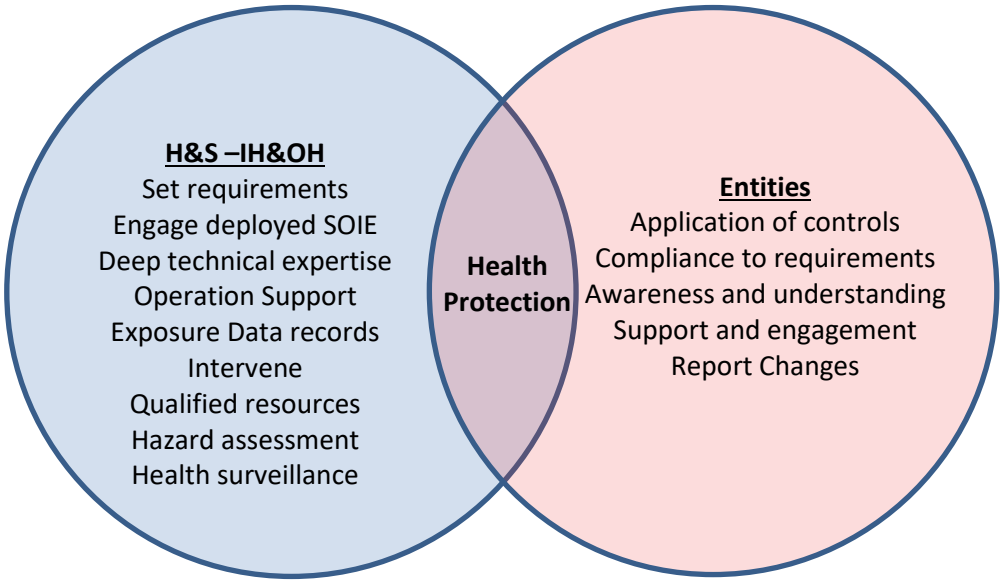


Figure 1 – Cenovus IH & OH Responsibilities

This technical standard defines the expectations required to prevent occupational illnesses and injuries at Cenovus workplaces by meeting the following objectives:

- Identify, assess, control and mitigate all hazards with IH impact.
- Application of accepted principles and practices of industrial hygiene to address health hazards of employees, community, business, or other work environments.
- Development and implementation of applicable hazard specific procedures and practices for chemical, physical, and biological hazards.
- Performance of ongoing IH surveillance activities to ensure that all identified health hazards are effectively controlled, and their respective exposure levels are recorded.
- Provision of support on occupational health concerns and the implementation of IH Practice recommendations at Cenovus workplaces.
- Compliance with applicable IH regulatory requirements, review of regulatory changes on a routine basis and the demonstration of due diligence.
- Observation of trends in occupational exposure data, illnesses and injuries and the initiation of applicable prevention initiatives.
- An IH Practice document shall be developed and utilized by IH resources to ensure application of acceptable practice elements and consistency with recognized professional practice requirements.
- Provision of support to Occupational Health programs and activities.

3.2.2 Industrial Hygiene & Occupational Health Focus Areas

The requirements of this document are supported by three interdependent focus areas described below:

- Governance supporting Cenovus's ability to demonstrate a duly diligent approach;
- Assurance that establishes professional and performance expectations; and
- Services offered to workers, front line supervision and entity leadership.

3.2.3 Industrial Hygiene & Occupational Health Activities

To meet the requirements of this standard, a number of practice areas are defined and implemented by the IH&OH group. These activities ensure that governance, assurance, and service requirements are effectively implemented. Using applicable resourcing strategies, the IH&OH group supports implementation of the requirements in the following activities:

- Health Risk Assessments (HRA) and Qualitative Exposure Assessments (QEA)
- Workplace exposure monitoring and surveillance
- Requested Assessments
- Exposure Control Management Plan
- Exposure data retention and monitoring
- Regulatory reporting for employee exposure data as needed
- Product Classification
- Safety Data Sheet (SDS) development and management
- Technical and Professional Representation
- Environmental Health support
- Occupational Health Program support

These activities are subject to the following regulatory and professional requirements.

3.2.4 Regulatory Requirement Interpretation and Inclusion

IH&OH group shall apply all relevant sections of the health and safety regulations of the federal, provincial, state, and local agencies in the authority having jurisdiction or as required by this standard where the operational area or entity is geographically located.

3.2.5 Cenovus Occupational Exposure Limits (OEL) Adoption

A majority of the health and safety regulations within Canada and the United States have occupational exposure limits (OELs) specified or a reference to the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs).

Where regulatory exposure limits are not specified for a specific contaminant, authoritative OELs are used by the IH&OH group as the best practice requirements for evaluating and controlling exposure. Authoritative OELs are those set by organizations such as the ACGIH, the American Industrial Hygiene Association (AIHA), or the National Institute for Occupational Safety and Health (NIOSH).

If no Short-Term Exposure Limit (STEL) or ceiling occupational exposure limit is listed for harmful substances. Cenovus shall ensure that a worker is not exposed to, whichever is lower of, 3 times the 8-hour OEL in increments less than 15 minutes at a time, no more than 4 times in a 24-hour period, with a one-hour space in between and not exceeding 5 times the 8-hour OEL, or the Immediately Dangerous to Life and Health (IDHL) concentrations. This practice has been adopted by many regulatory agencies in areas of Cenovus operations.

If no OEL's are established for harmful substances regulations state that worker's exposures to the substance is kept As Low As Reasonably Practicable (ALARP).

The corporate OEL's adopted by the Cenovus IH&OH group are included in *Appendix P*. Each year the IH&OH group reviews the OELs of the various jurisdiction of operation to identify the values that will best protect Cenovus employees and contractors throughout the various operating areas.

3.3 Hazard Specific Requirements

Specific hazards in Cenovus workplaces have been identified through historical IH assessments, HRA's and Cenovus exposure control requirements or legislated requirements.

Implementation of the requirements of this standard shall preferentially include corporate procedures. Where no corporate specific procedure exists, the Entities may develop an entity specific procedure.

Specific entity level procedures and practices may be required to meet the hazard specific requirements.

3.4 Control Strategies

The IH&OH group shall make recommendations for controls to various IH hazards identified on Cenovus sites based on level of risk and corporate standards and procedures.

All entity's /operational areas shall participate in the IH process of identification, assessment, and control to mitigate potential exposures.

The preferred hierarchy of controls shall be considered and applied in the following order: Elimination, minimize / substitution, separate / isolate, engineering controls, administrative controls such as organizational controls, procedures, and personal protective equipment. Refer to *Appendix* A for examples of controls following the hierarchy of controls.

3.5 Records

The IH&OH group shall utilize and maintain the approved record management system for health hazard inventory, industrial hygiene assessments, exposure measurements, controls applied and other relevant industrial hygiene records.

The system of record shall have security in accordance with Freedom of Information and Protection of Privacy (FOIP) Act to support the implementation of this standard and an ability to provide requested information to the applicable stakeholders.

The system of record shall have security in accordance with FOIP to comply with the privacy and confidentiality requirements identified by regulatory, professional practice, ethical and other identified Cenovus record keeping requirements.

3.6 Reporting

The IH&OH group shall ensure that reports include, but are not limited to, qualitative and quantitative exposure monitoring data and occupational health records. Reports shall be completed as per confidentiality agreements and regulatory requirements and distributed as appropriate to the relevant stakeholders, including affected employee groups while protecting their confidentiality.

IH&OH shall work in compliance with privacy and FOIP requirements, participants' IH activities will be made aware of the planned or intended reporting processes at the time of participation in exposure or health assessments.

3.7 Performance Measurement

Compliance with this standard shall be measured by its ability to:

- Analyze and trend information to assess the effectiveness of exposure control measures to identify and quantify current challenges, and to identify emerging issues pertaining to this standard.
- Establish and analyze performance metrics
- Apply applicable requirements identified in COIMS Assurance Performance and Improvement.

Results of the analysis, trending and performance metrics shall be communicated during the annual management review.

3.8 Information and Requirements

3.8.1 Animal Infestation

Recognition	1.1	The presence of animal pests can result in human infection hazards, contaminated foodstuffs, damaged materials, and structures or be a nuisance.
	1.2	Opening doors and windows without screens can allow rodents to get in. Piping, cable trays, and other utility lines can also provide entry.
	1.3	Once established, animal pests can be difficult and costly to eliminate.
Health Effects	1.4	Various biological hazards are harboured in animal urine or feces and can be transmitted to humans through exposure to the waste products or through bites. The most common illnesses caused by biological agents and spread by interactions with animals are the following: • Hantavirus • Histoplasmosis • Rabies • Lyme disease
	1.5	Symptoms of Hantavirus are similar to flu symptoms. Hantavirus Pulmonary Syndrome (HPS) can develop and can be differentiate from the flu by severe muscle aches in the low back, buttocks, and thighs or other of the large muscle groups. Severe abdominal pain is also common. The second stage of the illness can result in pulmonary edema, respiratory distress, kidney failure, low blood pressure, and low oxygen levels.
	1.6	Symptoms of histoplasmosis infection include fever, cough, fatigue (extreme tiredness), chills, headache, chest pain, and body aches. Severe infections can be life threatening.
	1.7	Symptoms of rabies are also similar to the flu (such as weakness, fever, headache) but through the progression of the illness additional symptoms such as agitation, confusion, hyperactivity, excessive salivation, difficulty swallowing, hallucinations, insomnia, and partial paralysis and ultimately death can result.
	1.8	Lyme disease is a tick-borne illness that is spread to humans if bitten by an infected tick. Lyme disease may be identified by a red ring like rash that appears like a bull's-eye. Other symptoms are fatigue, rash, headaches, fever, stiff neck, and sore muscles and joints.
Assessment Requirements	1.9	Regular visual inspections should be conducted to look for signs of animal infestation as well as conditions which allow animals access to buildings and equipment.
	1.10	Sources of animal intrusion shall be identified and addressed to prevent infestation.
	1.11	Further assessments should be completed as indicated by the type and degree of infestation.

Control Requirements	1.12	A building can be rodent proofed by minimizing all openings and penetrations to sizes smaller than a dime.
	1.13	To prevent rodent entry, any holes should be plugged with durable materials. Coarse steel wool is a good temporary plug when packed tightly into openings.
	1.14	Migratory birds are protected by the Migratory Bird Convention Act and active nests cannot be destroyed or removed. If an active nest is encountered at a Cenovus facility, the young must have fledged prior to removing the nest from a structure.
	1.15	To prevent bird entry netting can be placed over openings and skylights, predator decoys can be utilized, or anti-roosting systems can be installed such as spikes or electric strips.
	1.16	If the above prevention and control measures do not effectively reduce the population of animal pests a qualified, registered, or certified pesticide contractor shall be utilized as defined by the authority having jurisdiction or as required by this standard.
Education and Training Requirements	1.17	All workers who may be required to work in areas where animal pests are present shall be familiar with this program and any site-specific control requirements.
	1.18	Contractors shall also have appropriate training for the work that will be conducted.
	1.19	Cenovus shall inform contractors of the location of known animal infestation hazards present.
Health Surveillance	1.20	People with specific health susceptibilities should consult their doctor if concerned about exposure to animal infestation hazards.

3.8.2 Asbestos

Recognition	2.1	A material is considered to contain asbestos if it contains 0.1% or greater asbestos content by weight. Any vermiculite insulation or vermiculite containing product shall be considered asbestos containing material.
	2.2	The potential for asbestos or Asbestos Containing Material (ACM) to be present at a facility is dependent on two primary factors. • Age of the Facility - ACMs are commonly found in building materials used until approximately 1990. • Type of Material Present at the Facility - The primary use of asbestos has been as an insulator or fire retardant. A more comprehensive list is included in *Appendix B*.
Health Effects	2.3	Exposure to asbestos fibers has been associated with both lung disease and various cancers.
	2.4	The fibers are very fine and cannot be easily seen.
	2.5	Asbestos becomes a health hazard when ACM is disturbed, and fibers are released into the air and inhaled by workers.
	2.6	Illness may not become apparent for many years from the time of exposure. Symptoms of asbestosis or mesothelioma may not develop for 20-30 years. The latency period also depends on the duration and quantity of exposure.
	2.7	People are at a higher risk of asbestos-related disorders if their exposure can be described as: • High concentrations of asbestos • Long periods of time, and/or • High frequency.
Assessment Requirements	2.8	All sites with the potential to contain ACM shall have an up-to-date inventory of the materials.
	2.9	The inventory shall include, but not be limited to: • Amount of ACMs (e.g., area, linear length) • Type (e.g., insulation, surfacing materials, floor tiles) • Percentage of asbestos present, if known (materials can be assumed to be ACM when no laboratory sampling has been carried out) • Condition (good, fair, poor, debris present, contained, encapsulated, etc.) • Friability (is it friable or non-friable?) • Accessibility (can workers reach it or make contact with it?) • Type of asbestos present (e.g., chrysotile, amosite, crocidolite, etc.)
	2.10	The inventory shall be maintained and regularly updated as per the requirements of the site-specific Asbestos Management Plan and when asbestos and ACM are removed or newly identified.

Control Requirements

2.11 Controls should be utilized following the hierarchy of controls to reduce possible exposures in the work environment.

2.12 The specific method of controlling exposure shall be determined by evaluating the parameters assessed in the asbestos inventory.

2.13 If removal is the recommended risk control method, classification of the scope of the removal work shall be assessed, and controls applied as defined by the authority having jurisdiction or as required by this standard.

2.14 All materials that may contain asbestos should be disturbed as little as reasonably possible to prevent asbestos release to the environment and worker exposure.

2.15 All procedures shall focus on the same four principles:

- Isolate the work area;
- Protect workers;
- Minimize the release of asbestos fibers; and
- Ensure adequate clean-up, decontamination, and waste disposal.

2.16 “Non-friable” or “low risk” work activities have a minimal risk of releasing asbestos fibers into the air. Non-friable or low-Risk Asbestos Activities include the following:

- Removing manufactured products containing non friable asbestos, where sanding, cutting or similar operations are not required;
- Using non-powered hand tools designed to cut, drill or abrade a non-friable manufactured product containing asbestos, as long as water is used to control fibre release and waste products are controlled;
- Working in close proximity to friable material containing asbestos, provided that the asbestos material is not disturbed;
- Transporting or handling materials containing asbestos in sealed containers;
- Removing a false ceiling or part of a false ceiling to gain access to a work area where asbestos containing materials are known to exist. Loose friable asbestos materials shall not be lying on the surface of the false ceiling;
- Collecting small samples of suspected ACM material for identification; and
- Thawing asbestos-insulated lines.

2.17 Properly trained Cenovus employees may complete non-friable or low risk work activities. Using practices reviewed or procedures reviewed by the IH&OH group.

2.18 Only properly qualified workers or contractors following specific procedures as defined by the authority having jurisdiction or as required by this standard are allowed to complete friable or moderate to high-risk abatement activities of asbestos containing materials on Cenovus sites.

