



Procedure for Operation and Maintenance of Gas Detection Fixed & Portable Equipment

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TABLE OF CONTENTS

1. PURPOSE / SCOPE	3
1.1 DOCUMENT PURPOSE	3
1.2 SCOPE	3
2 DEFINITIONS.....	3
3 GENERAL REQUIREMENTS.....	4
3.1 LEGISLATION & STANDARDS	4
3.2 COMPANY REQUIREMENTS	4
3.3 STOPPING UNSAFE WORK.....	4
3.4 DEVIATIONS.....	4
4 KEY RESPONSIBILITIES.....	5
4.1 SITE MANAGER / SITE CONTROLLER / OIM	5
4.2 AREA AUTHORITY	5
4.3 GAS TESTERS	5
5 GAS DETECTORS.....	5
5.1 TYPE AND USE.....	5
5.1.1 All Gas Detectors	5
5.1.2 Fixed Gas Detectors	5
5.1.3 Portable Gas Detectors.....	6
5.2 FIXED GAS DETECTION SYSTEMS	6
5.2.1 Location and Use	6
5.2.2 System Failure	6
5.2.3 Lower Explosive Limits (Alarm and Shutdown Levels)	6
5.2.4 Calibration.....	7
5.3 PORTABLE GAS DETECTORS.....	8
5.3.1 Issue and Use	8
5.3.2 Gas Testers	9
5.3.3 Operation	9
5.3.4 Calibration.....	11
6 KEY DOCUMENTS / TOOLS / REFERENCES.....	12

1. PURPOSE / SCOPE

1.1 DOCUMENT PURPOSE

This Safe System of Work provides the guidelines and procedures necessary to ensure a safe working environment through the:

- Controlled and systematic monitoring for combustible gas using:
 - fixed gas detection systems
 - portable gas detection equipment
- Regular maintenance of gas monitoring equipment
- Use of suitably trained and authorised Gas Testers

1.2 SCOPE

The contents of this procedure are applicable to all BP owned and managed sites / installations in Azerbaijan and Georgia. Contractors working on BP owned or managed sites / installations are also responsible for alignment with this procedure.

This document does not replace the procedures prepared and adopted by specialist contractors. Neither does it supersede any national and local regulatory requirements.

This procedure contributes to compliance with Group Control of Work (CoW) standard that the Hazards associated with BP activities are identified and that the risks are assessed and managed.

All guidelines contained shall be regarded as the minimum requirements for BP owned or managed sites / installations in Azerbaijan and Georgia.

The scope covers defined activities of BP and Contractors at all BP AzSPU sites and installations.

2 DEFINITIONS

Refer to document [AzSPU-HSSE-DOC-00021-2](#) HSE Definitions for definitions common to this Procedure. Definitions specific to the Procedure are included below.

SM	Site Manager
SC	Site Controller
OIM	Offshore Installation Manager
AA	Area Authority
SSOW	Safe System of Work
AGT	Authorised Gas Tester
COW	Control of Work
CSE	Confined Space Entry
ICC	Isolation Control Certificate
L2RA	Level 2 Risk Assessment
PTW	Permit to Work
RTC	Risk It, Talk It, Check It Pre-Task Risk Assessment
TRA	Task Risk Assessment
TA	Technical Authority

TBT	Toolbox Talk
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3 GENERAL REQUIREMENTS

3.1 LEGISLATION & STANDARDS

This procedure complies with applicable national law. Applicable national law is national law as amended by project specific agreements, e.g. the ACG Production Sharing Agreement (PSA), and relevant International Conventions, if any, in force in Azerbaijan or Georgia, as applicable.

- Operating Management System OMS Essentials 3.2.1 and 4.5.1

In the absence of national legislation, or where national legislation is inconsistent with the requirements of project specific agreements, BP Group Standards or applicable requirements from UK or US legislation will be complied with.

Where requirements conflict, legal advice has been obtained and a defensible compliance position adopted.

The standards and practices contained in this procedure are consistent with those internationally recognized within the petroleum industry.

3.2 COMPANY REQUIREMENTS

It is a company requirement that all tasks are subjected to an assessment of risk to demonstrate that risks have been reduced to as low a level as reasonably practicable (ALARP). This can be achieved by complying with the Company's existing standards. Where compliance with Company standards cannot reasonably be achieved, a formal level 2 Risk Assessment will be undertaken to identify any additional controls and demonstrate that risks remain as low as reasonably practicable, whether by compliance with Company Standards or through level 2 Risk Assessment.

