

## Hot Work Practice

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## 1.0 Purpose

This practice describes the minimum requirements for the management of work when an ignition source is introduced into the work area.

## 2.0 Scope

The practice is designed with the intent to meet the governing regulations and to be used as a resource to support development of site/situation specific hot work procedures. This practice applies to all workers conducting hot work on behalf of Cenovus.

## 3.0 Process Requirements

**Hot work** means work in which a flame is used, or sparks or other sources of ignition may be produced, including:

- Cutting, welding, burning, air gouging, riveting, drilling, grinding, and chipping
- Using electrical equipment not classified for use in a hazardous location
- Introducing a combustion engine to a work process

### 3.1 Planning

Hot work planning includes the identification of hazards, conducting a hazard assessment specific to the hot work task being performed, and determining the controls necessary to eliminate or mitigate the potential hazards.

The following **must** be considered prior to starting any hot work:

1. The presence of a flammable substance that is, or may be, in equipment or in the atmosphere of the work area, including adjacent work areas
  - the permit issuer will decide if a written fire and explosion prevention plan is required based on the level of risk
2. The presence of a flammable substance or its residue that is, or may be, stored, handled, processed or used in the work area or equipment
  - potential fire hazards may exist when handling substances such as pyrophoric or reactive materials and flammable or combustible hydrocarbon liquids
3. The flammable or noxious gases that may be released by hot work (e.g. welding, steaming) may release a flammable or noxious gas
4. The fire and explosion hazards listed on the material safety data sheet (MSDS) for the product(s) that may be found in the work area

- the permit issuer will decide if a fire watch is required depending on the risks associated with the work, or if a <10% lower explosion limit (LEL) cannot be assured or maintained

### **3.1.1 Hazard Controls**

The permit issuer must be able to determine and apply the appropriate hazard controls needed to mitigate worker risk.

### **3.1.2 Hazardous Locations and Classification of Worksites**

Prior to issuing the safe work permit, the permit issuer will check with the facility manager and/or worksite supervisor to:

1. Identify all hazardous locations near the work area
2. Identify the boundaries of the hazardous areas
3. Review the facility/worksite documents and approved site specific procedures

## **3.2 Pre-Job Safety Meeting**

Prior to any hot work activity, a pre-job safety meeting must be held between all parties directly involved and/or affected by the hot work activity. The safety meeting should include:

1. Reviewing and discussing all hazards, hazard controls, conditions, and restrictions recorded on the hazard assessment with workers prior to starting the hot work
2. Discussing all aspects of the job, the operating practices required to complete the work, and each worker's job responsibilities and duties
3. Assessing impact on and from adjacent operations
4. Reviewing fire and explosion prevention controls and equipment requirements
5. Discussing emergency and rescue-response procedures, roles and responsibilities

## **3.3 Hot Work Safe Work Permit**

A hot work safe work permit must be prepared and issued whenever it is necessary to use tools or perform tasks that could cause the ignition or release of explosive or flammable gas mixtures and substances.

### **Specific conditions related to the permit include:**

1. The permit must be readily available to all workers
2. Attachments for confined space entry, ground disturbance, or respiratory protection may be required, depending on location and type of hot work
3. Atmospheric testing must be completed and the results recorded on the permit

Documentation for hot work does not have to be completed at the site of the hot work providing that the conditions of the hot work safe work permit can be satisfied.

### 3.4 Atmospheric Testing and Monitoring

An initial LEL gas test must be conducted by a competent person and the results recorded on the hot work safe work permit.

1. First, test the oxygen content as most combustible gas monitors are oxygen-dependent and will not provide reliable readings in an oxygen-deficient atmosphere.

Note: Check the manufacturer’s specifications, as some monitors require the oxygen content to be greater than 16% to function correctly.

