

قطر للبترول
Qatar Petroleum



INTER-DEPARTMENTAL PROCEDURE OPERATIONS – DUKHAN FIELDS

CONFINED SPACE ENTRY - DUKHAN FIELDS

IP-OPS-031

**Operations Manager,
Dukhan Fields**

Director Operations

Rev.	Date	Reason
A4	Mar13	Issued for use

OSD / QC: *CA*

INTER-DEPARTMENTAL PROCEDURE - OPERATIONS - DUKHAN FIELDS

CONFINED SPACE ENTRY - DUKHAN FIELDS

IP-OPS-031

DOCUMENT CHANGE HISTORY

Rev No.	Rev Date	Revision Description	Page No.	Approved by
A1	July 2002	Original Issue	-	OM(D), DO
A4	March 2013	Revised by SMS - PTW and JSA Committee based on the comments raised in Insurance audit report, third party SMS audit reports and by other departments and due for review as per the Procedure.	-	OM(D), DO

Remarks :

CONTENT LIST

1.0	OBJECTIVE	1
2.0	SCOPE	1
3.0	POLICY / MANAGEMENT INTENT	1
4.0	RELATED DOCUMENTS	1
5.0	DEFINITIONS AND ABBREVIATIONS	1
6.0	PROCESS	3
6.1	General	3
6.2	Job Planning for Confined Space Entry	3
6.3	Raise Permit	4
6.4	Water Flushing	4
6.5	Venting / Depressurising	4
6.6	Vessel Isolation (where the confined space is a vessel)	5
6.7	Air Purging (Open Vessel)	5
6.8	Combustible Gas and Oxygen Level Testing	6
6.9	Vessel Entry (Work Personnel)	7
6.10	Emergency Rescue Plan	7
6.11	Safe Working Guidelines	8
6.12	Handling Pyrophoric Iron Sulphide	8
6.13	Final Inspection	8
7.0	RESPONSIBILITIES	9
7.1	Permit Controller	9
7.2	Safety Officer	9
7.3	Worksite Supervisor	9
7.4	Standby Man	9

ATTACHMENTS

ATTACHMENT A - CONFINED SPACE ENTRY RESTRICTIONS	11
ATTACHMENT B - EXAMPLE OF CONFINED SPACE ENTRY CERTIFICATE	12
ATTACHMENT C - EXAMPLE OF SPADING / BLINDING LIST	13
ATTACHMENT D - EXAMPLE OF CONFINED SPACE ENTRY LOGSHEET	14

1.0 OBJECTIVE

The purpose of this procedure is to establish requirements and instructions for the safe entry of personnel into confined spaces.

2.0 SCOPE

This procedure applies to all work activities in which personnel are required to enter any confined space where immediate escape is restricted.

The procedure shall also apply to vessels or tanks which have contained harmless liquids (such as water) or which have remained empty and closed for an extended period.

This procedure applies to all Dukhan Fields operating sites.

3.0 POLICY / MANAGEMENT INTENT

Qatar Petroleum is committed to developing and managing safer working practices.

4.0 RELATED DOCUMENTS

- | | | |
|-------------------|---|--|
| IP-OPS-015 | - | Permit to Work System - Dukhan Fields |
| IP-OPS-029 | - | Mechanical Isolation Strategy - Dukhan Fields |
| IP-OPS-030 | - | Procedure for Scaffolding Work - Dukhan Fields |
| IP-OPS-032 | - | Excavation Procedure - Dukhan Fields |

5.0 DEFINITIONS AND ABBREVIATIONS

- | | | |
|--------------------------|---|--|
| Air Contaminant | - | Any hazardous substance or chemical which is present or which may be present in the atmosphere within a confined space.

