

	GAS DETECTION ALL-HSE-PRC--170		Retention Code: <i>CG01</i>
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1.0 Scope

The Gas Detection procedure covers the use of personal, portable continuous and tube-type gas detectors on ConocoPhillips Canada (CPC) locations. Fixed gas detection equipment is not included in the scope of this document and is contained within fixed combustible gas, H₂S and fire detection specifications for each business unit.

2.0 Hazards

- Toxic gas
- Fire
- Explosion
- Oxygen deficient or enriched atmosphere
- Improperly calibrated equipment

3.0 Roles and Responsibilities

3.1. Supervisors

- Ensure adequate gas detection equipment is available at the worksite.
- Provide employees with training in the use and maintenance of gas detection equipment.
- Regularly review function test and calibration records to verify compliance with this process.

3.2. Workers

- Properly select and use gas detection equipment according to the task hazards.
- Use and maintain the gas detection equipment in accordance with this process and the applicable manufacturer's instructions.

4.0 Safe Operating Practices

4.1. Approved Equipment

- Approved gas detection devices include personal gas detectors, portable continuous gas detectors and tube-type detectors.
 - Personal gas detection devices must not be used for operations requiring portable continuous gas detection devices.
 - Equipment designed and engineered to be attached to a personal monitor converting the detector to an aspirated, continuous detector will be deemed acceptable if used in accordance with the manufacturer's directions.
 - The attachment must be used with a separate personal gas detection device from those being used by the workers.

- Portable continuous gas detection devices must be able to provide continuous atmospheric readings and are mandatory in the following circumstances at a minimum:
 - Confined space entry.
 - Hot work (as specified in CPC’s hot work procedure (ALL-HSE-PRC-175))
 - Purging.
 - Other situations as determined by site-specific operating procedures or hazard assessments.
- Tube-type detectors may only be used for confirming gas concentrations and not for ongoing monitoring.
 - Detector tubes only provide an approximate measure of gas concentrations.
 - Readings may take up to one minute to register.
 - Accuracy of tubes is $\pm 25\%$ of the indicated reading.

4.2. Sensors and Set Points

- Personal gas detectors must be equipped with the following sensors:
 - Combustible gases - Lower Explosive Limit (LEL)
 - Oxygen (O₂)
 - Hydrogen sulphide (H₂S)
 - Carbon monoxide (CO)
- Portable continuous gas detection devices must be equipped with the appropriate sensors for the activities being completed.
- Personal gas detectors alarm settings must be set using the table below.

	LEL	O ₂	H ₂ S	CO
Low Alarm	10	19.5	10	25
High Alarm	20	23	15	200

Note: In British Columbia, Low and High H₂S settings must be set to 10 ppm

- Personal gas detectors must **not** be utilized to determine or measure personnel exposure. Time weighted average (TWA) and short-term exposure limit (STEL) settings and alarms, if available on instruments, must not be utilized.

4.3. Bump Testing (Function Testing)

- To assure functionality, personal and portable continuous gas detectors must be bump tested (function tested) prior to each day’s use in accordance with the manufacturer instructions.
- Retain all bump test records in accordance with the record retention guidelines. Records may be kept in electronic or paper formats.
- Personal and portable continuous gas detectors must also be bump tested as soon as is reasonably practicable in the following circumstances:
 - An exposure causes the detector to alarm.
 - The detector is dropped or exposed to a physical shock.

4.4. Calibration

- Calibrate gas detectors as per manufacturer's specifications, with a frequency not exceeding 90 days.
- Retain all calibration records in accordance with the record retention guidelines. Records may be kept in electronic or paper formats.
- Personal and portable continuous gas detectors must also be calibrated in the following circumstances:
 - An over-range occurs on a sensor.
 - The detector fails a bump test.
 - The monitor is exposed to liquids or condensation.
- Any gas detection device that fails a calibration test or is found to be otherwise defective is to be tagged as out of service and repaired prior to being returned to service.

4.5. Equipment Usage

Note: Most detectors are oxygen-dependent and will not provide reliable readings in an oxygen-deficient atmosphere. Check the manufacturer's specifications as some detectors require the oxygen content to be greater than 16 percent to function correctly.

Note: Ensure that the gas detector used has the appropriate sensors installed for the products being tested and the proper gas was used for the calibration and function tests.

Note: Self-contained breathing apparatus (SCBA) or supplied-air breathing apparatus (SABA) must be worn when determining H₂S concentrations or when measuring unknown atmospheres.

- Personal gas detectors must be worn by all workers on CPC locations, except in the following circumstances:
 - Where a crew of more than one worker is working together in close proximity to each other on a single sweet location deemed safe and recorded on a site-specific hazard assessment, at least one personal gas detector must be available to the crew (e.g., labour crews, casing cementers and wireline loggers, etc.).
 - Where a lease has been fully abandoned with no surface facilities remaining.
 - Drilling and completions rig personnel may work without personal monitors provided continuous monitoring is used on the rig floor, substructure, and mud tanks.
- Wear personal gas detectors near the worker's breathing zone on the outer layer of clothing with the sensors facing outwards. Detectors may be worn within mesh pockets if they are within the breathing zone and do not hinder airflow to the monitor sensors.
- Prior to proceeding with work or building entry, verify non-hazardous atmospheric conditions by following work site entry procedures.
 - Under normal operating conditions, it is not expected that combustible or toxic gases are present in detectable concentrations. In these conditions, one may use a personal gas detector to verify the absence of combustible or toxic gas (LEL, H₂S, CO, and O₂).

- Where portable continuous gas monitoring is required, the necessary equipment and atmospheric testing requirements (i.e., interval or continuous) must be identified on the hazard assessment. Prior to starting work and at the identified frequencies, the readings must be recorded on the hazard assessment.
 - Record all atmospheric readings on the file copy of the hazard assessment for audit purposes.
- When a monitor goes into alarm, it is indicating there may be a dangerous environment present.
 - The wearer must ensure the work area is evacuated immediately and in a safe manner.
 - Work must not continue in the area until the source of the alarm has been identified and controlled.
- Several cleaners, solvents and lubricants can contaminate and potentially cause permanent damage to the sensors. See Appendix A – for a listing of common products to avoid when utilizing gas detection equipment.

5.0 Document Retention

Records must be retained in accordance with ConocoPhillips' Document Retention Schedule.

Record	Owner	Classification	Retention
Bump Testing and Calibration Records	Field Leadership	EF04	Disposition of Equipment + 10 yrs

Appendix A – Products Causing Potential Sensor Damage

The following table lists products that should not be used in close proximity to the sensors due to the potential for sensor contamination.

Cleaners and Lubricants	Silicones	Aerosols
<ul style="list-style-type: none"> Alcohol based cleaners Anionic detergents Brake cleaners Citrus based cleaners Dish soaps Hand sanitizers Lubricants Methanol Rust inhibitors Window and glass cleaners 	<ul style="list-style-type: none"> Hand/body and medicinal creams that contain silicone Mold releasing agents Polishes Silicone based adhesives, sealants and gels Silicone cleaners and protectants Tissue containing silicone 	<ul style="list-style-type: none"> Bug repellents and sprays Lubricants Rust inhibitors Window cleaners

Appendix B – Definitions

Breathing Zone	An imaginary hemisphere forward of the shoulders with a radius of approximately 6-9 inches.
Personal Gas Detector	Also called a personal gas monitor. A compact four-head (LEL, O ₂ , H ₂ S and CO) detection device designed to be attached to and worn on the exterior of the clothing of an individual. It is intended to provide a last line of defense warning to individuals of imminent danger. This device is to remain affixed to the individuals clothing continuously while occupying any hazardous area.
Portable Continuous Gas Detection Device	Also called a portable gas monitor. An electronic aspirated hand-held device designed to be carried and used for continuous atmospheric monitoring of potentially hazardous atmospheres. These devices are configured according to the task being undertaken. Unlike the personal gas detectors, they are not designed to be affixed to an individual's clothing.
Tube-Type Gas Detection Device	These are bellows-type pumps that draw a known volume of air across tubes containing treated adsorbent granules that react with a specific compound or group of compounds, causing the adsorbent to change color. After sampling, the length of adsorbent bed that has undergone the color change is measured from a scale printed on the tube.

Appendix C – Revision Record

Page#	October 15, 2013	Previous Information	Risk Assessment
All	Document format revision	None	Low Readability
2	<p>Changed requirements for bump/function testing “To assure functionality, personal and continuous gas detectors must be bump tested (function tested) prior to each day’s use in accordance with the manufacturer instructions.</p> <ul style="list-style-type: none"> Personal and continuous gas detectors must also be function tested in the following circumstances: <ul style="list-style-type: none"> An exposure causes the detector to alarm. The detector is dropped or exposed to a physical shock. 	To assure functionality, personal monitors must be bump tested (function tested) a minimum of once per shift rotation with the results documented and retained on file for audit purposes. Personal gas detection monitors will also be function tested if “over ranged”.	Low Manufacturer and CSA requirements.
4	Added information regarding sensor poisoning.	None	Low Additional information provided regarding materials that can potentially poison sensors.
Various	Clarified information and removed redundant information contained in other controlled documents.		Low Clarity and readability.