2. Atmospheric testing must take place in close proximity to where the work is to be conducted. Concentrate on areas of the process where sources of flammable gas are known to exist (e.g. sewers, process flanges, hydrocarbon storage, natural gas powered instrumentation, drains, sample points, load stations).
3. Wind direction and strength can affect the accuracy of a gas test.
4. Hot work can only proceed if the gas tests clearly indicate less than 10% LEL, including the minimum ignitable concentration for dust.
5. Recommended best practice is to reduce LEL levels to 0% or as low as reasonably possible. Workers **must** wear respiratory protection if less than 10% LEL cannot be assured or maintained.
6. Hot work is not to be done in atmospheres that exceed a concentration of 10% LEL.
7. Continuous atmospheric monitoring is required for all hot work. Depending upon the work scope and hazard assessment, a four-head personal monitor (passive monitor) may be deemed acceptable for continuous monitoring, or an active monitor may be required. All monitors must be placed between the hot work and the potential fuel source, and set to alarm at a 10% LEL or less.

**Note: For hot work within a confined space, a personal gas monitor is not considered adequate for continuous monitoring.**

8. Worker exposure to any substance listed within the occupational health and safety legislation must be kept as low as reasonably achievable and must **not** exceed its occupational exposure limit.

### 3.5 Designated Safe Areas

It is important to note that the determination of a designated safe area(s) must be done in conjunction with other site information including:

- Lease layout, noting trenches and other low-lying areas where hydrocarbon accumulation may occur

- The nature of the hydrocarbons, lighter or heavier than air
- Ambient conditions
- Potential to create a hazardous atmosphere resulting from hot work in a designated safe area
- Known sources of hydrocarbons (e.g. vents, tanks)
- A safe area at a minimum distance of 25 metres from any source of hydrocarbons

The work site supervisor may designate a safe area for hot work, such as welding and cutting, without gas testing and safe work permitting providing the requirements of Section 3.5 are met and that the work will not create a hazardous atmosphere.

### **3.5.1 Designated Safe Area Identification**

The identification of a designated safe area must be conducted in a manner that clearly identifies a safe area on the worksite. The identification may include the use of signage, fencing, or a combination of both.

The access to a designated safe area may also be controlled to minimize the potential for hazards being inadvertently introduced into the safe area. If an unidentified hazard is introduced into the designated safe area, any work being conducted should be stopped and a hazard assessment completed.

### **3.5.2 Portable Electrical Equipment**

At a minimum, portable electrical equipment not classified for use in a hazardous location must be used outside of hazardous locations or must be treated and permitted as hot work. Further restrictions for use shall be detailed in site specific procedures.

### **3.5.3 Smoking**

Smoking is only allowed in designated safe areas for smoking and/or in areas a minimum of 25 metres away from sources of hydrocarbons and production, drilling or well-servicing operations or equipment.

### **3.5.4 Introducing a Vehicle to a Work Process**

All vehicles powered by an internal combustion engine must be operated outside of hazardous location boundaries, or be permitted as hot work. Staff should reference the hazardous location map and/or hazard assessment to determine the safe work distances. For example, some worksites may be of low risk and allow for a distance of 3.0 metres to be maintained, while other worksites may have a higher risk (e.g. diluents) and may require a distance of 7.5 metres or greater to be maintained.

### 3.5.5 Positive Air Shut Off (PASO)

The use of a positive air shut off, automatic or manual, is a common mitigation to the risk of an engine over-speed event. However, depending upon the hazard assessment and work scope, other mitigation techniques can be used. Some examples include staging the vehicle 25 metres away from any hydrocarbon source, plumbing the engine air intake 25 metres away from any hydrocarbon source, or having a nitrogen supply bottle immediately available for spraying into the air intake during an engine over-speed event.

### 3.5.6 Flame-type Equipment

All flame-type equipment used within 25 metres of a hydrocarbon source must be treated and permitted as hot work unless executed in a designated safe area.

## 3.6 Energy Isolation

Prior to conducting hot work in a hot work zone, all hazards including electrical, gas, liquid, free-flowing solid material and rotating equipment shall have adequate controls in place. Examples include the following:

- Blanking and blinding
- Double-block and bleed systems
- Lockout and tagout
- Partitions and barriers around combustible materials
- Disconnecting mechanical and electrical sources and interlocking systems

For more information on energy isolation, see CEN-EHS103, Energy Isolation Practice.

