



**AZERBAIJAN BUSINESS UNIT
(AzBU)**

**Procedure for:
Gas Detection Equipment**

C1	05.10.04		G.Stacey	G.Hunt	G.Laird	G.Campbell	
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Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 2 of 10
Dated: October, 2004	Originating Dept: HSE	

TABLE OF CONTENTS

1	INTRODUCTION	3
1.1	DOCUMENT PURPOSE	3
1.2	DOCUMENT SCOPE	3
2	RESPONSIBILITIES	3
2.1	SITE MANAGER.....	3
2.2	AREA AUTHORITY	3
2.3	GAS TESTERS	3
3	GAS DETECTORS (TYPE AND USE)	4
3.1	ALL GAS DETECTORS	4
3.2	FIXED GAS DETECTORS	4
3.3	PORTABLE GAS DETECTORS	4
4	FIXED GAS DETECTION SYSTEMS	4
4.1	LOCATION AND USE	4
4.2	SYSTEM FAILURE	4
4.3	LOWER EXPLOSIVE LIMITS (ALARM AND SHUTDOWN LEVELS)	5
4.4	CALIBRATION.....	5
4.4.1	Frequency	5
4.4.2	Calibration Records	6
5	PORTABLE GAS DETECTORS	6
5.1	ISSUE AND USE.....	6
5.1.1	Issue	6
5.1.2	Use.....	6
5.2	GAS TESTERS	7
5.2.1	Gas Tester Level 1.....	7
5.2.2	Gas Tester Level 2.....	7
5.3	OPERATION.....	7
5.3.1	Personal Protective Equipment.....	7
5.3.2	Test Criteria	7
5.3.3	Test Location	8
5.3.4	Reading Interpretation	8
5.3.5	Handling Portable Gas Detectors	8
5.4	CALIBRATION.....	9
5.4.1	Before Use	9
5.4.2	Additional Calibration	9
5.4.3	Calibration Method	9
5.4.4	Calibration Records	9

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 3 of 10
Dated: October, 2004	Originating Dept: HSE	

1 INTRODUCTION

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 DOCUMENT SCOPE

The contents of this Safe System of Work are applicable on all BP owned and managed sites and installations in Azerbaijan and Georgia and to all personnel employed on those sites and installations.

2 RESPONSIBILITIES

2.1 SITE MANAGER

The Site Manager / OIM is responsible for:

- 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 that ensure gas testing is carried out wherever necessary.

2.2 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.

2.3 GAS TESTERS

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

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 4 of 10
Dated: October, 2004	Originating Dept: HSE	

3 GAS DETECTORS (TYPE AND USE)

3.1 ALL GAS DETECTORS

Gas detectors shall:

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

3.2 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.

3.3 PORTABLE GAS DETECTORS

Portable gas detectors are often used during activities that take place where flammable 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.

4 FIXED GAS DETECTION SYSTEMS

4.1 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
- plant / equipment shutdown
- operation of fire extinguishing systems
- installation evacuation alarm.

4.2 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 an automatic shut down of that facility.

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.

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 5 of 10
Dated: October, 2004	Originating Dept: HSE	

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.

4.3 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.

- **10% Lower Explosive Limit** - Low alarm, actuate alarms/enunciator
- **50% Lower Explosive Limit** - High alarm, may or may not actuate shutdowns, depending upon the capability of the facility.

4.4 CALIBRATION

4.4.1 Frequency

Combustible gas detection systems shall be calibrated in accordance with the manufacturer's recommended procedures or at least every 3 months, whichever is more frequent.

Calibration 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 calibration 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.
- Do not puncture.
- Keep out of the reach of children.
- It is not permitted and it is hazardous to refill these gas tanks.

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 6 of 10
Dated: October, 2004	Originating Dept: HSE	

- Do not attach the calibration gas tank to any other apparatus other than described above.

4.4.2 Calibration Records

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

- detector location
- detector make/mode
- detector type
- date of calibration
- calibration results
- name of the person who completed the calibration.

5 PORTABLE GAS DETECTORS

5.1 ISSUE AND USE

5.1.1 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.

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

5.1.2 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.

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 7 of 10
Dated: October, 2004	Originating Dept: HSE	

5.2 GAS TESTERS

Personnel required to operate portable gas detectors shall have completed the training programme for **Authorised Gas Tester Level 1 or Level 2** and shall be formally appointed by the Site Manager for carrying out gas test (see Safe System of Work *UNIF-HSE-PRO-104 Authorisation*).

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

5.2.1 Gas Tester Level 1

An Authorised Gas Tester Level 1 is authorised to test for the presence of flammable gas or vapour, toxic gas and oxygen, and in particular to test atmospheres in 'Confined Spaces' as defined in *UNIF-HSE-PRO-108 - Confined Space Entry*

5.2.2 Gas Tester Level 2

An Authorised Gas Tester Level 2 is authorised to test for the presence of flammable gas or vapour.

5.3 OPERATION

5.3.1 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.

Fire resistant clothing is advisable where it is available.

5.3.2 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.

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 8 of 10
Dated: October, 2004	Originating Dept: HSE	

5.3.3 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.

5.3.4 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.

5.3.5 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).

Before Use:

Before use, check the:

- calibration of the instrument to be sure it is reading accurately.
- battery voltage 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

Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 9 of 10
Dated: October, 2004	Originating Dept: HSE	

(tetrathylead, 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.

5.4 CALIBRATION

5.4.1 Before Use

Portable combustible gas indicators shall be inspected and field calibrated, in accordance with the manufacturers instruction, prior to use.

All field calibration 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.

5.4.2 Additional Calibration

If the instrument is to be used numerous times during a shift, it may only be necessary to calibrate prior to the initial use unless the instrument:

- has been dropped
- used in a highly contaminated environment
- has been subjected to fluid entry
- has been subjected to extreme temperature change.

5.4.3 Calibration Method

There are two steps to thorough calibration:

- Set the Zero in air and the span using a certified known gas /air calibration gas.
- Perform a function test in the field (a solvent marker will be enough to activate the alarm on a combustible gas sensor).

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

5.4.4 Calibration Records

Field 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:

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Title: Gas Detection Equipment Procedure	Doc No: UNIF-HSE-PRO-201-C1	
	Rev No: C1	Page 10 of 10
Dated: October, 2004	Originating Dept: HSE	

- detector make/mode
- detector type
- date of calibration
- calibration results
- name of the person who completed the calibration.