3.3 STOPPING UNSAFE WORK

To stop the continuation of potentially unsafe work at the earliest possible stage, the Control of Work (CoW) Policy and this procedure for Gas Detection Equipment make it very clear that all personnel are obliged and have the authority to **"STOP"** the work that they consider to be unsafe.

3.4 DEVIATIONS

This procedure is written in sufficient detail that it should be able to be applied consistently at all sites / installations. There may still be the requirement for some local rules covering site / installation specific logistical/administrative arrangements and local variations in responsibilities to reflect differences in organisational arrangements. These local rules should not deviate from the core processes within this document. Any form of deviation from this procedure, including but not limited to local rules, shall be requested and authorised in accordance with SSOW, Procedure for Deviations (Doc. No: AZSPU-HSSE-DOC-00011-2).

4 KEY RESPONSIBILITIES

4.1 SITE MANAGER / SITE CONTROLLER / OIM

The Site Manager / Site Controller / Offshore Installation Manager shall be responsible and accountable for the application of this procedure in his area of responsibility, He shall ensure:

- That adequate numbers of Competent responsible persons are appointed to manage and maintain the requirements of this procedure
- Formally appointing suitably qualified and experienced persons to carry out:
 - gas testing
 - gas testing instrument calibration and testing
- Ensuring that fixed gas detection systems on the site / installation are maintained in an operational state
- Ensuring that procedures are in place, to ensure gas testing is carried out wherever necessary.

4.2 AREA AUTHORITY

Area Authorities are responsible for ensuring that gas tests are carried out within their area of responsibility wherever there is any possibility that combustible gas might be present.

4.3 GAS TESTERS

Authorised Gas Testers are responsible for carrying out gas tests to the level to which they are authorised.

5 GAS DETECTORS

5.1 TYPE AND USE

5.1.1 All Gas Detectors

Gas detectors shall:

- Be used wherever there may be a risk to people or property caused by the presence of flammable and toxic gas
- Be designed to issue suitable audible or visual warnings that alert personnel to the presence of flammable and toxic gas.

5.1.2 Fixed Gas Detectors

Fixed gas detectors are detectors that are permanently placed at strategic locations, and where deemed appropriate by local management, to monitor conditions on a continuous basis. In particular they are placed wherever it is thought that combustible gas could collect following an uncontrolled and unplanned release.

Note: Fixed gas detection systems may initiate specific safety actions automatically.

5.1.3 Portable Gas Detectors

Portable gas detectors are often used during activities that take place where flammable/toxic gas could exist, for example, in confined spaces. In most cases, the use of portable gas detection equipment will be called for by the work procedure / instruction.

It is recommended to use Multi-Gas detectors such as Triple Plus + IR (Intrinsically Safe Portable Monitors), or Tetra (Intrinsically Safe Personal Multi-Gas Monitor).

5.2 FIXED GAS DETECTION SYSTEMS

5.2.1 Location and Use

Fixed or automatic combustible gas detectors/systems may be used to initiate a number of automatic safety actions, including:

- Visual and audible warnings of flammable and toxic gas
- Visual and audible fault signal
- Plant / equipment shutdown
- Operation of fire extinguishing systems
- Site/installation evacuation alarm.

5.2.2 System Failure

Any malfunction, abnormal condition, or failure of the fixed gas detection system that prevents the safe operation of plant and machinery, shall initiate visual and audible fault signal.

Note: When the facility operates on purchased electrical power, shutdown features must incorporate adjustable time delays to prevent plant shutdown from short duration power outages. Automatic restart systems shall be overridden by the shutdown system.

Partially attended sites / facilities (those which are not manned 24 hours a day) must have suitable provisions incorporated so that affected plant / equipment can be automatically shutdown for 24 hours without causing damage to the facility.

In partially attended facilities, any malfunction, abnormal condition, or failure of the fixed gas detection system that actuates a plant or machinery shutdown must also actuate a visual enunciator. A remote signalling device must be actuated during unattended periods.

In **fully attended facilities**, each any malfunction, abnormal condition, or failure of the fixed gas detection system that actuates a plant or machinery shutdown must actuate a visual and audible alarm prior to the shutdown. These alarms must actuate sufficiently ahead of each shutdown point to give time for corrective measures to prevent a shutdown.

5.2.3 Lower Explosive Limits (Alarm and Shutdown Levels)

Concentrations of combustible gases that will trigger alarms and shutdowns shall be as follows. These are maximum set values. Set points may be lower.

