Chevron Products

Portable Gas Detection Standard

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Version 1.1

Portable Gas Detection Standard

1.0 Introduction

Portable Gas Detection requirements are designed to help prevent personnel from potential exposure or injury, property damage or adverse environmental impact from hazardous atmospheres that may exist in the workplace.

This standard defines the Global Products requirements for Portable Gas Detection instruments and equipment.

Occupational hygiene sampling and exposure monitoring are not included in this standard.

Note

This standard does not address:

- Occupational hygiene exposure monitoring
- The use of portable gas detection equipment as personal protection equipment (PPE) for the purpose of alerting wearers of a potential hazardous atmosphere
- Fixed gas detection/monitoring equipment

2.0 Requirements

1. The conditions under which Portable Gas Detection and personal gas monitors are to be used are as follows.
2. Gas testing shall be required when there is a potential for any hazardous working atmosphere, including oxygen deficient or enriched environments, flammable/explosive conditions, immediately dangerous to life or health (IDLH) atmospheres, or toxic atmospheres above permissible exposure limits.
3. Portable gas testing must be performed and evaluated by a Qualified Gas Tester (QGT) or by a person under training, in the presence of a Qualified Gas Tester.
    a. Only a QGT may perform initial, renewal and revalidation gas testing for permit clearance
    b. A Competent Gas Monitor (CGM) may perform only continuous gas monitoring
4. Gas testing shall be performed where there is a risk of a potentially hazardous atmosphere including, but not limited to the following activities:
    a. Hot work
    b. Confined space entry
    c. Isolation of hazardous energy activities as predetermined by the Hazard Analysis.
    d. Excavation and trenching
    e. Emergency response (e.g. leaks, spills, etc.)
    f. Process and production operations, handling or storage of hazardous materials or cargo (e.g., manufacturing facilities, drilling and productions facilities, storage tanks, ships/shipyards, tank cars, hazardous waste sites).
    g. Other activities or conditions as defined by the reporting unit/facility.

Note: Gas testing shall be conducted using active gas testing/monitoring equipment for initial, follow-up, and revalidation gas testing. Personal passive gas monitors must not be used for

initial, renewal and revalidation gas monitoring purposes. They are only designed for personal alarm purposes.

5. Gases must be tested in the following order:
    a. Oxygen content (i.e., % O_2)
    b. Flammable/explosive gases and vapors (i.e., %Lower Explosive Level (LEL))
    c. Toxic gases and vapors (e.g., hydrogen sulfide (H_2S), benzene).

6. Acceptable criteria for gas testing results (e.g., %LEL, %oxygen, and permissible exposure limits of other gases) shall be described and conform to applicable legal requirements, as well as Chevron standards and/or accepted best practices. Appropriate controls (e.g., engineering, administrative or PPE) must be used to control exposures consistent with gas testing results.

    The following atmospheric conditions / limitations apply:
    a. Oxygen outside of 19.5% to 23.5%. Work in environments less than 19.5% O_2 must only be conducted by specially trained personnel or contractors in conformance with all COEM requirements.
    b. LEL must not exceed 5% (0% for hot work)
    c. IDLH & Ceiling limits referenced from applicable regulatory and Chevron Occupational Exposure Standards (see The Chevron Occupational Exposure Standards Committee SharePoint site)

7. Work shall not commence until gas testing results are within acceptable criteria defined above. Gas testing results (e.g., initial, follow-up, revalidation) shall be documented in accordance with the Work Authorization Standard.

8. Gas testing shall be permitted and managed in accordance with the applicable Global Products Work Authorization Standard and/or other applicable Control of Work standard requirements (e.g., Hot Work, Confined Space Entry, Excavation, & Isolation of Hazardous Enegry).

9. Confined Space gas testing requirements:
    a. Gas tests for approving entry must be performed by a Qualified Gas Tester.
        i. Gas tests for Confined Space Entry must document a Lower Explosive Limit (%LEL) of < 5% before approval is allowed.
        ii. Confined space entry must occur no more than 30-minutes after the QGT has tested the area and cleared it for entry, except if continuous gas monitoring is in place.
    b. Continuous gas testing is also required for confined space entry, in addition to initial, renewal and revalidation testing. Continuous gas monitoring shall be conducted by a Competent Gas Monitor (CGM) or QGT.
        i. Sites may designate and document circumstances where continuous gas monitoring may be waived due to risk of damage to the equipment (e.g., excessively dusty conditions, water mist) or required monitoring is ineffective, providing that periodic gas testing frequencies are defined appropriate for the risk.
    c. An extension wand or tubing must be used to sample as far into the space as possible without making entry. Special consideration must be given to sample all levels of the space to account for atmospheric stratification.
    d. When the entire confined space cannot be sampled using an extension wand or tubing, the QGT must enter the space wearing a supplied air breathing apparatus to gas test the space.
        i. The QGT must have a confined space entry permit / certificate (issued specifically for gas testing) in accordance with the Global Products Work Authorization and Confined Space Entry Standard.

e. For spaces requiring continuous ventilation, the ventilation system must be shut down for a minimum of 15 minutes prior to conducting initial gas testing of confined spaces.
   i. The ventilation system must be returned to service upon completion of the gas test and must never be stopped while workers are inside the confined space.