## 3.7 Hot Work with Piles

In certain circumstances, hydrocarbon gases can become trapped in steel piles thus creating potential fire and/or explosion hazards.

When performing hot work with piles, it is recommended to use the following hazard control measures:

- Ensure all new piles are notched prior to the installation of a top plate so that any trapped gases are vented. The same notch can be used to monitor the presence of trapped gases.
- Prior to performing any work (e.g. drilling, welding) on existing piles, use a probe-style gas monitor to ensure there are no gases present in the piles.
- Use a pneumatic drill, instead of an electric drill, as it is less likely to be an ignition source.
- Use cutting oil to reduce the heat transferred to the drill bit.

- When working on a pile in which the presence of trapped gases cannot be confirmed, follow the hot work hazard precautions.

### 3.8 Emergency Preparedness and Response

Ensure that all emergency response plans are in place and available.

Those who may be required to participate in a rescue must have their emergency response competency and qualifications previously established.

### 3.9 Record of Work

All written hot work documentation must be maintained for a minimum of two years. For more information, see Cenovus Records Classification & Retention Schedule.

## 4.0 Roles and Responsibilities

Roles and responsibilities for safety documents are described in CEN-EHS234, Roles and Responsibilities Standard.

Role	Description
Business Leaders and Frontline Supervisors	<ul style="list-style-type: none"> <li>• Communicate and implement this practice at their operations or functional areas of authority</li> <li>• Demonstrate ownership and leadership by actively setting a positive example</li> <li>• Allocate and make available the necessary financial and human resources that are required to functionally implement this document</li> <li>• Confirm all workers are aware of their roles and responsibilities outlined in the process requirements section of this document</li> <li>• Confirm workers are trained, knowledgeable, experienced and competent on this subject</li> <li>• Coach and correct workers who do not understand or comply with the requirements of this document</li> <li>• Provide feedback to the document owner or representative concerning proposed changes or improvements to this document</li> </ul>
Operations Health & Safety Field Teams	<ul style="list-style-type: none"> <li>• Conduct worksite observations and assessments on a regular basis to verify compliance with the expectations described in this document</li> <li>• Assist with the implementation and communication of the documented requirements</li> <li>• Provide feedback to the document owner or representative concerning proposed changes or improvements to this document</li> </ul>

Role	Description
Central Health & Safety Services	<ul style="list-style-type: none"> <li>• Monitor and collect feedback related to this document to verify program effectiveness</li> <li>• Lead document reviews and revisions as per the expectations described in this document</li> <li>• Provide subject matter expertise when requested by Business Leaders or other functional teams</li> </ul>
Assurance Teams (COMS Assurance and EHSR Compliance Audit)	<ul style="list-style-type: none"> <li>• Lead, organize and conduct audits to verify compliance, identify gaps and suggest improvement opportunities</li> </ul>
Business Support Teams	<ul style="list-style-type: none"> <li>• Provide subject matter expertise when requested by Business Leaders or other functional teams</li> </ul>
Service Providers	<ul style="list-style-type: none"> <li>• Comply with the Cenovus hot work requirements and all applicable expectations related to the work, which include but not limited to: confined space entry, safe work permitting system, hazard assessments and controls, and atmospheric monitoring</li> <li>• If required, develop and implement a hot work practice and procedures that satisfy company-specific operational needs and align with the minimum requirements set forth in this document</li> </ul>

## 5.0 Training and Competency

Competency describes the knowledge and skills required to successfully perform the technical aspects of a job. A worker must be able to demonstrate competency in safely performing work tasks or using equipment.

### 5.1 Training

Personnel conducting hot work in a hot work zone must demonstrate competency in the following:

- Cenovus Safe work permit
- Risk management
- Portable, fixed-gas detection equipment used for samples and tests
- Emergency preparedness and response

## 6.0 Quality Assurance

### 6.1 Performance Measurement

Compliance with this practice and program effectiveness shall be assessed through program assessments and internal audits, or other measurement criteria as specified in the COMS Assurance Standard.