Air contaminants include (but are not limited to): <ul style="list-style-type: none">- hydrocarbon vapours or gases- vapours or gases resulting from production operations or from materials used within the confined space (e.g. treating chemicals)- H₂S, CO, SO₂- Naturally Occurring Radioactive Materials (NORM). |
| Authorised Person | - | Someone who is authorised to administer work permits and approve confined spaces for the entry of personnel. |

- Confined Space**
- Any enclosure having a limited means of entry and exit and not designed for continuous occupancy. Examples include (but are not limited to) the following:
 - process vessels, tanks, bins, stacks, large pipe, pits, vaults,
 - any enclosure where the presence of air contaminants may be harmful to a worker and prevent his ability to escape unaided.
 - Any excavation with a depth of more than 1.25m where hazardous atmosphere exists or could reasonably be expected to exist, such as excavations in landfill areas, contaminated areas, areas where hazardous substances are stored nearby and within the production/live stations
- Confined Space Entry**
- The act of physically entering a confined space. Entry covers not only complete body entry, but also when only the head is inserted for a quick visual inspection.
- Lower Explosive Limit (LEL)**
- This is the lowest concentration of gas in the atmosphere that results in a combustible mixture.
- NORM**
- Any material found in the natural environment that has radioactive properties. In oil exploration and production terms, this usually refers to radioactive scale sometimes found on the walls of vessels, pipes, valves, or entrained in sludge. This material is formed by the precipitation of salts brought to the surface in the produced water.
- Oxygen Deficiency**
- A condition in which the atmosphere contains less than 19.5% oxygen by volume.
- Policy**
- A rule or directive that guides or restricts action.
- Procedure**
- A document that details the execution of an activity.
- Pyrophoric Iron Scale**
- This is produced when iron oxidises in the presence of materials containing hydrogen sulphide. The resulting scale can ignite spontaneously when dry and exposed to air.
- Retrieval System**
- Line, chest harness and a lifting device. This equipment is used for the rescue of injured or unconscious persons from a confined space.
- Shall**
- A mandatory action or requirement.

- | | | |
|-------------------------------|---|--|
| Should | - | A preferred course of action. |
| Standby Man/Hole watch | - | Appointed by the Permit Applicant, he shall be approved in his duties by the Health, Safety & Environment (HSE) Department. He is stationed outside the confined space and shall maintain line of sight or verbal contact with personnel undertaking confined space entry. |

6.0 PROCESS

6.1 General

All activities involving the preparation of a confined space for entry of personnel shall be carried out in a planned and systematic manner. This includes (but is not limited to):

- preparation of the confined space including isolation, nitrogen purging where required, venting, water flushing, and purging with air
- the identification and control of hazards associated with pyrophoric iron sulphide, NORM, and toxic or flammable vapours associated with sludge
- conducting atmospheric testing including oxygen level, combustible gases or vapours, and toxic gases or vapours on a pre-determined schedule
- provision for the rescue of injured personnel from the confined space
- ensuring that a safety watch is maintained at all times at the manway or entrance to the confined space when personnel are within the confined space.

6.2 Job Planning for Confined Space Entry

The planned work shall be discussed with all departments, trades and personnel who will be involved in the isolation, preparation and safeguarding of the confined space.

Job planning shall include (but not be limited to) provisions for the following:

- administration of the Confined Space Entry Certificate and other permits (see Attachment B)
- physical isolation of the confined space from the rest of the system (if applicable)
- venting / depressurising of the confined space (if applicable)
- water flushing of the confined space (if applicable)
- chemical flushing and nitrogen purging (if applicable)
- air purging of the confined space
- atmospheric testing including oxygen level, combustible gases / vapours, and toxic gases / vapours
- safeguarding of the confined space
- Emergency Rescue Plan and provision of a Standby Man

Note: Consideration shall be given to the access and egress routes of the confined space for emergency purposes, e.g. construction of a scaffold.

- provisions to control hazards associated with pyrophoric iron sulphide, NORM, and / or toxic or flammable vapours from vessel sludge
- procedure to return the confined space to its normal operating condition
- discussion and use of a safety isolation procedure.

Requirements for spades, blinds, gaskets etc. shall be arranged in advance to ensure sufficient material is available before a process vessel is opened up.

6.3 Raise Permit

Prior to preparing a confined space for the entry of personnel, the job planning process shall identify which if the following work permits are to be raised:

- Cold Work Permit
- Hot Work Permit
- Confined Space Entry Certificate
- Preparation / Reinstatement Certificate

6.4 Water Flushing

A water flush program shall be considered for vessels that have contained crude oil, in order to reduce the amount of hydrocarbons left in the vessel and to soak any pyrophoric iron sulphide residues.

Flushing shall continue until all hydrocarbons have been removed or the amount of hydrocarbons remaining in the vessel has been reduced to a minimum.

Note: Water flushing and draining shall normally be to a closed drain system. Where such facilities do not exist, care shall be taken to contain the drained hydrocarbons so that no spillage occurs.

NGL facilities are not normally water flushed unless there are adequate 'drying out' facilities to reduce corrosion and prevent the risk of hydrates on start-up.

Nitrogen purging may be considered as part of this process to assist in the removal of hydrocarbon vapours and to provide a positive head of pressure in the removal of water. Gas and NGL processing facilities shall normally be purged with Nitrogen.

6.5 Venting / Depressurising

Venting, depressurising or blowdown of a vessel shall initially be done through the normal vent system.

The Production Supervisor or his nominated representative shall be present at all times during the venting of any process vessel.

Prior to the venting of any vessel to atmosphere, the following steps shall be taken:

- a) The area in the vicinity of the vessel shall be barriered-off and warning notices shall be posted at these barriers.
- b) All HOT WORK permits in the vicinity of the vessel shall be withdrawn while the vessel is being vented to atmosphere.
- c) All work procedures to be used in the venting of the vessel shall be discussed before the job is started.
- d) All affected personnel shall be informed prior to the venting of the vessel.

When all precautions have been taken, the atmospheric vent or other suitable valve connection can then be opened.

Note: The atmospheric vent may be blocked, hence failure of release of gas does not always mean that the vessel is fully depressurised. The vent shall be checked to ensure that flow is not restricted.

During venting to atmosphere operations, the rate of venting shall always be controlled and continuous gas monitoring shall be conducted until venting is complete.

6.6 Vessel Isolation (where the confined space is a vessel)

The vessel shall be positively isolated from all process and utility systems by blanking, spading or physical disconnection (e.g. removal of pipe spools).

Where disconnection is employed as the primary means of isolation, the vessel side shall be blanked to prevent harmful fumes / vapours from entering the vessel.

When physical disconnection is not possible, isolation shall be achieved by the installation of spades or spectacle blinds that have the same pressure rating as the flange. A Spading / Blinding List shall be completed and signed (see Attachment C).

The use of any other methods of isolation shall require the approval of the applicable Department Head.

All instrumentation connected to the isolated vessel shall be removed and plugged / capped.

6.7 Air Purging (Open Vessel)

Air purging of an open vessel can be achieved by either natural draft or by means of extraction fans or air blowers.

Static electricity may be created during this operation. Always ensure that the vessel and ventilators are properly bonded to earth.

Note: In cases where electric driven air movers may be used, they should only be used at a later stage of the vessel purge, after gas testing has confirmed that the atmosphere within the vessel does not contain flammable vapours within their explosive range.

During the initial stage of the air purge, when product gases in the vessel may be within the explosive range, the following precautions shall be taken:

- a) All HOT WORK permits local to the worksite shall be withdrawn.
- b) Site personnel shall be informed prior to commencement of the purge.
- c) Access to work areas in the vicinity of the vessel being purged shall be restricted to those personnel directly involved in the purging operation.

The rate of forced-air ventilation shall be sufficient to maintain a constant flow of fresh air into the vessel. Periodic oxygen level and combustible gas testing shall be conducted to confirm that the breathing atmosphere within the vessel is suitable for extended work periods.

On vessels with entry from a top hatch, a secondary ventilation point is required to enable forced air to be drawn through the entire vessel.

6.8 Combustible Gas and Oxygen Level Testing

Prior to the opening of the manway, the vessel shall be barriered-off from the surrounding work area. A warning notice stating 'Entry by Authorised Personnel Only' shall be placed at the manway entrance.

Immediately after opening the vessel manway, the atmosphere within the vessel shall be tested for oxygen, combustible gases / vapours, and for toxic gases / vapours.

The Permit Controller shall conduct this initial test from the manway entrance and shall wear a work line or self-contained breathing apparatus during the testing process. Follow-up testing may be delegated to authorised gas testers.

Note: Particular attention should be given to sumps and all low points within the vessel.

When the vessel is vacated, a new gas test shall be taken by the Permit Controller or his delegate before the vessel may be re-entered.

Entry to the confined space can only be authorised by the Permit Controller.

Entry or work is limited as per requirements noted in Attachment A - 'Confined Space Entry Work Restrictions'.

The vessel shall remain on air purge until testing confirms that the vessel is safe for entry with the oxygen level within acceptable limits.

6.9 Vessel Entry (Work Personnel)

Once acceptable vapor concentrations have been achieved, and permit controller to ensure that nitrogen hoses used for purging have been disconnected, the vessel may be cautiously entered and a buddy system shall be used.

Entry into the vessel shall be restricted to a 2-person team consisting of the Permit Controller or Safety Officer and an authorised gas tester. The team shall conduct additional oxygen level and combustible gas testing and inspect the interior of the vessel to determine if it is safe for entry by work crew personnel.

All personnel entering the confined space shall wear suitable personal protective equipment as specified in the applicable work permits.

When personnel are within the confined space without respiratory protective equipment, the oxygen level must remain within acceptable limits and the H₂S concentrations shall be 0 PPM, Hydrocarbon concentration is 0 LEL.

Note: When gas concentration levels have been sampled in the cooler hours of the morning, personnel should be aware that the gas concentration inside the confined space may rise due to an increase in ambient temperature.

When the confined space contains residual sludge or residues, work personnel shall wear a air line or self-contained breathing apparatus at all times when inside the confined space. Work personnel should be made aware of the previous contents of the vessel prior to entry, and of the possibility of fumes or vapours being emitted by the disturbance of vessel equipment or contents.

Note: When residual sludge or residues are disturbed by entry of personnel and during cleaning operations, flammable vapours may be released and vapour concentrations may increase.

Whenever personnel are not within the confined space and the Standby Man is not at his post, the entrance to the confined space shall have a barricade installed in the manway entrance and a sign prohibiting unauthorised entry into the vessel.

6.10 Emergency Rescue Plan

An Emergency Rescue Plan shall be discussed in pre-job meetings with all personnel who will be involved in the confined space entry, and shall address the following items:

- summoning rescue and emergency services
- rescuing personnel from the confined space
- emergency equipment ... to be made available and in place.

Rescue team duties shall be assigned to designated personnel within the work team and the appropriate rescue equipment shall be provided, especially where vertical entry and descent is required.

In all cases, rescue team personnel shall don supplied-air breathing apparatus before attempting a rescue of personnel within the confined space.

The use of lifelines can often be a hindrance and may well reduce the effectiveness of emergency action. It is therefore recommended that lifelines not be used in relatively small confined spaces.

6.11 Safe Working Guidelines

The 'buddy' system shall always be used for entering a confined space and the maximum number of persons allowed to enter shall be authorised by site management depending on circumstances.

Persons working inside confined spaces shall be allowed a rest period at 30 minute intervals, or more frequently depending on the prevailing conditions.

The Worksite Supervisor shall ensure that work crews are using approved QP work procedures (e.g. tank cleaning) for completing the work.

The use of tools inside the confined space shall be carefully controlled and non-sparking tools shall always be used where explosive vapours or flammable product are present.

Note: Where paints and solvents have been used inside a confined space, be aware of the possibility of a build-up of solvent fumes.

Only pneumatic tools or intrinsically safe lighting system shall be used in a confined space containing residual flammable gases.

All equipment used in gas-freeing, cleaning and repair work shall be effectively bonded and earthed. These precautions shall apply to all lines and hoses used for removing residues, mechanical ventilation exhausters, jetting equipment, grit-blast and paint-spray equipment.

6.12 Handling Pyrophoric Iron Sulphide

Interior surfaces of confined spaces suspected of containing Pyrophoric Iron Scale shall always be kept wet. If possible the purge air shall be water saturated.

All such scale removed from the confined space shall be kept damp while being disposed of.

The handling of NORM contaminated materials and equipment shall be covered in a separate procedure.

6.13 Final Inspection

Upon completion of the permitted work, authorised personnel shall inspect the confined space to ensure that no tools, equipment, rags or other foreign objects have been left there.