10. Excavation and trenching gas testing requirements:
   a. Gas testing must be performed within 30-minutes of work commencing for all excavations by a Qualified Gas Tester (QGT) upon detection of:
      i. Unexpected odors (e.g., exhaust fumes, H_2S odors, etc.).
      ii. Unexpected subsurface structures (e.g., pipelines, drums, tanks, etc.).
      iii. Unexpected leaks, releases, seeps or discharges of vapors or liquids (including water).
   b. The QGT will determine the frequency for follow-up gas testing based on the potential hazards identified and will document this on the Permit to Work. (A Competent Gas Monitor may be designated for follow-up gas testing).
   c. Excavations deeper than 4-feet (1.2 meters) are defined as confined spaces and must conform to the gas testing requirements above.

11. Hot Work gas testing requirements:
   a. Initial and revalidation gas testing must be performed by a Qualified Gas Tester (QGT) after the work site and equipment have been isolated and prepared per the requirements in the Global Products Hot Work Standard.
   b. Gas testing, when required, must encompass an area of 50 feet (15 meters) around the work location where flammable materials have a potential to impact the hot work such as sumps, drains, liquid boots, flanges, valves, pump seals, clamps on lines, storage tank headspaces.
      i. Gas testing shall be performed when opening process equipment that contains or contained a process medium/fluid with the potential risk of a hazardous atmosphere.
      ii. Work shall stop, zero-energy state verified, and gas testing shall be revalidated upon detection of unexpected leaks, releases, seeps or discharges of vapors or liquids or unexpected odors (e.g., exhaust fumes, H2S, etc.)

   c. The following gases must be tested in the following order when conducting initial gas tests for Hot Work and must conform with the following limits before approval is allowed:
      i. Oxygen (%O2): >19.5% and <23.5%
      ii. Lower Explosive Limit (%LEL): < 5%
      Note: for Global Products, LEL readings for Hot Work shall not exceed 0%.
   d. The Site may review and approve hot work above 5% LEL by using the site Management of Change or Deviation process but hot work is never allowed above 10% LEL.
   e. Hot work authorization must not extend beyond 12 hours without a new gas test and permit renewal.
   f. Hot work activities must begin no more than 30-minutes after the QGT has tested the area and cleared it for hot work to start.
      i. In the absence of continuous gas monitoring, in circumstances where work has not begun or is stopped for a period of more than 30-minutes, the hot work permit/certificate / form and gas testing by a QGT must be revalidated before work can resume.

g. The QGT will determine the frequency for follow-up gas testing based on the potential hazards identified and will document this on the hot work permit. (A Competent Gas Monitor may be assigned for follow-up gas testing.)
h. Continuous gas monitoring for %LEL is required inside of a Restricted (Hazardous (Classified)) Areas for all hot work.
i. Specific requirements for vehicle entry into restricted areas (C1D1 / C1D2) and hand-held battery operated devices are outlined in the Global Products Hot Work Standard.

12. Atmospheres that are potentially stratified shall be tested according to applicable legal requirements, as well as Chevron standards and/or accepted best practices.

13. Other activities requiring initial gas testing as defined shall be conducted within one (1) hour of conducting work.

14. When an area is suspected of being contaminated, gas detection readings must be taken during the approach to the area (e.g., hazardous material spill/release, etc.).

15. The conditions and frequency with which follow-up testing is required shall be described. Follow up testing is always required under these conditions:

    a. As determined by the QGT when performing all other types of work in potentially flammable/explosive conditions, immediately dangerous to life or health (IDLH) atmospheres, toxic atmospheres above permissible exposure limits, or other hazardous atmospheres.
    b. Whenever the work site is unattended for more than the defined time of the initial gas testing criteria without continuous gas monitoring.
    c. Prior to beginning work after a shift change occurs.
    d. Anytime there are changes in work conditions (e.g., emergencies, significant ambient temperature changes, work disruptions, etc.).
    e. At any other time specified by the reporting unit/facility.

