IPS ★ ITCS

Industrial Performance Services

Industrial Tubular Catalyst Services

INERT ENTRY OPERATIONS PROCEDURE

V:1 2022

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January 2022

A. Introduction

It is the fundamental rule of our company to take every precaution to protect the health and well-being of personnel entering confined spaces or other areas in which hazardous atmospheres may be present.

This procedure sets out the rules and principles that must be followed in order to:

- safeguard personnel working in hazardous atmospheres;
- guard against any unauthorized people intending to enter the dangerous areas;
- and, to outline inert entry and rescue procedures

B. Scope

This procedure applies only to work performed under inert atmospheric conditions.

Confined Space Work performed in *non-inert* atmospheric conditions is covered under the Confined Space Procedures found in Section 25.0 of the IPS*ITCS Safety Procedures Manual.

C. Compliance

The main components of the system must be designed and constructed to meet the following standards:

• Grade “D” Compressed Breathing Air	29 CFR 1910.134 ANSI/CGA G-7.1
• Regulators, Gauges and Manifolds	29 CFR 1910.134
• High-Pressure Air Hoses	29 CFR 1910.134
• Low-Pressure Air Hose	29 CFR 1910.134
• Fall Protection and Retrieval	29 CFR 1926.503 29 CFR 1910.146 NFPA 1983 - 1997
• Safety Harness	29 CFR 1926.503 29 CFR 1910.146 NFPA 1983 - 1997
• Mask	29 CFR 1910.134

D. Life Support Equipment

1. The life support equipment used for inert entry should be:

- a positive pressure supplied air system
- designed to control and monitor the clean breathing air supply for at least three people
  - one working in the inert atmosphere (Entrant or Inert Entry Technician)
  - one stand-by person (Top-Supervisor or Confined Space Entry Attendant)
  - one rescue assistant (Inert Entry Rescue Specialist)

2. The life support equipment shall have the capabilities of monitoring and observing:

- the air supply to the men working in the inert environment
- the atmosphere for toxicity, O_2, and LEL

4. The air supply system shall consist of the following:

- A complete primary air supply from the cylinders to the mask to help eliminate the possibility of a breathing air failure featuring:
  - Primary Cylinders (via 300 ft^3, 6-packs or 12-packs of breathing air)
  - Primary High-Pressure Hose
  - Primary, Gauges, and Manifolds
  - Primary Low-Pressure Hose
  - Primary Mask-Mounted Regulators
- And an (EEL) Emergency Egress Line **when necessary** for vessels that would be to large to egress with only 5-minutes of breathable air.
- The EEL would consist of the following
  - A separate 300 ft^3 cylinder of breathing air
  - A regulator with an alarm
  - A low-pressure hose suspended in the vessel at waist height to the entrant

5. Regulators on the primary air supply lines to control and monitor both the inlet pressure from the supplied air bottles (Bottle Pressure), and the actual supply pressure that the personnel under life support are breathing (Regulated Pressure).

6. High-Pressure Audio and Low-Pressure alarms are incorporated into the life support equipment that will alert the Operator that air supply has been interrupted or has been depleted to minimum acceptable level.

7. The high-pressure alarm will activate when the primary and secondary air supple (cylinder pressure) is approximately 500 psi

8. The high-pressure audio (bell) alarm activates at approximately 500 psi on the air supply (cylinder pressure). The volume of the high-pressure audio alarm

is such that it can be heard in extremely noisy conditions or at long distances from the regulator.

E. Air Supply

1. Breathing Air

a. Compressed Grade D breathing air in cylinders provided by either IPS*ITCS or the client will be used for both the primary and secondary air supply. The bottles must be supplied with a MSDS and a batch certificate to confirm the quality of the air that is being supplied to the technicians. It is also mandatory that air quality tests be taken with a monitor to ensure that the air is up to the standard required.

b. Operating pressures:

Primary – 3,000 psi -500 psi

c. The system will be capable of delivering at least 200L of air per minute to individuals connected to the system.

d. Bottle changeover procedure

NOTE: The primary air supply must <u>NOT</u> be running on only one bottle

Primary Supply (Minimum)

1 - 2 bottle on (bottle on, tap on)
1 - 2 bottle ready (bottle on, tap off)
1 bottle off (bottle off, bottle off)

Secondary Supply (Minimum)

1 - 2 bottles on (bottle on, tap on)
1 - 2 bottle ready (bottle on, tap off)

(if using 3 bottles)
1 - 2 bottle on (bottle on, tap on)
1 - 2 bottle ready (bottle on, tap off)
1 bottle off (bottle off, bottle off)