Preferred solution

Voted gas detection system (eg 2003)

- One detector achieve 20% Lower Explosive Limit – Low alarm, actuate alarms/enunciator
- Two detectors achieve 20% Lower Explosive Limit – High alarm, actuate trip signal.

Non-preferred solution-required TA approval for new systems

Non-voted gas detection system (eg 1001)

- The detector achieves 20% Lower Explosive Limit – Low alarm, actuate alarms/enunciator
- Two detectors achieve 60% Lower Explosive Limit – High alarm, actuate trip signal.

Concentrations of toxic gases that will trigger alarms and shutdowns shall be as follows.

Exposure limits for common toxic gases

Toxic Gas	COSHH (UK)	
	STEL (ppm)	TWA (ppm)
CO	200	30
CO ₂	15 000	5000
H ₂ S	10	5
HF	3	N/A(1.8)

5.2.4 Calibration

5.2.4.1 Frequency

Combustible gas detection systems shall be calibrated in accordance with the manufacturer's recommended procedures or at least every 6 months functional test/PM shall be performed by authorized instrument or F&G technician which passed CAMS for PMs.

Gas detectors are usually tested by using filter or gas from a test gas tank (2.5 %, 3.5% and 4% methane in a nitrogen balance).

If failure functional test the detector will be replaced and returned to manufacture for calibration/investigation.

Test Gas Tanks

Gas detectors are usually calibrated using gas from a calibration gas tank. It is a good safety practice to install a tube from floor level to detectors placed at high levels and ceilings. This permits introduction of the calibration gas through the tubes at ground level.

The contents of the test gas tank are under pressure. Therefore the following precautions should be observed at all times:

- Do not allow oil, grease or flammable solvents to contact the flow control of the calibration gas tank.

- Do not store calibration gas tanks near heat or fire, or in room used for habitation.
- When the tank is exhausted, discard in a safe place such as burial in the earth or in sanitary landfill.
- Do not throw in fire or incinerate.
- Keep out of the reach of children.
- It is not permitted and it is hazardous to refill these gas tanks.
- Do not attach the test gas tank to any other apparatus other than described above.

5.2.4.2 Functional test/PM Records

Records must be maintained on the **functional test/PM** of these instruments at the site / installation. Records should include the:

- Detector location
- Detector make/mode
- Detector type
- Date of **functional test/PM**
- **Functional test/PM** results
- Name of the person who completed the calibration

5.3 PORTABLE GAS DETECTORS

5.3.1 Issue and Use

5.3.1.1 Issue

Portable gas detectors must only be used:

- In accordance with the manufacturer's instructions for determining the lower explosive limit of combustible gas in the air
- By personnel trained in their use
- Where practicable be carried in their manufacturer suppliers' leather cases

Note: On BP sites and installations in Azerbaijan and Georgia this means that portable gas detectors may only be used by **Authorised Gas Testers**.

5.3.1.2 Use

Portable gas detectors, or **explosimeters**, use a set of batteries to measure the oxidation rate of the combustible gas. This measurement is then read from a meter showing the gas combustibility.

Portable combustible gas detectors shall be used when:

- Introducing flame into an area which may contain a flammable atmosphere.
- Lighting fired heater vessels.
- Issuing hot work permits.
- Doing all confined space entry work

- Leak seeking
- Verifying gas-free conditions

5.3.2 Gas Testers

Authorised Gas Testers are approved persons who have been trained and certified in gas testing, they are authorised to test for the presence of flammable vapours, toxic gas and oxygen as required in support of the Permit or Entry Certificate as requested by the AA.

Personnel required to operate portable gas detectors shall have completed the training programme for **Authorised Gas Tester Level 1, Level 2 or Level 3** and shall be formally appointed by the Site Manager, Site Controller or Offshore Installation Manager for carrying out gas test (see Safe System of Work *AZSPU-HSSE-DOC-00012-2 Authorisation*).

All training will be conducted by qualified personnel only and will be documented and kept on file.

5.3.2.1 Gas Tester Level 1

Level 1 AGT's are competent to carry out gas testing on all activities including Confined Space Entry (CSE) activities. For confined space work the Level 1 AGT must retest the atmosphere at the start of each shift, or when the work has been suspended for an extended period within the shift.

5.3.2.2 Gas Tester Level 2

Level 2 AGT's are qualified to carry out gas tests in support of all activities **excluding** Confined Space Entry & carry out continuous monitoring during ongoing work.

5.3.2.3 Gas Tester Level 3

Level 3 AGT's are individuals, usually the Performing Authority, who is approved by the Site Manager / Site Controller / Offshore Installation Manager as having undergone practical instruction on the use and interpretation of the results from both portable and personal gas monitors. The AGT 3 has no authority to record gas test results the PTW: their responsibility is only for continuous monitoring.

5.3.3 Operation

5.3.3.1 Personal Protective Equipment

Warning: It must be understood that testing an area because there is a possibility of a hazardous condition, the person conducting the test must be protected from the potential hazard and be properly equipped with the necessary safety equipment.

5.3.3.2 Test Criteria

Testing procedures must conform to the following criteria.

- The test must be valid and accurate which means that the correct instrument of known accuracy was used in such a manner as to give the true picture.
- The person using the instrument must make sure that the instrument is giving reliable information and that it is interpreted correctly.
- The goal of the test is not to show vapours within certain limits but to show the actual

picture of the entire contents of the space. If the presence of a vapour is indicated, the space or area must be re-evaluated to determine why, and corrective measures must be taken before work proceeds.

- Field calibration records must be documented by the tester. This documentation should include the serial number of the unit, the date and results of the calibration and the name of the person performing the calibration/gas testing.

5.3.3.3 Test Location

Location is important because the hazard may be restricted to a small portion of the entire volume. Therefore, **it is important to test the whole volume**. If the vapour or gas has a specific gravity which is different from that of air, there may be lighter gases collecting at the top of the space while the heavier ones will hug the floor and collect in pits and sumps.

Note: Most flammable gases are heavier than air and will settle in low-lying areas.

5.3.3.4 Reading Interpretation

The operator must always watch the meter while testing. The needle can quickly rise and fall in a high concentration and come to rest on that part of the scale that would indicate a safe reading, yet in actual fact, an extremely dangerous concentration could exist. This is particularly evident when strong concentrations of explosive vapour are in an oxygen deficient atmosphere.

Some instruments cannot be used in oxygen deficient atmospheres. In these cases detector tubes will be used to give accurate readings, or alternatively, purpose made gas detector for oxygen deficiency atmosphere can be used, e.g. Triple Plus + IR. Utilizing infrared sensing technology Triple Plus + IR is suitable for both high gas concentrations and for use on inert (oxygen free) backgrounds.

5.3.3.5 Handling Portable Gas Detectors

Sampling Hoses:

Select the correct sampling hose for the specific application and always use the shortest length of sampling hose (this will minimize the possibility of vapours condensing in the hose), with exception of vessel sampling, i.e. testing from door way.

Before Use:

Before use, check the:

- Calibration of the instrument to be sure it is reading accurately.
- Battery charge and/or zero adjustment periodically.
- Instruments for tightness

Purging:

Whenever a reading is obtained, purge the instrument in fresh air, and take a second test to be certain of an accurate reading.

Purge the indicator by drawing in fresh air, even if another sample is not to be taken right away, as this removes any possibility of contamination by corrosive gases in the combustion chamber.

Restrictions in Use:

Warning: Do not remove the **flashback arrestors** from the instrument. They prevent the explosion that occurs in the combustion chamber from passing back to the mixture being sampled.

- Do not sample high temperatures with a cold instrument. Condensation may occur and give a false reading. Whenever possible, the instrument must be at the same temperature as the vapour being sampled.
- Do not use the indicator for sampling gasoline vapours containing TEL (tetraethyllead, liquefied lead additive) unless the indicator has been approved for this specific application.
- Do not let the sampling hose or probe reach into a liquid.
- Do not adjust the voltage when a sample is in combustion chamber.

5.3.4 Calibration

5.3.4.1 Calibration

Generally the portable gas detectors will be calibrated every 6 month in accordance with the manufacturers' instruction. Usually this is performed by sending detector to a 3d party/manufacture or calibrated by certified personnel at site. An additional calibration may be required when one of the following has happened:

- Has been dropped
- Used in a highly contaminated environment
- Has been subjected to fluid entry
- Has been subjected to extreme temperature change

5.3.4.2 Before Use

Portable combustible, toxic, oxygen gas detectors shall be inspected and zero checked, in accordance with the manufacturer's instruction, prior to use.

Check detector has a valid calibration

Where built-in test facilities are provided, function of the detector shall be confirmed prior to use (self-test).

All such tests will be done upwind, in a clean fresh air environment, away from the area to be tested. The reasons for testing in this area are to ensure:

- The instrument is not contaminated and therefore may give false readings.
- That personnel are in a safe working environment

Note: Function tests do not replace calibration. Function tests are only used to confirm operation of the sensor and alarms.