Education and Training Requirements	2.19	All workers who are required to work in areas where ACM is present shall be familiar with this standard, any site-specific requirements, and have asbestos awareness training.
	2.20	Cenovus shall inform contractors of the location of all ACM. This can be accomplished through a combination of identification/labeling of process lines/tanks/vessels and review of the site-specific Asbestos Management Plan.
	2.21	Contractors engaged in abatement or removal activities shall meet the training requirements of the authority having jurisdiction or as required by this standard.
Health Surveillance	2.22	Any Asbestos Exposed Worker shall undergo the required medical surveillance as outlined by the authority having jurisdiction or the requirements of this standard.
	2.23	Contractors are responsible for ensuring that their workers comply with these requirements.

3.8.3 Benzene

Recognition	3.1	Benzene occurs naturally in oil and gas reservoirs and is present throughout the whole production chain.
	3.2	Benzene can be found in the main process stream in upstream and downstream oil and gas operations and also in support systems and waste streams.
	3.3	Benzene is also produced as a product for refinery feedstock, fuel and for other engineered processes.
	3.4	Sources of benzene outside the process streams may include solvents, paint and oil-based mud containing aromatic compounds.
	3.5	Exposures are often related to opening equipment and systems contaminated with benzene-containing materials, including transfer, maintenance, sampling, and inspection activities.
Health Effects	3.6	Benzene is a known carcinogen and mutagen.
	3.7	Typical routes of exposure for benzene are inhalation, skin, and eye contact. Benzene is also harmful if ingested.
	3.8	Repeated or prolonged exposure to even relatively low levels may result in blood disorders such as leukemia and anemia.
Assessment Requirements	3.9	Worker exposure assessment for benzene shall be conducted as required by the authority having jurisdiction or as required by this standard.
Control Requirements	3.10	Benzene exposures shall be reduced to levels As Low As Reasonably Practicable (ALARP).
	3.11	Where levels are unassessed or found to be at concentrations equal to or greater than 50% of an applicable exposure level, controls shall be implemented.
	3.12	If benzene is a known hazard the entity shall have a Benzene Exposure Control Program for the facility.
	3.13	Controls shall be considered based on elimination, substitution, engineering controls or administrative controls first, before implementing PPE and RPE as the method of control. *Appendix C* can be used as a guide to help with RPE selection.
Education and Training Requirements	3.14	At all Cenovus workplaces where benzene-containing materials are handled, used, stored, or transported, a benzene awareness training program shall be implemented to ensure workers are aware of benzene's properties, toxicity, safety procedures and controls.
	3.15	Workers handling benzene containing materials should receive appropriate training during their initial safety orientation training to understand the hazards present and the controls required to prevent exposures.

Health Surveillance	3.16	Any Benzene Exposed Worker shall undergo the required medical surveillance as outlined by the authority having jurisdiction or the requirements of this standard.
	3.17	Contractors are responsible for ensuring that their workers comply with these requirements.

3.8.4 Chemical Management Program

Introduction	4.1	Unplanned releases, improper handling and unsafe storage of hazardous products can cause injury, disease, property loss and environmental damage. This Chemical Management Program outlines the key essentials for an effective chemical management system. Implementation of the program is expected to minimize Health, Safety and Environmental losses that arise from unexpected incidents or ill-prepared precautionary and remediation measures.
Safety Data Sheet Management	4.2	Cenovus utilizes an electronic database system to store and manage all SDS throughout the company.
	4.3	The system provides the ability to house, organize, document, and record chemical inventories.
	4.4	The inventory included in this system represents Cenovus's Material/Substances Register.
	4.5	The system also provides the capability to assess and approve hazardous products introduced and used at Cenovus sites.
Chemical Hazard & Approval Requirements	4.6	Only approved products may be acquired, produced, or used at Cenovus locations.
	4.7	A formal review process shall govern the procurement of all hazardous products to ensure that the introduction of such substances are compliant with regulatory requirements and do not pose an unacceptable risk to Cenovus's employees, processes, products, the environment, or the public.
	4.8	Chemical approvals shall be managed by the entity or facility, with the assistance of the IH&OH group for high hazardous chemicals.
SDS Authoring Requirements	4.9	Products that are manufactured/blended at Cenovus shall be properly classified by the IH&OH group.
	4.10	Products that are manufactured/blended at Cenovus shall have an SDS developed prior to manufacturing/blending or as soon as possible after manufactured/blended.
	4.11	Materials that require development of an SDS include product streams, intermediate streams, and waste streams.
	4.12	For more information on how a product is sampled and classified, refer to the Cenovus Chemical Guidance Sheet.
Chemical Storage	4.13	Storage and handling systems for hazardous products shall be designed, constructed, and installed to minimize risks associated with the substances being stored / handled.
	4.14	A proper storage system shall take into consideration the properties of the chemicals, any form of incompatibility, quantity, operational and environmental conditions.
	4.15	Substances shall be stored in accordance with the applicable standards (ASTM, CSA, WHMIS, NFPA etc.) as defined by the authority having jurisdiction or as defined by this standard.

	4.16	Containers shall contain a clear, legible label identifying the substance as per the authority having jurisdiction or as required by this standard.
Transportation of Dangerous Goods Requirements	4.17	All hazardous products and dangerous goods including waste shall be transported in packaging as outlined in the Transportation of Dangerous Goods (TDG) and Department of Transportation (DOT) regulations. Section 14 of the Safety Data Sheet includes Transportation Information for the product and shall be used when filling out transportation documentation.
Education and Training Requirements	4.18	Training and communications are an essential component of chemical management.
	4.19	All entity personnel that handle, are exposed to or are potentially exposed to hazardous products are to be adequately trained as per the authority having jurisdiction or the requirements of this standard.
	4.20	All Cenovus personnel are to be fully trained in WHMIS2015 (Canada) / HAZCOM (US) requirements.

3.8.5 Crystalline Silica Management

Recognition	5.1	Silica is one of the most abundant minerals on earth and makes up nearly all of what we call sand and rock.
	5.2	Silica exists mostly in crystalline form and a small proportion exists in amorphous form.
	5.3	Many types of crystalline silica exist, with quartz being the most abundant. Other types of crystalline silica include cristobalite and tridymite.
	5.4	Airborne crystalline silica can be generated when silica-containing material is chipped, cut, drilled, ground, or blasted.
	5.5	Crystalline silica exposure can occur in a variety of work environments depending on the products used and the activities conducted.
Health Effects	5.6	Exposure to respirable crystalline silica has been associated with the development of lung disease. Silicosis (scarring of the lung) can develop over an extended period of time (15–20 years) following exposure to low concentrations of silica dust, or it can develop after a few months of high exposures. Silicosis can be debilitating or even fatal. Due to reduced lung function, people suffering from silicosis are also prone to other lung diseases such as tuberculosis.
	5.7	The respirable fraction (very small particles) of crystalline silica can be readily inhaled and deposited in the deep region of the lung where it may cause illness.
	5.8	Quartz and cristobalite are classified as “Group 1, carcinogenic to humans” by the International Agency for Research on Cancer (IARC). Workers exposed to high concentrations of respirable dust who have developed silicosis have an increased risk of developing lung cancer.
Assessment Requirements	5.9	Personal exposure assessment shall be conducted to identify tasks that expose workers above the OEL. Once these tasks have been identified, site-specific assessment protocols shall be instituted to identify exposure risk.
Control Requirements	5.10	Controls should be utilized following the hierarchy of controls to reduce possible exposures in the laboratory environment.
Education and Training Requirements	5.11	All workers who may be required to work in areas where silica is present shall be familiar with this program, and any site-specific silica management procedures.
	5.12	Contractors shall also have appropriate training for the work that will be conducted.
	5.13	Cenovus shall inform contractors of the location of all silica hazards that may impact their work on Cenovus sites.
Health Surveillance	5.14	Silica exposed workers shall undergo the required medical surveillance outlined by the requirements of the authority having jurisdiction or as required by this standard.
	5.15	Contractors shall undergo health assessments as required by their employer.

3.8.6 Emergency Shower and Eyewash Requirements

Recognition	6.1	Eyewash and emergency showers are considered safety critical equipment.
	6.2	If hazardous substances cannot be substituted, Cenovus shall ensure first aid response equipment are available and accessible, which includes eyewashes and emergency showers, appropriate to the risk of injury or illness.
	6.3	When workers are utilizing hazardous substances requiring wash facilities/ eyewashes or emergency showers, workers are to be made aware of the locations of the facilities.
	6.4	Workers/Contractors shall document the locations of the eyewash/emergency showers on their Field Level Hazard Assessment when working with hazardous substances.
	6.5	Eyewashes and emergency showers shall comply with the ANSI Z358.1 including being provided with potable water or other suitable flushing fluid as defined in ANSI Z358.1.
	6.6	Eyewashes and emergency showers are not considered a control or barrier. Controls may need to be implemented when working with hazardous substance to prevent eye or skin contact. If there is a chance a hazardous substance may contact a worker's eyes or skin, eyewash and emergency shower equipment may be required.
Equipment Type Requirements	6.7	The design and installation of eyewash and emergency showers shall meet the requirements of ANSI Z358.1 in conformance with Cenovus's Packaged Emergency Shower and Eyewash Station Cenovus Energy Specifications.
	6.8	The placement of eyewash and emergency shower equipment shall meet requirements in ANSI Z358.1. Final placement shall be determined by facility operations and engineering in consultation with Health & Safety.
Substances Requirement	6.9	Hazardous products with the following WHIMS and Hazcom classifications may require eyewash and emergency shower equipment dependent upon the outcome of an IH&OH Chemical Task Assessment; • Acutely Toxic – Dermal (Categories 1-4) • Skin Corrosion / Irritation (Categories 1 and 2) • Serious Eye Damage / Eye Irritation (Categories 1 and 2) • Skin Sensitizer (Category 1)
	6.10	Serious burns may occur rapidly when hot liquids come in contact with unprotected skin. Eyewash and emergency shower equipment may help to cool the impacted areas to lessen pain, swelling and depth of injury.
	6.11	Flammable/combustible liquids or solids and oxidizing liquids or solids are a safety risk when they get on a worker. Especially where open flames or ignition sources (hot work) are being conducted. Eyewash and emergency shower equipment may be used to remove these substances from the body to decrease the risk of burns from fire or combustion.

Education and Training Requirements	6.12	Workers who work with or near hazardous substances shall be instructed on the location and use of eyewash and emergency shower equipment. If different models are present, workers must know how to use each model
	6.13	Workers using eyewash and emergency shower equipment should know that removal of clothes may be necessary to allow for the effective removal of harmful substances from the skin.
	6.14	Where harmful substances are utilized or work is conducted near them, workers shall be made aware of emergency response procedures in the event of an emergency.
Care and Maintenance Requirements	6.15	Eyewash and emergency shower safety equipment is to be inspected and maintained as per ANSI Z358.1
	6.16	Eyewash and emergency showers used for first aid purposes are required to be function tested on a routine basis to ensure proper operation and be maintained in a clean and Industrial Hygiene serviceable condition.
	6.17	Refer to *Appendix D* for basic visual inspection, which should be conducted on a weekly basis and *Appendix E* for routine function testing conducted on a monthly basis to meet ANSI Z358.1 requirements.
	6.18	Bacteriological water testing should be completed to ensure potable water requirements are met.
	6.19	Emergency eyewash and showers shall have a Preventative Maintenance (PM) schedule in place. The manufacturer's recommended maintenance schedule should be adhered to when establishing the PM schedule.
	6.20	Any identified defects, including expired solutions, cracked, or used bottles, or rusted handles must be corrected immediately.
	6.21	A relief eyewash or shower station shall be identified or provided when a permanent eyewash or shower station has an identified defect, failed water test or the equipment is under maintenance.

3.8.7 Ergonomics

Recognition	7.1	Ergonomics focuses on the relationship between workers and their environment and the design, manufacture, and arrangement of equipment for the purpose of improving the efficiency, comfort, and safety of workers.
	7.2	Applying ergonomic principles during facility or office design can improve comfort and safety in the workplace.
	7.3	Cenovus goal is to manage ergonomic risks through hazard identification, evaluation, control, training, and education.
	7.4	Facility design (industrial ergonomics) and workstation set-up (office ergonomics) that allow our workforce to maintain proper posture reduces the risk for developing musculoskeletal injuries.
Health Effects	7.5	Certain tasks employees perform throughout their workday can put strain our on bodies and cause injuries to muscles, ligaments and tendons, nerves, and joints in the neck, shoulders, arms, wrists, legs and back. These injuries are collectively called Musculoskeletal Injuries (MSI).
	7.6	Risk factors that can increase the likelihood of MSI's are awkward posture, the use of high force, static holds, and repetitive motions.
Assessment Requirements	7.7	Ergonomics assessment in the facility should include the following elements: • Review of job scope and tasks. • Identification of task risk factors (e.g., body positioning, weights of load, distance of load, frequency of task). • Consideration of other environmental conditions that may contribute to overall ergonomics (e.g., noise, lighting) risks or concerns. • Evaluation of design of the equipment and how it may increase identified risk factors. • Engagement of Industrial Hygiene for assessment support.
	7.8	Office ergonomics assessments should include the following elements: • Self-assessment – Workday offers an e-learning module available to employees that will walk them through an overall set-up for workstations; • Assessment by IH; • Assessment by ergonomists; • During all assessments, consideration of potential environment factors (e.g., noise, lighting, draft) that may contribute to the risk. • *Appendix F* identifies typical process workflow for Office Ergonomics.
	7.9	For vehicle ergonomics consultation of the Cenovus guidance document which has been developed for reference – In-Vehicle Computing Ergonomics, provides basic ergonomic considerations.
	7.10	Vehicle ergonomics are complicated, and the Industrial Hygiene group shall provide specialist assessment when required.

Control Requirements	7.11	Apply engineering design with a focus on ergonomics to eliminate ergonomic hazards in both facilities and office work locations.
	7.12	Apply engineering design to remove environmental conditions that can contribute to ergonomic concerns (e.g., noise, lighting, draft).
	7.13	Consider selection of ergonomically designed tools, equipment that supports proper worker interaction with materials, equipment, or tasks (e.g., pulley systems).
	7.14	Administrative controls that reduce ergonomic risks should be applied to processes, situations and tasks where ergonomic hazards exist Administrative controls for ergonomics include: • Policies/procedures that direct proper body positioning, lifting requirements and techniques • Stretching techniques and formal work break frequencies
	7.15	Vehicles are not designed to offer good ergonomics as a workstation. Minimize amount of in-vehicle computer work. Follow the In-Vehicle Computing Ergonomics document if in-vehicle computer work is required.
Education and Training Requirements	7.16	Resources are available through *Industrial Hygiene* SharePoint. *E-learning for Office Ergonomics* can be located on Workday.

3.8.8 Fungal Management

Recognition	8.1	Fungi (mould) are present almost everywhere. The term "mould" applies to a large group of microorganisms, which, together with mushrooms and yeast, form the Fungi Kingdom of living matter.
	8.2	Certain species identified in indoor environments termed "indicator species" are common when there is indoor amplification occurring in a building.
	8.3	The identification of elevated mould spores as compared to outdoor samples or indicator species is an indication of mould growth indoors. Fungal growth indoors requires three items; water, organic matter (such as drywall paper or wood) and fungal spores to support fungal growth. In many instances fixing water leaks quickly can prevent fungal growth from occurring or becoming a problem in indoor environments.
Health Effects	8.4	The most common symptoms from exposure to fungi in indoor environments are runny nose, eye irritation, cough, congestion, aggravation of asthma, headache, flu-like symptoms, fatigue, and skin rash.
	8.5	People with respiratory conditions or allergies and asthma, and persons with weakened immune systems may be more susceptible to adverse affects of exposure to indoor fungal contamination.
Assessment Requirements	8.6	Requests for fungal assessment are typically prompted by indoor air quality (IAQ) complaints, an uncontrolled water intrusion event, or observation of suspect fungal contamination.
	8.7	Assessment includes visual inspection, delineation of water intrusion event and the collection of airborne fungal contaminant or bulk sample to identify recognized indicator species.
Control Requirements	8.8	Quick and effective response to water intrusion can prevent fungal growth and worker exposure to bioaerosols. To remediate problematic fungal contamination, a proper abatement plan should be adhered to.
	8.9	Cleaning of fixed building materials is recommended for non-porous materials such as glass, metal, and plastics.
	8.10	Cleaning of semi-porous materials including wood and plaster is possible, but not always effective. If semi-porous materials cannot be effectively cleaned, they should be abated.
	8.11	Porous materials which are not fixed in place, including upholstery and fabrics may be laundered; however, the extent of fungal contamination may determine the effectiveness of this.
	8.12	When wet or fungal-contaminated building materials are identified, an abatement plan is necessary to ensure timely removal and/or clean-up of these materials.
	8.13	Assessment and abatement plans shall be developed in consultation with the IH&OH group.
	8.14	Moderate Risk (fungal contaminated areas between 10-100 ft2) and High-Risk (fungal contaminated areas greater than 100ft2) fungal abatement activities

		shall be conducted by a qualified abatement contractor as defined by the authority having jurisdiction or as required by this standard.
Education and Training Requirements	8.15	All workers involved in fungal abatement activities for medium and high-risk abatement shall be in possession of a valid fungal abatement training certificate as defined by the authority having jurisdiction or as required by this standard.
Health Surveillance	8.16	People with specific health susceptibilities should consult their doctor if concerned about fungal exposure.

3.8.9 Hearing Conservation

Recognition	9.1	Noise at work can cause hearing damage that is permanent and disabling. Harmful noise levels are present consistently across all of our operations. This can be hearing loss that is gradual because of exposure to noise over time, but also damage caused by sudden, extremely loud noises.
	9.2	All new facilities or operational areas shall be assessed for elevated noise levels during or within 6 months of commencing operations.
	9.3	Additional assessments should be conducted when there are changes that may affect noise levels.
	9.4	Exposure to certain chemicals, called ototoxins, can cause hearing loss and increase the risk of hearing loss when employees utilize them in high noise environments. Some ototoxic chemicals that can be found on Cenovus sites include benzene, toluene, carbon monoxide and carbon disulphide.
Health Effects	9.5	Worker exposure to noise of sufficient intensity and duration can result in Noise Induced Hearing Loss (NIHL).
	9.6	The primary goal of the hearing conservation is to reduce the risk of exposure to elevated noise levels and to prevent NIHL.
Assessment Requirements	9.7	Noise assessments shall include, but are not limited to: • Noise maps for buildings and areas with noise levels at or above 80 dBA; • Reviewing effectiveness of the noise controls; • Monitoring for any changes in production, process, equipment, or controls which may render the hearing protection inadequate; • Octave band analysis may be completed on sources of noise >100 dBA; • Octave band analysis when employees are required to work in an area where noise levels are above 95 dBA for more than 1 hour in duration; • Confirming the suitability of hearing protection devices; • Re-evaluation of areas where noise levels are greater than 80 dBA when significant changes affecting the level of noise have occurred or every three years, whichever comes first.
	9.8	Noise dosimetry shall be conducted on noise exposed employees as required by the requirements of the authority having jurisdiction, as required by this standard or as indicated by collected assessment data.
Control Requirements	9.9	New projects, renovations, or alterations of existing facilities shall be designed and constructed such that the continuous noise levels generated are not greater than 85 dBA or are as low as reasonably practicable.
	9.10	Hearing protection signage shall be posted on entrances and around all areas (Indoor/outdoor) as required by the criteria of the jurisdiction having authority.
	9.11	Hearing protection shall be worn by all personnel where there is a risk of elevated noise levels as required by the jurisdiction having authority. Appendix G identifies various jurisdictions noise legislation.
	9.12	Dual hearing protection (ear plug and earmuff) shall be worn in locations where noise levels are greater than 105 dBA.

Education and Training Requirements	9.13	Employees required to routinely work in areas where noise levels are greater than 80 dBA shall receive education on the following: • description of the Hearing Conservation Requirements; • the hazards of noise; • development of hearing loss; • the purpose of audiometric testing; • the purpose and limitations of hearing protectors; • the proper way to wear hearing protectors; and • characteristics of noise in the working environment.
Health Surveillance	9.14	Noise Exposed workers shall be included in audiometric testing as per the requirements of the authority having jurisdiction, as required by this standard or at intervals not greater than 24 months.
	9.15	Contractors are responsible for ensuring that their workers comply with these requirements.

3.8.10 Hydrogen Sulfide (H_2S)

Recognition	10.1	H_2S is a naturally occurring colourless gas commonly encountered in oil and gas reservoirs and can be present throughout the whole production chain.
	10.2	H_2S may be trapped in solid sediment, dissolved in produced water, crude oil, or natural gas condensate. Commodities that contain sulfur compounds including H_2S are termed "sour" and facilities that process sour commodities are termed sour facilities.
	10.3	Facilities and reservoirs that do not have H_2S may turn sour over time.
	10.4	Agitation or circulation of sour material or depressurization of a sour system may cause H_2S gas to be released.
	10.5	At low concentrations, H_2S has a characteristic rotten egg smell. The rotten egg smell may not be detectable at higher concentrations due to olfactory fatigue (loss of sense of smell).
	10.6	H_2S gas is highly flammable with a flammability range of 4-44%.
	10.7	H_2S gas is slightly heavier than air and tends to settle in low lying areas such as sumps, cellars, and basements.
	10.8	All tasks conducted on any Cenovus worksites where H_2S is known or suspected to be present require that the H_2S source be identified, evaluated, and controlled.
Health Effects	10.9	H_2S is acutely toxic. Inhalation of H_2S gas at levels >500ppm can render a person unconscious and can cause death.
	10.10	H_2S is an olfactory sensitizer and at levels >100ppm can cause a loss of smell. Workers should never rely on their sense of smell to detect H_2S gas.
	10.11	Refer to *Appendix H* for H_2S exposure symptoms & effects.
Assessment Requirements	10.12	When working with sour materials or equipment, or in an area where H_2S may be present, a hazard assessment must be conducted.
	10.13	The following must be considered and reviewed before working with sour materials: • Safe work permit obtained; • Job specific work instructions/procedures reviewed by all involved in the work; • Job Safety Analysis (JSA) or exposure protection plan; • H2S hazards and where they are found; • Required PPE and RPE; • Air monitoring requirements; • Safety watch and rescue personnel requirements; • Alarms and rescue evacuation plans; and • Muster point locations.
	10.14	H_2S monitoring on Cenovus worksites is achieved using a variety of gas detection systems including fixed monitors, personal monitors, stationary monitors, and handheld monitors.

Control Requirements

10.15 All tasks conducted on any Cenovus worksites where H_2S is known or suspected to be present require that the H_2S sources be identified, evaluated, and controlled.

10.16 If feasible, an H_2S-free product should be chosen over a product containing H_2S, provided the substitute material has no greater health, safety and/or environmental impact.

10.17 Wherever possible, engineering controls shall be employed to reduce H_2S release and worker exposure. Recommended engineering controls include the following:

- Keep H_2S containing materials enclosed whenever possible
- Neutralize H_2S via a chemical process (e.g., H_2S scavenging)
- Provide local exhaust ventilation where handling material containing H_2S
- Design facilities with materials and components appropriate for the level of H_2S in the fluid streams to prevent corrosion of piping or equipment and the subsequent release of H_2S

10.18 Install closed drain systems and connecting drain, vent, and relief devices to a flare system where H_2S can be safely combusted

- Equip facilities with purge connections to provide for safe purging of residue sour fluid from piping or equipment to flare prior to opening equipment for maintenance

10.19 Where contact with H_2S is anticipated, mitigations shall be documented and implemented to reduce potential exposure. Mitigations may include the following:

- Conduct a process hazard analysis such as a HazOp to study scenarios for leaks and loss of containment of sour fluids as part of a Management of Change (MOC) procedure.
- Educate workers of the hazard associated with H_2S exposure. Workers must participate in training and monitoring programs
- Conduct pre-job hazard assessments.
- Utilize signage to inform workers of the hazard and limit access to authorized persons only.
- Have an inspection and maintenance schedule to ensure engineering controls are working properly.

10.20 Due to the risk associated with H_2S exposure, and in the event respiratory protection is required, only the following supplied air breathing apparatus are acceptable:

- A full-face, positive-pressure Self-Contained Breathing Apparatus (SCBA)
- A full-face, positive-pressure Supplied Air Breathing Apparatus (SABA) equipped with a minimum of a 5-minute escape air bottle

10.21 Air purifying respirators are not acceptable for the purpose of protecting against H_2S exposure.

Education and Training Requirements

10.22 All personnel involved in performing work or supervising work related to H_2S shall have received training related to:

- Occupational Health and Safety regulations governing H_2S exposure prevention.
- All functional and site-specific rules, procedures and plans associated to H_2S exposure control and response.
- Any relevant service provider's work procedures meant to control the hazards associated to H_2S

10.23 All Cenovus personnel whose work duties include handling or working in proximity to sour materials at Northern Cenovus worksites including transportation of sour products, are required to complete the following training:

- A site-specific orientation on the worksite's rules and procedures and any site-specific required training (such as H_2S Awareness) along with the relevant emergency response and rescue/evacuation procedures
- An Energy Safety Canada H_2S Alive Training course.

10.24 Employees and contractors working at Cenovus sites where H_2S is present, but their tasks do not take them out to operating areas other than on the odd occasion while accompanied by an operator. These employees would be required to complete H_2S Awareness training.

3.8.11 Indoor Air Quality

Recognition	11.1	Various indoor comfort parameters such as temperature, Relative Humidity (R.H.), Carbon Dioxide (CO_2) and certain indoor air quality contaminants like Volatile Organic Compounds (VOCs) and mould can lead to unsatisfactory conditions for building occupants.
	11.2	Indoor Air Quality (IAQ) issues can develop due to various situations including seasonal variances in temperature, RH, hazards in the area or ubiquitous hazards in our environment.
	11.3	Elevated levels of CO2 are often an indication the ventilation system is not providing sufficient fresh air into the building.
	11.4	Renovations, new furnishings, office equipment (such as copiers and printers), cleaning products, and personal care products can lead to elevated levels of various VOC contaminants. These can cause discomfort and odour complaints leading to unsatisfactory conditions for building inhabitants.
	11.5	The locations of fresh air intakes for buildings can lead to indoor air quality concerns. Especially when placed in locations close to parking areas, garbage, or waste storage, and even process operations.
	11.6	Water intrusion events can lead to fungal growth in indoor spaces resulting in elevated indoor mould spore counts resulting in air quality concerns.
Health Effects	11.7	Excursions outside of indoor air quality guidelines can lead to discomfort of employees from temperature fluctuations or eye and respiratory irritation as a result of low indoor relative humidity levels.
	11.8	Respiratory tract irritation, headaches, nausea, and fatigue can occur due to elevated CO2, CO, or VOC levels in indoor environments.
	11.9	Elevated airborne fungal spore counts may cause employees with sensitivities to develop allergy like symptoms.
Assessment Requirements	11.10	Facility managers need to ensure Heating Ventilation and Cooling (HVAC) equipment and systems are inspected regularly to ensure systems are operating properly and are providing a clean supply of fresh air and providing adequate air changes per hour into buildings and offices to reduce indoor pollutants.
	11.11	At Cenovus facilities, if employees have concerns regarding indoor air quality, they can contact the IH group to conduct an IAQ assessment including collecting readings of various indoor air quality comfort parameters.
	11.12	If fungal contamination within buildings is suspected contact IH to conduct a fungal assessment including collecting air samples for fungal spore counts to compare to the outdoor environment. The IH team can also identify building materials to be removed or cleaned and conduct post remediation inspections and post remediation air clearance sampling.

Control Requirements	11.13	Complete regular planned maintenance and inspections of HVAC and other building systems to ensure they are properly functioning.
	11.14	Proper systems and procedures utilized by facilities and building managers to warehouse new furnishings and office materials to allow for sufficient time for them to off gas.
	11.15	Identify and repair water intrusion situations.
	11.16	Implement prompt clean up of water intrusion events into buildings. This will help to control the growth of mould and reduce the risk of fungal contamination on building materials.
	11.17	Removal of fungal contaminated building materials by appropriate and properly trained contractors to remove fungal amplification sites within buildings.

3.8.12 Laboratory Chemical Hygiene

Recognition	12.1	Laboratory practices and procedures provide a unique set of hazards and exposure potentials. The hazards and the risks to workers, defined by the procedures and practices used in the laboratory, can vary by facility.
	12.2	All hazards, risks and control process shall be defined in a site-specific Laboratory Chemical Hygiene Procedure.
Health Effects	12.3	The health effects vary based on the products being analyzed, the lab practices being used, and the controls in place.
	12.4	Various health effects are possible from the multitude of chemicals, products, and equipment that can be found in Cenovus laboratories.
Assessment Requirements	12.5	All local exhaust ventilation, including fume hoods shall be assessed annually.
	12.6	Personal exposure assessment shall be conducted to identify tasks that expose workers above the OEL. Once these tasks have been identified, site-specific assessment protocols shall be instituted to identify exposure risk.
Control Requirements	12.7	Safe laboratory practice relies on the completion of a risk assessment of the hazardous work.
	12.8	Controls should be utilized following the hierarchy of controls to reduce possible exposures in the laboratory environment.
	12.9	Local Exhaust Ventilation shall be designed, constructed, and installed to meet the requirements of ANSI/AIHA Standard Z9.5, Laboratory Ventilation. The ventilation design and installation shall be certified by a competent professional engineer.
	12.10	Safe laboratory work practices shall include chemical handling and storage, hazard identification and communication, chemical spill response and waste disposal and other risk-based requirements.
Education and Training Requirements	12.11	In addition to training required by Cenovus's Chemical Management requirements, all personnel required to work in a laboratory setting shall be trained on any site-specific laboratory safety procedures.
Health Surveillance	12.12	Workers exposed to specific substances (e.g., benzene) may be included in medical surveillance programs as required by the authority having jurisdiction or as required by this standard.