NOTE: When using individual air bottles, when the pressure drops to 500psi (34 Bar) on the bottle, changeover to the next bottle in the sequence

2. Air Lines

a. The primary high-pressure supply lines will be constructed of identical hose and will be fed from Grade D breathing air cylinders. The airline must be rated to a working pressure of not less than 5,000psi (350 Bar).

b. two air lines will be in use for all reactor entry work – one connected to the individual entering the reactor and the second system connected to the stand-by technician. A third airline will be available at the entry location as a part of the rescue kit should it be needed by a third operator to assist from outside the reactor in an emergency situation.

c. The primary air supply line will be connected to a rack of grade D air cylinders. The rack will generally consist of a minimum of six cylinders. A minimum of three bottles must be hooked up via the primary air supply manifold at any one time.

d. Both Primary and Secondary High Pressure hoses must be connected to the life support panel to ensure that both supplies are functional at all times.

3. Safety Harness and Escape Assembly

a. The safety harness can be used to assist the wearer while entering or leaving a confined space or vessel and in cases of an emergency to assist the removal of the wearer by hand lifting to safety. In all cases, a recovery winch/device will be made available at the manway to assist in entry and removal from the confined space.

b. The escape assembly consists of a small escape bottle of compressed grade D breathing air that enables the wearer to exit the dangerous area in the unlikely event that both air line systems fail. This bottle is connected to the safety harness and to the mask.

c. A rescue box should be readily available to the inert entry crew containing, but not limited to:

- A hoisting device to extricate the personnel from the confined space
- Extra supplied breathing air equipment for entry during rescue
- Extra protective clothing for entry during rescue
- Additional ropes and harnesses
- First-aid kit
- Fire extinguishers
- A means of lowering injured persons to the ground
- Provisions for summoning assistance

4. Mask

a. The full-face positive pressure mask supplies the wearer with more than sufficient clean breathing air.

b. These six major components used together make up the life support system for our inert entry specialists. Since this system is used to perform work in atmospheres that are usually immediately dangerous to life, it is extremely important that each component is used and maintained at top efficiency.

5. Personnel

a. Ideally, an inert entry team consists of a supervisor and five technicians:

1 x inert entry technician
1 x stand-by/rescue technician
1 x life support panel technician
1 x ground support control technician
1 x floating inert entry technician

b. In addition to inert entry crew, additional personnel may be required to assist with ground support activities (eg, drum movements, forklift driver etc). These personnel must undergo a basic IPS*ITCS training session (i.e.: familiarization with inert entry and IPS*ITCS hazards) prior to assisting with the project.

6. Training

a. Inert entry personnel will undertake the IPS*ITCS Inert Entry training course prior to be being authorized to undertake inert entry work.

b. Inert entry personnel will be required to undertake refresher training every year. New ideas and equipment are discussed and introduced with thorough explanations on these matters.

c. the initial/refresher training should consist of the following as outlined in the Inert Entry Training Manual:

Confined Space
Respiratory Protection
Confined Space Rescue
Lock-out/Tag-out
First Aid/CPR
Inert Entry Procedures
Nitrogen Safety and Operations
HAZWOPER – for hazardous materials, hazardous waste and pyrophoric material

7. Medical Examinations

a. All personnel who are involved with the use of life support equipment must have an annual medical examination.

b. For those projects where personnel may be coming into contact with designated hazardous substances (as defined in the Hazardous Airborne Contaminates Regulations 29 CFR 1910.1000), personnel must undergo baseline medical surveillance prior to commencing the project.

c. Personnel are selected for training by taking into account the results of a medical examination to determine their fitness to perform breathing apparatus work.

8. Roles and Responsibilities

a. IPS*ITCS Team Protocols:

1. The supervisor has the overall responsibility for the job with regards to safety, progress, records and contact with client's representatives etc.
2. One individual will be responsible for the operation of the Breathing Air Cylinders at any one time during an entry under inert conditions.
3. One individual (to enter the vessel) will be fully equipped to meet all the dangers inside the vessel.
4. One individual (suited up) will be outside the vessel entry/exit point to watch and assist the individual inside the vessel.

b. **Project Supervisor**

Requirements: Leadership, supervision and client liaison skills
Certified inert entry technician
Knowledge of site and reactor
Familiar with job scope and all equipment
Commitment to safety

Responsibilities: Establish channel of communication with plant supervisors
Obtain permits to work
Ensure all equipment is set out correctly
Brief all employees of the safety requirements and job scope
Ensure that signage is placed at appropriate sites to warn of N2 presence
Ensure all equipment is within test date
Establish an order in which personnel will enter
Check reactor atmosphere for suitability to enter
Monitor activities inside the reactor
Report to client as soon as possible the need for spare parts
General liaison with client

Complete all QA/QC documentation and have signed off
Prepare a job report
Oversee of the cleanup of pyrophoric/hazardous materials
Control of equipment on site
Report defect equipment, by use of tag out system.
Security of equipment
Third party equipment

c. **Bottle Watch * Module Operator**

Requirements: Certified inert entry technician
Project experience
Commitment to safety

Responsibilities: Ensure all air lines are securely connected
Test alarms
Ensure communications panel is charged and working
Ensure that all air bottles are connected (as per Inert Entry Requirements)
Monitor all pressure gauges on the panel
Control the operation of the panel during an inert entry
Communicate to ground support to change bottles when necessary (low pressure - before alarm sounds)
Communicate with and relay messages from person inside
Liaise with project supervisor
Fill out inert entry checklist
Is responsible in the first instance to control emergency situation

d. **Inert Entry Technician** *

Requirements: Certified inert entry technician
Commitment to safety

Responsibilities: Check all equipment about to be used and make sure that it is clean and fit for purpose
Ensure all correct PPE is worn
Check integrity of all hose connections to the harness
Check egress bottle is full
Ensure communications are functioning correctly
Check reactor atmosphere
Enter the reactor in an orderly and safe manner
Work safely and efficiently while inside
Continually inform the top hole personnel of the status of work
Clean-up of pyrophoric/hazardous materials
Check all lines and hoses are free from obstruction before exit

Change coveralls after exiting vessel and wash as soon as possible
Brief next entry person on status of work

e. **Stand-by Person** *

Requirements: Certified inert entry technician
Commitment to safety

Responsibilities: Primary responsibility is to ensure that the technician entering the vessel is appropriately dressed for entry under inert conditions
Check all equipment about to be used and make sure that it is clean and fit for purpose Ensure all correct PPE is worn
Check integrity of all hose connections to the harness
Check egress bottle is full
Ready all lights and tools necessary for the work
Ensure trip hazard is minimised on reactor top
Connect fall arrester to entry operator
Assist entry operator to enter and inform of any hazards
Lower equipment and tools as required
Check reactor atmosphere
Assist entry operator to exit the reactor
Cover the reactor manway and make safe (manway Locking device)
Brief next entry person on status of work

f. **Second Stand-by/Assistant * Top Supervisor**

Requirements: Certified inert entry technician
Commitment to safety

Responsibilities: Assist top hole stand-by
Tidy the area
Assist panel watch
Direct crane if being used
Assist entry operator to enter and inform of any hazards
Lower equipment and tools as required
Check reactor atmosphere
Assist entry operator to exit the reactor
Cover the reactor manway and make safe (manway Locking device)
Assist with QA documentation

g. **Ground Support Personnel**

Requirements: Ability to run all ground activities
Knowledge of inert entry activities
Commitment to safety

Responsibilities: Ensure all equipment is set out in an orderly manner
Brief all ground support personnel on their duties
Ensure all personnel wear correct PPE
Direct forklifts
Maintain regulated area and keep non-authorized personnel out
Ensure drums are lined and labelled correctly
Monitor catalyst flow and temperature
Monitor nitrogen flow and supply
Monitor air supply (eg, bottle connections and changeovers) Clean-up of pyrophoric or hazardous materials
Ensure liners are tied and lids are sealed
Ensure the drums are stored in an appropriate location
Liaise with Project Supervisor
Assist with control of QA/QC
Know what is happening on top and inside the vessel at all times
Control project area

Note: Trades marked with "*" should be skilled in all duties to allow for rotation of people.

h. A certified Inert Entry Technician is an individual who has current certification for:

- Inert Entry Technician and/or Inert Entry Rescue Specialist (See Inert Entry Training Procedure or the IPS*ITCS Training Matrix for specifics)
- First Aid/CPR
- Current Medical Evaluation/ Physician's Recommendation
- Current Fit Test

i. Project Supervisor to nominate one individual at the entry level to be a team leader.

j. The team leader is responsible for ensuring all applications of inert entry activities. This can be a rotational role shared between members of the inert entry crew.

9. Project Procedures for Inert Entry

a. Pre-Contract Meeting

1. Prior to commencing any inert entry work, a pre-contract meeting between the client and IPS*ITCS must be held.

2. Personnel required to attend the meeting would normally include:

- Client mechanical, maintenance, engineering and process and operations personnel
- Client and IPS*ITCS safety personnel
- IPS*ITCS Project Manager and/or Supervisor

3. The meeting should address the following issues:

- Site/Plant rules
- Designation of working areas
- Positioning of barricading
- Information on the vessel/job/blinding
- Loading diagrams and requirements
- Catalyst storage locations and requirements
- Catalyst disposal
- Location of the IPS*ITCS equipment (eg, screeners, vacuum units etc)
- Location of the nitrogen bullet (if used in the process)
- Induction/Training of personnel involved in the activity
- Interaction of mechanical personnel with inert entry work (eg, maintenance of blinding, elbow removal and replacement etc)
- Screening requirements of the catalyst
- Safety procedures (including review of the JSEA's)
- Compatibility of IPS*ITCS equipment with site facilities (eg, hose connections, electricity supply, etc)
- Site security
- Rescue procedures
- Preparation at Work Site
- Equipment layout plan in order to place materials in an orderly, functional manner
- The cleanup of pyrophoric/hazardous materials
- Utilities supplied by the client for proper use by the contractor
- Safety facilities such as showers, eye wash, medical centre, safe areas etc
- Placement of barricading and signs to restrict the area to prohibit all personnel not directly involved with the inert entry from entering a potentially dangerous area
- Contacts with client's representative/s.

10. Life Support Equipment

a. Life support equipment is to be inspected according to Inert Entry Checklist to confirm that all components are functioning properly. Visual checks must be made before any and every entry is made.

11. Other Equipment and Facilities

a. Other equipment and facilities either supplied by the client and/or IPS*ITCS such as:

- Vacuum unit
- Screening machine
- Recirculation unit
- Dust collection equipment
- Drums/palets/lids/clamps/trash cans, etc.
- Hoisting/transport equipment
- Safety equipment
- Utilities etc,

b. must be inspected prior to the project commencing (and regularly throughout the duration of the project) to ensure that equipment is operational and fit for use.

c. The rescue equipment is to be positioned as close as possible to the manway at which the inert entry is being performed.

12. Project Kick-Off Meeting

a. At the commencement of the inert entry project, the Project Supervisor must hold a project kick off meeting with all personnel involved in the project.

b. The kick off meeting should cover the following:

- expected condition of the vessel into which the entry is to be made (i.e.: temperature, atmospheric conditions, location and condition of internals, the types and quantities of catalyst, balls, baskets, grids, plates etc);
- a review of the JSEA relevant to the work to be done;
- allocate specific tasks to members of the crew;
- review inert entry requirements for the particular vessel being worked on; and
- review rescue procedures
- QA/QC requirements
- Permit system/requirements

c. A comparison can be made with similar previous jobs to determine the most practical and safest approach.

13. Vessel Conditions for Inert Entry Activities (All other Sub-Sections)

a. Prior to entry being made into an inert vessel, the inert entry crew is to check:

- all blinding
- connection of the utilities to, or in, the vessel for leakage and correct supply etc
- check that either a regulator, flow meter/indicator and pressure gauge is present on the inlet of nitrogen supply to the vessel to ensure that a pressure build-up cannot take place (Grubs Manifold)
- the inert entry limits are satisfied (see Table 1)

Table 1
Inert Entry Limits

Criteria	Limit
Benzene	<1ppm
Furfural	<2ppm
Hydrogen sulphide	<10ppm
Lower Explosion Level	<5% (for initial entry)
Nickel Carbonyl	<0.05ppm
Arsenic	<0.05mg/m^3
Oxygen	<3% volume maximum
Temperature	<100^oF

Note: If Benzene, Furfural, Nickel Carbonyl or Hydrogen Sulphide levels exceed those specified above, consideration should be given to further purging of the vessel and/or upgrading the protective clothing to worn by the technicians entering the vessel/space.

b. In the event the entry criteria cannot be achieved and/or cannot be maintained, entry into the space/vessel must be suspended and the work activities (including the level of personal protective equipment utilised) and environment reviewed.

13.1 Benzene Considerations

a. Vessels containing concentrations of benzene above 1ppm should not be entered without respiratory protection. Because catalyst work is generally performed under a nitrogen blanket, the risk of inhalation of Benzene is eliminated because technicians are wearing supplied air respiratory protection. As such, the next most hazardous route of exposure will be skin absorption – an acknowledged low level exposure route.

b. It is acknowledged that attaining 1ppm Benzene concentrations inside reactor vessels may not always be possible. In this case, the following personal protective equipment guidelines should be adopted by personnel when entering vessels with Benzene concentrations:

Table 2
PPE Requirements for Personnel Entering Benzene Contaminated Vessel/Space

Concentration	Clothing
0 < 1ppm	Standard overalls
> 1ppm < 100ppm	Standard overalls with covering Tyvek protective overalls
> 100ppm < 1200ppm	Gas suit
> 1200ppm	Evacuate reactor and ascertain reason for LEL environment

Note: Due to presence of Nitrogen, supplied air respiratory protection required as mandatory equipment for all persons entering that space

c. Due to the action of a nitrogen purge on a vessel, personnel working at the open manway can potentially be exposed to Benzene. If Benzene concentrations in the area surrounding the manway are high, consider adopting other control actions:

- Tarp over manway (to deflect vapours away from the technicians)
- Relocate the panel and other operations to a location upwind of the vapour plume
- Supply of personal protective equipment as outlined below (see Table 3) (for concentrations monitored in the technicians personal breathing space).

Table 3
PPE Requirements for Working in Benzene Areas (Outside the Vessel/Space)

Concentration	Respiratory	Clothing
0 < 1ppm	No respiratory protection required	Standard overalls
> 1ppm < 25ppm	Air purifying respiratory protection (half face with organic vapour filters)	Standard overalls
> 25ppm	Supplied air respiratory protection	Standard overalls with Tyvek overalls

Note: Personnel working outside the vessel will not be exposed to excessive Benzene concentrations for excessive periods of time and as such the wearing of a gas suit as not been deemed necessary.

13.2 Nickel Carbonyl Considerations

Table 4
PPE Requirements for Entering Nickel Carbonyl Contaminated Vessel/Space

Concentration	Clothing
0 < 0.025ppm	Standard overalls
> 0.025ppm < 50ppm	Standard overalls with covering Tyvek protective overalls
> 50ppm < 250ppm	Gas suit
> 250ppm	Evacuate reactor and ascertain reason for high Nickel Carbonyl concentration

Note: Due to presence of Nitrogen, supplied air respiratory protection required is mandatory equipment for all persons entering that space.

e. Due to the action of a nitrogen purge on a vessel, personnel working at the open manway can potentially be exposed to Nickel Carbonyl. If Nickel Carbonyl concentrations in the area surrounding the manway are high, consider adopting other control actions:

- Tarp over manway (to deflect vapours away from the technicians)
- Relocate the panel and other operations to a location upwind of the vapour plume
- Supply of personal protective equipment as outlined below (see Table 5) (for concentrations monitored in the technicians personal breathing space).

Table 5
PPE Requirements for Working in Nickel Carbonyl Contaminated Areas (Outside the Vessel/Space)

Concentration	Respiratory	Clothing
0 < 0.025ppm	No respiratory protection required	Standard overalls
> 0.025ppm < 2ppm	Air purifying respiratory protection (full face)	Standard overalls (including gloves)
> 2ppm < 50ppm	Supplied air respiratory protection	Standard overalls with Tyvek overalls

Note: Personnel working outside the vessel will not be exposed to excessive Nickel Carbonyl concentrations for excessive periods of time and as such the wearing of a gas suit has not been deemed necessary.

13.3 Furfural Considerations

Table 6
PPE Requirements for Personnel Entering Furfural Contaminated Vessel/Space

Concentration	Respiratory Protection	Clothing
0 < 1ppm	No respiratory protection required	Standard overalls
> 1ppm < 50ppm	Air purifying respirator (full face)	Standard overalls with covering Tyvek protective overalls
> 50ppm	Supplied air respiratory protection	Gas suit

Note: Due to presence of Nitrogen, supplied air respiratory protection required is mandatory equipment for all persons entering that space.

a. Due to the action of a nitrogen purge on a vessel, personnel working at the open manway can potentially be exposed to Furfural. If Furfural concentrations in the area surrounding the manway are high, consider adopting other control actions:

- Tarp over manway (to deflect vapours away from the technicians)
- Relocate the panel and other operations to a location upwind of the vapour plume
- Supply of personal protective equipment as outlined below (see Table 7) (for concentrations monitored in the technicians personal breathing space).

Table 7
PPE Requirements for Personnel in Furfural Contaminated Areas (Outside the Vessel/Space)

Concentration	Respiratory	Clothing
0 < 1ppm	No respiratory protection required	Standard overalls
> 1ppm < 50ppm	Air purifying respiratory protection (full face)	Standard overalls with covering Tyvek protective overalls
> 50ppm	Supplied air respiratory protection	Standard overalls with covering Tyvek protective overalls

Note: Personnel working outside the vessel will not be exposed to excessive Furfural concentrations for excessive periods of time and as such the wearing of a gas suit has not been deemed necessary.

13.4 Temperature Considerations

a. In some circumstances the reduction in temperature to this level is not possible.

b. The following are general recommendations to be considered and implemented when and where possible to reduce the impact of heat stress on individuals entering and working inside vessels:

c. the use of cool suits/vortex type systems and/or reflective thermal suits. This will usually assist the person carrying out the work to maintain a stable body temperature.
Note: In some reactors it may not be practicable to wear this additional protective equipment as it either restricts the wearer (already wearing full BA Equipment) or allows too much oxygen to enter the atmosphere you are working in and puts the person at greater risk from other sources.

d. Where the use of specialised heat minimisation clothing and/or equipment is to be considered, please refer to the HSE Manager for guidance on the development of a project specific safety management plan

e. In the event that work is to take place in temperatures above 100^0F (40^0C) and they are not using a cooling system, then the worker must be closely monitored (eg, personal heat stress monitoring etc) and strict safety management guidelines adopted and adhered to. The team must ensure that a suitable work/rest schedule and rotation system is adopted to ensure that no individual is exposed to excessive heat stress conditions.

f. No specific work/rest schedules have been provided as each individual reacts differently to heat and may encounter heat stress symptoms at different temperatures ranges. Hence, these figures are to be used as a guideline only by the Project Supervisor.

g. IPS*ITCS does not encourage working in hot environments and believe that when the vessel can be cooled to $<100^0$F ($<40^0$C), then this is the preferred method. The client must understand that when temperatures are increased, productivity will be reduced through both the impact of the heat on the workers and the additional weight needed to be carried by the worker as personal protective equipment.

h. All work is to be undertaken using the complete IPS*ITCS life support system equipment, including communications equipment. This enables suitable monitoring of the person completing the work.

14. Client Issues Related to Vessel Entry

A. Work Permits

1. The work permit system will vary from client to client.

2. Prior to the commencement of the work, valid permits are required in which all arrangements and special conditions are recorded. This should be approved and signed by all the necessary parties.

3. In some circumstances it is usual to have in place two or more permits, i.e;

- Vessel entry permit
- Hot work permit
- Cold work
- Vehicle entry

4. In all cases, there will have to be checks of blinds list of equipment etc, prior to issue.

5. Usually, the permit will be issued by the operations department or the contract engineer and be countersigned by the members of the inert entry crew undertaking the work. Required tests or inspections described have to be performed before the issue of the permits and at the stated intervals thereafter, should the need arise.

6. After any long breaks in the work schedule, the permits should be renewed.

7. If the first test has proved acceptable for entry, it is probably not necessary to stop the work in anticipation of the results of the following tests.

8. All test results should be noted on the permits.

9. Should any conditions in the vessel or area change, then all parties involved in the issue of the permits should be notified and conditions checked.

B. Access

1. Access to the platform or barricaded area should be restricted to IPS*ITCS personnel only. No other authorized personnel are permitted unless agreed by the IPS*ITCS Manager/Supervisor.

2. Barricade the work area and post “Vacuum Operation” signs in accordance with the Vacuum Operations procedure.

a. Signs should state the following:

DANGER

VACUUM OPERATION

IN PROGRESS

VAPOR MAY BE PRESENT

DO NOT ENTER!

3. Post “Danger – Nitrogen” Signs in specified locations
   a. Signs should state the following:

DANGER
CONFINED SPACE
NITROGEN ATMOSPHERE
I.D.L.H. AUTHORIZED
PERSONNEL ONLY

C. Weather

1. It is also important to check the weather forecast prior to work commencement as weather conditions can play an active role when accidents occur. For example:

- High ambient temperature
- Low wind speed from variable directions
- High or low humidity

2. It is always important when working in close vicinity to the entry/exit points of the vessel to keep to the windward side.

15. Entry

A. When all conditions have been met, the technician will enter the vessel and/or atmosphere. Their entry will be assisted by the second technician (stand-by person) suited up outside the vessel. At all times, people not wearing life support equipment must be upwind from the vessel or atmosphere. An air purifying respirator may be necessary for some support crew activities.

B. Entry is usually accomplished by the use of fixed or rope ladders.

C. When ladders are used, fall arrest equipment must be used by the individual ascending/descending the ladder. Where possible, a mechanical hoist to assist for emergency use should be available at the work site.

D. During descent or ascent, all slack must be kept out of the umbilical. Care must always be taken to ensure that there are no twists or that the umbilicals are not twisted around other obstacles inside the vessel as this will restrict movement and disrupt an emergency attempt.

16. Identification of Hoses and Manifolds

A. All hoses and manifolds to be identifiable (either labelled or colour coded) to enable technicians to easily identify the function of individual hoses and to verify that the hose to manifold connections are correct.

17. Work Area

A. When the technician reaches the work area, he will inform the personnel on the entry/exit point, his location and conditions.

18. Dangerous Locations

A. During inert entries and/or dumping, contact with dangerous chemical substances is possible at a number of locations:

- the platform of a vessel
- the inside of the vessel
- the surroundings of a dump nozzle during dumping or screening
- the inside of a vessel after ventilation
- the roped off area around the work place.

B. It is essential to monitor, at regular intervals, the atmosphere at the various locations, for which proper devices like Combustible Gas Indicators (capable of monitoring Oxygen, Hydrogen Sulfide and Carbon Monoxide concentrations and LEL percentages) and PIDs (when monitoring for specific substances is required) will be available as a part of our inert entry equipment.

19. Suspending Work

A. There are factors beyond our control that on some occasions may force us to stop work entirely or adapt to the new circumstances. For example, if the top of a catalyst bed is badly blocked, the possibility exists that dangerous substances may be trapped beneath this layer which can cause vapours to escape creating a threat to the life support team.

B. On such occasions, the team leader and/or client's representative will stop the job.

Other factors on which work would stop are:

- if the temperature of the catalyst increases more than 5^{o}C
- when the temperature rises above the pre-determined level
- when nitrogen supply falls below (90psi) 6 Bar or insufficient to maintain purge
- in case of high rises in measured safety values as compared with previous readings
- if the oxygen content on the working platform falls below 20%
- in the event of bad weather, alarms etc.

C. Upon vacating the vessel and top platform, the vessel should always be left in a safe condition, whereby it cannot cause any additional hazards to the surrounding area other than those normally accepted.

D. Suspension of Work

E. The Supervisor/Team Leader have the authority to suspend work and evacuate the area if they are not satisfied with the work and/or environmental conditions.

20. Related Field Documentation

A. Certain documentation is required to maintain the benchmark of IPS*ITCS quality in the field. This documentation is only a qualitative measure. It is important to understand why we do the documentation, and how to use it properly in the field.
B. Management shall plan, calculate, and allow the supervisors and employees adequate time to complete and review the required documentation in the field.
C. The job supervisor and inert entry team is responsible for ensuring the documentation is completed and reviewed by the entire team.
D. Disciplinary actions will be taken by management if the documentation is not accurate, complete, or if it has been “pencil-whipped”, nor reviewed by supervisors or other team members.
E. Only original documentation will be accepted during audits or reviews.

1. The following documentation is required for all inert entry jobs regardless of frequency, location, size, or duration:

a. JSEA (Job Safety Environmental Analysis) – Every job is unique due to location, plant specific requirements, pre-existing hazards, and client job requirement specifications. This is where the importance of a JSEA comes into effect. It is required that every inert entry job has a JSEA wrote and reviewed by the entire inert entry team prior to beginning work.

i. It is acceptable to use a template JSEA for jobs that are done frequently; although, it is the responsibility of the Supervisor to review the JSEA with the inert entry team each and every time the job is started.

ii. The JSEA shall be signed by all inert entry team members, understanding the risks, hazards, and conditions of the job.

iii. The original copy of the signed JSEA needs to be placed in the project file for future reference.

b. Tool Box - Safety Meeting

i. A toolbox safety meeting needs to be held every shift to reiterate the specific risks, dangers, and required PPE used on the job.

ii. Every tool box safety meeting needs to be documented with the following information (minimum):

- Instructor(s) or Conductor(s)
- Specific Topics Covered
- Duration
- Attendance

c. Job Scope Change - Safety Meeting

i. Every time the scope of the job changes because of unforeseeable events, a Job Scope Change safety meeting is required.

ii. The same form used for toolbox safety meetings can be used for job scope change safety meetings.

iii. Every job scope change safety meeting needs to be documented with at least the following information:

- Instructor(s) and/or Conductor(s)
- Specific Topics Covered
- Duration
- Attendance

d. Inert Entry Checklist

i. An inert entry checklist is one of the most vital steps prior to starting an inert entry job.

ii. The inert entry checklist should be completed prior to starting work or;

iii. prior to restarting work, such as:

- Shift Change
- Lunch Breaks
- Anytime the entire crew has left the proximity of the reactor structure

iv. The inert entry checklist should comply with the IPS*ITCS Inert Entry Procedures Manual and the API guidelines for inert entry in confined spaces.

e. Personnel Documentation

i. Personnel documentation should be inspected prior to job commencement and available in the field for audits and/or inspections, the documentation for each inert entry technician shall include:

- Physician’s Recommendation Letter
- Fit Test Card or Certificate
- First Aid/CPR Card or Certificate
- Inert Entry Technician/Rescue Specialist Card or Certificate

ii. It is the responsibility of each inert entry technician to ensure their training, physician's recommendation, and fit testing documentation is current and available on site.

f. Written Rescue Plan

i. The rescue plan should be in compliance with the IPS*ITCS Inert Entry Procedures Manual, API guidelines for inert entry in confined spaces, and 29 CFR 1910.146 – See Confined Space Rescue Plan

g. Confined Space Entry Log

i. A confined space entry log shall be used in accordance to the IPS*ITCS Inert Entry Procedures Manual and 29 CFR 1910.146.

ii. The Top Supervisor/Confined Space Entry Attendant is responsible for filling out the entry log on a real-time basis.

h. Confined Space Entry Permit

i. Prior to any type of entry in a confined space, an entry permit is required to be reviewed by the entire inert entry team and signed by the appropriate personnel.

ii. The confined space permit shall be in compliance with the API guidelines for inert entry in confined spaces, and 29 CFR 1910.146

Revision History

Rev	Rev Date	Rev By	Approved By	Description

Approvals:

Procedure Owner

_____ _____
Print Name Date

_____
Signature

Competency Assessment

No.	Questionnaire	C/NYC
Q1		
A1		
Q2		
A2		
Q3		
A3		
Q4		
A4		
Q5		
A5		

Enclosed Attachments	
Risk Assessment	☑
Environmental Aspect and Impact	☑
Training and Competency	☑
Measure and Evaluation Tools	☑

Competency Checklist

To be filled out by Trainer and signed by Employee, Assessor and Supervisor before being returned to the HSEQT Manager for recording purposes.

Procedure	Competency	Date	Competent YES / NO	Employee Signature

(please tick appropriate box)

This employee is competent in performing the job.	
This employee has not attained the competency level.	*

* *If the employee has not attained all competency levels, the General Manager must assess the action to be taken, provide an extension of training or alternative action as listed below.*

Alternate action to be taken : _____

Signed By Employee: _____ Date: _____

Trainer: _____ Date: _____

Assessor: _____ Date: _____

Regional Manager: _____ Date: _____

Environmental Aspects and Impacts

Identified Environmental Aspects and Impacts

The following table is a summary of the likely environmental aspects and impacts that may be identified during site inspections. The significance of each impact needs to be assessed using the Risk Assessment Model.

Activity	Aspect	Impact
Purchasing & Administrative Work	Consumption of goods	Conservation of natural resources
	Consumption of energy (eg. Electrical equipment and facilities)	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of waste (eg. Paper)	Consumption of space for waste disposal; Habitat loss
Climate Control	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of noise	Disturbance to community; Habitat loss
Cleaning of – offices / vehicles	Storage, use and release of chemicals	Contamination of air, water or soil; Risk to human health
Transport (Fleet vehicles / staff travel)	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Loss of habitat at all stages of generation; Light pollution
	Consumption of goods (eg. Oil)	Consumption of natural resources; Generation of waste; Habitat loss; Biodiversity impacts
	Generation of waste (eg. Oil)	Consumption of space for waste disposal; Potential contamination of water or soil; Habitat loss
	Exhaust emission	Release of greenhouse gases and atmospheric pollution
	Use of dangerous goods (eg. Batteries)	Potential contamination of air, water or soil; Risk to human health
	Generation of noise	Disturbance to community; Habitat degradation
Operations		

Risk Assessment // insert name here					
Step No: Logical sequence	**Sequence of Basic Job Steps documented in the Procedure, Work Instruction and project plans. Break down Job into steps.** Each step should be logical and accomplish a major task.	**Potential Safety & Environmental Hazards/Impacts at the site of the Job** Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job.	**Risk Rating** Refer to the risk matrix or HSEQT.PRO. Risk Mgt	**Recommended Corrective Action or Procedure** ***Determine the corrective actions necessary to reduce the risk to as low as reasonably practical (ALARP) refer to HSEQ.PRO.Risk Mgt. The risk must be rediced or controlled to ALARP before work commences.*** Document who is responsible for implementing the controls to manage each hazard identified.	**Risk Rating** refer to the risk matrix or HSEQT.PRO.Risk Mgt
1.					
2.					
3.					
4.					
5.					

Risk Assessment Audit

Process: insert// **Procedure**: Insert //	Date:	Audited by :
	Location of Audit:	Area Mgr/Supervisor:

Item	Question	Evidence Sited	Comments	Conformance Score 0,3,5
1.				
2.				
3.				
4.				
5.				
6.				
7.				

AUDITOR'S SIGNATURE: SAFETY REP'S SIGNATURE:	CONFORMANCE SCORE: / 25 CONFORMANCE %:	0 – Non Conformance 3 – Continuous Improvement Opportunity 5 – Total Conformance