Warning: Using a butane lighter to activate the alarm during function testing is dangerous

5.3.4.3 Records

Portable gas detectors will have calibrated sticker attached to them showing due date of next calibration; carried out by properly trained and certified personnel amongst a staff.

Calibration and maintenance records must be documented by operating personnel and maintained on file at the local field office.

Records must be maintained on the calibration of these instruments at the installation / local field office. Records should include the:

- Detector make/mode
- Detector type
- Date of calibration
- Calibration results
- Name of the person who completed the calibration.

6 KEY DOCUMENTS / TOOLS / REFERENCES

This procedure shall, where appropriate, be used in conjunction with this suite of AzSPU Procedures referenced below.

Document Number	Title of Procedure
AZSPU-HSSE-DOC-00011-2	Procedure for Deviations
AZSPU-HSSE-DOC-00060-2	Procedure for Permit To Work
AZSPU-HSSE-DOC-00063-2	Procedure for Task Risk Assessment
AZSPU-HSSE-DOC-00048-2	Procedure for Energy Isolations-Electrical
AZSPU-HSSE-DOC-00049-2	Procedure for Energy Isolations-Process
AZSPU-HSSE-DOC-00013-2	Procedure for Confined Space Entry
AZSPU-HSSE-DOC-00015-2	Procedure for Control Of Over-rides Inhibits And Alarm Disables
AZSPU-HSSE-DOC-00051-2	Procedure for Fire Prevention, Detection & Response
AZSPU-HSSE-DOC- 00002-2	Procedure for Control of Work

Revision/Review Log

Revision Date	Authority	Custodian	Revision Details
05 October 2004	Alan McNulty	Esmira Akhundova	Initial Issue
30 September 2008	Central H&S Manager Alan McNulty	Central Safety TL Abbas Islamov	<p>General: The titled of the Procedure is changed to 'Procedure for Operation and Maintenance of Gas Detection Equipment</p> <p>Throughout the Procedure the document numbering for referred procedures has been changed from UNIF to AzSPU.</p> <p>The following inclusions made to Section 1:</p> <ul style="list-style-type: none"> 1.2 Scope; 1.3 Legislation & Standards; 1.4 Company Requirements; 1.5 Stopping Unsafe Work; 1.6 Deviations; 1.7 Document Review; 1.8 SSOW Specific Cross References; 1.9 Language Facilitation <p>Section 2. Definition – is added.</p> <p>Section 3. Roles & Responsibilities: Changes made to Paragraph 3.1</p> <p>Section 5. Fixed Gas Detection Systems Along with “flammable gas” toxic one is added taken into account.</p> <p>Additional point is added to Paragraph 5.1. Additional wording is added to Paragraph 5.2. Considerable changes made to Paragraph 5.3 & sub-paragraph 5.4.1.</p> <p>Sub-paragraph 5.4.2 is changed.</p> <p>Section 6. Portable Gas Detectors. Considerable changes made to Paragraph 6.2. Sub-paragraph 6.2.3 Gas Tester Level 3 is included. New wording is added to Subparagraph 6.3.4., Reading Interpretation., in regard to equipment used on oxygen deficiency background. Changes were made to Paragraph 6.4 regarding parties involved and terms of calibrating.</p> <p>Additional Appendix A is added: Feedback and Improvement Suggestions</p>

05 December 2008	Yuliy Zaytsev Safety & Compliance Systems Manager	Adalat Mamedov Central Safety TL	Authority position/name and custodian name have changed to reflect org changes in HSE&TD.
16 September 2009	Yuliy Zaytsev Safety & Compliance Systems Manager	Niyaz Mamedov, HSE Systems / CoW Adviser	<p>The numbering of the whole procedure is changed in accordance with requirements of Standardized Document Control Procedure Template (AzSPU-HSSE-DOC-00026-2).</p> <p>Additional point has been added to the sub-paragraph 5.3.1.1, Issue;</p> <p>Additional wording has been added to the sub-paragraph 5.3.3.5, Handling Portable Gas Detectors, regarding Sampling Hoses;</p> <p>Wording has been slightly changed in sub-paragraph 5.3.4.1, Calibration</p>
25 January 2011	Yuliy Zaytsev Safety & Compliance Systems Manager	Elman Shikhkerimov Safety Systems/CoW Lead	<p>Section 3 General Requirements</p> <p>Removed reference to Getting HSE right, Golden Rules and replaced with OMS, Group requirements</p>