3.8.13 Lead Management

Recognition	13.1	Lead is a naturally occurring soft metal with desirable properties. These properties include its malleability, resistance to corrosion, and ease of melting. However, it is highly toxic when overexposure occurs.
	13.2	At Cenovus Facilities, lead may be present in various locations and particularly in paints existing before 2000.
	13.3	Lead may be found in building materials, paint in floor, columns and tanks, tile, roofing materials, plumbing materials, anodes, solder materials, alloys, fittings, valves, piping etc.
Health Effects	13.4	Inhalation and accidental ingestion are the primary routes of exposure.
	13.5	Harmful effects can occur after high acute exposure, or long-term exposure to lower doses.
	13.6	High exposure over a short period of time can result in a metallic taste in mouth, gastrointestinal symptoms, such as vomiting, abdominal cramps, constipation, and diarrhea.
	13.7	Lead can accumulate in soft tissues (e.g., liver, kidneys, lungs, brain, spleen, muscles, and heart) and ultimately bones and teeth.
	13.8	Early signs of lead poisoning include tiredness, irritability, muscle and joint pain, headaches, stomach aches, and cramps.
	13.9	Severe chronic poisoning symptoms include blue line on the gums, wrist drop (inability to hold the hand extended), severe abdominal pain and pallor.
	13.10	Lead has been classified by IARC as a 2A for inorganic lead compounds (probable carcinogen) and 3 for organic lead compounds (not classifiable).
Assessment Requirements	13.11	Where the identification of lead-containing material is unspecified, a competent person shall collect bulk samples. Materials containing 90 mg/kg or 0.009% or higher are defined as lead-containing materials.
	13.12	Worker exposure assessment for lead shall be conducted as required by the authority having jurisdiction or as required by this standard.
Control Requirements	13.13	Before starting work involving potentially lead-containing or contaminated materials, the surface(s)/materials shall be tested for lead content,
	13.14	Where any activities are known or expected to generate airborne levels of lead the IH&OH group shall be consulted prior to commencement of work.
	13.15	Refer to *Appendix I* for risk classification and *Appendix J* for general control measures.
	13.16	Moderate-high and high-risk activities are not to be completed by Cenovus employees. A qualified abatement company shall be hired.

Education and Training Requirements	13.17	All workers who may be required to work in areas where lead is present shall be familiar with these requirements and any site-specific lead management procedures.
	13.18	Contractors shall also have appropriate training for the work that will be conducted.
	13.19	Cenovus shall inform contractors of the location of all materials containing lead.
Health Surveillance	13.20	People with specific health susceptibilities should consult their doctor if concerned about lead exposure.
	13.21	Lead-exposed workers shall undergo the required medical surveillance required by the authority having jurisdiction or as required by this standard.
	13.22	Contractors shall undergo health assessments as required by their employer.

3.8.14 Legionella

Recognition	14.1	Legionella bacteria live in both natural and human-made water sources. Legionella bacteria are often naturally present at low levels in rivers, lakes, streams, and municipal water supplies and generally do not pose a risk.
	14.2	The presence of Legionella becomes a health hazard when bacteria amplify to high numbers in water systems that generate aerosols or sprays.
Health Effects	14.3	Inhalation of water aerosols containing elevated levels of Legionella bacteria can cause two types of illnesses in humans: Legionnaires' disease and Pontiac fever.
	14.4	Legionnaires' disease is a serious respiratory illness that results in severe pneumonia and may lead to death.
	14.5	Symptoms can include fever, cough, muscle pain and headache. Symptoms can present within two to fourteen days of infection and last for several months.
	14.6	Pontiac fever is a milder illness than Legionnaires' disease. It causes flu-like symptoms, but it does not cause pneumonia.
	14.7	People with Pontiac fever generally recover within two to five days without treatment.
Assessment Requirements	14.8	A systemic assessment of the various water systems at a site/facility shall be conducted to determine potential for hazardous conditions to exist that would amplify the growth of Legionella bacteria or increase the risk of aerosolization.
	14.9	Specific assessments and testing as required by the authority having jurisdiction or as required by this standard.
Control Requirements	14.10	Regular planned maintenance and management of water systems shall be implemented to control the growth of Legionella bacteria and reduce the risk of bacterial contamination.
	14.11	Minimizing aerosolization and water droplets will reduce exposure potential.
	14.12	If Legionella contamination has been identified, the affected system shall be isolated and shut down and undergo a thorough cleaning and disinfection.
	14.13	Additional control and testing requirements for Legionella amplification shall be applied as required by the authority having jurisdiction or as required by this standard.
Health Surveillance	14.14	People with specific health susceptibilities should consult their doctor if concerned about Legionella exposure.
	14.15	Additional specific heath monitoring maybe required by the authority having jurisdiction or as required by this standard.

3.8.15 Lighting

Recognition	15.1	Proper lighting at work is essential to the health and safety of Cenovus employees and contractors.
	15.2	Proper lighting allows individuals to complete their work safely and effectively.
	15.3	The quality of light can be improved by reducing glare, improving contrast, and improving the distribution of light.
Health Effects	15.4	Improper lighting may lead to symptoms commonly described as eyestrain.
	15.5	Symptoms may include irritation (inflammation of the eyes and lids), itchiness, breakdown of vision and blurred or double vision. Other symptoms of improper lighting may include headaches, fatigue, drowsiness, and irritability.
	15.6	Adopting unsuitable postures in response to improper lighting can lead to discomfort such as neck, back and shoulder pain.
	15.7	Additionally, poor lighting may give rise to an increased risk of falling, tripping, and dropping materials or tools.
Assessment Requirements	15.8	Lighting quality shall be assessed through visual observations and quantitative assessment when required.
	15.9	Minimum quantitative light levels for specific work activities may be stipulated in the requirements by the authority having jurisdiction or as required by this standard.
Control Requirements	15.10	Lighting levels and fixtures requiring repair or maintenance shall be included in regular facility inspections and be addressed accordingly.
	15.11	Lighting needs to match the requirements for work to be performed at a facility or specific location.
	15.12	Minimum lighting levels for safety shall comply with the requirements stated by the authority having jurisdiction or as required by this standard.

3.8.16 NORM

Recognition	16.1	Naturally Occurring Radioactive Material (NORM) has been recognized as a potential hazard in the petroleum resource industry. NORM is present in low concentrations throughout the earth's crust as well as in all living tissues.
	16.2	NORM originating in geological oil and gas formations is usually brought to the surface in emulsion. As the emulsion approaches the surface, temperature changes cause radioactive elements to precipitate. Resulting scales and sludge may collect in separation systems. Radium is usually found in this type of NORM contamination.
	16.3	Gas brought to the surface will enter the gas production stream. As it decays, thin radioactive lead films may form on the inner surfaces of gas processing equipment. In sales gas, the radon concentrations are identical in both the inlet and outlet gas and are generally low. It has been found that the propane and Liquefied Propane Gas production process generally concentrates radon, and this is where the NORM hazard potential may be the greatest.
	16.4	Transport equipment may be contaminated with NORM. This includes pipelines, rail cars and truck tanks. Even if the production site does not contain significant amounts of radon, loading contaminated transport tanks into the facility may contaminate the loading facilities.
Health Effects	16.5	Alpha and beta particles pose a serious health threat if significant quantities are inhaled, ingested, or absorbed through the skin (e.g., cuts, abrasions, or damaged skin). Once inside the body, the alpha and beta particles can cause considerable damage to tissues. The most significant risk associated with alpha particles is lung cancer, although other organ damage is possible. Exposure to beta particles often causes cancer, dependent on the location of where the beta particles accumulate in the body.
	16.6	Gamma rays can easily penetrate the skin and can cause tissue damage once inside the body. The extent of the tissue damage is less severe than that of exposure to alpha or beta particles as only a small amount of gamma rays are actually absorbed into the tissues.
	16.7	Radium, radon, and their decay products are radioactive elements of concern in petroleum production and gas processing. Human exposure may occur when contaminated dust and sludge are inhaled or ingested (internal exposure) or when gamma radiation from surrounding equipment strikes the body (external exposure). The amount of gamma radiation able to penetrate processing equipment is generally not large enough to present a health risk to employees although exceptions have been found.

Assessment Requirements	16.8	Only competent personnel who are adequately trained in the hazards of NORM and the calibration, testing, and use of radiation monitoring equipment shall conduct NORM testing.
	16.9	External screening surveys shall be repeated every five years at Cenovus Energy facilities that have the potential for NORM contamination to be present. Contamination criteria are included in *Appendix K*.
	16.10	When the external screening survey has identified a piece of equipment to be potentially NORM contaminated, a surface contamination survey shall be conducted when the equipment is being opened.
	16.11	Bulk NORM analysis shall be completed to identify the individual radionuclide and their individual radiation levels. Identification of the radionuclide and its level will determine the proper NORM waste disposal method since there are restrictions on where NORM contaminated waste can be disposed. This type of analysis can only be conducted by an external laboratory.
	16.12	Waste, materials, and equipment (e.g., scrap equipment and piping) that have the potential to be NORM contaminated shall be tested before leaving site.
	16.13	If NORM is detected on the waste materials or equipment, it cannot be disposed of as regular oilfield waste.
	16.14	The results of the bulk sample analysis will assist in determining where the NORM contaminated waste can be disposed.
	16.15	A company that is knowledgeable about NORM waste management shall be consulted for more specific direction on disposal.
Control Requirements	16.16	The basic philosophy of worker protection from all radioactive materials, including NORM, is to maintain all exposures As Low as Reasonably Achievable (ALARA).
	16.17	Avoid unnecessary exposures above normal background levels.
	16.18	Selection of the most appropriate control options shall be governed by the specific task and specific work area.
Education and Training Requirements	16.19	Workers who require an understanding of NORM hazards and controls shall attend approved NORM Awareness Training.
	16.20	Workers who will be working with NORM or NORM contaminated equipment shall attend approved NORM Worker Training.
	16.21	Workers who are responsible for organizing, supervising, or managing work involving NORM shall attend approved Advanced NORM Training.
	16.22	All workers responsible for NORM assessment shall attend approved NORM Surveyor Training.
	16.23	Contractors may take equivalent third-party NORM courses.
Health Surveillance	16.24	Any NORM Exposed Worker shall undergo the required medical surveillance as outlined by the authority having jurisdiction or as required by this standard.
	16.25	Contractors are responsible for ensuring that their workers comply with these requirements.

3.8.17 Radiation Safety

Recognition	17.1	Some Cenovus assets require the use of fixed nuclear devices for density or level measurements.
	17.2	Nuclear devices are strictly regulated, and Cenovus must possess the appropriate license in each operating asset to possess and use these devices.
	17.3	An accurate record of nuclear devices must be kept at all times.
	17.4	Nuclear devices must be maintained and secure and any incidents involving nuclear devices must be immediately reported to the Canadian Nuclear Safety Commission (CNSC) or the authority having jurisdiction by the Cenovus Radiation Safety Officer (RSO).
	17.5	Each site or facility that has regulated nuclear devices must designate a Site RSO to manage the requirements of the devices at their site
	17.6	An annual compliance report must be filed with the CNSC or as per the requirements of the authority having jurisdiction.
Health Effects	17.7	Radioisotopes contained within the nuclear devices can emit high levels of penetrating radioactivity.
	17.8	Radiation affects our health through damage to our DNA molecules.
	17.9	Short-term exposure may cause radiation sickness. Long-term exposure may cause cancers, chronic diseases, and hereditary diseases.
Assessment Requirements	17.10	Conduct a hazard assessment when planning activities in and around vessels with nuclear devices.
	17.11	Engage the Site RSO to ensure the nuclear devices are isolated and radiation doses measured prior to commencement of work.
	17.12	Follow prescribed procedures to work safely with nuclear devices. Radiation doses received will be tracked.
Control Requirements	17.13	Ensure to obtain and maintain a Nuclear Substances and Radiation Devices (NSRD) license, or appropriate license as stated by the authority having jurisdiction, prior to any activity involving a nuclear device; and only perform licensed conditions as stated.
	17.14	Develop a CNSC-approved radiation safety program, or program meeting the authority having jurisdiction requirements, and adhere to the prescribed procedures for possessing, transferring, importing, exporting, using, and storing the nuclear devices.
	17.15	As part of the radiation safety program, procedures must be developed to account for the management of the life cycle of a nuclear device, including purchasing, receiving, sales, transfer, disposal, storage, packaging, and transportation, and decommission.

Education and Training Requirements	17.16	Different levels of training are required for workers with varying responsibilities and engagement with nuclear devices. These include awareness training for general workers, authorized worker training for those who work with nuclear gauges, and RSO training for those with oversight responsibilities.
	17.17	Contractors shall also have appropriate training for the work that will be conducted.
Health Surveillance	17.18	A worker deemed to be a nuclear energy worker will have his/her annual dose tracked.
	17.19	Overexposed workers and workers contaminated with radioactive materials must be reported to the CNSC or to the authority having jurisdiction. Medical assistance will be provided.

3.8.18 Refractory Ceramic Fiber

Recognition	18.1	Refractive Ceramic Fibers (RCF) are a type of man-made vitreous fibers manufactured for high temperature thermal insulation applications.
	18.2	It is used primarily to line furnaces, kilns, process heaters, but can also be use as pipe wrapping, welding protection, filters, flame retardants and acoustical insulation.
	18.3	There are numerous RCF product forms, such as blankets, papers, boards, textiles, ropes, cements, and casting mixes.
	18.4	When RCF are used in high temperature applications, the silicate may be transformed into crystalline silica (cristobalite) if the temperature is high enough (greater than 1000°C). Additional precautions may be required if the equipment has been in service at temperatures greater than 1000°C.
	18.5	RCF are manufactured with zirconium compounds which may contain trace quantities of NORM, consisting of uranium, thorium and/or radium. The presence of radioactive elements can cause additional health hazard and may require additional precautions.
Health Effects	18.6	RCF can irritate the skin, eyes, and upper respiratory tract but the main concern is that the individual fibres are small enough to penetrate deep into the lungs and possibly lead to the development of lung cancer.
	18.7	RCF have been classified by the IARC as Group 2B, possibly carcinogenic to humans, based on an increased risk of lung cancer in experimental animals.
	18.8	Health effects of cristobalite are covered in the Crystalline Silica section of this document.
Assessment Requirements	18.9	Worker exposure assessment for RCF shall be conducted as required by the Cenovus Industrial Hygiene Practice. Personal exposure assessment shall be conducted to identify tasks that expose workers above the OEL.
Control Requirements	18.10	Controls should be utilized following the hierarchy of controls to reduce possible exposures in the work environment.
Education and Training Requirements	18.11	All workers who may be required to work in areas where RCF is present shall be familiar with this program and any site-specific RCF management procedures.
	18.12	Contractors shall also have appropriate training for the work that will be conducted.
	18.13	Cenovus shall inform contractors of the location of all RCF.
Health Surveillance	18.14	People with specific health susceptibilities should consult their doctor if concerned about RCF exposure.
	18.15	Contractors shall undergo health assessments as required by their employer.

3.8.19 Respiratory Protective Equipment

Requirements	19.1	Site-specific procedure(s) shall include the following elements: • Roles and responsibilities; • Hazard assessment; • Respirator selection; • Training; • Respirator fit testing; • Use of respirators (where, when and type required); • Cleaning, maintenance, inspection, pre use fit check, and storage requirements; • Change out schedule for chemical cartridges/filters based on airborne concentration of contaminants; • Program evaluation; and • Recordkeeping.
	19.2	Appropriate RPE shall be worn where: • There is a potential for exposure to a hazardous atmosphere; • Where the application of the hierarchy of controls has not yet been fully implemented or are not reasonable/or practical for the length of time or frequency of exposure.
Program Components Requirements	19.3	Proper respiratory protection shall be selected to ensure full protection from inhalation hazards. See *Appendix L* for guidance on selecting RPE.
	19.4	In selecting this equipment, the following shall be considered: • The identity, physical form, and potential concentration of the airborne contaminants; • The oxygen concentration of the environment and the stability of the oxygen concentration; • The toxic properties and specific characteristics of the airborne contaminants; • The type of work to be performed, whether routine, non-routine, emergency, or rescue; and • The degree of protection afforded by each specific respiratory protective device.
Equipment Standards Requirements	19.5	All RPE offered and utilized on Cenovus sites shall be NIOSH approved.
	19.6	All RPE shall be maintained according to manufacturer's specification;
	19.7	All breathing air equipment and breathing air used in atmosphere supplying respirators shall comply with the requirements of the authority having jurisdiction or as required by this standard.
Medical Evaluation	19.8	Entity to ensure employees go through a Fitness to Wear a Respirator and a medical assessment prior to use of respiratory protective equipment.

Fit Testing Requirements	19.9	Respirator fit testing shall be conducted by a qualified fit tester in accordance with the requirements of the authority having jurisdiction or as required by this standard.
	19.10	Fit testing shall be: • Conducted at a frequency meeting the requirements of the authority having jurisdiction or as required by this standard; • Whenever changes to a respirator user's physical conditions affect respirator fit.
	19.11	Whenever a respirator user informs their supervisor, or by the qualified person, that the fit of the respirator is unacceptable.
Training Requirements	19.12	Employees shall be trained in the purpose, selection, use, inspection, maintenance, and limitations of respiratory protective equipment when they start work with Cenovus and at least every three years.
	19.13	Site management is responsible for ensuring all affected employees are current in their RPE training.
	19.14	The training shall be specific to the type of RPE that will be used at the site.

3.8.20 Temperature Extremes

Recognition	20.1	Working in extreme temperatures poses a significant health and safety hazard as serious illness and injuries could result if workers are not adequately protected.
	20.2	Many Cenovus employees at our various field locations experience thermal stress caused by seasonal conditions. Thermal stress can also arise from working conditions indoors, such as entry into a hot vessel, or working in a walk-in freezer.
	20.3	Thermal stress can be made worse if an employee is new to the job, are new to the area, if tasks are physically demanding, or if employees are required to wear PPE such as respirators and chemical suits.
	20.4	A core temperature of 37°C is required for normal functioning of vital organs. The body adapts to maintain that temperature by sweating in a hot environment, shivering in a cold environment, and increasing or decreasing blood flow to the skin.
Health Effects	20.5	When the body fails to control core body temperatures caused by working in extreme temperatures, individuals succumb to thermal stress. Various health effects arising from exposure to thermal stress are identified in *Appendix M*.
Assessment Requirements	20.6	Worksite Observations and assessments should be conducted on a regular basis during work being conducted in extreme temperature conditions.
Control Requirements	20.7	Prior to working in extreme temperatures an FLRA must be completed to identify work/rest schedule and the most appropriate time of day for work to be completed (warmer/cooler times in the day). See *Appendix N* for Work Warm up and Work Rest Schedules.
	20.8	The modified work schedules provided in *Appendix N* are guidelines designed for the average worker. Supervisors should revise work schedules for individuals requiring further rest or who are experiencing extreme discomfort. For workers with medical conditions, a health-care professional should be consulted prior to following these schedules.
	20.9	Additional controls would be to minimize employee's exposure to the elements by providing shade, work in a well-ventilated or air-conditioned area. Add shielding to reduce wind, heat the area, or insulate metal surfaces and handles.
	20.10	Workers are able to acclimate to hotter temperatures when given time to ease into the job. This usually takes 4-7 working days for workers in good health and who are physically fit.
	20.11	When working in a hot environment, workers must continue to wear all mandatory PPE, unless instructed by a Cenovus supervisor. Consideration should be to first implement engineering controls or administrative controls to mitigate the risk of heat stress.
	20.12	Commercially available personal cooling clothing and equipment may be considered provided it does not create additional hazards and is approved by the Cenovus Supervisor in charge.

	20.13	When working in a cold environment, workers can utilize insulated clothing including outerwear, balaclava, neck warmers, and gloves that are flame resistant. Preferably in layers so that clothing can be removed to help prevent sweating which can contribute to hypothermia.
Education and Training Requirements	20.14	Supervisors and workers should review the requirements in this document prior to conducting work in extreme hot or cold environments.
Health Surveillance	20.15	If thermal stress is suspected, certified first aid responders may assist a worker by providing first aid. Refer a worker for medical.
	20.16	Refer a worker for medical attention if their condition does not respond to treatment, if it worsens, or if first-aid care is not available.

3.8.21 Turnaround Support

Recognition	21.1	Each turnaround (TA) provides a unique set of hazards and exposure potentials which are related to the work activities and controls included in the scope of work.
	21.2	Risks to health in an oil and gas turnaround/outage may arise from the presence of chemical, biological, physical, and ergonomic factors.
	21.3	At the planning and preparation stages, the health hazards need to be identified and a preliminary evaluation of the risks made in order to identify the control options necessary for the various tasks.
	21.4	The evaluation risks will identify the need for procedures for those activities and tasks which could otherwise result in significant exposure to health hazards.
Health Effects	21.5	Various health effects are possibly from the multitude of chemicals, products and equipment that can be found involved during turnarounds.
Assessment Requirements	21.6	Industrial Hygiene considerations shall be taken into account during all phases of the turnaround/outage.
	21.7	Development of an IH exposure monitoring plan is a key activity associated with the TA/outage.
	21.8	The IH exposure monitoring plan shall define how workers' exposures shall be evaluated and measured throughout the shut-down, maintenance and start-up phases of the TA/outage.
	21.9	The Turnaround/Outage Coordinator shall engage with the IH&OH group to assist in development of an exposure monitoring plan.
	21.10	The plan shall be completed prior to the execution of the TA/outage, in the planning stages of the TA/outage.
	21.11	Turnaround plans shall account for resources for industrial hygiene requirements in TA/outage activities (e.g., exposure monitoring, hazard awareness training for employees and/or contractors).
Control Requirements	21.12	The strategy to control IH health risks shall be based on the hierarchy of controls.
	21.13	The IH&OH group shall provide assistance to Entities and Turnaround Planners to establish control strategies for identified health hazards.
	21.14	Contractors shall provide up to date SDS's for all materials being brought onto site during turnarounds.
	21.15	All contractor chemicals shall be reviewed for acceptance for use onsite prior to bringing on site.
	21.16	Contractors shall remove all unused chemical or materials brought onsite or used during turnarounds.
Education and Training Requirements	21.17	All workers onsite during turnaround activities shall have all applicable site-specific and site required training.
	21.18	Contractors shall also have appropriate training for the work that will be conducted.

Health Surveillance	21.19	Workers with specific health susceptibilities should consult their doctor if concerned about specific workplace exposures.
	21.20	Additional specific health monitoring may be required by the authority having jurisdiction or as required by this standard.
	21.21	Contractors shall undergo health assessments as required by their employer.

3.8.22 Wildfire

Recognition	22.1	Cenovus operations located within densely forested areas are at an increased risk of being affected by wildfires.
	22.2	Recommended guidelines will enable the entity to categorize the air quality, determine potential health risks, and communicate recommended actions to ensure the health and safety of workers at our sites.
Health Effects	22.3	Wildfire smoke is a complex mixture of carbon dioxide, water vapour, carbon monoxide, particulate matter, hydrocarbons and other organic chemicals, nitrogen oxides, and trace minerals.
	22.4	Particulate matter exposure is the principal threat from short-term exposures to wildfire smoke.
	22.5	The health effects of smoke range from eye and respiratory tract irritation to more serious disorders, including reduced lung function, bronchitis, worsening of asthma symptoms, heart failure, and premature death.
	22.6	The health status of individuals affects their susceptibility to health hazards of wildfire smoke.
	22.7	Exposures to fine particulates are irritants and can also affect healthy employees, causing respiratory symptoms, temporary reductions in lung function, and pulmonary inflammation.
	22.8	Carbon monoxide (CO) enters the bloodstream through the lungs and reduces oxygen delivery to the body's organs and tissues.
	22.9	Exposure to CO occurs through inhalation of the gas. CO works to prevent red blood cells in the body from carrying enough oxygen to body tissues and organs.
	22.10	When it is inhaled, CO binds to red blood cells forming carboxyhemoglobin, and prevents the uptake of oxygen by cells.
	22.11	Levels of carboxyhemoglobin accumulate in the body according to the concentration of CO in the atmosphere, as well as the duration of the exposure.
	22.12	Symptoms of CO exposure vary according to the severity of exposure. At low concentrations, CO can cause mild headaches and fatigue in healthy people. At higher concentrations symptoms include serious headaches, nausea, fatigue, impaired vision and coordination, unconsciousness, and death.
Assessment Requirements	22.13	It is important to monitor the levels of fine particulate, carbon monoxide and other potential smoke exposure related contaminants, in order to assess health risk and compliance with regulatory requirements during a wildfire smoke event.
	22.14	Monitoring requirements shall be developed based on impact of a smoke event and the operational needs of an entity.
	22.15	The IH&OH group provides support for monitoring requirements and data analysis.

Control Requirements	22.16	Control requirements shall be developed based on impact of a smoke event and the operational needs of a entity. The Cenovus IH&OH group provides support to establish specific control requirements.
	22.17	Health risk information shall be used to determine appropriate response requirements, thus aiding those charged with evacuation and shelter in place responsibilities. Note: Evacuation should only be considered if it is necessary and safe to do so or as required by the authority having jurisdiction or as required by this standard.

4 Related information

4.1 Glossary of terms

Table 1: Terms and abbreviations

Term or abbreviation	Details
ACGIH	American Conference of Governmental Industrial Hygienists
Administrative Controls	If engineering controls are not sufficient or available due to the nature of the task or equipment, reduce occupational exposure to below occupational exposure limits (OELs) or the Cenovus action levels by implementing administrative controls such as installing warning signage, rotating work schedules, modifying work procedures and ensuring employees are following proper personal hygiene measures.
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
Asbestos Exposed Worker	Workers who may reasonably be expected to work in an area where the OEL may be exceeded at least 30 days in a 12-month period or as defined by the authority having jurisdiction or as required by this standard.
Benzene Exposed Worker	Workers that are routinely exposed to benzene or products containing benzene as defined by the authority having jurisdiction or as required by this standard.
CSA	Canadian Standard Association
Elimination	Elimination of a hazardous means physically removing the hazard from the procedure or the work area. Eliminating the hazard is the most effective method of minimizing an exposure to any hazard.
Engineering Controls	Where possible, implement engineering controls to reduce potential exposures to concentrations at or below the occupational exposure limits (OELs) or Cenovus action levels. Examples are process automation, local exhaust ventilation, fume hoods, incorporated spill containments.
Friable Asbestos	Friable material means a material that when dry can be crumbled, pulverized, or powdered by hand pressure.
High Risk Abatement	Activities where there is a high risk of exposure to airborne asbestos fibers.
Lead Exposed Worker	A worker who is exposed to lead as a result of the maintenance and disposal of lead material and products.
Moderate Risk Abatement	Activities, where there is a moderate risk of exposure to airborne asbestos fibers.
NIOSH	National Institute for Occupational Safety and Health
Noise Exposed Worker	Workers who are routinely exposed to noise above 80 dBA as defined by the authority having jurisdiction or as required by this standard.
NORM Exposed Worker	A worker who is working in an occupational exposure environment, and their average annual effective dose should not exceed 20 mSv.

Term or abbreviation	Details
Octave Band Analysis	Octave band measurement is used when the frequency composition of a sound is needed to be determined. The octave analysis is used in noise control, hearing protection and sometimes in environmental noise issues. The ten-octave bands that are commonly used for this purpose are those with the following centre frequencies – 31Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, and 16kHz.
OEL	Occupational Exposure Limit – Limits established to protect workers from workplace exposure to certain chemical substances or physical agents.
Personal Protective Equipment (PPE)	PPE and Respiratory Protective Equipment (RPE) are the last lines of defense and should not be the only means of protection for workers. They are means of putting a physical barrier that the worker wears between the worker and the hazard.
QEA	Qualitative Exposure Assessment – This process is used to determine the procedure level aspects and impacts of risks, as well as the order in which identified health hazards are evaluated. This process does not determine quantitatively if an exposure is within occupational exposure limits; rather, it models and ranks exposures for a more comprehensive evaluation that can determine exposure status.
Silica Exposed Worker	A worker who may reasonably be expected to work in an area where there is a reasonable chance that the airborne concentration is greater than the OEL for at least 30 workdays in a 12-month period.
Substitution	Substitution replaces hazards with a material, process or equipment that is less hazardous. The Cenovus IH&OH group can assist with substitution recommendations.
TLV	Threshold Limit Values (TLVs®) – TLVs are developed as guidelines by ACGIH to assist in the control of health hazards. These recommendations or guidelines are intended for use in the practice of Industrial Hygiene, to be interpreted and applied only by a person trained in this discipline.

4.2 References

Table 2: Internal Governing References

Governing Document	Document Title
Regulation	Alberta Occupational Health and Safety Code – (Part 4, 16)
Regulation	British Columbia Occupational Health and Safety Regulations – (Part 5, 6, 7)
Regulation	Saskatchewan Occupational Health and Safety Regulations – (Part VIII, XXIII, XXIV)
Regulation	Manitoba Workplace Safety and Health Regulation – (Part 12, Part 37)
Regulation	Canada – Newfoundland and Labrador Offshore Marine Installations and Structures Occupational Health and Safety Transitional Regulations
Regulation	OSHA Standards – (1910.95, 1910.134, 1910.1001, 1910.1101,1910.1450)
Corporate Standard	Corporate Standard Personal Protective Equipment

Table 3: External Governing References

Reference Document	Document Title
Reference Document	*Food Safety Guidebook*, Chapter 9 – Developing a Pest Management Program, Alberta Agriculture and Rural Development
Reference Document	Volume 2, *Best Practices for the Assessment and Control of Biological Hazards*, Work Safe Alberta
Regulation	Relevant sections of the health and safety regulations of the federal, provincial, state, and local governments, where the operational area or Entity is geographically located will apply e.g., Alberta Occupational Health and Safety Code 2009. WHMIS HPA HPR HAZCOM
Work Instruction	Chemical Assessment and Approval Work Instruction
SharePoint Site	Chemical Management Program SharePoint Site
SharePoint Site	Industrial Hygiene SharePoint Site
Government Reference	Safe Work Practices for Handling Asbestos WorkSafeBC 2020
Government Reference	*Saskatchewan Asbestos Abatement Manual 2021*
Government Reference	*Guide for Asbestos Management Safe Work Manitoba 2020*
Government Reference	*Alberta Asbestos Abatement Manual 2019*
Benzene in the Workplace	*https://work.alberta.ca/documents/WHS-PUB-CH065.pdf* *WorkSafe Alberta, 2010*
Cenovus MSDS for Pure Benzene	Cenovus *SDSBinders.com*, search term: Benzene (Lima)
SharePoint Site	Chemical Classification and Sampling Work Instruction.
Guideline	*Fungal Contamination in Public Buildings: Health Effects and Investigation Methods*

Reference Document	Document Title
	By Health Canada
Guideline	*Best Practices Mould at the Work Site* By Government of Alberta Employment and Immigration, July, 2009
Guideline	*Facts About Mould* By the Government of Saskatchewan, Saskatchewan Labour and Saskatchewan Health, health and Safety Division, April, 2007
Guideline	*Indoor Air Quality: A Guide for Building Owners, Managers, ad Occupants* By WorkSafeBC, Workers Compensation Board of B.C., 2005
Guideline	*Mould Guidelines for the Canadian Construction Industry* By the Canadian Construction Association, 2004
Guideline	*Guidelines on Assessment and abatement of Fungi in Indoor Environments* By the New York City Department of Health and Mental Hygiene, November, 2008
Technical Standard	*ANSI/IESNA RP-7-01 Recommended Practice on Industrial Lighting*
Technical Standard	*ANSI/ASA S12.19, Measurement of Occupational Noise Exposure*
Technical Standard	*ANSI/ASA1.25 Specification for Personal Noise Dosimeters*
Technical Standard	*ANSI/ASA S1.4 Electroacoustics - Sound Level Meters*
Technical Standard	*ANSI/ASA S1.43 Specifications for Integrating-Averaging Sound Level Meters*
Technical Standard	*CSA Standard Z107.56, Measurement of Noise Exposure*
Technical Standard	*CSA Z94.2-14, Hearing protection devices - Performance, selection, care, and use*
Guideline	*Hydrogen Sulphide at the Work Site* *WorkSafe, AB, Bulletin 2010*
Guideline	*Laboratory Health and Safety Handbook*
Guideline	Lima Refinery Laboratory Chemical Hygiene Plan
Guidance Sheets	*HGS440 Chemical Storage, HGS001 to HGS104 Handling of Chemicals are available on the Chemical Management SharePoint Site*
Federal	*Canadian Surface Coating Materials Regulation*
British Columbia Provincial Guideline	*Safe Work Practices for Handling Lead*
Standard	*ANSI/ASHRAE 188-2018 Legionellosis: Risk Management for Building Water Systems*
Guideline	*ASHRAE Guideline 12-2000 Minimizing the Risk of Legionellosis Associated with Building Water Systems*
Guideline	*Legionella Who's Addressing the Risks in Canada*, National Research Council of Canada, health Canada and Public Services and Procurement Canada, 2018
Guideline	*Public Health Disease Management Guideline* – Legionellosis, Alberta Health, March 2018
Guideline	*Legionella and the prevention of legionellosis*, World Health Organization, 2007
Guideline	*Lighting at Work, Industrial Accident Prevention Association* (Canada)
Guideline	*The Lighting Handbook, Tenth Edition* | Reference and Application by the Illuminating Engineers Society

Reference Document	Document Title
Federal and Provincial	*Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM),* by the Canadian NORM Working Group of the Federal Provincial Territorial Radiation Protection Committee
Federal	*Federal Transportation of Dangerous Goods Act, by the Minister of Transport*
Technical Standard	*CSA Standard - Z94.4-11, Selection, Use, and Care of Respirators*
Technical Standard	*CSA Standard - Z180.13 - Compressed Breathing Air and Systems*
Technical Standard	*CAN/CSA Z94.4-11 (R2016) Selection, use and care of respirators.*
Guideline	*Crystalline Silica at the Work* WorkSafe AB
Guideline	*Crystalline RCF at the Work* WorkSafe AB
Guideline	*Best Practice – Working Safely in the Heat and Cold* WorkSafe AB
Guideline	*Cold Condition Guidelines for Working Outside* WorkSafe Saskatchewan
Guideline	ACGIH (2013) *Cold Stress; Heat Stress*
Guideline	*Heat Stress* Ministry of Labour (Ontario)
Guideline	*Heat Stress Guidelines for Working Outside* IAPA
Guideline	*Management of Occupational Health Risks during Refinery Turnarounds*, CONCAWE 2000
Technical Standard	Portable Gas Detection Technical Standard
Technical Standard	Confined Space Entry Technical Standard
Guidance Sheet	Turnaround Advice (HGS506)
Guide for Wildfires	*Emergency Preparedness Guide for Hazards Associated with Wildfires*, 2015 Canadian Association of Petroleum Producers
Guide to Wildfire Smoke	*Wildfire Smoke, A Guide for Public Health Officials, 2016* U. S. Environmental Protection Agency

Appendix A: Hierarchy of Controls Examples

Control	Examples
Elimination	• Asbestos removal • Renovations at facilities or new projects designed and constructed to keep noise levels generated below 85 Dba
Substitution	• Utilizing additive fluids that do not contain benzene • Substitute quieter equipment or tools for noisier ones • Alternative forms of insulating materials other than hazardous ones • Use only abrasive blasting material that contains >0.1% crystalline silica
Engineering Controls	• Automation of operations that open process flows • Relocating process sources of exposure away from personnel or equipment • Directing blowdown lines for meters and orifice plate changers to the processing system flare • Providing mechanical ventilation (dilution and local exhaust) • Limit evaporation of fluids containing benzene by equipment or vessel design (i.e., controlling release of vapours) • Incorporate splash and spill prevention measures in facility/equipment design • Lubricating machines to reduce noise levels • Reducing rotational speeds • Enclosures or shielding between noise and other hazard sources or employees • Using sound absorbing materials • Installing mufflers or silencers on vents and air intakes • Installing vibration damping materials to isolate equipment vibration • Reducing the velocity of air flow • Wall & ceiling mounted noise absorbing panels • Installation of acoustical blanketing and/or pipe lagging • Ensure water systems are designed to avoid excessive aerosolization, have drain plugs, adequate circulation and allow access for cleaning and disinfecting • Dust collection and suppression systems

Control	Examples
Administrative Controls	• Rotating work schedules, jobs, or positions • Changing production schedules • Modifying work procedures • Posting warning signs • Having SDS easily accessible • Proper handling of contaminated work clothing and practicing post-exposure personal hygiene • Ensure there is no eating, drinking, or smoking where chemicals are handled, processed, or stored • Washing hands carefully before eating, drinking, or smoking • Ensuring workers are fully trained in the hazards and in the location and operation of safety equipment and warning systems • Increasing distance between hazard sources and workers (setting up restricted work areas) • Requiring a worker to notify area when starting up noisy or hazardous equipment • Develop work practices and procedures (standard operating procedures, safe work practices, spill response, hazard identification and communication, limited access, personal hygiene, and waste disposal) to reduce/minimize hazardous exposures • Inspection and maintenance schedule for engineering controls used to reduce exposures
PPE/RPE	• Gloves with proper chemical resistance to the degradation of the fluids being utilized • Footwear that will provide adequate resistance and meets the appropriate standards and requirements of the authority having jurisdiction or as required by this standard • Eye and body protection (face shield, splash googles, and chemical resistant suit) that meet the appropriate standards and requirements of the authority having jurisdiction or as required by this standard • Fire-resistant (FR) coveralls and lab coats • Disposable coveralls can also be worn over FR coveralls to protect contamination of FR coveralls and they can be easily disposed of • Hearing protection with the appropriate Noise Reduction Rating (NRR) and in some cases dual hearing protection (ear plug and earmuff) • A NIOSH approved respirator with the appropriate protection factor for the hazards • Appropriate cartridge for the hazards with a defined change out frequency

Appendix B: Common Sources of Asbestos Containing Materials

Material or Location	Examples
Building Exteriors	• asbestos cement siding panels – flat, corrugated, shingles or accent panels • asbestos cement soffits – flat or perforated panels • asbestos cement roof panels – corrugated • roofing felts and mastics • building overhangs – thermal spray • stucco • brick and block mortar • loose fill insulation in exterior wall cavities (vermiculite)
Flooring	• vinyl asbestos tiles (VAT) • sheet vinyl flooring (asbestos paper backing) • floor leveling compound
Ceilings	• T-bar ceiling tile • asbestos cement ceiling tile • acoustic and stippled finishes • plaster or drywall jointing materials
Walls	• plaster or drywall jointing materials • stippled finishes • thermal spray • asbestos cement panels
Service Areas	• insulation in boiler rooms — boilers, vessels, pipes, ducts, incinerators, floors, • ceilings, walls • fan rooms — insulation on pipes, ducts, chillers, floors, ceilings, walls • machine rooms — insulation on pipes, ducts, floors, ceilings, walls • crawl spaces — insulation on pipes, ducts • wall cavities, insulation above ceiling spaces — pipe and duct chases, pipes, ducts
Pipes (insulation on either exposed or concealed pipes)	• steam and hot water heating supply and return lines • domestic water supply and drain lines • chilled water lines • rainwater and sanitary lines — asbestos cement or bell and spigot cast iron, • insulated or bare pipe • gaskets in flanged pipe joints
Miscellaneous	• incandescent light fixture backing • wire insulation • fume hoods – internal linings and exhaust ducts • lab counters • elevator brake shoes • heating cabinet panels (asbestos cement) • fire dampers and fire stop flaps

	• diffuser back plaster • emergency generators – thermal insulation and exhaust manifolds • firestopping • welding blankets and screens • incinerators – internal insulation • cooling towers – panels and fill • duct tape • duct expansion/vibration isolation joints

Appendix C: Benzene Respiratory Selection Matrix

Airborne Concentration of Benzene	Type of Respirator Required
≤ 2.5ppm(10xTWA)	Half facepiece air-purifying respirator with organic vapor cartridges.
≤ 6.25ppm (25xTWA)	Full facepiece air-purifying respirator with organic vapor cartridges; or Powered air purifying respirator with a hood or helmet equipped with organic vapor cartridge; or Supplied-air respirator with a hood or helmet operated in continuous flow mode.
≤ 12.5ppm (50xTWA)	Full facepiece air-purifying respirator with organic vapor cartridges; or Powered air purifying respirator with a full facepiece and organic vapor cartridge; or Supplied-air respirator with full facepiece operated in continuous flow mode.
>12.5ppm (50xTWA)	Supplied air respirator or self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure or continuous flow mode.
Escape	Any escape self-contained breathing apparatus or any air purifying respirator with organic vapor cartridges.

- RPE recommendations are based off of screening measurements until characterization monitoring can be conducting.
- Based on NIOSH recommendations and the ACGIH 12-hour TWA of 0.25 ppm.
- For shifts other than 12 hours, consult with the Cenovus Industrial Hygiene Group for respirator selection.

Appendix D: Recommended Basic Visual Inspections of Eyewash and Emergency Showers

Emergency Shower and Emergency Shower/Eyewash combination units

Weekly visual inspection shall be carried out for the following items:

- Check for visible damage to the shower/eyewash facility
- Check for external damage to electrical units, cables, or junction boxes
- Check temperature of the flushing fluid (external gauge should be present on the shower unit)
- Check for any labelling on the unit that may be torn off or non-readable
- Check for the interior of the shower unit to ensure it is well lit and no damage to any of the activation mechanism

All weekly visual inspection shall be recorded as part of the Operations ODR system.

Standalone Eyewash Station

Weekly visual inspection shall be carried out for the following items:

- Check for visible damage to the eyewash station
- Check for any labelling on the unit that may be torn off or non-readable
- Check for tempered seal sticker, if the sticker is broken, the unit may have been used. Mark the unit for out of service and contact H&S technicians forre-qualification of the unit
- If there is debris/dust build up on the unit, clean the unit with a towel to ensure no additional contamination is introduced to the users' eyes

All weekly visual inspection shall be recorded as part of the Operations ODR system.

Eyewash Bottles

Weekly visual inspection shall be carried out for the following items:

- Check for visible damage to the eyewash bottle
- Check for expiration date
- If there is debris/dust build up on the unit, clean the unit with a towel to ensure additional contamination is introduced to the users' eyes

Appendix E: Routine Function Testing of Eyewash and Emergency Showers

Routine function testing shall only be conducted on all emergency safety showers and eyewash facilities that are part of a combination unit. The frequency can be determined at the site level unless the safety shower/eyewash facility is plumbed in.

All plumbed in units shall be activated on a weekly basis to ensure the supply pipework has been flushed out.

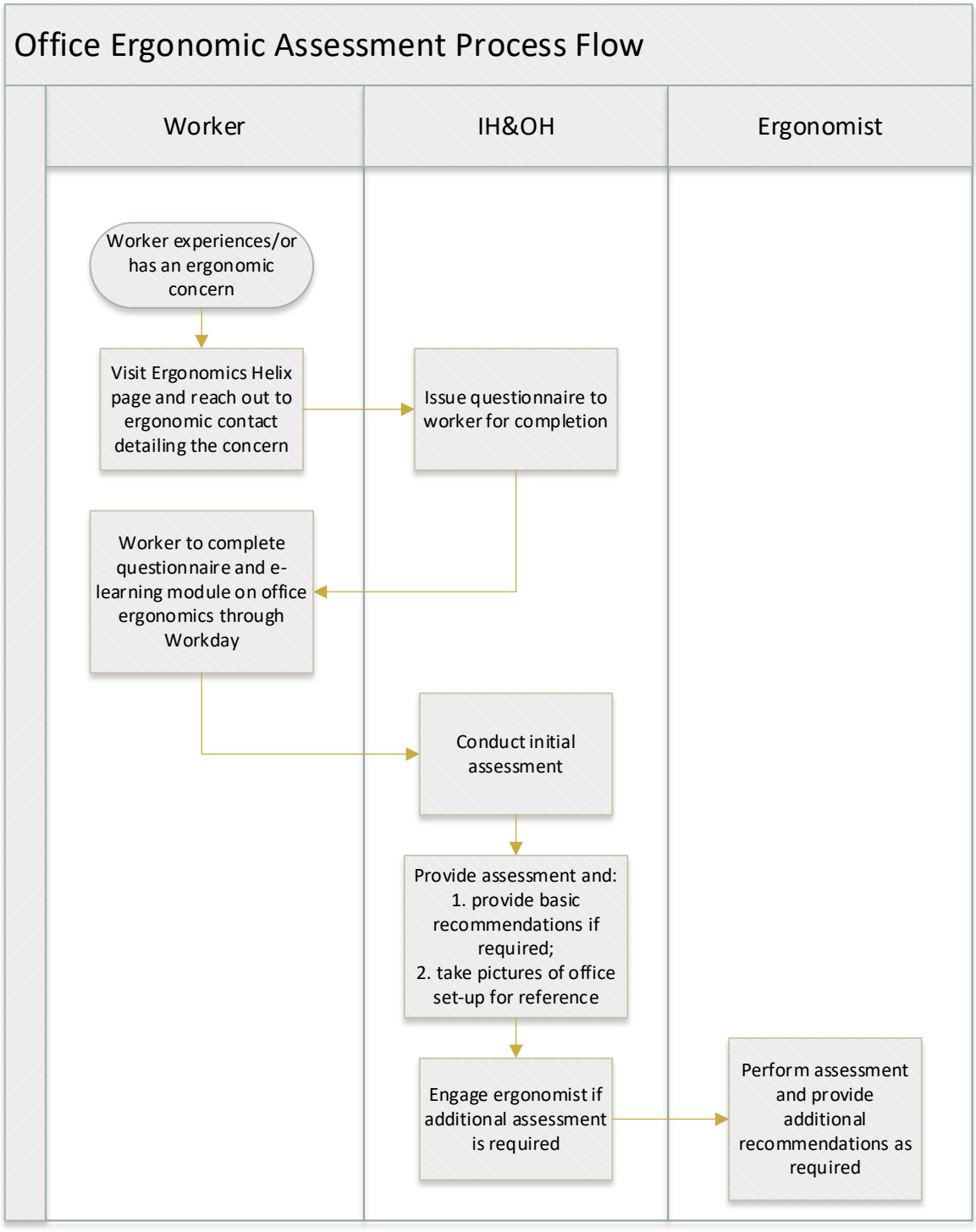
All function tests shall be carried out for the following items:

- Shower and/or eyewash facility shall be activated between 30-60 seconds toensure proper operation and flushing fluid is available
- Collection of water sample for laboratory analysis of harmful micro-organisms, pH, turbidity, and residual free chlorine level
    - Micro-organism (E. Coli & Coliform) should be 0 CFU in sample
    - Water sample pH should be less than 8.0
    - Water turbidity should be below 1 NTU, but never above 5 NTU.
    - Residual free chlorine level should be greater than or equal to 0.2 mg/L, but never exceeds 5.0 ppm
- Double check presence of Aquanella sticks inside water holding tank if installed and practical
- Ensure sufficient chlorine pucks are in automatic chlorine dispenser inside waterholding tank if used
- Flushing fluid temperature shall be checked with an external equipment to ensure proper flushing temperature. Flushing temperature shall meet ANSI Z358.1 or manufacturers' recommendation, whichever is more stringent

If shower and/or eyewash facility failed to function properly or water laboratory analysis indicate presence of microorganisms, the facility shall be put out of service and corrective action shall take place.

Routine function testing shall be documented including laboratory analytical results using Operations ODR system. It shall also be recorded on the shower and/or eyewash facility itself.

Appendix F: Office Ergonomic Assessment Process Flow



Appendix G: Jurisdictional Noise Legislation

Jurisdiction	Survey requirements	Signage Requirements	Hearing Protection Threshold	Audiometric Testing Requirements	Fit Testing Requirements
BC	If a worker is or may be exposed to potentially harmful levels of noise or information indicates worker's may be exposed to levels >82 dBA	Where noise levels are >85 dBA	Workers who are exposed to >85 dBA	An initial hearing test as soon as practicable after employee starts, must be within 6 months of start date. At least once every 12 months after the initial test.	None
AB	Where noise expected to be >85 dBA or in alignment with the extended shift adjusted exposure levels	Where noise levels exceed >85 dBA	Workers who are exposed to >85 dBA for 8-hour exposure period >84 for 10 hour* >83 for 12 hour*	An initial hearing test as soon as practicable after employee starts, must be within 6 months of start date. After the baseline within 12 months then every 2 years thereafter.	Qualitative or Quantitative
SK	Areas where workers are required to work that the noise level may frequently be >80 dBA	Any area >80 dBA has signage indicating the range of noise levels	If a worker's exposures are believed to be between >80 dBA to 85 dBA employers must inform the employees and on request provide hearing protection, and train employees on selection, use, and maintenance of hearing protectors. If worker's occupational noise exposure is >85 dBA or noise levels are >90 dBA employers must inform, train and take reasonable steps to reduce noise levels and document. If levels cannot be reduced employers must provide hearing protection.	If a worker's noise exposure is >85 dBA arrange for a worker to have an audiometric test at least once every 24 months.	None

Jurisdiction	Survey requirements	Signage Requirements	Hearing Protection Threshold	Audiometric Testing Requirements	Fit Testing Requirements
MB	If a worker is likely to be exposed to noise levels >80 dBA	At the entrance to any area >85 dBA	If a worker is likely to be exposed to noise between >80 dBA to 85 dBA employers must inform the employees about the hazards of noise, and if requested by the worker, provide hearing protection that is selected, used, and maintained in accordance with CSA Z94.2. If a worker's exposure is >85 dBA employer must implement controls inform workers of hazards, provide hearing protection and train workers on performance care and use as per CSA Z94.2.	Noise exposure >85 dBA employer to provide a baseline with 6 months, then every 2 years after baseline.	None
NFLD	In areas >85 dBA	At entrances to areas >85 dBA identifying what PPE is required	>85 dBA for 8-hour exposure period as per ACGIH TLV	Within 3 months of start of employment and on an annual basis or as recommended by an audiologist or occupational physician.	None
C-NLOPB	>85 dBA as per ACGIH TLV	>85 dBA as per ACGIH TLV	>85 dBA for 8-hour exposure period as per ACGIH TLV	Every 2 years.	None
OSHA	>85 dBA	Inform at >85 dBA	At >85 dBA provide hearing protection to employees upon request or who have not yet had a baseline audiogram or have experienced a threshold shift. Required at exposure levels >90 dBA for 8-hour duration per day.	Within 6 months of employee's first exposure at or above 85 dBA (Action level). If mobile test vans are used a valid baseline audiogram must be completed within 1 year of first exposure. Annual audiograms are conducted after baseline for employees exposed at or above an 8-hour TWA of 85 dBA.	Ensure proper initial fitting

Notes - * Noise reduction levels for extended shifts Schedule 3 Table 1 AB OHS Code

Appendix H: H2S Exposure Symptoms & Effects

Source: U.S. Occupational Safety and Health Administration

Concentration (ppm)	Symptoms/ Effects
0.01-1.5	Odour threshold (when rotten egg smell is first noticeable to some).
2-5	Prolonged exposure may cause nausea, tearing of the eyes, headaches, or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
20	Possible fatigue, loss of appetite, headache, irritability, poor memory, or dizziness.
50-100	Slight conjunctivitis ("gas eye") and respiratory tract irritation after 1 hour. May cause digestive upset and loss of appetite.
100	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours. Death may occur after 48 hours.
100-150	Loss of smell (olfactory fatigue or paralysis).
200-300	Marked conjunctivitis and respiratory tract irritation after 1 hour. Pulmonary edema may occur from prolonged exposure.
500-700	Staggering, collapse in 5 minutes. Serious damage to the eyes in 30 minutes. Death after 30-60 minutes.
700-1,000	Rapid unconsciousness, "knockdown" or immediate collapse within 1 to 2 breaths, breathing stops, death within minutes
1,000-2,000	Nearly instant death.

Appendix I: Lead Risk Levels

Risk	Potential airborne lead concentration (mg/m^3)	Activity
Low	< 0.05	Applying lead-containing paint with a brush or roller (not permitted at Cenovus facilities).
		Removal using chemical gels or pastes.
		Installing or removing sheet metal that contains lead.
		Operating an excavator during a demolition.
		Transporting sealed containers of lead.
Low-Moderate	0.05 - 0.50	Removal using a power tool with effective dust collection and a HEPA filter.
		Scraping or sanding with non-powered hand tools.
		Welding, burning, cutting surfaces with removed coatings.
Moderate	> 0.50 – 1.25	Scraping or sanding using non-powered hand tools (larger projects).
		Manual demolition of lead-painted walls.
		Cleaning lead-containing dust and debris.
Moderate-High	> 1.25 – 2.50	Spraying coating.
		Removal of lead-containing mortar using electrical or pneumatic cutting devices.
		Removal using power tools without effective dust collection.
		Removing or repairing ventilation system used to control lead exposure.
		Demolishing or cleaning where lead-containing materials are manufactured.
		Removal using high-pressure waterjet.
High	> 2.50	Abrasive blasting of lead-contaminated coatings or materials.
		Dry-ice blasting of lead-contaminated coatings or materials.
		Removal of lead dust using air mist extraction system.

Appendix J: Lead Control Measures

Risk	Control Measure
Low	Washing facilities.
	No eating, drinking, chewing gum, smoking, or biting fingernails.
	Wash hands prior to eating, drinking, smoking, or leaving work area.
	Breaks (coffee, lunch) shall be taken in a separate clean area.
	Disposal drop sheets shall be used below working area.
	Waste, dust, and debris shall be placed in sealed and labeled containers.
	Compressed air or dry dusting is not permitted for cleaning dust.
	Work clothes shall be removed and kept at work.
	Respirators are not required but recommended.
Low-Moderate, Moderate	Block off work area to prevent access to the work area.
	Post signage at all entrances to work area indicating the risk and requirement for respiratory protection.
	Protective boots, gloves, and impervious disposable coveralls shall be worn to minimize contact with lead-contaminated materials or equipment. PPE should be easily washable and/or disposable where possible.
	A ventilation system with HEPA filters shall be used when welding, burning, or cutting.
	The work area shall be kept cleaned using methods that limit dust (wet dusting, sweeping, or vacuuming with HEPA filters).
	Respiratory protection is required (NIOSH approved half or full-face piece elastomeric respirator with P100 HEPA cartridges, or powered air-purifying respirator (PAPR) with P100 HEPA cartridges). All respiratory protective equipment shall follow the applicable CSA standards.
Moderate-High	Moderate-High risk activities shall not be performed by Cenovus employees; a qualified abatement company shall complete this work.
High	High risk activities shall not be performed by Cenovus employees; a qualified abatement company shall complete this work.

Appendix K: Norm Management

NORM Management Classification

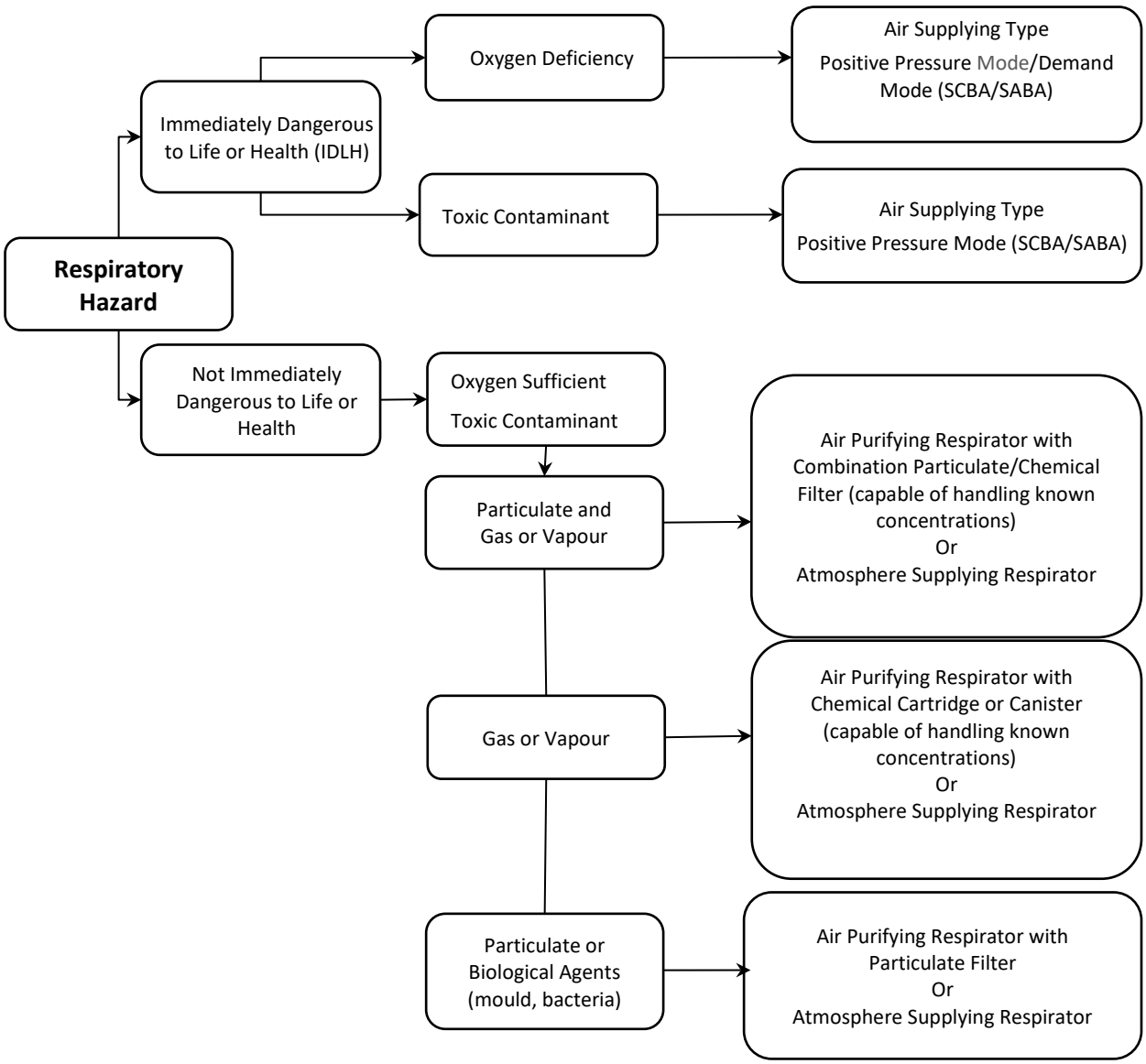
NORM screening surveys help to determine the level of protection required for individuals working in and around potentially NORM-contaminated equipment. If NORM contamination is confirmed or suspected, the worksite shall develop and implement site-specific procedures based on the NORM management classification table below.

Table Classification of NORM Management

Classification	Health Canada Guideline Levels*[1]	Equivalent Screening Levels*	Actions
	*Above Background Levels		
Unrestricted	< 0.3 mSv/a	< 150 nSv/hr	• No further action is needed
	0.3 mSv/a	*2x background or 150 nSv/hr.*	***Threshold for further investigation***
NORM Management	0.3 – 1 mSv/a	150 – 500 nSv/hr	• Public access restricted • Worker access unrestricted
Dose Management	1 – 5 mSv/a	500 – 2500 nSv/hr	• Worker notification of sources • Work procedures and worker PPE to limit dose • Consider engineering controls • Training • Assess work site periodically
Radiation Protection Management	> 5 mSv/a	> 2500 nSv/hr	• Formal radiation protection program • Personal radiation dosimetry program • Modified work procedures and provision of PPE to reduce dose

Note: 1) US & International jurisdictions may have different requirements. Follow the requirements of the jurisdiction having authority.

Appendix L: Respiratory Protection Selection Chart



Appendix M: Health Effects of Heat and Cold Stress

Condition	Core Temperature	Signs and Symptoms
Heat Edema	N/A	Heat-induced swelling
Heat Rash	N/A	Tiny red spots, prickly sensation
Heat Cramp	N/A	Sharp pains in larger muscles – usually back, legs and arms
Heat Exhaustion	N/A	Heavy sweating, weakness, dizziness, nausea, headache, diarrhea, muscle cramps, etc.
Heat Syncope	N/A	Heat-induced fainting
Heat Stroke	N/A	Body can no longer cool itself and core temperature is >41 °C Partial or complete loss of consciousness Confusion, convulsions, irrational behavior Sweating may or may not be present
Frostnip	N/A	Effected skin turns white and may feel numb Top skin layer may peel off
Frostbite	N/A	Redness and swelling of skin in patches with pain Burning or prickling sensations, and blistering may develop
Mild Hypothermia	37.2–36.1°C (99–97°F)	Shivering may begin
	36.1–35°C (97–95°F)	Cold sensation, goose bumps, unable to perform complex tasks with hands, mild to severe shivering, numbness in hands
Moderate Hypothermia	35–33.9°C (95–93°F)	Intense shivering, muscles incoordination becomes apparent, movements are slow and laboured, stumbling pace, mild confusion, may appear alert Use a sobriety test: if unable to walk a 9-metre (30-foot) in a straight line, the person is likely hypothermic
	33.9–32.2°C (93–90°F)	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements are sluggish, unable to use hands, stumbles frequently, difficulty speaking, signs of depression, withdrawn
Severe Hypothermia	32.2–30°C (90–86°F)	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness
	30–27.8 °C (86–82 °F)	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation
	27.8–25.6°C (82–78°F)	Unconscious, heartbeat and respiration erratic, a pulse may not be obvious
	25.6–23.9°C (78–75°F)	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached

Appendix N: Recommended Work Warm up/Rest Cycles

Information needed to use this tool: air temperature and wind speed
Note: This work/warm-up schedule assumes workers are wearing dry clothing, and it applies to any 4-hour work period with moderate to heavy activity (e.g., sustained hand and arm movement, normal to fast-paced walking, pushing, or pulling heavy loads, carrying, or shoveling). A break (as per the schedule) is either a 10-minute warm-up period or an extended meal break in a warm location.

Work/Warm-up Schedule

Air Temperature	No Noticeable Wind		8 km/h (5 mph) Wind		16 km/h (10 mph) Wind		24 km/h (15 mph) Wind		32 km/h (20 mph) Wind	
°C (approx.)	Max. Work Period	# of Breaks	Max. Work Period	# of Breaks	Max. Work Period	# of Breaks	Max. Work Period	# of Breaks	Max. Work Period	# of Breaks
-26 to -28°C -15 to -19°F	120 min.	1	120 min.	1	75 min.	2	55 min.	3	40 min.	4
-29 to -31°C -20 to -24°F	120 min.	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32 to -34°C -25 to -29°F	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35 to -37°C -30 to -34°F	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38 to -39°C -35 to -39°F	40 min.	4	30 min.	5	Non-emergency work should cease					
-40 to -42°C -40 to -44°F	30 min.	5	Non-emergency work should cease							
-43°C and below -45°F and below	Non-emergency work should cease									

Adapted from WorkSafe Saskatchewan. December 2009. **Cold Condition Guidelines for Working Outside**

Information needed to use this tool: air temperature, relative humidity, and Humidex chart (see *Appendix O*)

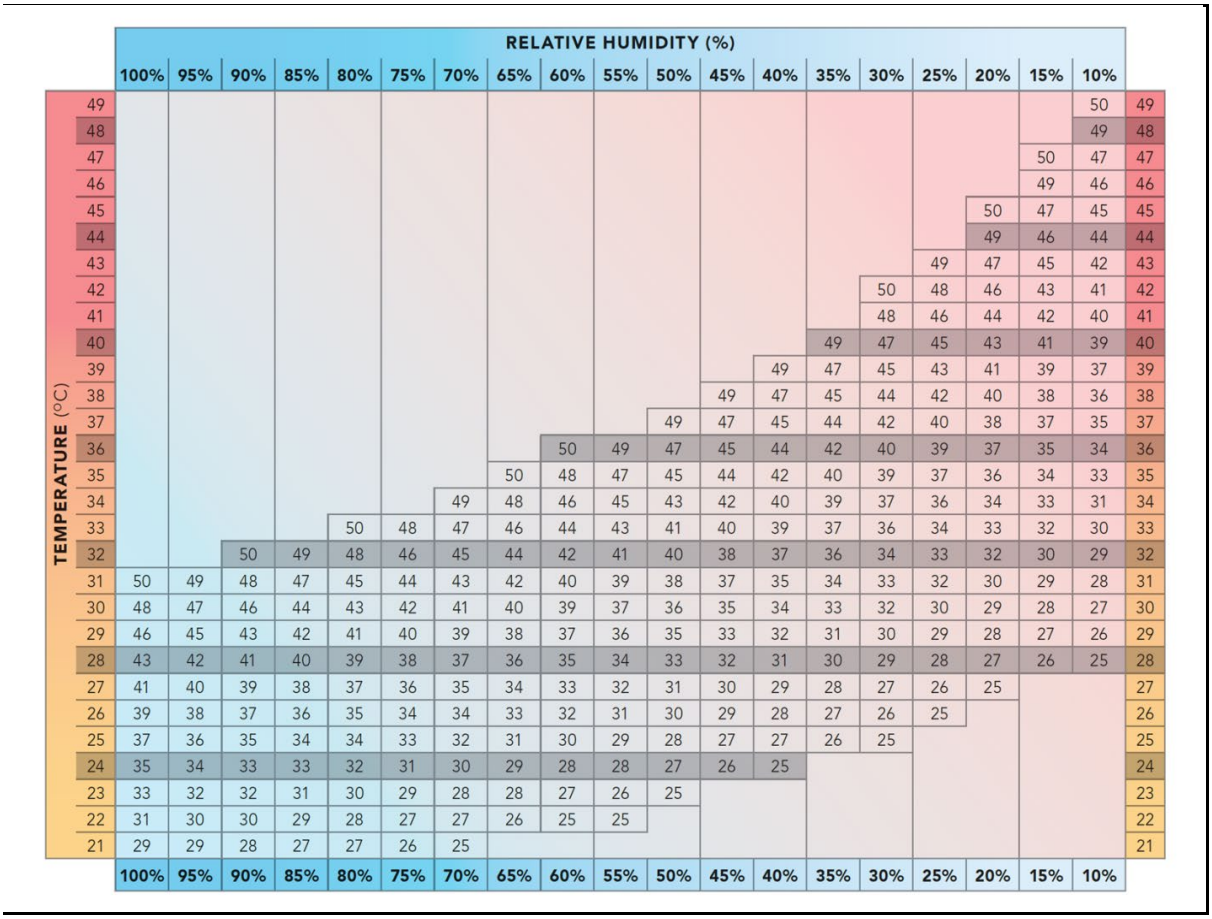
Note: This work/rest schedule assumes workers are dressed in full coveralls and work is being conducted under an overcast sky, or indoors with little radiant heat. For outdoor work in direct sunlight, take your Humidex measurement and add 2–3° based on the percent of cloud coverage.

Work/Rest Schedule

Acclimatized workers – Heavy work Un-acclimatized workers – moderate work	**Work/Rest Schedule and Response**	**Acclimatized workers – Moderate work Un-acclimatized workers – light work**
Humidex Value (°C)		**Humidex Value (°C)**
20–24	Supply water on an as-needed basis	27–30
25–28	Encourage workers to drink extra water	31–34
29–32	Notify workers to drink extra water Ensure workers are trained to recognize symptoms.	35–37
33–34	15-minute break per hour 240 mL water every 20 minutes	38–39
35–36	30-minute break per hour 240 mL water every 20 minutes	40–41
37–39	45-minute break per hour 240 mL water every 20 minutes	42–44
40+	Only work if medically supervised or until Humidex drops	45+

Adapted from Occupational Health Clinics for Ontario Workers Inc. (OHCOW). April 2012. **Humidex Based Heat Response Plan**

Appendix O: Humidex Chart



TEMPERATURE (°C)	RELATIVE HUMIDITY (%)																		
	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%
49																		50	49
48																		49	48
47																		50	47	47
46																		49	46	46
45																	50	47	45	45
44																	49	46	44	44
43																49	47	45	42	43
42															50	48	46	43	41	42
41															48	46	44	42	40	41
40														49	47	45	43	41	39	40
39													49	47	45	43	41	39	37	39
38												49	47	45	44	42	40	38	36	38
37											49	47	45	44	42	40	38	37	35	37
36									50	49	47	45	44	42	40	39	37	35	34	36
35								50	48	47	45	44	42	40	39	37	36	34	33	35
34							49	48	46	45	43	42	40	39	37	36	34	33	31	34
33					50	48	47	46	44	43	41	40	39	37	36	34	33	32	30	33
32			50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	32
31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30	29	28	31
30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	32	30	29	28	27	30
29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28	27	26	29
28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	28
27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25			27
26	39	38	37	36	35	34	34	33	32	31	30	29	28	27	26	25				26
25	37	36	35	34	34	33	32	31	30	29	28	27	27	26	25					25
24	35	34	33	33	32	31	30	29	28	28	27	26	25							24
23	33	32	32	31	30	29	28	28	27	26	25									23
22	31	30	30	29	28	27	27	26	25	25										22
21	29	29	28	27	27	26	25													21
	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%	

Source: Occupational Health & Safety Council of Ontario (OHSCO). April 2007. **Heat Stress Awareness Guide**

Appendix P: Cenovus Occupational Exposure Limits (OEL) Adoption

Agent	8 Hour TWA[1]	STEL[2]
ACETIC ACID	10 ppm[3]	15 ppm
ACETONE	250 ppm	500 ppm
ALUMINIUM OXIDE	1 mg/m^3[4] (Respirable) [5]	
AMMONIA	25 ppm	35 ppm
ANTIMONY	0.5 mg/m^3	
ASBESTOS	0.1 f/cc[6]	
BARIUM	0.5 mg/m^3	
BENZENE	0.5 ppm	2.5 ppm
BERYLLIUM	0.002 mg/m^3 (Total)[7] 0.00005 mg/m^3 (Respirable)	0.005 mg/m^3
CADMIUM	0.01 mg/m^3 (Total) 0.002 mg/m^3 (Respirable)	
CARBON DIOXIDE	5000 ppm	30,000ppm
CARBON DISULPHIDE	1 ppm	10 ppm STEL 30 ppm Ceiling
CARBON MONOXIDE	25 ppm	125 ppm
CHLORINE DIOXIDE	0.1 ppm	0.3 ppm
CHROMIUM III	0.5 mg/m^3 (Total) 0.003 mg/m^3 (Inhalable)[8]	
CHROMIUM VI	0.005 mg/m^3 (Total) 0.0002 mg/m^3 (Inhalable)	
COBALT AND COBALT COMPOUNDS	0.02 mg/m^3 (Total) 0.02 mg/m^3 (Inhalable)	
COPPER FUME	0.1 mg/m^3	
DIETHANOLAMINE	2 mg/m^3	
DIMETHYL DISULPHIDE	0.5 ppm	
DIMETHYL SULPHIDE	10 ppm	
D-LIMONENE	30 ppm	
ETHANOL	1000 ppm	1000 ppm
ETHYL BENZENE	20 ppm	
ETHYL MERCAPTAN	0.5 ppm	
ETHYLENE GLYCOL	100 mg/m^3	
FLOUR DUST - INHALABLE	0.5 mg/m^3	
FORMALDEHYDE	0.1 ppm	0.3 ppm
GASOLINE	300 ppm	500 ppm
GASOLINE ENHANCED (ALCOHOL)	300 ppm	500 ppm

Agent	8 Hour TWA[(1)]	STEL[(2)]
GRAIN DUST	4 mg/m^3	
HEXANE (including n-HEXANE)	500 ppm	
HYDROCHLORIC ACID		2 ppm Ceiling
HYDROFLORIC ACID	0.5 ppm	2 ppm Ceiling
HYDROGEN PEROXIDE	1 ppm	
HYDROGEN SULPHIDE	10 ppm	15 ppm STEL 10 ppm Ceiling
IRON OXIDE	5 mg/m^3	
KEROSENE (PETROLEUM)	200 mg/m^3	
LEAD INORGANIC	0.05 mg/m^3	
LIQUIFIED PETROLEUM GAS	1000 ppm	1200 ppm
MANGANESE	0.2 mg/m^3 (Total) 0.02 mg/m^3 (Respirable)	
METHANOL	200 ppm	250 ppm STEL
METHYL MERCAPTAN	0.5 ppm	
MOLYBDENUM	10 mg/m^3 (Total) 3 mg/m^3 (Respirable)	
MONOETHANOLAMINE	3 ppm	6 ppm
NAPHTHALENE	10 ppm	
NICKEL (Elemental)	1.5 mg/m^3 (Inhalable)	
NICKEL (Soluble inorganic compounds)	0.1 mg/m3 (Inhalable)	
NICKEL (Insoluble inorganic)	0.2 mg/m^3 (Inhalable)	
NOISE LEVEL (LEQ)	85 dBA	
NOISE LEVEL (LEX)	85 dBA	
NOISE LEVEL (PROJECTED PERCENT DOSE)	100%	
OIL MIST	5 mg/m^3	10 mg/m^3
PROPYL MERCAPTAN		0.5 ppm
REFRACTORY CERAMIC FIBRES	0.2 f/cc	
RESPIRABLE - PARTICULATE NOT OTHERWISE CLASSIFIED	3 mg/m^3	
SILICA - CRISTOBALITE	0.025 mg/m^3 (Respirable)	
SILICA - QUARTZ	0.025 mg/m^3 (Respirable)	
STODDARD SOLVENT	100 PPM	
SULPHUR DIOXIDE	2 ppm	5 PPM
TITANIUM DIOXIDE	10 mg/m^3 (Total) 3 mg/m^3 (Respirable)	
TOLUENE	20 ppm	
TOLUENE -2,4-DIISOCYANATE	0.005 PPM	
TOTAL - PARTICULATE NOT OTHERWISE CLASSIFIED	10 mg/m^3	
TRICHLOROETHYLENE	10 ppm	25 ppm

Agent	8 Hour TWA(1)	STEL(2)
TRIETHANOLAMINE	5 mg/m^3	
TVOC - GASOLINE	300 ppm	500 ppm
VANADIUM	0.05 mg/m^3 (all fractions)	
XYLENE	100 ppm	150 ppm
ZINC OXIDE	2 mg/m^3 (Respirable)	10 mg/m^3 (Respirable)

Notes:

(1) TWA - Time Weighted Average
(2) STEL – Short Term Exposure Limit
(3) ppm – Parts Per Million
(4) mg/m^3 – milligrams per meter cubed
(5) Respirable –the fraction of inhaled airborne particles that can deposit in the gas exchange region of the lungs and have an aerodynamic diameter less than 4.0 um
(6) f/cc – fibers per cubic centimeter
(7) Total – All airborne particulate matter with an upper size limit of approximately 100 um aerodynamic diameter
(8) Inhalable – The size fraction of airborne particulate matter that can enter the respiratory system through the nose and mouth and are hazardous when deposited anywhere in the respiratory tract that have an aerodynamic diameter of less than 100 um