Business functions or departments impacted by this practice must include compliance and program effectiveness verifications in their business assurance

program. Performance will be monitored and reported within the responsible departments at least every three years.

## 6.2 Management of Change

The document owner will complete and document reviews of this practice as follows:

- at minimum once every three years
- if there is a significant regulation or industry best practice change that indicates the need for review
- if an incident investigation indicates the causes were related to unclear or inadequate written instructions described within this document

If frequent and multiple variances are required due to operational needs, the reason(s) will be investigated and the document owner will determine if there is a business need to update this document.

If submitted MOC requests indicate gaps or significant improvement opportunities, the document owner will determine if there is a business need to update this document.

Proposed changes to this practice can be directed to H&S Programs and Projects.

## 7.0 Glossary

Definitions and acronyms for safety documents are described in CEN-EHS243, Definitions and Acronyms.

The following definitions and acronyms are specific to this document.

Table 1: Terms and Definitions

Term	Definition
Active monitor	A gas detection monitor that uses a mechanical action (via a pump or a fan) to draw air into the sensors.
Atmospheric testing	Tests to determine the presence and concentrations of atmospheric hazardous substances.
Designated safe area	An area that has been evaluated and deemed to be safe from all hazards and risks associated with a job task.
Engine over-speed	An engine that has gone out of control due to the inhalation of combustible gases or fumes, which, as a result, caused the engine to run at a very high speed until it reached the point of self-destruction. This can ignite surrounding combustible gases or fumes and/or cause personal injury.
Fire watch	A dedicated person or persons whose sole responsibility it is to look for, and respond to, any fires within an established work area.
Flammable atmosphere	An atmosphere which exceeds the mixture percentages of the lower explosive limit (LEL) of a flammable gas or vapour, which may be ignited or cause an explosion.

Term	Definition
Flame-type equipment	Electric or fired heating equipment using an open flame, electrical arc or element and including a space heater, torch, heated process vessel, boiler, electric arc or open flame welder, or an open element electrical heater or appliance.
Hazardous location	A place where fire or explosion hazards may exist due to flammable gases or vapours, flammable or combustible liquids, combustible dust or ignitable materials as described in the Canadian Electrical Code.
Hot Work Zone	The area where a potential ignition source and an explosive or flammable product may be present simultaneously.
Inert(ing)	Displacing the atmosphere with an inert gas to the extent that the atmosphere is not combustible.
Lower Explosive Limit (LEL)	The lowest concentration of air to gas, vapour, dust, or any combination of these three, at ambient temperatures, which may be ignited or cause an explosion.
Occupational Exposure Limit (OEL)	The exposure limit as specified by provincial occupational chemical regulation (OH&S).
Oxygen Deficient Atmosphere	An atmosphere where the oxygen content is less than 19.5% oxygen by volume.
Particulate Contaminants	Dusts, fibres or mists suspended in air that may be explosive, flammable or inhaled.
Portable Instrumentation	Usually hand-held instruments used to test an atmosphere by electronic or chemical means for flammability, toxicity, oxygen content, or particulate contaminant.
Passive monitor	A gas monitor that relies on diffusion or air movement.
Pyrophoric	A substance that will ignite spontaneously in air (e.g. iron sulfide).
Transient vapours	Combustible gases or vapours capable of migrating from their source via air movement.

## 8.0 References

### 8.1 External Documents

Table 2: External Document References

Document Type	Document Title
Canadian Safety Association	<a href="#">W117.2-060 (R2007) – Safety in welding, cutting and allied processes</a>
Enform	<a href="#">IRP 18 – Fire and explosion hazard management</a>
Regulatory	<a href="#">Alberta OH&amp;S Code (2009) – Part 2 and Part 10</a>
Regulatory	<a href="#">Saskatchewan OH&amp;S Regulation – Part III and Part XXV</a>
Regulatory	<a href="#">Alberta Oil and Gas Conservation Regulations 151/71</a>

Document Type	Document Title
Regulatory	Canadian Electrical Code

## 8.2 Internal Documents

Table 3: Internal Document References

Document Type	Document Title
Policy	<a href="#">Corporate Responsibility Policy</a>
Framework	<a href="#">Cenovus Operations Management System (COMS)</a>
Policy	<a href="#">Enterprise Risk Management Policy</a>
CEN-EHS019	<a href="#">Hazard Assessment and Control Practice</a>
CEN-EHS022	<a href="#">EH&amp;S/Operations Risk Management Practice</a>
CEN-EHS039	<a href="#">Fire Explosion Hazard Management Practice</a>
CEN-EHS103	<a href="#">Energy Isolation Practice</a>
CEN-EHS090	<a href="#">Gas Detection Practice</a>
CEN-EHS010	<a href="#">Respiratory Protection Code of Practice</a>
CENPM020	<a href="#">Electrical Safety Program</a>
CEN-EHS243	<a href="#">Definitions and Acronyms</a>
CEN753	<a href="#">Safe Work Permit with Record of Safety Meeting and Hazard Assessment</a>

### Appendix A: Worksite Preparation Checklist

Prior to starting any hot work, use this checklist as a reminder to prepare the work area accordingly.

1. Clean up and remove all flammable or combustible materials and liquids	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Ensure all combustible materials (including lower levels) are removed or suitably isolated from the work area. <b>Note:</b> Where it is not feasible to remove all combustible materials or equipment from under or beside the work area where sparks or slag may land, these areas must be covered with welding blankets or tarps, and the area must be continuously monitored by the safety watch for a potential fire.	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Ensure fire-retardant tarps are used where there is danger of sparks being carried outside or below the work area. This applies particularly to work in elevated positions. Tarps should be kept damp if the heat is intensive.	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Ensure oily surfaces and spills are cleaned, hosed down, and sanded over.	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. If pyrophoric materials (e.g. iron sulphide) are involved in a process, or if they may be encountered in the job performed, keep the materials wet until they are properly disposed. This will prevent these materials from igniting and potentially igniting other flammable materials.	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Ensure covers are tight and seal all containers that cannot be relocated.	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. Cover manholes and other sewer connections.	<input type="checkbox"/> Yes <input type="checkbox"/> No
8. Flush catch basins and drains with water before covering them.	<input type="checkbox"/> Yes <input type="checkbox"/> No
9. Ensure all open sumps are pumped out and securely covered in a manner that will prevent the entry of hot sparks or slag. In addition, protect production equipment that is in close proximity to sparks and slag.	<input type="checkbox"/> Yes <input type="checkbox"/> No
10. Plug sump vents to prevent the escape of gases.	<input type="checkbox"/> Yes <input type="checkbox"/> No
11. Do not assume valves are leak proof. Bleeder valves on pumps, lines and vessels must be plugged off when they contain combustibles.	<input type="checkbox"/> Yes <input type="checkbox"/> No
12. Ensure the equipment is adequately grounded and bonded to prevent ignition by static electricity.	<input type="checkbox"/> Yes <input type="checkbox"/> No
13. If welding, cutting, or brazing is being conducted in an area near other workers, erect a curtain or barrier.	<input type="checkbox"/> Yes <input type="checkbox"/> No
14. Never locate welding machines or gas cylinders within the hot work area. Access for removal in an emergency must be maintained.	<input type="checkbox"/> Yes <input type="checkbox"/> No
15. Ensure welding equipment is in good condition. Splices or joints in cables must be properly made, insulated, and inspected. Inspect the connections to cylinders.	<input type="checkbox"/> Yes <input type="checkbox"/> No
16. Monitor the expansion of air or gas in equipment adjacent to the hot work zone (e.g. crude oil tanks).	<input type="checkbox"/> Yes <input type="checkbox"/> No
17. Ensure walkways, ladders and other approaches to the area are accessible and free from obstruction.	<input type="checkbox"/> Yes <input type="checkbox"/> No
18. Check all fire-fighting and rescue equipment in the work area to ensure it is in good condition and operating correctly and is readily available to the Safety Watch, if required.	<input type="checkbox"/> Yes <input type="checkbox"/> No