16. Conditions for which continuous gas testing is required shall be described. Continuous gas testing is always required under the following conditions:

    a. Hot work performed inside a hazardous (classified) / restricted area.
    b. At any time required by the work permit / form and/or Hazard Analysis.
    c. Whenever hazardous atmospheric conditions may occur.
    d. Confined space entry

17. If gas testing results exceed the acceptable limits the following actions must be executed in the order listed below:
    a. Stop work immediately.
    b. Evacuate workers from the hazardous area.
    c. Review work conditions and the source of hazardous condition.
    d. Implement mitigation solutions.
    e. Retest the atmospheric conditions.
    f. Revalidate work permits/ form per Global Products Work Authorization Standard before returning to work.

18. Portable Gas Testing instruments and equipment (including sensors and detectors) shall meet applicable legal requirements, manufacturer's recommendations, Chevron standards and accepted best practices including but not limited to the following:

    a. Approved for use in potentially hazardous atmospheres (e.g., intrinsically safe) by a recognized testing organization (exception: no intrinsically safe instrument and equipment exists).

b. Appropriateness for the monitored environment (e.g., sensitivity, specificity, temperature, moisture, inert environments and susceptibility of sensor to poisoning or inhibition by other gases present).

c. Capability of measuring oxygen content, combustible/flammable limits and toxic gases and vapors accurately to the lowest concentration at which the material becomes hazardous.

d. Having both audible and visual functioning alarms.

e. Having established alarm set points.

f. Having personnel placement criteria for personal gas monitors.

   i. If used, Personal passive gas monitors must not be used for initial, renewal and revalidation gas monitoring purpose as they are only designed for personal alarm purposes.

   ii. If used, Personal gas monitor should be placed/clipped around chest area over the personal protective clothing should it be used.

19. The following requirements for gas detection instruments and equipment shall be described in accordance with manufacturer instructions including but not limited to:

    a. Maintenance and inspection (e.g., leak tests, connections, batteries).

       i. The instrument shall be inspected for physical defects, to ensure that is has no visible cracks, the seals are still intact, and the filters (including the filter on the probe / wand) are clean and not discolored.

       ii. The battery life shall be checked – instruments with battery charge levels of less than 50% shall not be used, as the instrument could power off while the testing is in progress.

       iii. The sample line and probe / wand shall be tested for leaks.

    b. Storage conditions (e.g., temperate environments, dust-free, away from chemical vapors).

       i. Instruments should always be stored in a cool, non-hazardous environment and in its original case.

    c. Field verification of instrument accuracy (e.g., function/bump test, full calibration):

       i. Self-Check (Bump Test) must be conducted at a minimum daily or before use.

       ii. Bump tests must be conducted in accordance with the manufacturer's instructions.

       iii. Calibration is required at a minimum monthly (not to exceed 30 days) unless alternatives are recommended by the manufacturer.

       iv. Additional intervals based on environmental conditions (e.g., exposure to environmental conditions such as sensor poisons).

    d. Manufacturer calibration. The instrument is to be sent to the manufacturer / supplier for servicing and calibration, or during any of the following conditions :

       i. When an instrument does not pass a field full calibration.

When an instrument does not pass a full calibration test, it must be recalibrated by the manufacturer, unless manufacturer-approved techniques allow for simple repairs that will resolve the problem (e.g., replacement of sensors outlined in manufacturer guidelines).

ii. More frequently, as recommended by the manufacturer (e.g., exposure to environmental conditions such as sensor poisons).

e. Compatible or manufacturer approved accessories and supplies (e.g., tubes, filters and probes).

f. Records shall be maintained of the Bump Test, Monthly Full Field Calibration and the Annual Service and available at the site where the instrument is being used.

20. Gas detection equipment shall be calibrated with certified calibration gases of known concentrations.

    a. The Calibration Gases must be used within the expiry date reflected on the cylinder.

    b. The list of gases in the cylinder must match the sensors on the instrument.

21. Gas testing equipment, supplies and media (e.g., colorimetric tubes, calibration gases) shall not be altered, used if damaged, or used after expiration of the designated service life.

22. Personnel involved in work activities that require gas testing (e.g., Authorized Entrants, their authorized representatives or other affected personnel) shall be allowed to observe initial and all subsequent gas tests.

    a. Asset Optimization contractors are required to provide their own 4 gas detectors, which will be used by their trained staff (QGT and/or CGM) to monitor their work environment. The contractor will be responsible to ensure that the user of the instrument is properly trained by the supplier and that all required records (Training Certificate, Bump Test, and Monthly Full Field Calibration & Annual Service Records) for the instrument is available at the jobsite.

23. Personnel assigned responsibilities in gas detection roles and workers using personal gas monitors must be trained and competent.

24. Training requirements and competency assessments for personnel authorized in gas detection and personal gas monitors shall be documented.

    a. Refresher training shall be conducted at least every 3 years and may be conducted more frequently to maintain or enhance QGT competency.

25. The Gas Detection Standard shall define the policy for record retention (e.g., calibration results) that meets applicable legal, corporate, and operating company requirements (or at least six months, whichever is more).

3.0 Roles and responsibilities

Table 1: Roles, Responsibilities & Competencies

Role	Responsibilities	Minimum Performance-Based Skills Required
Work Crew Members (i.e. Field personnel)	• Understands the planned work and emergency notification procedures	• Global Products COW Process and relevant

Role	Responsibilities	Minimum Performance-Based Skills Required
	• Follow all required procedures • Adheres to all permits and hazard analysis conditions • Understands responsibilities to place personal locks onto isolated systems or equivalent Process. • Understands when to stop work	Standard elements pertaining to their work • Global Products Isolation of Hazardous Energy Std.
Portable Gas Detection ***Competent Gas Monitor (CGM)***	• CGM may perform only continuous gas monitoring. • Knowledgeable about acceptable atmospheric working conditions and gas testing order • Verifies and validates field calibration checks of gas testing equipment • Understands when to stop work	• Global Products Portable Gas Detection Std. • Global Products Permit to Work/Hazard Analysis Std. • Global Products Confined Space Entry Std. (Entry Watch) • Global Products Hot Work Std. (Fire Watch) • Specific training in the use of relevant portable gas detection equipment • Demonstrated competency in the use of portable gas detection equipment in the field • Training to recognize potential hazards for work requiring gas testing.
Portable Gas Detection ***Qualified Gas Tester (QGT)***	• QGT may perform initial gas testing for permit clearance. • Knowledgeable about acceptable atmospheric working conditions and gas testing order • Knowledgeable about gas testing techniques (e.g. vessel testing, stratified atmospheric testing, etc.) • Conducts and documents gas tests • Allows work crew (authorized entrants, hot work crews, etc.) to witness gas testing if requested. • Determine the frequency of follow-up gas testing for tasks. • Verifies and validates field calibration checks of gas testing equipment • Calibration and response testing of portable gas testing equipment. • Understands the hazards inherent in hot work and confined space entry and the gases that may be present for relevant tasks where gas testing is required. • Understands when to stop work	• Global Products Portable Gas Detection Std. • Global Products Work Authorization/Hazard Analysis Std. • Global Products Confined Space Entry Std. • Global Products Hot Work Std. • Global Products Knowledge and Operational Level COW Practice Training • Specific training in the use of relevant portable gas detection equipment • Demonstrated competency in the use of portable gas detection equipment in the field. • Training to recognize potential hazards for work requiring gas testing.

4.0 Training Requirements

4.1. Initial Training

Personnel must meet the competency requirements and be trained on the requirements of this standard, prior to starting work. Refer to the Global Products Training Requirements Tool.

4.2 Refresher Training

Refresher training session shall be provided as follows:

- As required by local regulations or site policy.
- Whenever a person demonstrates insufficient knowledge of the Global Products Gas Detection Standard.
- When a serious incident related to gas detection occurred and the root cause identified the need to be retrained.
- Trained on the requirements of this standard, at least every three years

5.0 Records

5.1 Records requirements

- Records of Bump Test, Monthly Full Field Calibration and Annual Service/Calibration by supplier/manufacturer shall be maintained in accordance with Global Products COW Process.

5.2 Retention requirements

Records shall be retained for the periods as specified below:

- Records of Bump test, monthly Full Field Calibration and the Annual Service/Calibration shall be retained by the facility or the contractor for at least 1 year after the job has been completed.
- Training Records shall be maintained for 3 years or until re-training occurs.

6.0 Document Control Information

6.1 Documents Reference List

Title	Attachment
Sample of Bump Test Record Sheet	Daily Bump Test Sheet
Sample of Monthly Field Calibration Sheet	Monthly Field Calibration Sheet
Sample of Additional Gas Testing Record Sheet	Additional Gas Testing Record Sheet
Gas Monitor Use Guidance	Gas Monitor Use Guidance
OE Standard - Portable Gas Detection Appendices	OE Standard – Portable Gas Detection

7.0 Document Control

Description	Corporate	DS&C	Global Products Specific
Approval Date			*July 2021*
Next Process Document Review			*July 2026*
Control Number			*Version 1.0*

7.1 Document Change History

Changes to this document are listed in the table below by change date.

Date (DD/MMM/YR)	Version Number	Description of Change
15 July 2021	*1.0*	*Adoption of new Global Products standard*
15 January 2024	*1.1*	*Adoption of new OE Portable Gas Testing Standard language.*