The Permit Controller shall then witness the closing up of the confined space as necessary and shall ensure that the relevant work permit and certificate are endorsed accordingly.

7.0 RESPONSIBILITIES

7.1 Permit Controller

He shall conduct the initial Oxygen level, toxic gas / vapour, and combustible gas tests on the atmosphere within a confined space scheduled for entry by personnel.

He shall always carry out the first test on continuous work at the beginning of his shift, and may delegate follow-up testing to an authorised gas tester.

He shall ensure that tests are carried out prior to re-entry.

He shall authorise entry into a confined space by issue of a 'Confined Space Entry' certificate, and shall close out the certificate when the work shift is complete.

7.2 Safety Officer

In the absence of the Permit Controller OR in assistance to him, the Safety Officer shall conduct the tests, as stated above, within the confined space prior to first entry of personnel.

7.3 Worksite Supervisor

He shall ensure that the work crew involved in confined space entry and under his direction adhere strictly to the requirements of this procedure.

7.4 Standby Man

The following responsibilities and duties apply to the Standby Man in all cases of entry into confined spaces:

- a) Attend the pre-job meeting to discuss the particular confined space entry.
- b) Fully understand the requirements of the work permit.
- c) Fully understand the emergency response procedures to be used in the event of an emergency in this specific job.
- d) Have a good command of the English language.
- e) Ensure a radio is available for communications and identified emergency equipment is available at the entrance to the confined space.
- f) Understand the hazards that may be faced within the confined space, including information on the signs, symptoms and consequences of exposure to such hazards.
- g) Maintain an accurate headcount of personnel entering or leaving the confined space by using the 'Confined Space Entry Logsheet' (see Attachment D). Completed logsheets should be signed and filed along with the work permits upon job completion.
- h) Notify the Permit Controller every time the personnel enter or leave the confined space and do not allow unauthorised personnel to enter the confined space.
- i) Maintain visual contact at all times with at least one of the persons working inside the confined space. If visual contact cannot be maintained, then voice

contact shall always be maintained.

Note: If, due to the configuration of the confined space, visual contact cannot be maintained, radio contact may be used if the confined space is free of gas and sludge, life lines are used by the personnel inside, and they are not required to wear respiratory protective equipment. Radio contact frequencies shall be established at the pre-job meeting and approval to use this method of contact shall be obtained from the applicable Department Head.

- j) If an incident occurs within the confined space, raise the alarm and summon assistance from emergency response personnel. He shall not attempt a rescue until the emergency team arrives, unless a rescue does not involve entry into the confined space.
- k) In the event of a general alarm sounding, evacuate personnel from within the confined space.
- l) Ensure the confined space entry is closed and barricaded when it is unoccupied or finished or stopped the work for any reason..

Note: If, for any reason, the Standby Man is required to vacate his post, all personnel within the confined space shall be evacuated until his return, unless an alternative Standby Man is provided immediately.

ATTACHMENT A - CONFINED SPACE ENTRY RESTRICTIONS

Entry without respiratory protection is acceptable only after ALL of the following conditions have been verified:

- Oxygen content is between 19.5% and 23.5% by volume.
- H₂S concentration is nil
- Air contaminants are below permissible exposure limits.
- A means of maintaining an adequate flow of fresh air is provided.

Entry with respiratory protection is required when ANY of the following conditions exist:

- Oxygen content is between 16.5% and 19.5% by volume.
- H₂S concentration is greater than 10 ppm.
- Permissible exposure limits of air contaminants have been exceeded (these exposure limits shall be agreed at the planning stage).
- Hydrocarbon concentration is 1% or greater and less than 10% of the LEL.

NO ENTRY - Under no circumstances will entry be permitted when:

- **The hydrocarbon concentration is greater than 10% of the LEL.**
- **Hazardous material such as acids or caustics are present.**
- **The toxicity of the atmosphere is Immediately Dangerous to Life or Health (e.g. H₂S is greater than 100 ppm).**
- **The facility or associated processes are experiencing operational problems.**
- **Oxygen concentrations are greater than 23.5% or less than 16.5%.**
- **There is an inert atmosphere present.**

ATTACHMENT B - EXAMPLE OF CONFINED SPACE ENTRY CERTIFICATE ATTACHED

DUKHAN FIELDS
CONFINED SPACE ENTRY CERTIFICATE
 VALID FOR ONE CONTINUOUS WORKSHIFT

CERTIFICATE No:

CSE

Worksite Location:

Work Permit No:

1. REASON FOR ENTRY / DESCRIPTION OF WORK

2. PREPARATION (Completed by Permit Controller)

YES NO N/A

1. All lines have been removed, spaded or valves secured with lock and chain as per spading list attached.			
2. The Vessel / Tank / Confined Space has been purged with Nitrogen/Steamed out			
3. The Vessel / Tank / Confined Space has been flushed with water.			
4. The Vessel / Tank / Confined Space has been force ventilated with air.			
5. The earth bonding has been checked by an Electrician.			
6. Precautions for pyrophoric deposits are in place.			
7. Specified breathing apparatus is on site and checked serviceable.			
8. Required rescue equipment is on site and checked serviceable.			
9. All persons involved have been fully briefed on site for Entry and Emergency actions.			
10. Required EX type lighting with 24 V / air driven generator is in place.			
11. The area is barriered off and signs in English and Arabic are posted.			
12. Permit Authority is aware of the confined space entry and has authorised the Work Permit.			

3. INITIAL GAS TEST PRIOR TO ISSUE OF CONFINED SPACE ENTRY CERTIFICATE (By Permit Controller)

Oxygen Content _____ % Flammable gas _____ % of LEL Hydrogen Sulphide _____ PPM

I confirm the worksite readings as above. Requirement for portable gas detectors at worksite - YES NO

Print Name: _____ Signature: _____ Time: _____ Date: _____

4. DECLARATION OF CONFINED SPACE ENTRY (Completed by Permit Controller)

Entry without Respiratory Protection Permitted	Oxygen content is between 19.5% and 23.5%, H ₂ S concentration is less than 10ppm, air contaminants are below permissible exposure limits and hydrocarbon concentration is less than 1% of the LEL. A means of maintaining adequate flow of fresh air is provided.
Respiratory Protection Required for Entry	Oxygen content is between 16.5% and 19.5%, or H ₂ S concentration is greater than 10ppm, or permissible exposure limits to air contaminants have been exceeded, or hydrocarbon concentration is between 1% and 10% of the LEL.

The Vessel / Tank / Confined Space preparations have been completed. The 'Prior to Entry' testing has been completed and is within limits. **Continuous Monitoring** **Tests to be carried out at _____ hour interval(s) and recorded in Box 5.**

I confirm that it is now safe for personnel to enter the above confined space and carry out the work as described, provided that all requirements in Section 3 remain in effect and the gas monitoring levels remain below the acceptable safe limits.

Print Name: _____ Signature: _____ Time: _____ Date: _____

4. WORKSITE SUPERVISOR DECLARATION

I understand my responsibilities and will ensure that personnel under my supervision are fully briefed. I will ensure that all preparations are complete and that all protective and rescue equipment are in place at all times while personnel are in the confined space. The nominated Standby man has been fully briefed on his duties and responsibilities.

Worksite Supervisor Name: _____ Signature: _____ Date: _____

5. RECORD OF GAS TESTS (To be used to record any additional gas tests required during validity of Certificate)

Time														
Oxygen														
Hydrogen Sulphide														
Flammable Gas														
Other:														
Initial														

6. COMPLETION AND CERTIFICATE CLOSE OUT

The Confined Space is ready to close left open for re-entry For Re-Entry, a new Certificate must be applied for.

The vessel has been left in a safe condition with all tools and equipment removed barricaded, and left open for re-entry

Worksite Supervisor Name: _____ Signature: _____ Date: _____

Permit Controller Name: _____ Signature: _____ Date: _____

ATTACHMENT D - EXAMPLE OF CONFINED SPACE ENTRY LOGSHEET

QP - DUKHAN FIELDS

CONFINED SPACE ENTRY LOGSHEET

Logsheets No:

Vessel No:

Related Permit No:

VESSEL ENTRANT NAME	TIME IN (24 hour clock)	TIME OUT (24 hour clock)	DATE

STANDBY MAN:

Print Name:

Signature:

Date: