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0	05.11.2018	Initial Issue - Issued for Implementation
1	16.01.2022	<ul style="list-style-type: none"> Document modified to align with IMS Doc. Control Procedure. Structure of the document and clauses are rearranged. The Document is Reviewed & updated with changes which are highlighted in Italic font. Document name amended as Safe Work Practice on Confined Space Entry. User shall refer the entire document to acquaint with the changes. <p>Major changes are mentioned below.</p> <ul style="list-style-type: none"> Executive Summary added. Inert entry definition added in the definition section. Abbreviation section added. Identifying Confined Spaces in Non-Operational Areas added under section 6.2.3 Additional requirements added under Atmospheric hazards & control measures, section 6.6. Requirement of rescue plan for confined space is added under section 6.8.8. Additional responsibilities added for Inert entry Attendant's Responsibilities. Oxygen value for Inert entry revised. Confined space depth condition for floating roof tank is revised. Additional requirements added under Personal Protective equipment, section 6.11. RACI Chart added under Section 10.0

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EXECUTIVE SUMMARY

Confined space entry is classified as highly critical in nature due to multiple inherent unseen hazards present within the space which is not designed for continuous human occupancy. This document addresses the essential elements of KIPIC's Confined Space Entry program, which is also one of the KIPIC HSE Golden rules emphasizing the authorization for any confined space entry.

Hazards associated with confined space entry, safe work practices for entry are detailed in this document. Guidance on Hazard Identification, Risk Assessments and determining appropriate control measures are mentioned in the document. Gas testing procedure and gas concentration limits for safe entry are specified in the document.

Safe procedures for inert entry are elaborated in detail. Safe gas concentrations for inert atmospheric entry, hazards of inert entry, conditions that require evacuation of inert confined spaces, Rescue and Retrieval systems for confined space are mentioned in the document.

The criteria for determining respiratory protection equipment and the training and medical fitness requirements are included in the document. Responsibilities of confined space entrant, attendant, issuer & executor are listed out.

Procedure for reclassifying a confined space as 'Confined Space Not Requiring Entry Authorization' (CSNREA) and the criteria for reclassifying the same also included in the document.

1. INTRODUCTION

A confined space can be more hazardous than regular workspaces for many reasons. Work in confined spaces is always to be considered as a serious and critical activity with significant hazards. This SWP specifies the requirements to be complied for ensuring the safety and health of personnel required to enter, or work in confined spaces by providing guidance and standards to control the associated risks.

This document primarily addresses safe work practices to protect all employees including contractors and their sub-contractors from the hazards of confined space entry. The requirements detailed in this document are meant as general guidelines and shall not be assumed to cover every condition or circumstance that may be present or may arise during the work.

2. PURPOSE

The purpose of this document is to outline minimum safety requirements for planning and executing entry into confined spaces.

There are many confined spaces available within the work areas, which require entry of personnel for Inspection, maintenance, construction, etc activities. Various potential hazards due to entry into confined spaces require implementation of appropriate mitigation measures. This document details various requirements to be implemented to mitigate the hazards related to confined spaces.

3. SCOPE

The primary scope of this document is to identify the type of confined spaces and its associated hazards which varies widely according to the configuration, nature of service, material stored and work to be executed inside the confined spaces.

This scope is applicable to all KIPIC sites including Al-Zour Refinery (ZOR), Liquefied Natural Gas Import (LNGI) facility, Petrochemicals project (PRIZE), Head office (HO) and other areas wherever KIPIC has a degree of control.

Mandatory rules are characterized by the word "SHALL" throughout the text.

Advisory rules or recommendations are indicated by the word "SHOULD". The words shall and should have been used to remain in line with the terminology used by the American National Standards Institute.

Various designations mentioned in the document are refinery based. Equivalent designations shall be applicable for other locations/ sites.

4. TERMS, DEFINITIONS & ABBREVIATIONS

- A) **Attendant (Stand-by person):** An individual stationed outside the confined space who monitors the authorized entrants and who performs attendant's responsibilities assigned as per Section # 8.1.
- B) **Authorized Entrant:** An employee (KIPIC or Contractor) who is certified as medically fit by KIPIC Health team and authorized by KIPIC HSE Group (after ensuring appropriate training) to enter a confined space. *(Described in 5.4 under entrant responsibilities)*
- C) **Blinding:** The absolute closure of a vessel nozzle, pipe, line, or duct by the fastening of a solid metallic plate (such as a spectacle blind or a spade blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.
- D) **Confined Space:** "Confined space" means space that meets all three of the following conditions:
- Is large enough and so configured that a person can bodily enter and perform the assigned work.
 - Has limited or restricted means for entry or exit
 - Is not designed for continuous human occupancy.
- E.g. Vessels, tanks, furnaces, heat exchanger shell open from one end or from both ends, culverts or excavations or pits or manholes or sewers or trenches, *Columns, Reactor skirt support entry* etc. deeper than 1.2 meter including pits in head office and other buildings, *entry on external floating roof of tanks when the roof is more than 1.5 meters down from the top*, AC ducting systems, very large diameter piping and ducts etc.

- E) **Confined Space Entry Authorisation:** Confined space entry authorisation is an authorisation only for personnel entry and not for working inside. To *carry out any* work within the confined space will require additional documents in conjunction with confined space entry authorisation, such as hot and cold work permit, excavation authorisation..... etc.

It is a printed document (yellow colour titled as confined space entry authorization) and also generated through an e-work permit application (Refer - Annexure - A).

- F) **Entry:** An act that begins when any part of the body crosses the plane of an opening to a confined space where the aperture is sufficient to allow full-body access to the space.

Compliance to man way size as per SHELL DEP 30.00.60.20 (minimum dia. of 610mm (24 in.) shall be complied with. For vessels with man way size less than 24 in., hazards arising from the same shall be addressed in Work Permit Risk Assessment (WPRA).

- G) **Executor:** *Person who is authorized by KIPIC HSE Group to apply for and receive work permits, after an appropriate assessment.*

Furthermore he ensures that all conditions written on entry authorization have been met, verifies ongoing precautions to maintain the safe working conditions during entry, takes the responsibilities of various roles specified are fully understood and is authorized to *supervise entry operations and to terminate entry.*

Note: Responsibilities of work permit executor for confined space entry specified below and in section #5.3 are in addition to as defined in KIPIC procedure for Work Permit System & Risk Assessment.

- H) **Hazardous Atmosphere:** An atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a confined space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapour, or mist in excess of 10% of its lower explosive flammable limit (10% LEL or LFL).
 - Airborne combustible dust at or above its LEL. (If the dust obscures vision at distance of 1.52 m (5 feet) or less it can be considered as at LEL.).
 - Atmospheric oxygen concentration below 19.5% or above 23.5% (vol.).
 - Atmospheric concentration of any substance above the Threshold Limit Value or Time Weighted Average (TLV-TWA: H_2S -10 ppm, NH_3 – 25 ppm, CO – 25ppm, SO_2 – 2ppm, see Safety Data Sheet (SDS) for other materials).
 - Any other atmospheric condition that is immediately dangerous to life or health.
- I) **Immediately Dangerous to Life or Health (IDLH):** Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a confined space.
- J) **Inerting:** Displacement of the atmosphere in a confined space by a non-combustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non-combustible.
- Note: Inerting produces an IDLH oxygen-deficient atmosphere as oxygen is reduced below 4% vol.
- K) **Inert Entry:** *Entry into a confined space where the existing atmosphere is intentionally displaced with a non-combustible gas (such as Nitrogen) creating an inert atmosphere in the confined space. Entry into an inert confined space starts as soon as any part of the entrant's body breaks the plane of an opening into the space and triggers the need for rescue capability.*
- L) **Positive Isolation:** Process by which a confined space / equipment / pipeline is isolated from service, *completely separated from other parts of the system*, and protected against the release of energy and material into

the space by such as blinding, *physical disconnection (i.e. removing sections of lines, pipes, or ducts)* and lockout or tag out of all sources of energy. *This is the most secure method of isolation. Before human entry into any confined space, the confined space shall be positively isolated. Isolation by valve closure alone is not considered as positive isolation. Also, Double Block and Bleed isolation method is not positive isolation.*

- M) **Issuer:** *Person who is authorized by KIPIC HSE Group to issue work permits, after an appropriate assessment.*

Furthermore he is authorised to verify that all conditions for entry into confined space have been met, to define ongoing precautions to maintain the safe working conditions during entry, to authorise the entry to occur and to cancel the authorisation allowing entry.

Note: *Responsibilities of work permit issuer for confined space entry specified below and in section #5.3 are in addition to as defined in KIPIC procedure for Work Permit System & Risk Assessment.*

- N) **Line Breaking:** Intentional opening of a potential line, or duct that is or has been carrying flammable, corrosive or toxic material, an inert gas or any fluid at a volume, pressure or temperature, capable of causing injury.
- O) **Oxygen Deficient Atmosphere:** Oxygen deficient atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume.
- P) **Oxygen Enriched Atmosphere:** Oxygen enriched atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.
- Q) **Rescue Service / Team:** *A team of personnel designated to rescue employees from confined spaces.*
- R) **Retrieval system:** The equipment (including a retrieval line, full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from confined spaces.

ABBREVIATIONS	
BA	<i>Breathing Apparatus</i>
CS	<i>Confined Space</i>
CSE	<i>Confined Space Entry Authorisation</i>
CSNREA	<i>Confined Spaces Not Requiring Entry Authorization</i>
EDC	<i>Emergency Dispatch Centre</i>
ELCB	<i>Earth Leakage Circuit Breaker</i>
ERP	<i>Emergency Response Plan</i>
HSE	<i>Health, Safety and Environment</i>
HSSE	<i>Health, Safety, Security and Environment</i>
IDLH	<i>Immediately Dangerous to Life or Health</i>
LEL	<i>Lower Explosive Limit</i>
LOTO	<i>Lock Out Tag Out</i>
LSS	<i>Life Support System</i>
PEFS	<i>Process Engineering Flow Scheme</i>
PMC	<i>Project Management Consultant</i>
MP	<i>Major Projects</i>
RA	<i>Risk Assessment</i>
RFT	<i>Respiratory Fit Test</i>
RACI	<i>Responsible Accountable Consulted Informed</i>
SCBA	<i>Self-Contained Breathing Apparatus</i>
SDS	<i>Safety Data Sheet</i>
SHELL DEP	<i>SHELL Design Engineering Practice</i>
SWP	<i>Safe Work Practice</i>
TLV	<i>Threshold Limit Value</i>
TWA	<i>Time Weighted Average</i>
WMS	<i>Work Method Statement</i>
WPRA	<i>Work Permit Risk Assessment</i>

5. RESPONSIBILITIES

Responsibilities of various role players related to confined space entry are detailed below.

5.1 Management Responsibilities:

- 1. Implement this procedure and ensure that the requirements of this procedure are communicated to all relevant personnel within KIPIC facilities.*
- 2. Ensure that the guidelines and requirements set forth in this procedure are complied in all KIPIC facilities.*
- 3. Ensure that periodical audits are conducted to verify the compliance of this procedure.*

5.2 Attendant Responsibilities:

- a) Shall know the likely hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. He shall be able to read, write and understand English. He shall be trained and certified (holding *Confined Space Entry Attendant Authorization* card)
- b) Is aware of possible effects of hazard exposure in authorized entrants;
- c) Continuously maintains an accurate count of authorized entrants in the confined space and accurately identifies who is in the confined space; *throughout the duration of entry* using Confined Space Entry Attendance sheet (Refer Annexure-D).
- d) Attendant shall check the entrants CS Entrant Card validity, Respiration use authorization card validity (Respirator use authorization card is required only for work inside confined space where respiratory protection is required) and get sign from the entrant in the attendance sheet prior to allowing entry and also close the same while the entrant is leaving the space.
- e) Remains outside the confined space during entry operations until relieved by another attendant (entrants shall come out if there is no substitute). Wears distinguishing jacket, *preferably title printed on backside of the jacket* for easy identification.

- f) Attendants may enter a confined space to attempt a rescue if they have been trained & equipped for rescue operations, if they have been relieved by another authorized attendant and if they possess a valid confined space entrant authorization card. Attendant shall not be engaged in any other activity.
- g) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate.
- h) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the confined space immediately under any of the following conditions.
- If the attendant detects a hazardous condition.
 - If the attendant detects the behavioural effects of hazard exposure in an authorized entrant.
 - If the attendant detects a situation outside the space that could endanger the authorized entrant.
 - If the attendant cannot effectively and safely perform all the duties required.
 - Permit is taken away for renewal.
- i) Summons rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from confined space hazards.
- j) Takes the following actions when unauthorized persons approach or enter a confined space while entry is underway:
- Warns the unauthorized persons that they shall stay away from the confined space;
 - Informs the Executor if unauthorized persons have entered the confined space;
- k) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

- l) *Ensure that unauthorized persons stay away from the confined space area.*
- m) *Attendant ensures the availability of Work Permit copies, WPRA, attendance sheet, rescue plan and emergency contact details near the entry.*
- n) *In case of Inert entry, confined space Attendant, shall wear at least airline respirator with escape cylinder or SCBA (positive pressure, full face piece) as a precautionary measure.*

5.3 Issuer and Executor responsibilities:

Both Issuer and Executor shall be responsible for recognizing and evaluating the hazards throughout the entry, specifying the essential precautions during the entry and authorizing entry.

Their responsibilities include the following:

- a) Knowing the potential hazards – Issuer and Executor.
- b) Evaluating changes to entry conditions as a result of the work being performed within the space - Issuer and Executor
- c) Knowing how to control and manage hazards - Issuer and Executor.
- d) *Preparing confined spaces for entry, Verifying & certifying* that the space is safe to enter, including checking that respective atmospheric sampling results are compatible with entry – Issuer
- e) Authorizing confined space entry by *issuing the Confined Space Entry authorization* - Issuer.
- f) Ensuring that all necessary work permits are obtained along with confined space entry authorization – Executor.
- g) Ensuring the responsibilities of the various roles specified are fully understood, including overcoming language difficulties – Executor.
- h) *Anyone who observes conditions are unsafe, can terminate the entry.*
- i) Transferring duties formally - Issuer and Executor.
- j) Ensuring that entrants and attendants have valid authorization cards – Executor.
- k) Brief entrants, attendants about the hazards & precautions prior to entry– Executor.

- l) Conspicuously displaying Entry Authorisation with associated work permits, risk assessment, attendance Sheet, blind list and rescue plan at the man way – Executor
- m) Displaying green “ENTRY ALLOWED” signs at authorised entry points, while attendant is present– *Executor*
- n) Displaying red “NO ENTRY” signs or tape barricade at manways not approved for entry and at authorised entry point during break times or when the attendant is away– Executor
- o) *Ensure gas test is conducted and sampling results are recorded - Issuer & Executor*

5.4 Entrant responsibilities:

The entrant shall be responsible for entering the space and performing the authorized task safely. The entrant’s responsibilities include the following (but not limited to as mentioned above):

- a) Knowing the potential hazards
- b) Knowing how the hazards are controlled
- c) Evaluating changes to entry conditions as a result of the work being performed within the space
- d) Knowing how to use entry equipment and PPE
- e) Knowing the communication procedures
- f) Knowing how to evacuate from confined space
- g) Knowing the terms and conditions of safe entry
- h) Maintaining good health and diet plan prior to inert entries to avoid any health issues while working inside inert entry
- i) *Entrants shall enter the name and other details in the CSE Attendance sheet and sign while entering and leaving the CS*

6. CONFINED SPACE ENTRY PROCEDURE / GUIDELINES

6.1 Confined Space Hazards Examples

- a) Oxygen deficiency (less than 19.5% vol.) or enrichment (more than 23.5%)

- b) Presence of toxic, corrosive or hazardous materials (H₂S, Hydrocarbons, NH₃, Sulphur, coke dust, *Acids / acid fumes* etc.).
- c) Presence of flammable, combustible, explosive or pyrophoric material (e.g. sludge).
- d) Restricted access & Egress- Limited number of entry / exit points (e.g. Single man way, basements with low ceilings and difficult escape routes).
- e) Restricted freedom of movement inside confined space (e.g. Trays in towers and pipes in excavations).
- f) Falling / tripping hazards.
- g) Poor illumination / visibility
- h) Communication.
- i) High temperature and humidity.
- j) *Poor Ventilation*.
- k) Electrical, static or radioactive hazards.
- l) Mechanical Hazards (e.g. tank mixers, falling objects such as tools, refractory).

6.2 Identifying confined spaces

6.2.1 Identifying confined spaces in operations units:

- Operations / Custodian Team Leader shall conduct a facility review to identify the confined spaces in their area through a team of representatives consisting of Operations and Safety Team.
- Above team shall develop a list of confined spaces and keep it current. The list to be signed by Operations / custodian Team Leader & dated. The list could form part of Operations manual or *maintained separate*. Format for the list is given in "Annexure – H".
- The identified confined spaces to be properly marked with a warning board in the field – "Confined Space Entry Authorization required for entry".
- At the time of planning specific entry into any identified confined space a comprehensive Work Permit Risk Assessment (WPRA) shall be carried

out to identify all the associated hazards before & during entry and to determine appropriate control measures.

- Entry of operations personnel into certain spaces for day to day operational activities (confined spaces such as cooling tower pump pits, etc.) may be required. For entry into such spaces, *only* if they are identified as confined spaces, appropriate mitigation measures (*which does not involve utilization of CSE Authorization*) shall be incorporated after carrying out risk assessment (as per OHS Hazard Identification & Risk Assessment procedure) and incorporating the same in the OH & S Risk and Opportunities Register. All the control measures determined & documented in the risk & opportunities register shall be complied with. In such cases mandatory requirements shall include (but not limited to) pre entry gas testing & buddy system.

6.2.2 Identifying confined spaces in construction activities:

- During construction activities in project-controlled area, identification of confined spaces shall be done (both at the beginning of the construction activity and at various stages at which confined spaces may occur) by Major Projects Team Leader through a team consisting of Major Projects & Safety Teams.
- After identification of Confined Spaces, WPRA shall be done and other confined space entry requirements shall be followed. The team shall develop the list of confined spaces and keep it current & *communicated to relevant personnel* for the respective project. The list to be signed by Major Projects Team Leader & dated. Format for the list is given in "Annexure – H".

6.2.3 Identifying Confined Spaces in Non-Operational Areas: (Head office, buildings etc.)

Asset Custodian Team Leader shall be responsible to identify confined spaces, maintaining the list and conducting WPRA while planning entry into confined spaces.

6.2.4 Review of confined space list:

- Operations / Custodian Team Leader must review the list of confined spaces annually and as and when new confined spaces are identified through a team of representatives from Operations and Safety Teams.
- Review of confined space list in projects area shall be more frequent and shall be as and when required.
- Review outcomes and recommendations shall be communicated to Safety Team Leader at respective site.
- The record of the review shall be kept until next review.

6.3 Overview of safety requirements for entry into confined spaces:

6.3.1 Confined space entry shall be considered only as a last option if no other approach to task completion is practical.

6.3.2 Confined Space Entry Authorization:

- a) The entry into confined spaces must have an entry authorization (format in Annexure-A) unless the space is reclassified as 'confined space not requiring entry authorization'. (Refer – Section # 8.1)
- b) A confined space entry authorization provides a formal check to ensure all elements of a safe system of work are in place before people can enter the confined space.
- c) Entry authorization is only for *permitting* personnel entry. Work within the confined space will require additional documents in conjunction with the confined space entry authorisation, such as, hot or cold work permit,

excavation authorisation.... etc. The validity period of entry authorizations will be similar to other permits. The retention period of confined space entry authorizations shall be at least 30 days from the date of closure.

- d) A confined space with single controlled entry point shall have one entry authorisation, which indicates maximum persons allowed in at a time irrespective of number of groups working. When different crafts are involved, use of a common Entry Authorisation countersigned by other executors is recommended.

6.3.3 All personnel involved with confined space entry (entrant, attendant, *Gas Tester*, issuer & executor) shall be trained a) in confined space hazards and b) to perform activities defined in this document. All shall have respective valid authorization cards.

6.3.4 Prior to entry, identification of associated hazards, assessment of risk associated with the hazards and determination of possible control measures shall be accomplished to prevent personal exposure to potential hazards. A comprehensive Work Permit Risk Assessment (WPRA) shall be conducted to achieve this. The approved Rescue Plan to be available, if mentioned in the Risk Assessment.

6.3.5 Gas testing before entry & periodic / continuous monitoring of the space shall be ensured by an authorized gas tester.

6.3.6 Requirement of Confined Space Entry Attendant

- a) Executor shall provide an attendant whose name appears on the permit. Attendant shall be trained and certified to do the responsibilities mentioned in section # 5.1 of the procedure.
- b) A confined space with single controlled entry point shall have one attendant. When different crafts are involved, use of a common attendant with the consent of the attendant's supervisor is recommended.
- c) In case of small vessel, exchanger *shell (open on both ends)* or small excavation etc., if the Work Permit Risk Assessment (WPRA) indicates that the risks can be reduced to an acceptable level without the need for an attendant, then attendant may not be required. Waiver for attendant shall be decided by all the members of WPRA team.

- d) *Deployment of one attendant for entry into open ended shells(Open on both sides) of many exchangers is acceptable, provided it is within the vicinity of the attendant and the confined space responsibilities given in section # 5.1 can be effectively discharged for each confined space that is monitored. Work Permit Risk Assessment shall establish the appropriate control measures in case of a single attendant manning many spaces or many man ways of a large confined space.*
- e) Executor shall provide a list of authorised entrants to the attendant. Attendant shall allow entry strictly as per this list.
- 6.3.7 Green "ENTRY ALLOWED" signs shall be displayed at authorised entry points, while attendant is present. Display red "NO ENTRY" signs or tape barricade at manways not approved for entry and also at authorised entry point during break times or when the attendant is away. *This shall be ensured by the executor.*
- 6.3.8 Covering top entry area for protecting the vessel from rain and enabling man entry should be done by Executor.
- 6.3.9 Fixed and portable firefighting equipment, suitable for the type of work being undertaken, shall be provided at and adjacent to the workplace. It shall be ensured that the fixed firefighting system at and adjacent to workplace is in operating condition.
- 6.3.10 WARNING: CO₂ or dry chemical powder type extinguishers shall not be used inside of confined spaces when personnel are inside. Also, water shall not be used if 'live' electrical equipment is being used inside the confined space. *WPRA shall identify suitable mitigation measures for the same.*
- 6.3.11 Compressed gas cylinders (other than SCBA cylinders, cylinders connected with airline respirators) shall not be taken inside the confined space.
- 6.3.12 Entry points into confined spaces (when they are opened) shall be properly secured to prevent unauthorized entry.
- 6.3.13 Access and egress: A safe way in and out of the confined space *shall* be provided for the individuals carrying out the work. Wherever possible, quick, unobstructed and ready access and egress should be allowed. It is essential

that the means of escape be suitable for use by every individual who enters the confined space so that he or she can escape quickly in an emergency.

6.3.14 Before the confined space entry starts, appropriate rescue plan *if mentioned in the risk assessment* shall be available & briefed and essential resources shall be readily available / given. *Rescue Plan to be prepared in consultation with HSE team.*

6.3.15 *Issuer and executor together* shall ensure that all entrants came out of the confined space before starting boxing-up operations, However, this shall be a part of equipment box up checklist of Issuing & Executing teams.

6.4 Preparing confined spaces for entry:

6.4.1 Positive isolation of confined space:

- a) The purpose of positive isolation is (i) To prevent accidental introduction of materials into the confined space, through equipment such as piping, vents, drains, or fire protection equipment and (ii) To prevent the activation or energization of equipment / services which may pose a risk to the persons occupying the confined space.
- b) All connected lines to the confined space shall be positively isolated by blinding (spading) or disconnecting at nearest possible points. Disconnected lines shall be blind flanged. Duly completed and signed blind list shall be attached/displayed with the permit at job location. Relevant & approved *PEFS* duly marked with blind locations shall be available for referring to know the exact connecting lines. Blinds to be properly tagged for easy identification. Valve closure alone *or utilization of double block and bleed arrangement along with valve closure are not positive isolation and hence is not acceptable.*
- c) The confined space shall remain isolated (Blinds shall not be removed) until all work requiring entry is completed and confined space is boxed up and condition checked by Issuer.

6.4.2 The confined space shall be made safe for entry by such methods as depressurising, venting, draining, steaming, purging, washing, and ventilating. Ionizing radiation sources if any shall be removed & *made safe.*

6.4.3 Where vessels have contained or are suspected to have contained leaded products, special precautions shall be observed. *WPRA team shall identify appropriate precautions to be followed for such works.*

6.4.4 De-energization and lockout & tag out of equipment such as mixers, agitators or other equipment containing moving parts in the confined space shall be ensured. Isolation of other energy sources such as steam for heating coils shall also be ensured.

6.5 Hazard Identification, Risk Assessment & determining control measures:

6.5.1 Hazard identification:

In the hazard identification stage of WPRA, as a minimum, the following types of hazards shall be considered.

- a) Atmospheric hazards (includes oxygen deficient atmosphere, oxygen enriched atmosphere, flammable atmosphere, toxic atmosphere, Inert atmosphere, etc.)
- b) Mechanical hazards such as hazards created by equipment with stored energy such as mixers, agitators, *hazards due to other energy sources such as heating coils etc.*
- c) Physical hazards such as slips, trips & falls, radiation, vibration, extremes of temperature (excessive heat), entrapment, etc.
- d) Hazards arising from exposure to chemical fumes (*including acid fumes*), mists, dusts shall also be considered.
- e) Hazards arising from different crafts working simultaneously and possibility of falling objects.

6.5.2 *In addition to the above-mentioned types of hazards, all other hazards which are inherent to the confined space or introduced into the space or due to the activities carried out adjacent to the space shall be considered during WPRA.*

- a) **Inherent hazards**—Hazards due to the internal shape and restrictions in the confined space (for example bulkheads, plates and down comers), size

and shape of entry/ exit points, fixed equipment within the space, products / residues in the space.

- b) **Introduced hazards**— Hazards introduced into the space due to nature of work being done such as chemical cleaning, painting, contaminants entering inadvertently along with ventilation air, fumes from welding / cutting, *use of inert gas (such as Argon) during welding*, hazards due to electrical equipment brought inside, slip, trip & fall hazards posed by material brought inside.
- c) **Adjacent hazards**— Potential effects of activities outside the space on the conditions within the space shall also be considered.

6.5.3 After hazards are identified, appropriate control measures shall be determined to bring the risk to an acceptable level.

6.5.4 Hierarchy of hazard controls shall include (but not limited to) elimination, substitution, engineering controls, administrative & work practice controls and use of PPEs.

6.6 Atmospheric hazards & control measures:

6.6.1 Monitoring the space atmosphere:

- a) An authorised gas tester, who has been trained, tested and certified by KIPIC HSE Group shall carry out the gas test using an approved gas detector.
- Field Operator shall be the minimum eligibility level (with the below mentioned conditions) to become an authorized gas tester.
 - He shall have at least 2 years of working experience as Field Operator, with adequate competency and knowledge of their respective units.
 - It is the responsibility of concerned Operations Group to ensure the required Competency of nominated employees (2 years' experience and knowledge) for the subject certification before the employee is nominated for the training course on Gas testing.

- He shall undergo *Gas testing Authorization Training* and Test on Gas Testing course with KIPIC HSE Group and he will be certified as Authorized Gas Tester after successful completion of test.
 - After certified as Authorized Gas Tester, initially he shall be supported and supervised by his direct controller for at least 3 months for all kinds of works, including confined space entry. The same period shall be extended further until the controller find him suitable for performing gas test independently. *For entry into inert confined spaces, the Controller of the unit (who is an authorized gas tester) shall conduct the gas test before issuing / renewing the entry authorization. Continuous monitoring of inerted space's atmosphere shall be done by the life support system.*
 - *Validity of gas testing authorization is 3 years. The concerned area Team Leader shall maintain a record of authorized Gas Testers and initiate action for timely renewal or new authorizations.*
- b) *Gas tests are mandatory for all confined space entries. Authorized gas tester shall fill section-4(A) on work permit: to record measurement results of concentrations of oxygen, flammable gases / vapours, toxic gases and other gases as applicable to the location of work.*
- c) *Operation Team Leader / Section Head shall ensure that, gas detectors are available with calibration validity and in 'ready to use' condition with the required accessories. Service records shall be maintained. Defective gas detectors shall be withdrawn and sent for repairs. Replacements shall be arranged immediately.*
- d) *Operations Controller shall test his gas detectors at the beginning of the shift and log the condition (e.g. Detector No.1 – satisfactory, Detector No.2 – O₂ sensor defective etc.).*
- e) *In case of qualifying for Authorized Gas detector other than operations personnel, the below criteria shall be met*
- *Shall be nominated for AGT by the respective Asset custodian.*
 - *Knowledgeable and Competent on the work being carried out.*

- *He shall undergo Gas testing Authorization Training and Test on Gas Testing course with KIPIC HSE Group and he will be certified as Authorized Gas Tester after successful completion of test.*

6.6.2 Gas Testing Procedure:

- Issuing authority shall determine and record the gases to be measured. Minimum requirement shall be O₂%, LEL, H₂S and any other toxic gas expected to be present inside the confined space being tested. As a minimum gas testing shall be done before first entry and before each renewal of permit. Issuing authority shall determine the frequency of repeating the gas test (over and above the minimum requirement of before each renewal) or the need for continuous monitoring.
- Spaces shall be evaluated prior to re-entry after any break in continuous entry and satisfactory results obtained and recorded. As a minimum first entry shall be made within 30 minutes of gas testing. For re-entry after any break for a duration more than 2-hour, gas testing shall be done again.
- The Authorised Gas Tester as specified in sec. # 6.6.1 (a) shall carry out gas test. He shall ensure that his authorisation is valid, and the *gas detector* is in good condition (calibration valid and battery charged).
- Ventilation (blowers) shall be stopped approx. 15 minutes in advance prior to carrying out gas test for the confined space.
- Initially, he shall test from outside the confined space, using a long probe. If the entry involves a vertical descent, the atmosphere should be tested at 4 ft. (1.2 m) intervals starting at the opening of the space and working towards the bottom of the space. For a horizontal entry, a rigid sampling probe is required, and the atmosphere should be tested at 4 ft. (1.2 m) intervals working inward from the opening of the space. Wherever possible the above-mentioned method (of doing gas test at an interval of 4 ft.) should be followed.
- Duration of testing: Gas testing shall be made for at least the minimum response time of the test *instrument specified by the manufacturer*. Also, the length of the sampling tube/ probe shall be considered in addition to the

response time as recommended by manufacturer. The gas tester shall allow 2 seconds for one foot of sampling tube/ probe, in case of gas testers equipped with pumps.

- g) Testing stratified atmospheres: Gas test shall be done at all levels of the space since heavier than air gases may get accumulated at the bottom and lighter than air gases may be at the top.
- h) If the initial gas tests indicate a concentration above the permissible limits, further gas freeing shall be done until the gas concentration is within the permissible limits.
- i) The gas tester shall carry an escape breathing apparatus while testing from outside of man way, if the presence of toxic vapour or gases is suspected. Issuer shall ensure availability of escape breathing apparatus. However, carrying escape breathing apparatus while doing gas test for inert confined space is strictly prohibited. SCBA or airline respirator with escape cylinder shall be worn while testing inert confined spaces from outside.
- j) Test result shall be representative of the entire confined space. Hence the need may arise to enter for gas testing at different locations inside large tanks or towers and complex vessels based upon number of man ways, toxic materials handled, size of the vessel, etc. (e.g. reactors) to get a representative result. Operation Team Leader / Risk Assessment Team Leader shall decide at planning stage, the need for entering the confined space for gas testing and communicate this to the issuer.
- k) Gas testing of large or complex confined spaces: The Operations Controller/ Controller 1 shall issue a confined space entry authorisation, describing in Section -1B the gases to be measured to the authorised Gas Tester who will sign as executing authority and tick "pre-entry gas test" in section-4A and leave rest of the section 4A blank. *In such cases "Authorized Gas Tester card" is considered equivalent to "Work Permit Executor Authorization Card". The gas tester who enters for carrying out gas test shall have a valid 'Confined Space Entry Authorization card'.* The atmosphere shall be treated as IDLH and SCBA or airline respirator with escape cylinder shall be worn during entry.

- l) Test results shall be entered on the entry authorisation and check box *titled "see associated entry authorization"* ticked on the associated work permit. If there is a requirement of frequent monitoring, test results shall be entered in *the next two rows of sec. # 4(A) of entry authorization and further test results shall be recorded in the area Field Operator's logbook for record, in case of manual authorization forms.*
- m) Executor of actual work *shall accompany the gas tester up to the manway to witness and satisfy himself, that actual gas test has been done before accepting the permit. Executor has the right to refuse the permit if proper gas test was not done (e.g. Filling section 4A without testing). This is always applicable for all entries.*
- n) *Area / Shift Safety Engineer shall be called by Operations for witnessing & cross checking the gas test before first entry. He/she shall witness gas test conducted by authorized gas tester from Operation prior to confined space FIRST ENTRY. He/she shall cross check the gas test results by doing gas test with his gas detector and register gas test results in Area Safety advice logbook prior to confined space first entry. Same procedure shall be followed while changing over from inert entry / entry with supplied air respirators to normal atmospheric entry.*
- o) In case of any violations / discrepancies, he *Area / shift Safety Engineer* shall bring the same to the notice of the Issuer & Executor and log his observations in Area Safety advice logbook.
- p) *The Gas Tester shall conduct tests for atmospheric hazards simultaneously or in the following order (i) Oxygen, (ii) Flammable gases / vapours & (iii) Toxic gases.*
- q) At least 13% Oxygen is required to obtain an accurate LEL reading from a *gas detector equipped with catalytic combustion type LEL sensor.* Hence, these cannot give a proper reading in atmospheres such as a vessel purged with steam or nitrogen. Hence LEL and O₂ shall be measured simultaneously in such situations or *O₂ shall be measured first. Gas detectors with Infra-Red (IR) type LEL sensor shall be used for Oxygen deficient atmospheres. One of the limitations of IR type LEL sensor is that it will not detect*

Hydrogen. For measuring Acetylene vapor concentration IR type LEL detector, which is specific to Acetylene is required.

- r) The detector used for gas testing shall be an approved KIPIC multi gas detector with calibration validity.
- s) Where atmosphere within confined space is initially made safe, but there is a reason to believe that it may become unsafe during the period for which entry is authorized, or (e.g., from emission of gases / vapours from sludge or deposits contained in the space or welding fumes or inerting), continuous gas monitoring is required.
- t) A continuous monitor shall be arranged so that the entrants and the attendant should see or hear any alarm. The continuous gas monitor shall draw sample from near the work area. Issuer shall arrange continuous monitor & executor shall arrange to monitor the readings and activate response to alarms by training the attendant.
- u) Gas detector used for leaded gasoline shall be equipped with special filters to prevent damage to the sensor by lead, which may result in reading errors.
- v) Moisture/dust filter and/or liquid trap is required when measuring probe comes in contact with excessive moisture/dust and liquid.
- w) Portable electronic gas monitors should not be used within 18 in (0.47 m) of the antenna of the handheld radio as *Gas monitor or sensor readings can be affected by radio frequency interference (RFI) or other electromagnetic interference (EMI).*

6.6.3 Gas Test Limits:

- a) **Oxygen:** Oxygen test shall be carried out first. Preferably the oxygen concentration of the air inside the confined space should be equal to that outside the space. The oxygen content of the air shall be in the range from 19.5% to 23.5% to work without an air supplied respirator. For inert entry, oxygen content shall be less than 4%.
- b) **Flammable gas:** Flammable gas *concentrations* is measured as %LEL (percentage of Lower Explosive Limit). For cold work without airline

respirator & escape cylinder / SCBA reading shall be below 10% LEL. For hot work inside confined space *the concentration shall be zero (0%)*. Above 10% LEL for cold work, further gas freeing to be done to bring down the *flammable gas concentration* below 10% of LEL. Still if LEL is more than 10% only inert entry is allowed.

- c) **All toxic gases:** As applicable, the concentration shall be below TLV - TWA for entry without airline respirator/SCBA (e.g. H₂S – 10 ppm, CO - 25 ppm, Cl₂ - 0.5 ppm, SO₂ - 2 ppm, NH₃ - 25 ppm). Entrants shall wear airline respirator with escape cylinder or SCBA (Self-Contained Breathing Apparatus) for concentration greater than TLV.

In *case of exceptional circumstances where toxic gas concentration in the* confined spaces remain above one third (1 / 3) of IDLH value, (IDLH values: CO – 1200 ppm, Cl₂ – 10 ppm, H₂S – 100 ppm, SO₂ – 100 ppm, NH₃ – 300 ppm), further Work Permit Risk Assessment shall be done. This WPRA shall be done by a team headed by the Operations Team Leader. Operations Section Head & Senior Engineers of the concerned teams shall be the members of this WPRA team. Based on the WPRA findings, WPRA team can authorise entry up to IDLH value. This procedure is not applicable for inert entry where entry conditions are IDLH and separate set of work procedure & special respiratory protection equipment are deployed as mandated in sec. # 6.8.

- d) Concentration of airborne combustible dust shall be below its LEL (*Examples of combustible dust include coke and Sulphur dusts*). (This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less).

6.7 Other hazards & control measures:

6.7.1 Temperature & humidity:

- a) For initial entry into spaces like heaters, reactors, *boilers* etc. additional hazards may exist. These hazards exist due to the operational service where

the space has been subjected to high temperature. Temperature and humidity are related to each other and do not have fixed limits.

- b) These should not create a hazard for personnel at any time during entry. A Work Permit Risk Assessment shall be undertaken bearing in mind the PPE to be worn, the nature of the work and the surrounding conditions.
- c) Hazards such as internal temperature, humidity and hot surfaces shall be included in the risk assessment, and suitable controls put in place. These controls could be for example, reduced work duration, extended cooling time etc. For deciding such controls temperature and humidity shall be measured and recorded in the confined space entry authorization sec. 4 (A).
- d) Precautions given in "Heat Stress Management Program"- (*KIPIC/HSEF/SYSOH/18/1606*) shall be followed. This provides acceptable methodologies for managing heat stress. KIPIC *Health team* should be consulted if needed.
- e) Provision of air conditioning and precautions regarding air conditioning or special clothing depending on each situation shall be jointly evaluated by Issuer and Executor. Prior to entry, hot confined spaces shall be allowed sufficient time for cooling (e.g. Heater refractory, reactor catalyst etc.).

6.7.2 Atmosphere & Ventilation:

- a) Wherever possible the confined space shall be ventilated & *made free of air contaminants (flammables & toxic gases)* to enable entry without respiratory protection.
- b) Ventilation shall ensure circulation of air within the confined space leaving no stagnant pockets.
- c) Ventilation during entry should not substitute for prior removal of residual material from the space.
- d) Ventilation can be used to reduce or remove the atmospheric hazards created while personnel are in a confined space. Mechanical ventilation is preferred over natural ventilation.

- e) Air intake of forced ventilation equipment shall be from an uncontaminated location.
- f) At least 2-man ways shall be open in every chamber of space for proper ventilation.
- g) In single man way spaces, dropping of a spool piece / valve or disconnecting and dropping a line from far end shall be adopted.
- h) Air suction (i.e., *Local Exhaust Ventilation*), if used, should be sucking air away from the immediate vicinity of the work.
- i) Care should be taken when ventilating vessels containing pyrophoric scales to avoid spontaneous ignition. In such situation, inert entry with required safety precautions or handling pyrophoric material in wet condition shall be adopted.
- j) Utility/instrument air or oxygen shall not be used as a means of ventilation or as air supply to breathing apparatus (can be used to drive air movers).
- k) Compressed air from Portable compressors directly into the confined space (Other than use in Eductors/Fans as drivers) shall be avoided due to oil mist carryover.
- l) All personnel (including all the entrants & attendant) shall mandatorily wear personal H₂S monitors where H₂S is expected, irrespective whether process unit is shutdown or in start-up phase.

6.7.3 Process equipment within the confined space:

- a) Power driven internal equipment that affects the confined space such as mixers etc. shall be mechanically and electrically disconnected from the power source e.g. physical disconnection of motor leads.
- b) The cathodic protection system shall be disconnected at least 24 hours earlier to dissipate the residual currents.
- c) Pneumatic or steam driven equipment if any shall also be disconnected.

- d) *Electric heat tracing, if any, shall be de-energized and electrical isolation by lock out Tag out to be ensured.*
- e) *Steam tracing, if any, to be isolated and tagged at steam and condensate sides.*
- f) Although process equipment (e.g., an agitator) within a confined space is isolated, it still poses a hazard. Equipment could move. Equipment that could move shall be secured.

6.7.4 Visibility:

- a) Visibility shall be considered inside a confined space, both prior to entry and during the work. Appropriate equipment and precautions shall be specified in the entry authorisation.
- b) Confined Spaces shall be provided with illumination of not less than 300 lux.
- c) Appropriate equipment includes using 24 Volt (or below) explosion proof lamps for adequate illumination.
- d) Precautions shall ensure that the lighting used do not create additional hazards. Also lighting used should be positioned to enable the attendant to see clearly the entrants working in confined space.
- e) To ensure adequate illumination, light intensity shall be measured by work permit executor, using Lux meter. The level of illumination throughout a work area, should be measured at various locations on the horizontal work-plane, at least 6 feet (2m) from the nearest light sources. *If lux meter is not intrinsically safe hot work permit is required to use them.*
- f) Situations may arise where the light intensity may reduce due to various factors such as deposition of dust, paint on the light. Hence, illumination shall be measured by work permit executor inside the confined space at various stages of the work and as and when required.
- g) The executor shall ensure even distribution of illumination, especially full visibility at work spots, access and egress, without dazzle. Consideration

should be made for jobs requiring more visibility, such as erection of scaffolding. Any complaint of inadequate illumination or dazzle by workmen shall be seriously viewed and addressed on priority.

- h) In spaces of total darkness, entrants shall also carry battery operated intrinsically safe flashlight (torch) for use in case of hand lamp outage.

6.7.5 Fall Prevention:

- a) Executor shall provide means for exit and entry of personnel into and out of the confined space.
- b) Cramped working conditions can make changing levels difficult and can increase the hazard of falling.
- c) Consideration shall be given to the potential for falling when preparing and entering confined spaces, as well as specific details of the rescue method and how an attendant shall monitor the condition of people inside the confined space.
- d) Working at two levels simultaneously shall be avoided until it has been made safe after work permit risk assessment.
- e) When working at height inside a confined space is involved appropriate fall protection equipment such as safety harness with necessary lifelines, safety nets, and self-retracting device while climbing ladders, etc. can be used. The appropriate fall protection equipment shall be determined during WPRA.
- f) While utilizing portable ladders three-point contact shall be maintained at all times.
- g) When man way covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier. This will prevent anyone from falling through the opening, especially for manways on top of vertical vessels.
- h) Fixed ladders to be used. Rope ladders shall not be used, unless the situation warrants and if so, to be done only upon approval after carrying out Risk Assessment.

6.7.6 Static electricity:

- a) Equipment shall be grounded where static electricity is a potential hazard or could be created by the activities in or around the confined space (e.g., water washing, catalyst loading in reactors, etc.).
- b) Mechanical ventilation equipment shall be properly grounded (earthed) to dissipate any static charges. Pneumatic air movers (eductors) and exhaust fans are recommended for this purpose.

6.7.7 Electrical hazards:

- a) Confined-space entrants shall be protected from electrical hazards arising from tools and lighting. Precautions as per KIPIC procedure on Electrical Safety shall be ensured.
- b) Use of 24 Volt or below explosion proof lamps for adequate illumination is permitted.
- c) Use of any electrical equipment above 24V shall have earth leakage tripping device. Electrical fittings *and lamps* exceeding 24V and connections inside confined space (including ELCB) shall be inspected & approved by KIPIC Electrical & Instrumentation Maintenance Team before starting the job and record shall be maintained. Thorough work permit risk assessment shall be conducted which shall include requirement of inspecting the condition of electrical cables for any defective/damaged insulation etc.

6.8 Inert Entry:

Inerting of confined spaces is adopted when it is impossible to gas free below 10% LEL and / or pyrophoric material is present. Inert atmospheres are IDLH due to oxygen deficiency.

Since inerting involves displacement of atmosphere by a non-combustible gas (such as Nitrogen), the oxygen concentration becomes very low making the confined space atmosphere highly hazardous.

While inert atmospheres in confined spaces are indeed “immediately dangerous to life or health (IDLH),” the hazard is much more severe and immediate than the often-used definition available in sec. # 4.

Since inert atmosphere entry is a high-risk operation, Work inside an inerted vessel, reactor or any other inerted confined space should be avoided or minimized. Where practical, other alternative methods of doing the job to be considered. Only if all other methods are not feasible, inert entry option to be selected as a last option.

Inert Atmosphere Entry is a high-risk operation and shall be performed only by specialized contractors (specially trained & experienced contractors using specialized equipment).

Specially trained & experienced personnel must be available with the specialty contractor to fill all critical positions including all entrants, rescuers, attendants, and entry supervisors (Work Permit Executor of inert entry activity).

Prior to inert entry, the approved equipment blind list shall be checked by both Issuer and Executor for proper isolation.

6.8.1 Pre-job planning:

- As part of planning, a detailed Work Permit Risk Assessment (WPRA) shall be conducted.
- The catalyst handling services contractor shall submit a detailed work procedure from which inputs can be taken for WPRA.
- All resources necessary to implement control measures identified in WPRA shall be made available.
- Adequate supervision to be ensured by KIPIC Mechanical Maintenance Team and Operations for the inert entry activity.
- Work Permit executor shall deliver a toolbox talk for the working crew clearly explaining the hazards and required control measures before the start of the job.
- An inert entry pre-job safety checklist is attached as Annexure-G.

6.8.2 Inert entry gas test limits:

Inside an Inert Confined Space:

- Oxygen concentration shall be below 4%
- Flammable gases shall be below 10% of LEL (for hot work inside the inert confined space)
- Flammable gases shall be below 20% of LEL (for cold work inside the inert confined space)

6.8.3 Inert entry hazards:

- a) **Oxygen deficiency:** Oxygen deficiency is the principal hazard when persons perform inert entry. **Oxygen deficiency hazard exists not only inside the inert confined space but outside also.** Personnel working outside, i.e. near inert confined space opening / entry points (including dump nozzles) are equally exposed to oxygen deficiency hazard.

An oxygen-deficient atmosphere rapidly overcomes the victim and there is no warning before being overcome.

- b) **Fires and explosions:** In case of increase in oxygen concentration to 4% or more, fire or explosion may result inside the inert confined space. Also, effluent gas leaving the space from an open man way may mix with outside air and result in a fire and/or explosion hazard for personnel outside the space.

Spent catalyst being unloaded through the dumping nozzles may come in contact with air and get ignited before they get collected in drums.

- c) **Pyrophoric material hazards:** During inert entry if the pyrophoric deposits of iron and/or sulphur accumulated from the hydrocarbons that pass through the catalyst bed is exposed to air, or another source of oxygen, the pyrophoric deposits will begin to generate heat due to oxidation

reaction. If allowed to continue, this could generate a potential ignition source.

Spent catalyst removed from reactors also present potential pyrophoric hazard.

- d) **Hazard due to Catalyst Crusting:** Sometimes, it is possible for a hard crust to form at the top of the catalyst bed. This can sometimes be very difficult to remove and can be self-supporting even when the bed (tray) beneath it has fallen. Personnel working on the crust surface can fall when the crust suddenly disintegrates. A crust could be present even though a flow of inert gas (N₂) has been established through the vessel/reactor.

Build-up of pressure under a catalyst bed causing the crust to rupture violently is another potential hazard of catalyst crusting. This violent rupture can result in Physical injury, forceful expulsion of workers from vessel.

- e) **Nickel Carbonyl hazard:** One hazardous chemical unique to refinery catalytic reactor operations using nickel catalyst is nickel carbonyl {Ni (CO)₄—nickel tetra carbonyl}. Nickel carbonyl is a highly volatile (a gas above 110 °F) chemical that can be formed by reaction of carbon monoxide with nickel. Exposure route is by inhalation. Concentrations of only a few parts per million (ppm) for short durations can cause severe acute symptoms; There is often a delay in the onset of symptoms (dizziness, headache, respiratory distress) of 12 to 36 hours after exposure. Carbon monoxide in the inert gas can lead to formation of nickel carbonyl. Nickel carbonyl should be treated as a carcinogen. It is highly flammable, explosive and reactive. It may explode in air.

- f) **Other Hazards Inside the Inert Confined Space:**

- i. Catalyst engulfing workers,
- ii. Catalyst beds / internal structure not supporting workers' weight,
- iii. Catalyst build-up attached to walls falling on entrant,
- iv. Clinkers deep inside beds remaining hot,

- v. Elevated temperatures increasing physical stress on entrants, *Effect of heat stress on entrants*
- vi. Other hazards related to all confined spaces such as inadequate positive isolation of the confined space, inadequate lock out/tag out of pneumatic / power driven equipment, restrictive workspace.
- vii. The Life Supporting hoses shall be properly dressed to avoid entangling with any pipes / supports etc., as this may restrict air flow to the face mask.

g) Other Hazards Outside the Inert Confined Space:

- i. Weather enclosures (tents) around entry points to an inert blanketed vessel can function as a partially confined space causing accumulation of inerted atmosphere leading to oxygen deficiency or an accumulation of flammable or toxic effluent material. Such enclosures shall be avoided.
- ii. Oxygen deficiency / toxic gas / flammable gas hazard for Personnel working near confined space opening / entry points (including dump nozzles).
- iii. Congestion at the job site caused by life-support hoses, breathing-air systems and the presence of rescue and emergency response equipment.

6.8.4 Inert Entry Requirements:

- a) Inert Atmosphere Entry is a high-risk operation and shall be performed only by specially trained with internationally approved certificate for inert entry competency, fully medically certified & experienced contractors using specialized equipment. These requirements are for inert entrants and rescuers also.
- b) Gas limits as available in sec.# 6.6.3 shall be complied with.
- c) To protect entrants from oxygen deficiency, a certified Life Support System (LSS) shall be deployed for the job. The Life Support System used shall fully

comply with the requirements mandated by KIPIC HSE document on 'Respiratory Protection Program' (KIPIC / HSE S&F /HE/19/001).

- d) A minimum safety perimeter shall be established around vessel opening / entry point (including dump nozzles) and clearly marked by barricades and signs. Signs shall indicate oxygen deficiency hazard. **Executor shall display "Nitrogen Purging" or Contaminated Area" text written in red colour on warning board and tape barricade to prevent entry into contaminated area.** Only authorized personnel with appropriate safety gear shall be allowed inside the safety perimeter. Personnel inside the safety perimeter, including confined space Attendant and authorized gas tester, shall wear at least airline respirator with escape cylinder or SCBA (positive pressure, full face piece). At least one person shall be stationed as a potential rescuer near the manway. He shall be fully suited with Life Support System respiratory equipment.

During breaks (when no personnel are present), the manway shall be covered and access to the manway shall be secured to prevent inadvertent entry of unauthorized personnel.

- e) Spent catalysts containing pyrophoric material shall be safely disposed.
- f) Before the first Inert Entry, the following procedure is recommended to find out the presence or absence of a catalyst crust prior to starting the catalyst dump:
- Establish an inert gas (N₂) purge from below the potential crust layer using the top vessel/reactor manway as a vent.
 - Isolate the inert gas (N₂) purge from below the potential crust layer. The pressure at the bottom of the reactor should fall quickly. If the pressure does not fall rapidly this indicates that a catalyst crust could be present.
 - Physically examine the top of the catalyst bed from outside of the vessel/reactor first, then obtain proper entry permits and examine from inside the vessel/reactor and break-up any crusting, if present.

Do not allow entry onto a crusted surface if catalyst has already been partially dumped from beneath it or a void under the crust is suspected. Attempt to break the crust from outside the vessel/reactor while maintaining Opsi pressure underneath the beds. Where this is not possible, special procedures shall be developed to allow a person to work from inside the vessel/reactor with appropriate safety equipment.

- g) For protection from formation of Nickel Carbonyl in reactor / vessel containing nickel catalyst, the manufacturer's recommendations / best practices shall be followed including use of personal protective equipment.
- h) While digging through catalyst, care shall be taken to ensure that no high wall of catalyst is left in place, ready to cave in if disturbed. Recommended maximum height is 0.8 m to 1.0 m.
- i) If there is a temperature rise of 3 deg. C or more for every 15 minutes, it indicates air intrusion. Hence, temperature to be monitored continuously. In order to prevent or mitigate the effects of heat stress on the entrants, due to elevated temperatures, a proper work rest regime and use of personal cooling suits or vests shall be considered. Heat stress program requirements shall be followed if temperature increases above 38 deg.C.
- j) Care shall be taken while erecting temporary enclosures (tents) to prevent accumulation of IDLH atmosphere.
- k) Pneumatic tools, if required to be used inside inert confined space, shall be powered with nitrogen to prevent the introduction of air into the inert atmosphere.
- l) Backup supplies are required to be immediately available for both inert purge gas and breathing air.
- m) Hands free communication, as mandated in 'KIPIC HSE document on 'Respiratory Protection Program'(KIPIC / HSE S&F /HE/19/001) shall be used.
- n) Use of distress signal unit by the entrants should be considered.

- o) Mechanism to ensure quality of inert gas shall be established and followed by Operations.
- p) Adequate lighting near the man way and inside the confined space shall be ensured while working at night.
- q) Other confined space entry requirements such as confined space entry authorization, positive isolation except for the Nitrogen connection, lock out / Tag out of energy producing equipment, removal or shielding of radiation sources, if any, inside confined space shall be followed.

6.8.5 Training Requirements:

The contractor shall properly train persons involved in inert atmosphere entry. In addition to the confined space entrant training, the training shall include (but not limited to) the following:

- Hazards of inert entry
- Generic control measures to be followed during inert entry
- Training on the use of Life Support System
- Training on the safe methods of job execution
- Training on the emergency response activities
- Rescue operations training (for assigned rescuers)

6.8.6 Testing and monitoring the atmosphere:

- a) Issuer shall ensure gas testing with a properly calibrated multi gas detector, for gas test before entry & gas test at periodic intervals (minimum once in a shift / during each renewal of the permit whichever is earlier).
- b) Executor in charge of inert entry activity shall ensure the following by using remote sensing vessel condition monitoring *gas* detectors and temperature measuring instrument (which form part of inert entry life support system).

- i. Continuous monitoring of oxygen & flammable gases inside the confined space and alerting the attendant to evacuate entrants and inform the issuer if oxygen /flammable gas level is exceeded.
- ii. Continuous monitoring of H₂S inside the confined space and the H₂S alarm in the Life Support System are for the following purpose:
 - To prevent exposure of personnel who are outside the confined space (near the man way & outside the minimum safety perimeter) to H₂S concentration above 10 ppm.
 - To assess whether more dilution of the confined space with Nitrogen is required to reduce H₂S concentration (outside) to less than 10 ppm.

The personnel near the man way shall wear airline respirator with escape cylinder or SCBA. However, exposure of personnel outside the minimum safety perimeter to H₂S above 10 ppm to be prevented.

Whenever the remote sensing H₂S detector gives alarm, the concentration of H₂S outside (near the man way & outside the minimum safety perimeter) shall be checked. If it is more than 10 ppm outside the minimum safety perimeter further dilution of confined space with more nitrogen shall be considered which issuer shall ensure.
- iii. Continuous monitoring of temperature inside the confined space and alerting the attendant to evacuate entrants and inform the issuer if the rate of rise is 3 deg. C or more in 15 minutes.
- c) *Inert entry where low oxygen conditions (Less than 13%) exist, a standard catalytic bead sensor combustible gas detection does not operate correctly. Hence, infrared (IR) sensor to detect flammable gases shall be used.*
- d) Continuous oxygen monitor shall be set to give alarm at oxygen concentrations below 4% oxygen. These alarms will alert the entrants & the crew for evacuation well before the 4% oxygen concentration is reached. Flammable gas detectors shall give alarm at 10% LEL.

- e) Audio-visual personal oxygen alarm set at concentrations below 4% shall be carried by the entrant in a way that entrant is able to see or feel or hear the alarm while wearing BA.

In addition to the temperature monitoring instrument used by the working crew & issuer, all temperature indicators connected to the confined space shall remain in service during the entry for monitoring temperature.

- f) The work permit issuing team shall ensure the quality of Nitrogen used for Inerting the vessel. Operations team shall control the required flow of nitrogen (to keep the oxygen in the vessel below 4%).

6.8.7 When to evacuate?

Evacuation of inert confined space shall occur under the following conditions:

- Oxygen concentration greater than 4%
- Flammability reaches 10 % LEL or greater (if hot work is being performed in the inerted space)
- Flammability reaches 20 % LEL or greater (where cold work is being performed)
- Loss or problem with inert gas (Nitrogen) flow
- Temperature rise greater than 3 deg.C within 15 minutes
- Loss of lighting
- Loss of communication system
- Loss of breathing air or problem with Life Support System
- Non-functional Screens, third party uncertified, defective etc. Life Support System
- Pressure rises inside the confined space
- If any entrants are observed to be in distress

- Plant emergency outside the confined space
- *If the attendant detects any other prohibited condition*
- *If the attendant detects a situation outside the space that could endanger the authorized entrants.*
- *In case of liquid Nitrogen entrainment into the vessel*

Anytime a confined space is evacuated, a thorough investigation shall be performed *by issuer and executor in consultation with safety team (if required)* to identify the cause(s) that led to the condition requiring evacuation. Entry shall not be permitted back into the space until corrective actions have been implemented to address the cause(s).

6.8.8 Emergency preparedness & rescue services:

Availability of appropriate Rescue Team shall be ensured during inert entry. Rescuers shall strictly follow safe rescue procedures.

A rescue plan shall be prepared for each specific confined space taking into consideration the complexity of the job, potential emergency scenarios and unique configuration of the vessels.

Emergency procedures shall be developed to cover, at a minimum, the following:

- Loss of N₂ supply (low pressure)
- High pressure inside the confined space (*Forced ventilation, air conditioning, etc*)
- High Oxygen concentration inside the confined space
- High temperature inside the confined space
- Loss of breathing air supply
- Loss of communications with person(s) working inside
- Emergency inside the confined space
- Plant emergency outside the confined space

- Spillage of spent catalyst outside reactor & fire hazard in immediate surroundings of the confined space.

In the event of an emergency resulting in loss or interruption of breathing air supply, there is very limited time available (even 1-minute counts) to successfully rescue the worker and provide medical treatment.

For evacuation in case of any emergency adequate emergency rescue equipment & the personnel trained in its use shall be immediately available at the vessel manway. This shall include (but not limited to):

- a) Hoisting device and a wire lifeline to extract person from inside confined space.
- b) Persons working inside the vessel/reactor shall wear a harness, which enables the person to be lifted out of the vessel/reactor in a vertical position
- c) A pre-planned means of lowering the person to the ground
- d) A radio used for summoning for assistance
- e) At the vessel man-way standard Inert Entry equipment shall be available for rescuers also, so that in an emergency they can enter the vessel/reactor to assist personnel in need.
- f) Adequate anchor points shall be installed at or near the manway entry point to aid in ingress and egress in the event of an emergency.
- g) Direct communication shall be maintained (Voice and or line of sight) with all personnel during rescue operation.

6.8.9 Inert entry Attendant's Responsibilities:

In addition to the responsibilities of a normal confined space attendant (as given in section # 5.1) the inert confined space entry attendant has the following additional responsibilities:

- a) Attendant shall wear suitable respiratory protection
- b) If attendant can function as a rescuer (after relieved by another attendant), he shall meet all the requirements of an entrant.

- c) Coordinate and help in use of Life Support System by the entrants
- d) Evacuating personnel if the continuous oxygen monitor shows oxygen at or above 4%, if LEL increases above limit and if the temperature rise is more than 3 deg.C within 15 minutes.
- e) To initiate rescue and other emergency services in case of emergencies.
- f) *Monitor activities inside and outside the space and evacuate the space if prohibited situations/abnormal conditions develop.*
- g) *Ensure proper housekeeping near the manway to facilitate easy egress.*
- h) *Prevent unauthorized person from entering the restricted area.*
- i) *Do not perform other duties.*

6.9 Entry to a live floating roof:

Entry to a floating roof may be required for inspection, checking the condition of the seal, cleaning, maintenance etc. A floating roof is considered as a hazardous confined space when the roof is more than 1.5 meters below the top of tank shell. Hence except blinding and mechanical ventilation, other confined space entry precautions shall be followed.

- a) The roof should be checked for thickness (as applicable) by Inspection & corrosion team before Operation or Maintenance personnel enter the roof. Inspection & corrosion personnel can check thickness by using crane with man basket, without stepping onto the roof. All the safety guidelines for lifting appliances & tackles shall be followed, if crane man basket is used for thickness measurement. Full Body Harness shall be used by all entrants to avoid any accident due to weak roof.
- b) Operation or any other person shall not enter alone to a floating roof.
- c) Wherever possible, the work should be scheduled when the tank is full.
- d) Attendant shall remain at landing platform with a radio and SCBA. He shall communicate with the entrants by voice or radio.

- e) Gas meter or personal gas monitor with 10% LEL alarm shall always be available with the entrants and they shall come out on alarm. Entrants shall carry Personal H₂S monitor.
- f) Entrants shall be equipped with SCBA and ready to wear if the LEL exceeds 10%. Airline breathing apparatus with escape cylinder can also be used but users and attendant shall ensure hoses are not subjected to damage.
- g) When maintenance personnel are working, Operations shall continuously monitor LEL%. H₂S measurement is also required if the product is contaminated.
- h) Tank shall not receive or discharge product during entry.

6.10 Communication:

- a) An effective, dependable communication route between attendant and the entrant shall be maintained at all times when the entrant is in the confined space.
- b) If the attendant cannot directly and effectively communicate visually or by voice with the entrants, effective means of communication shall be available (e.g. radio, no movement alarm, intermediate man, whistle etc.). Intrinsically safe hands-free communication sets should be preferred.
- c) Radio or intrinsically safe mobile shall be used for communication in large confined spaces and shall be addressed in relevant Work Permit Risk Assessments.
- d) In IDLH atmospheres, a common communication link system shall be provided and used by personnel who are entering, standby, and maintaining the life support system.
- e) If communication is interrupted, entrants shall be evacuated.
- f) Proper mode of communication for the attendant to activate emergency response shall be ensured.

- g) Radio used for floating roof entry shall have Emergency Dispatch Centre (EDC) channel.
- h) Noise generated due to various activities such as grinding, ventilation fan operation shall not hinder communication between entrants and attendant.

6.11 Personal Protective Equipment:

- a) Determination of acceptable PPE for a confined-space entry is based on an assessment of the hazards associated with the material, atmosphere, conditions that are normally in the space and the work being planned.
- b) Once the PPE and respiratory protection levels are specified, they shall not be relaxed unless the hazards are reassessed and found to call for a lower level of protection by Issuer / Risk Assessment Team.
- c) Atmosphere improved by using forced ventilation shall reach the stable level before the hazards are reassessed.
- d) If ongoing forced ventilation shall be in place, the assessment shall be conducted as if the ventilation were not present.
- e) Entrants shall wear SCBA or airline respirator with escape cylinder in oxygen deficient atmospheres, when toxics are beyond TLV and where atmosphere within confined space is initially made safe, but there is a reason to believe that it may become unsafe during the period for which entry is authorized (e.g., from emission of fumes from sludge or deposits contained in the space or welding fumes or activities like painting, etc.). Requirement for SCBA or Airline respirator with escape cylinder shall be determined through risk assessment.
- f) Under no circumstances chemical cartridge/canister type gas masks shall be used for confined space entry. Particulate respirator may be used if required and when the atmosphere inside confined space is safe.

- g) Executor shall ensure that, air supplied respirators (airline BA with escape cylinder or self-contained breathing apparatus) are in good condition, well maintained and inspected according to manufacturer's specifications.
- h) Executor shall ensure that, all respirator users: have undergone respirator fit test, trained and have respirator use authorization card. (RFT card)
- i) The executor shall also ensure that only the respirator(s) mentioned in the Respirator use authorization card are being utilized by the user. Also, executor to ensure that BA users are having valid 'Respirator use authorization card specific to the BA being used (i.e. medically certified and trained to use breathing apparatus). Safety precautions described in procedure on Respiratory Protection Program (KIPIC/ HSE S&F /HE/19/001) shall be followed.
- j) In *Oxygen deficient atmospheres & atmospheres where toxic gas concentration is above TLV-TWA (except inert entry)*, entrants shall wear SCBA or airline mask attached with stand-by escape cylinder. *For inert entry 'Life Support System' must be used and entry shall be only by specialist contractor.* Rescue arrangements shall be readily available.

Examples of *such* atmospheres (*other than inert entry*) are provided below.

- Oxygen deficient *atmosphere (Oxygen concentration below 19.5%)*
- Unknown atmosphere including line breaking & untested confined spaces
- Accidental release or potential release of toxic gas/vapour during maintenance activities
- Concentration of toxicants at or above IDLH values

There could be more situations, which require SCBA or airline respirator with escape cylinder, in addition to those listed above. They shall be identified through WPRA.

6.12 Requirement of respiratory protection equipment inside confined spaces:

Not all confined space jobs pose the same hazards. In some cases, use of respirator is not essential. Decision on whether entry into a confined space requires respiratory protection equipment or not shall be taken after a joint risk assessment, which shall be to be done. Annexure-E "Decision table for requirement of Respiratory protection equipment inside the confined space shall be used as a guidance during risk assessment.

6.12.1 Entry without respiratory protection

If oxygen *concentration is between 19.5% and 23.5%* and the concentration of other gases (toxic gases & flammable vapour) can be brought down to those levels specified in column (II) Of the decision table in Annexure-E, then entry can be permitted without any respiratory protection. However, other conditions as mentioned below also shall be considered and ensured while carrying out risk assessment before deciding that no respiratory protection is required. *Consideration of these conditions during WPRA shall be recorded in WPRA itself.*

- There is no chance of deficiency or enrichment of oxygen (meter shows consistently between 19.5% and 23.5% only) *throughout the duration of entry.*
- Flammability consistently less than 10% of LEL *throughout the duration of entry.*
- Toxicity consistently less than TLV of the likely contaminants present *throughout the duration of entry.*
- The above readings will be maintained without use of forced ventilation of the space.
- There is no chance of additional respiratory hazards developing due to the work to be taken up inside- like welding, cutting etc.

- The space shall remain free of atmospheric hazards at all times *throughout the duration of entry*. There is no chance of entry of any contaminants due to surrounding activities.

Following are some of the confined space entry jobs which may not require respirators. It shall be noted that the below list is only suggestive and final decision depends on the risk assessment conducted for the task considering the actual condition prevailing at the site.

- Work in large excavations
- Work in storage tanks which have been left open for long time after isolation and removing of all contaminants and gas tests have proved that there is no hazard due to toxic or hydrocarbon vapours.
- Work on floating roof tanks where gas tests have confirmed that the tanks does not contain any hydrogen sulphide or other toxic / hydrocarbon (Flammable) gases in case of empty tanks only.
- Working inside Tanks / Vessels / Columns under Construction / after installation prior to commissioning.
- Basement of electrical substations / high voltage rooms under construction / maintenance where gas tests have confirmed that the basement does not contain any Toxic / Flammable gases.
- Newly constructed open pits in project areas.

6.12.2 Entry with respiratory protection

If the concentration of oxygen and concentration of other gases (toxic gases & flammable vapour) are in the range specified in column (I) of the decision table in Annexure-E, then entry shall be permitted with airline mask attached with escape cylinder or SCBA. Also, as mentioned in column (I) if the toxic gases concentration from 1/3rd of IDLH to IDLH authorization from WPRA team is required as mentioned in section # 6.6.3.

6.13 Training and Certification requirements

The following table shall serve as a guide on the requirement of cards for work inside confined spaces.

Sr.#	Job	Required training /test	Cards required
1	Work inside confined space without respiratory protection	a. Medical fitness examination b. Classroom training & test	Confined Space Entry Authorization Card
2	Work inside confined space with respiratory protection	a. Medical fitness examination b. Classroom training & test c. Respirator fit test d. Training on use of respirator	Confined Space Entry Authorization Card + Respirator use Authorization Card

- i. Concerned Team Leaders shall ensure that all KIPIC and contractor's personnel acting in roles associated with confined space entry are trained to perform the activities defined in Annexure B. Training includes a classroom session and a test at the end of the session.
- ii. For training of contractors and their employees, their Top Management shall be responsible to ensure including their medical fitness tests & certification.
- iii. HSE Group or any other agency e.g. Key personnel of contractors, approved by HSE Group shall provide Confined Space Entrant authorization training for all personnel.
- iv. *Excavation jobs & the job of cable pulling (which involve work inside an excavated area or areas whose depth is more than 1.2 meters) are executed by Major Projects / Maintenance Team with the help of contractor workers who are illiterate(Excavation, cable pulling Labours only). For such illiterate personnel training shall be conducted in the language they understand, and a verbal test shall be conducted. The verbal test shall be conducted by*

contractor Safety personnel (Safety Engineer or Safety Supervisor). This test shall be witnessed and endorsed by Safety Engineers from the respective Safety Team. This mode of test (verbal test) is applicable for the illiterate contractor employees (labour class) engaged by Major Projects / Maintenance Teams. However, the requirement of medical fitness test shall be complied with before issuing entrant authorization card.

- v. For all the literate workforce the test shall be a written test.
- vi. This training shall be provided before personnel perform any duties related to these roles.
- vii. Training shall be certified by KIPIC HSE Group.
- viii. Training for personnel involved in confined space entry shall be provided by knowledgeable and experienced instructors.
- ix. Training shall be documented.
- x. For confined space entry authorization, refresher training shall be provided at an interval of no more than three years from the previous training.
- xi. Entrants shall have a valid 1-year medical certificate. Validity of Entrant card is 1 year. However, this can be renewed for two more years if the medical certificate is renewed on a yearly basis. After this he will have to undergo training and certification again. *The results of the medical examination shall be approved by KIPIC Health team.*
- xii. Attendants shall also undergo training and certification. No medical certificate is required. Validity of Attendant card will be 3 years.
- xiii. Approved, trained and certified HSE staff of Contractors by HSE Group can conduct these trainings for their employees. However, authorization test shall be conducted by HSE Group. The issuance of card is subjected to successful clearance of test.
- xiv. For details on Respirator use Training & Authorization, Requirements of Respiratory Protection Program (KIPIC/ HSE S&F /HE/19/001) shall be ensured.

7. RESCUE SERVICES:

7.1 Rescue and Emergency Services:

Asset Custodian shall decide the requirement of rescue and emergency services based on the work nature inline with KIPIC work permit system and risk assessment procedure requirements. Condition for providing Rescue Services are controlled by the Fire Team and hence request for rescue services shall be routed to the Chief Fire Officer.

Concerned team shall request to the maintenance planning team and who in turn shall initiate the request to the Chief Fire Officer based on priority. Rescue plan and drawing shall be made available to the Rescue team and mock drills to be conducted prior to the start of actual work.

7.2 Retrieval systems:

- 7.2.1 Each authorized entrant shall use a full body harness, with a retrieval line attached at the centre of the entrant's back near shoulder level, or at another point, which enable the successful removal of the entrant.
- 7.2.2 Wristlets may be used in lieu of the full body harness if the use of a full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
- 7.2.3 The other end of the retrieval line shall be attached to a mechanical (hoisting) device or fixed anchor point outside the confined space to enable fast rescue. A mechanical device should be available to retrieve personnel from vertical type confined spaces more than 5 feet (1.52 m) deep.
- 7.2.4 As an alternative, rope grip, pulley, stretcher and ladders also should be available
- 7.2.5 A means of lowering the injured person to grade should be readily available (ex. elevator, crane with basket).

8. PROCEDURE FOR RECLASSIFICATION:

8.1 Confined Spaces Not Requiring Entry Authorizations (CSNREA):

8.1.1 Entry into all confined spaces shall be permitted only with the confined space entry authorization, unless the space is reclassified as 'confined Space Not Requiring Entry Authorization'.

8.1.2 In some cases, the hazards associated with working in a confined space are fully defined, less severe and have already been protected against (e.g. storage tanks under continued maintenance work, Large wide-open excavations without imminent hazards.... etc.). For such cases, the work with a control system under other permit without entry authorisation may be approved. A Work Permit Risk Assessment shall be done by a team headed by concerned Team Leader (operations Team Leader in case of Operations area & Major Projects Team Leader in case of Major Projects controlled area). Section Head and/or Senior Engineers of concerned teams shall be the members of the WPRA team. If the WPRA establishes that the space can be reclassified as CSNREA, then the WPRA team will approve the confined space as 'Confined Space Not Requiring Entry Authorization'.

8.1.3 A confined space that has one or more of the following four characteristics shall not be reclassified as a 'confined Space Not Requiring Entry Authorization'. These four characteristics shall be considered while conducting the WPRA mentioned in sec. # 8.2.

- Confined space contains or has the potential to contain a hazardous atmosphere (either due to its normal contents or due to the nature of the work to be done)
- Confined space contains a material that has the potential for engulfing an entrant
- The space has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section.
- The space contains any other recognized serious safety or health hazard.

8.1.4 The basis for determining that all hazards in a confined space have been eliminated or isolated and the protection measures established that resulted in the reclassification shall be documented in the Work Permit Risk Assessment.

Forced-air ventilation to control atmospheric hazards does not constitute elimination of hazards.

8.1.5 If hazards arise within a confined space that has been reclassified as a 'Confined Space Not Requiring Entry Authorization. Each employee in the space shall immediately exit the space. Concerned personnel (Operations Team Leader or Major Projects Team Leader along with WPRA team) shall then re-evaluate the space and reclassify it as a confined space requiring entry authorization.

8.2 Spaces Not Clearly Defined as Confined Spaces:

8.2.1 There are areas or locations that do not meet the confined space criteria but may pose similar hazards to a confined space should entry occur e.g., putting one's head inside a 12-in. [30-cm] diameter pipe or duct or into a nitrogen-purged pot.

8.2.2 Operations Team Leader should treat these examples as a confined space requiring entry authorisation to control such activities.

9. MANAGEMENT SYSTEM:

9.1 Support resources:

KIPIC HSE Group should assist with implementation of this procedure.

9.2 Management records:

All records shall be maintained in compliance with this procedure.

9.3 Audit requirements:

Each site should be audited for the compliance of Safe Work Practices detailed in the procedure. At least 25% of the permits audited under work permit and compliance audit program shall cover confined space entry.

9.4 Deviation process:

Deviations from the requirements of this procedure shall be authorised by the concerned Deputy Chief Executive Officer for the relevant Operation after consultation with the HSE Group.

Deviations shall be documented, and documentation shall include the relevant facts supporting the deviation decision. Deviation authorisation shall be renewed periodically and no less frequently than every three years.

10. RACI CHART

Legends

- R: Responsible* - Those who do the work to complete the task
- A: Accountable* - The one ultimately answerable for the correct and thorough completion of the deliverable or task.
- C: Consulted* - Those whose opinions are sought, typically subject-matter experts.
- I: Informed* - Those who are kept up to date on progress, often only on completion of the task or deliverables.


Sr #	Activities	Custodian Group Team Leaders	Executing Group Team Leaders	Sec. Head, Sr. Engineer / Issuers	Work Permit Executors	CS Entrants	CS Attendants	Authorized Gas Tester	Safety Team
1	Identification of Confined Spaces in the Area, preparation of Confined Spaces list, review and update of the list (as & when required and annually, whichever is earlier) and communicating to TL, Safety	R	C						C,I
2	Preparing Confined Space for Entry	A	I	R	I	I	I	I	I
3	Carrying out WPRA before entry	A	A	R	I	I	I	I	A
4	Gas Testing & related activities (including monitoring the atmosphere, using calibrated gas detectors)	A	I	A	I	I	I	R	C,I
5	Decision to declare a confined space as a space not requiring entry authorization as per conditions specified in sec. #8.1	R	I	R	I	I	I	I	C,I
6	Responsibilities of CSE Attendant (sec. # 5.1)	I	A	I	A	I	R	I	I
7	Responsibilities of Permit Issuer & Executor (sec. # 5.2)	A	A	R	R	I	I	I	I
8	Responsibilities of CS Entrants (sec. # 5.3)	A	A	A	R	R	I	I	I
9	Ensuring conduct of medical fitness exam / RFT (as required & as tabulated in sec. # 6.13) for CS Entrants	R	R	R	I	R	I		I
10	Ensuring all CSE role players are appropriately trained & retrained	R	R	R	R	R	R	R	C
11	Witnessing gas test by operations / asset custodian gas tester and cross checking by testing with their own gas detectors for the first-time entry only	I	I	I	I	I	I	I	R

11. REFERENCES

- a) Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries—API2217A
- b) 29 CFR part 1910.146 of OSHA
- c) 29 CFR part 1926 subpart AA of OSHA
- d) Working in confined spaces—Criteria for a recommended standard—NIOSH
- e) NFPA 350—Guide for Safe Confined Space Entry and Work
- f) SSPC: The Society for Protective Coatings--Technology Guide No.12--Guide for Illumination of Industrial Painting Projects
- g) K-EPA –Annexure # 7

ANNEXURE – A – “CONFINED SPACE ENTRY AUTHORISATION”

Ref.No. KIPIC/ZOR/HSE/SAF/0631-F1

1	SER.NO.	Continues from permit KIPIC INTEGRATED PETROLEUM INDUSTRIES COMPANY تصريح دخول مكان شبه مغلق CONFINED SPACE ENTRY AUTHORISATION		Associated CWP/HWP No: Attachments <input type="checkbox"/> Blind List With diagram <input type="checkbox"/> Risk Assessment <input type="checkbox"/> Rescue pre plan <input type="checkbox"/> Attendant Sheet <input type="checkbox"/> Any other
	1. (A) Exact Location.. (Area/ Unit/ Equip / ect) <input type="checkbox"/> ZOR REFINERY <input type="checkbox"/> PRIZO <input type="checkbox"/> LNGI <input type="checkbox"/> HO Other (B) Description of Wok; (attach sketch if required) <input type="checkbox"/> Maintenance &/or Inspection Work <input type="checkbox"/> Other (specify) (C) Issued to, Dept/ Div / Craft/ Contractor الدائرة / القسم / المقاول Tel : هاتف :			
2. Entry is Critical <input type="checkbox"/> Yes <input type="checkbox"/> No Fire Station informed (Tel.: NO.) <input type="checkbox"/> Yes <input type="checkbox"/> Not Required Issuer & Executor jointly checked work site <input type="checkbox"/> Yes <input type="checkbox"/> Not Required 3- Safety Requirements ATTENDANT & POSITIVE ISOLATION OF CONFINED SPACE ARE MANDATORY				
(A) Has the equipment been? Y N R <input type="checkbox"/> isolated from power/ steam/ air <input type="checkbox"/> isolated from liquid or gases <input type="checkbox"/> depressurised &/ or drained <input type="checkbox"/> blanked/ blinded/ disconnected (B) Expected Residual Hazards Y N <input type="checkbox"/> lack of O2 <input type="checkbox"/> corrosive chemicals <input type="checkbox"/> heat/steam / frost (C) Protection Measures Y N R <input type="checkbox"/> gloves (type) <input type="checkbox"/> Protective clothing (.....) <input type="checkbox"/> grounded air eductor/blower/AC <input type="checkbox"/> max ... men allowed in, at a time <input type="checkbox"/> Any other				
(A) هل تم للععدة؟ Y N R <input type="checkbox"/> إزالة مصادر الإشعاع <input type="checkbox"/> توفير الإضاءة المناسبة <input type="checkbox"/> proper lighting provided (B) المخاطر الباقية والتوقعة Y N <input type="checkbox"/> كبريتيد الهيدروجين / غازات سامة <input type="checkbox"/> H2S/toxic gases <input type="checkbox"/> كهرباء / كهربية / استاتيكية <input type="checkbox"/> إشعاع متأين <input type="checkbox"/> ionizing radiation (C) إجراءات الوقاية Y N R <input type="checkbox"/> واقبات العينين / واقى الوجه <input type="checkbox"/> goggles (.....) / face shield <input type="checkbox"/> جهاز إنذار شخصي للغاز <input type="checkbox"/> personal gas alarm <input type="checkbox"/> معدات إنقاذ / خطة مسبقة <input type="checkbox"/> rescue equipment/pre-plan <input type="checkbox"/> صافرة حالة الطوارئ / معدات الاتصالات <input type="checkbox"/> communication equipment/ distress alarm				
Others / details:- See the back of this permit for additional requirements and other conditions.				

فحص الغازات اجباري لدخول الأماكن الشبة مغلقة
LEL, O₂ H₂S TESTS ARE MANDATORY FOR CONFINED SPACE ENTRY

4- (A) Gas Test ☐ Continuous monitoring مراقبة مستمرة ☐ Re-test everyhour (s) يعاد الفحص كل ... ساعة ☐ Pre-entry gas test فحص الغاز قبل الدخول

الوقت Time	التاريخ Date	فحص الغاز GAS TESTER'S		الرطوبة نسبة RH %	درجة الحرارة Temp °C	أخرى Others	ثاني أكسيد الكبريت SO ₂ PPM	أول أكسيد الكربون CO PPM	هيدروجين الكبريت H ₂ S PPM	أكسجين O ₂ & >19.5	الحد الأدنى لأشغال Comb LEL <10%	الوردية Shift
		الاسم / التوقيع Name and signature	رقم التوظيف Emp.No.									

(B) Electrical Isolation ☐ Not Required غير مطلوب ☐ Use Multilock استخدام نظام القفل المتعدد

الوقت Time	التاريخ Date	الاسم / التوقيع / رقم التوظيف Name / Emp.No. / Signature	المصانة الكهربائية Electrical Maint.	المصانة الميكانيكية Mechanical Maint.	أخرى Others	الوردية Shift

5- Authorization/ Renewal (It is safe to proceed with this job) (التصريح / التحديث) (التي يمكن الدخول)

الوقت Time	التاريخ Date	الاسم / التوقيع / رقم التوظيف Name / Emp.No. / Signature		ممثل العميل Field Operator	المقاول Contractor	التفقد Executor	المصدر Issuer
		من From	إلى To				

6- Permit Closure إغلاق التصريح

(A) Work ☐ Completed تم تجاوزه ☐ Stopped توقف ☐ Will continue on سوف يستمر في

Site handed-over in safe condition ☐ Yes ☐ No تم تسليم الموقع بوضع آمن

Housekeeping done ☐ Yes ☐ No تم تنظيف المكان

Ensured all men have come out ☐ Yes ☐ No التأكد من خروج جميع الأفراد

Manways barricaded/"No Entry" sign displayed ☐ Yes ☐ No تصوير الفتحات / وضع علامة ممنوع الدخول

Multilock Removed ☐ Not applicable ☐ Yes ☐ No نظام القفل المتعدد أزيل

هاتف Tel.	التاريخ Date	الوقت Time	التوقيع Signature	الوظيفة Designation	رقم التوظيف Emp.No.	اسم التفقد Executor name

Remarks: ملاحظات

(B) Agreed to above. Site was Checked and found safe. ☐ Yes ☐ No (ب) تمت الموافقة على ما ذكر أعلاه ، وفحص الموقع ووجد آمناً

Field Operator signature/Emp. No توقيع ممثل العميل / رقم التوظيف

هاتف Tel.	التاريخ Date	الوقت Time	التوقيع Signature	الوظيفة Designation	رقم التوظيف Emp.No.	اسم المصدر Issuer name

DIAL "170" IN ANY EMERGENCY اتصل على هاتف رقم ٨٨٨ ، في حالة الطوارئ

(To be printed at the back of confined space entry authorisation form)

General Conditions of Permit

1. Display this Authorisation at the man way with associated work permit(s).
2. Only authorised personnel holding valid "Work permit Issuer/ Executor" card can sign permit.
3. Only field operators/ contractors with valid "Work permit awareness training" card can sign respective column.
4. Only authorised gas testers holding valid certification for gas test can sign gas test.
5. Issuer may authorise work, only if the gas test results are within the permissible range.
6. Mention clear description of the work. Issuer or Executor may fill section-1.
7. Issuer must fill or tick relevant items from section 2 to 4. Specify additional requirements under remarks. Inform critical work and road closures to EDC (EDC will inform Safety).
8. Operation's issuer is responsible for safe handing over of confined space to maintenance.
9. Field operator must check site and initial the permit before start of the work.
10. Executor must not start work before getting permit or on an incomplete work permit.
11. Executor must provide adequate supervision and must be always present during critical work.
12. Executor must ensure providing all recommended protectives before starting work and compliance to all permit conditions. He must ensure his people are wearing appropriate PPE.
13. Suspend all work in case of plant emergency or accident.
14. Issuing division and safety personnel have the right to stop the job any time on safety reasons.
15. Field operator shall monitor permit conditions and site conditions frequently.
16. Executor must renew the permit if the work is stopped or not started for over 2 hrs.
17. Close the permit by completing Section-6 of original and field operator copy. Keep in file for 1 month.
18. All tools and equipment shall be secured, and personnel protected from falling objects.
19. Do not use scaffolds without valid green scaffold tag.
20. Any exemption shall be with prior approval of KIPIC Safety.

Special Precautions & Conditions for Confined Space Entry

1. Provide positive isolation by blinding or other means. Valve closure alone is not acceptable
2. Install blind tags. Follow blinding procedure. Check blinds of every renewal. Do not disturb once isolated.
3. Isolate any power-driven internal equipment. Use multi lock (LOTO).
4. Maintain continuous and adequate ventilation using educator / blower/A.C.

5. Never use utility/instrument/compressed air directly or oxygen for ventilation.
6. Ground/bond educators /blowers to avoid static charge hazards.
7. Provide enough lighting using explosion proof type and 24 volts max.
8. Provide easy access for entry/exit.
9. Initial gas test is a must. Do fresh test at every renewal or as per section-4A.
10. Values shown in section-4A are limits allowed without BA (airline respirator).
11. Do not leave any column blank in section-4 and write NR if not applicable or not required.
12. Entry without BA not allowed if LEL more than 10% (For cold work) or toxic gases above TLV.
13. Do not use canister/cartridge masks. Use airline mask along with standby escape cylinder.
14. Only trained and medically fit persons must use BA. Executor to show proof on this to issuer.
15. Display "No entry without airline respirator" sign at manway in inert and toxic confined spaces.
16. Do not allow entry even with BA if LEL more than 10% or H₂S more than 33 ppm or CO more than 400ppm, unless authorized by WPRA team.
17. Oxygen must be below 4%, LEL must be below 10% (for hot work) & below 20% (for cold work) for inert entry and monitored continuously.
18. Scales/sludge inside to be kept wet during ventilation, removal and after removal.
19. Provide reliable communication system between attendant and workers inside.
20. Men inside must come out if attendant leave or if ventilation or communication is interrupted.

ATTENDANT DUTIES:

1. Keep rescue equipment ready (ex. Reactors: air winch with standby rope-grip and elevator or crane with basket). He must have same PPE as people inside.
2. Maintain count of entrants and identify who is inside using attendance sheet.
3. Frequently communicate with entrants.
4. Remains at man way during entry until relieved.
5. Evacuate confined space if any hazardous condition is detected.
6. Ensure Rescue pre-plan copy available. Do not attempt rescue by putting own life in danger. Call rescue as per plan.
7. Air supply for the BA of standby man must be independent.
8. Do not allow unauthorised persons to enter
9. Do not perform any other duty, which can interfere with the attendant's duty.

Note: Duties are part of Attendant's responsibilities given in main procedure on "Confined Space Entry". For full detail, please refer the procedure.

ANNEXURE – B – “TRAINING TOPICS FOR PERSONNEL”

Participants must be trained and certified in the following topics at the minimum.

Topics	Issuer and Executor	Entrant	Attendant
1. Responsibilities	✓	✓	✓
2. Application of entry principles	✓		
3. Preparation for entry	✓		
4. The hazards e.g. chemical, mechanical, thermal, fall.....etc & their effects and symptoms	✓	✓	✓
5. Monitoring equipment uses and limitations	✓	✓	✓
6. PPE uses including SCBA / Airline respirators and limitations	✓	✓	✓
7. Entry authorization and termination	✓	✓	✓
8. Transferring entry operation responsibility	✓		
9. Maintaining entry operations consistent with entry permit conditions	✓		
10. Awareness of rescue procedures and verification of availability of rescue services	✓		✓
11. Communication methods	✓	✓	✓
12. How to alert attendants / entrants	✓	✓	✓
13. When to exit the confined space	✓	✓	✓
14. Maintaining the count of entrants			✓
15. Summoning rescue and emergency services	✓		✓

Note: - Input on each topic may differ for different groups.

Authorised Gas Tester

Persons involved in evaluating the air quality within a confined space should be certified in the following topics at the minimum:

- Identification of potential hazards that might be associated with the space.



- The hazards, precautions, and initial checks associated with collecting samples, including appropriate means of sampling from confined spaces (e.g., access and purging with inert gases) and any permission to begin sampling.
- How to operate the measuring equipment and what its limitations are.
- Type of sensor of gas detector
- knowledge about response time of equipment
- Determination of the essential sampling points of the space.
- How to sample appropriately and in the correct sequence for current conditions (e.g. oxygen, flammability, toxicity, biological hazard etc.)
- Verification that the equipment is operating properly and how to collect a sufficient volume to sample for potential contaminants
- Recognition of indicators of other potential hazard properties or improper calibration
- Validation of sampling findings against the outlined entry parameters
- Posting the sampling findings on the Permit / Authorisation etc.

ANNEXURE – C – “SUGGESTED FORMAT OF CONFINED SPACE ENTRANT AUTHORIZATION CARD”

Front side of the card

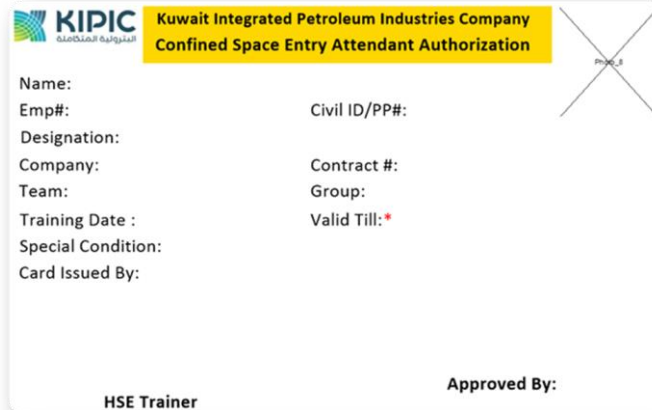
 Kuwait Integrated Petroleum Industries Company Confined Space Entrant Authorization	
Name:	
Emp#:	Civil ID/PP#:
Designation:	
Company:	Contract #:
Team:	Group:
Training Date :	Valid Till:*
Special Condition:	
Card Issued By:	
HSE Trainer	Approved By:

Back Side of the card

*Card Validity extension subject to proof of Medical Fitness	
<u>Instructions</u>	
<ol style="list-style-type: none"> 1. Holder of this card is trained by KIPIC HSE. 2. Show the card on demand. 3. This card is KIPIC property and shall be returned to KIPIC TL HSE Technical Support in case of Expiry/Completion of Contract/Services or found unattended. 4. Misuse of this card shall be dealt legally as per Company procedure. 	
Card no:	  HSE/Cards/CSE/Rev.0

FORMAT OF CS ENTRY ATTENDANT CARD

Front Side of the Card



KIPIC Kuwait Integrated Petroleum Industries Company
المؤسسة البترولية المتكاملة
Confined Space Entry Attendant Authorization

Name: _____ Civil ID/PP#: _____
Emp#: _____
Designation: _____
Company: _____ Contract #: _____
Team: _____ Group: _____
Training Date : _____ Valid Till: *
Special Condition: _____
Card Issued By: _____

HSE Trainer _____ Approved By: _____

Back Side of the card



***Card validity until "Valid Till" date or End of Contract date whichever is earlier**

Instructions

1. Holder of this card is trained by KIPIC HSE.
2. Show the card on demand.
3. This card is KIPIC property and shall be returned to KIPIC TL HSE Technical Support in case of Expiry/Completion of Contract/Services or found unattended.
4. Misuse of this card shall be dealt legally as per Company procedure.
5. For inert entry, CSE attendant shall wear breathing apparatus.

Card no: _____

170 الخط الساكن للطوارئ
في البترولية المتكاملة
KIPIC's Emergency Hotline

KIPIC
HSE/Cards/CSA/Rev.0

ANNEXURE – D – “CONFINED SPACE ENTRY ATTENDANCE SHEET”

Kuwait Integrated Petroleum Industries Company

☐ ZOR Refinery ☐ PRIZe ☐ LNGI ☐ HO ☐ Other

Confined Space Entry Attendance Sheet

Ref.No. KIPIC/ZOR/HSE/SAF/0631-F2

Date: _____

Confined Space Entry Authorization No.: _____

Unit No. & Name: _____

Vessel / Equipment No.: _____

Max. No. of persons allowed at a time: _____

Condition: ☐ Atmospheric ☐ With BA ☐ Inert

Read & understood the conditions & requirements of confined space entry authorization permit No.: _____ and / or the executor / issuer briefed the conditions.

Sr. No.	Name of person entering Confined space	Emp. No.	Company	Sign. In (Entrant sign.)	Sign. Out (Entrant sign.)	Validity of Confined space entrant authorization card (for atmospheric entry) Validity entrant & respirator use authorization card (for BA & inert entry)	Time in	Time out	Attendant Signature
1.									
2.									
3.									
4.									
5.									
6.									

Note: At all times attendant shall be in attendance outside the confined space wearing florescent yellow jacket. He shall frequently communicate with entrants.

Attendant shall not be engaged in any other activity. Dial – 170, in emergency or use radio/break glass alarm/paging system.

**ANNEXURE – E – “DECISION TABLE FOR DETERMINING THE
REQUIREMENT OF RESPIRATORY PROTECTION EQUIPMENT INSIDE
THE CONFINED SPACE”**

Use of Cartridge or canister gas mask is not allowed inside confined space

Respiratory protection requirement Hazards	Airline mask attached with escape cylinder or SCBA (I)	Respiratory protection not required (II)
1. Oxygen	Below 19.5%	Above 19.5% up to 23.5% (Entry not allowed if Oxygen is above 23.5%)
2. Flammability	<i>If flammable gas / vapor concentration is 10% of LEL or above, entry into confined space is not allowed even with respiratory protection. Further gas freeing shall be done to bring flammable gas / vapor concentration below 10% of LEL.</i>	<i>Less than 10% LEL (for cold work only) (hot work allowed only if LEL is 0%)</i>
3. Toxic gases	Greater than TLV (Refer Note 1* below)	Less than TLV (PEL)
a. H_2S	10 – 33 ppm	Less than 10 ppm
b. CO	25 – 400 ppm	Less than 25 ppm

* Note 1 - Refer to the two bullet points below.

- If toxic gases concentration is above 1/3rd of IDLH further gas freeing to be done & concentration to be brought down to below 1/3rd of IDLH.
- Even after further gas freeing if toxic gas concentration could not be brought down to below 1/3rd of IDLH, then procedure mentioned in sec.# 6.6.3 shall be followed.

IDLH – Immediately dangerous to life or health, LEL – Lower explosive limit

TLV – Threshold limit value, ppm – parts per millions,

BA – Breathing apparatus, SCBA – Self-contained breathing apparatus

ANNEXURE-F – “GUIDANCE ON CONFINED SPACE ENTRY AUTHORIZATION”

Issue For Entry Of Operations Personnel Into A Confined Space For Visual Inspection Only

Scenario 1: Entry of Operations personnel into a confined space in their unit, when there is no CSE Authorization (yellow colour permit) issued to any other craft.

#	Entrants from Operations	CSE Authorization Issuer	Person who signs in Executor column of CSE Authorization <i>See Note-1</i>	Other key requirements <i>See Note-2</i>	Attendant
1.	All Operations personnel except Controller (Field Operators / Control room Operators / Operations Engineer/ Sec. Head / Controller-I / RSL / TL, Operations., Manager, Operations.)	Controller	Concerned Operations personnel	a) Valid CS Entrant authorization card b) Respirator use authorization card (for those confined spaces that require respirator use) (Work Permit Executor authorization card is not required as they are not going to execute any job)	Anyone who possesses valid CS Entry Attendant authorization card /CS Entrant authorization card & who is relieved from his other duties during entry period. (Attendant shall discharge all the duties as mentioned in sec.# 5.1)
2.	Controller	Controller-I	Controller		

Note-1: If any one of the personnel mentioned wants to enter Confined Space, then he shall sign in the executor column of CS Entry permit.

If more than one of them (for example two operators want to go inside or the Controller wants to go inside along with an operator), then any one of them shall sign in the executor column of CS Entry permit.

Note-2: If the entry of operations personnel is for pre-entry gas test then valid gas testing authorization card is also required and the atmosphere inside confined space shall be considered as IDLH.

Scenario 2: Entry of Operations personnel into a confined space in their unit, when already a CSE Authorization (yellow colour permit) is issued to another craft.

Entrants from Operations	CSE Authorization Issuer	Other key requirements
All Operations personnel (field Operators/ Control room Operators/ Operations Engineer/ Controller/ Sec. Head / Controller-I/ RSL / TL, Operations., Manager, Operations.)	Entrants to use the same CSE authorization and <ul style="list-style-type: none"> to read & understand CSE authorization conditions & requirements or to be briefed about the same by issuer or executor, get concurrence of the issuer & executor follow the entry procedure (i.e. show their CS Entrant authorization card to the attendant, sign the attendance sheet and enter). 	a) Valid CS Entrant authorization card b) Respirator use authorization card (for those confined spaces that require respirator use) (Work Permit Executor authorization card <u>not required</u> as they are not going to execute any job) (This requirement is applicable to Process Engineers, I&C Engineers who require entry into confined spaces for visual inspection only with the condition that they read & understand CSE authorization conditions & sign in the attendance sheet)

The above guidelines are for entry of operations personnel into confined spaces that will be opened during shutdown or for maintenance.

ANNEXURE-G – “INERT ENTRY PRE-JOB SAFETY CHECKLIST”

Ref.No. KIPIC/ZOR/HSE/SAF/0631-C1			
Sr.#	Activity by Permit Issuer	Yes / No	Remarks
1.	Is it essential that the work be carried out under inert entry conditions?		
2.	Does the catalyst contain cobalt or nickel - is a check for CO required?		
3.	Have plans for an independent back-up of N ₂ been provided for in the event of loss of the primary N ₂ supply?		
4.	Is the vessel blinded from all process and utility connections (excluding the N ₂ purge)?		
5.	Have precautions been taken to avoid the potential blow out of a catalyst crust?		
6.	Has the pressure drop across the bed(s) been checked?		
Sr.#	Activity by Permit Executor	Yes / No	Remarks
1.	Does the Contractor submitted the work procedure?		
2.	Whether steps taken to minimize duration of inert entry? All required material moved to job location		
3.	Does the contractor's BA equipment, Life Support System, communication system and emergency rescue facilities etc. comply with KIPIC requirements? Approval given by KIPIC?		
4.	Is Confined Space - Inert Entry sign readily visible at point of access and entry point? Has the general work site been barricaded and signs put up to warn of Inert Entry Job in progress?		
5.	Are the atmospheric monitoring and alarm systems functioning properly?		
6.	Has the contractor checked all his equipment to confirm that it is inspected, calibrated and working correctly? • BA equipment, air supplies and escape bottles • Life support system & alarms • Communication equipment • Gas/Vapor detection • Emergency rescue equipment • Harnesses		

Sr.#	Activity by Permit Executor	Yes / No	Remarks
7.	Have fire extinguishers/charged water hose been provided to deal with any minor spill of pyrophoric catalyst?		
8.	Have facilities been provided to quickly retrieve an injured person from the confined space, and to lower him from the vessel platform to ground level?		
9.	Has adequate safe lighting been provided?		
10.	Pneumatic tools will be supplied with N ₂ and not air?		
11.	Are the persons working inside the confined space continuously monitored and in communication with a person outside the space		
Sr.#	Activity by permit issuer & executor	Yes/ No	Remarks
1.	Do the persons carrying out the inert entry work have adequate experience? Whether their training validity is current? (for confined space entry, RFT & medical exam)		
2.	Has WPRA been completed and communicated to all involved personnel?		
3.	Is necessary equipment available/on-site to conduct atmosphere tests at low O ₂ levels?		
4.	Do the contractors know what actions to take if the specified atmospheric monitoring limits are exceeded?		
5.	Rescue team available on site?		
6.	Has safe access to the vessel been provided?		

Issuer Sign.: _____ Executor Sign.: _____

ANNEXURE-H – “LIST OF CONFINED SPACES”

Ref.No. KIPIC/ZOR/HSE/SAF/0631-F3				
Sr.#	Tag number of confined space	Description of Confined Space (Column/ Reactor / Drum/ Excavation / Pit)	Location (Unit / Area / Site)	Permanent / Temporary Confined Space

Facility review for confined space identification done during _____ (date or month & year to be filled).

Name of Team Leader, Operations / Team Leader, MP:

Signature of Team Leader, Operations / Team Leader, MP: