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1.0 PURPOSE

This procedure establishes:

- Minimum guidelines for the safe entry into inert confined spaces
- Requirements for working safely near inert confined spaces.

2.0 SCOPE

This procedure applies to the entry into confined spaces that have been inerted so that:

- Catalyst can be replaced, or
- Maintenance or modifications can take place.

3.0 PROCEDURE

3.1. Note: These "Inert Entry" requirements are to be followed in addition to PR-1 Confined Space Procedure. All inert entry work must be performed by Inert Entry Trained Personnel.

3.2. Planning

3.2.1. The contractor performing the inert entry must submit a Site-Specific Safety Plan (e.g., Job Specific Safety Plan) to the Safety Department prior to the entry. The plan should include, but not be limited to:

3.2.1.1. The scope of work

3.2.1.2. Designation of employees' roles (i.e. who is entrant, attendant, etc.)

3.2.1.3. Equipment used, including PPE and air monitoring equipment

3.2.1.4. Equipment inspection/calibration information

3.2.1.5. Requirement for 100% video recording and monitoring of video camera for all inert entry work

3.2.1.6. Inert gas source purity and breathing air documentation

3.2.1.7. Plan for measuring temperature

3.2.1.8. Communication plan

3.2.1.9. Site layout and barricading/signing plan with hot zone designation

3.2.1.10. Lifting/rigging plans, if necessary

3.2.1.11. The rescue pre-plan (See 3.8)

3.2.2. A pre-job planning meeting must be conducted prior to inert entry operations beginning to review the specific work procedures, personnel responsibilities, potential hazards and safe guards to be followed.

3.2.3. Pre-job planning shall involve personnel responsible for the overall work on site during the inert entry and those who will be leading the inert entry work.

3.3. Pre-Entry Evaluation

3.3.1. A pre-entry evaluation shall be conducted prior to initial entry to ensure that all requirements are in place and the training of all personnel involved in the inert entry has been verified. The Pre-Entry Checklist, Attachment A, must be completed to document the evaluation. The evaluation team should include representatives from Operations, Maintenance, Safety, and the Inert Entry Contractor. All discrepancies are to be corrected prior to issuing the work permit for entry. The pre-entry evaluation shall be kept with the Confined Space Entry Tracking Log and turned in with the last inert confined space Safe Work Permit for the respective space.

3.4. Acceptable Inert Atmosphere

3.4.1. For purposes of this procedure, the oxygen concentration shall be maintained at 4% oxygen by volume or less to ensure a safely inerted atmosphere in the vessel and absolutely prevent any ignition of the catalyst or flammable vapors in the vessel.

3.4.2. The oxygen concentration must be continuously monitored.

3.4.3. If oxygen concentrations exceed 4% by volume, entrants shall be required to immediately exit the inerted confined space until the oxygen concentration is reduced to 4% or less.

3.5. Inert Gas Source

3.5.1. Gas Purity

3.5.1.1. The inerting gas will typically be nitrogen, although carbon dioxide and argon may be used.

3.5.1.2. Whatever inerting gas is used, its composition shall be maximum 0.5% oxygen and verified in writing prior to it being discharged into the confined space.

3.5.1.3. If gas is supplied by a vendor's truck, the vendor should supply verification. Nitrogen must be verified to be 99.5% pure during the verification process.

3.5.1.4. For Hydroprocessing units (hydrotreaters, hydrocrackers, etc.) and Tail Gas Reactors (SCOT Catalyst), membrane technology shall not be used as the source of inerting gas. Membrane generating units may be used for inerting Claus sections of sulfur unit trains if 99.5% purity is confirmed and maintained.

3.5.1.5. Plant nitrogen may be used for inerting operations if the supply is adequate to maintain an inert atmosphere, defined as 4% oxygen or less.

3.5.2. Inert Gas Supply and Back-up Supply

3.5.2.1. There must be an adequate supply of inert gas to maintain the inert atmosphere in the confined space at all times to 4% oxygen or less for the duration of the work.

3.5.2.1.1. The inert gas flow must be controlled to prevent ice formation within the inerted vessel and ensure proper purging. The formation of ice within the vessel may be determined via cameras or indicated by the buildup of pressure in the vessel.

3.5.2.2. In addition, there must be an immediately available back-up supply of inert gas sufficient to maintain flow to the vessel for the duration of the proposed work.

3.5.2.2.1. This supply shall be immediately available and be connected to a manifold attached to the primary inert gas supply.

3.5.2.3. A qualified person shall monitor the inert gas supply and be immediately available to shift to the back-up supply.

3.6. Inert Confined Space Evaluation, Monitoring and Evacuation

3.6.1. Monitoring Near Restricted Areas

3.6.1.1. During the inerting process, vapors are being vented from any access opening(s). These vapors contain inert gas and vapors already present in the confined space and thus, a hazardous atmosphere may exist outside the inert confined space near the access openings.

3.6.1.2. Using supplied breathing air respiratory protection, initial air monitoring shall be conducted by the Inert Entry Contractor. Monitoring will be conducted at the inert confined space openings to determine the level of respiratory protection that is required, if any, for personnel working in those areas.

3.6.1.3. Two people will conduct initial testing, one to do the testing and one to remain at a safe distance away from the testing location as a back-up person. Both individuals will don supplied breathing air equipment while conducting initial testing.

3.6.1.4. MPC Safety Department and Owning Department will observe the initial testing remotely.

3.6.1.4.1. This should be completed by remotely watching video monitors from the Inert Entry Contractor’s equipment trailer.

3.6.2. Inert Entry Attendant Back-Up

3.6.2.1. In addition to the Inert Entry Attendant required for a confined space entry, a back-up person is always required for any personnel working or sampling near the confined space opening, regardless of the atmospheric conditions.

3.6.2.2. The back-up person shall:

3.6.2.2.1. Be responsible for controlling worker access to the restricted areas (e.g. manway platform)

3.6.2.2.2. Have the workers sign in and out of the restricted access area, including Inert Entry Attendant.

3.6.2.2.3. Have PPE similar to an Inert Entrant immediately available to don and assist in an emergency.

3.6.2.2.4. Visually observe and monitor all personnel working in a restricted area including the Inert Entry Attendant.

3.6.2.3. Only employees who are essential to the Inert Entry work are permitted in restricted areas when conditions require a back-up person. All worker traffic that is non-essential to the operation while the hazard requiring the back-up person exists shall be eliminated.

3.6.3. Warning Signs at Access Openings

3.6.3.1. In addition to the signs normally required for confined space entry, the area around the restricted access area shall be marked with signs to warn personnel of the hazardous condition around openings and any respiratory protection requirements.

3.6.3.1.1. MPC Safety, Operations, and the Inert Entry Contractor Safety Representative and Supervisor will determine the restricted area.

3.6.3.1.2. The restricted area should be hard barricaded when feasible to restrict non-essential personnel from entering.

3.6.3.2. These signs must be posted in the immediate area of the restricted area openings and at every ladder and stairways leading to the restricted areas.

The signs should reflect the example provided below:

Danger - Inert Confined Space Restricted Area

Potentially Immediately Dangerous to Life & Health

Continuous Air Monitoring or Supplied Breathing Air Required

Due to Vented Vapors, Areas Immediately Outside Access Opening May Contain Hazardous Vapors Requiring Respiratory Protection

3.6.4. Air Monitoring Requirements

3.6.4.1. Before entry, the following atmospheric conditions must be met and then maintained throughout the entry.

3.6.4.2. Equipment used to analyze the confined space and effluent atmospheres must be properly calibrated and capable of accurately measuring low levels of oxygen and flammables in an oxygen deficient atmosphere.

3.6.4.2.1. MPC Safety must verify the Inert Entry Contractor's monitoring equipment is properly calibrated and capable of accurately measuring low levels of oxygen and flammables in an oxygen deficient atmosphere.

3.6.4.2.2. The employer (Inert Entry Contractor) shall monitor the internal atmosphere of the confined space and the effluent gasses immediately outside the confined space openings in the restricted area(s) for oxygen content, flammable levels, and all applicable toxic air contaminants.

3.6.4.2.3. In addition, the confined space must be monitored for temperature and inert gas back-pressure (catalyst removal only).

3.6.4.2.4. The following conditions must be maintained:

Inside Confined Space	**Outside Confined Space**
Oxygen: 4% by volume or less *	**Oxygen: N/A***
Toxics: N/A	**Toxics<IDLH* H**2S & CO – continuous monitoring required. Benzene – periodic monitoring to confirm respiratory protection
Flammables: <10% LEL for hot work, <20% LEL for cold work*	**Flammables: <10 % LEL***
Carbon Monoxide: 10 PPM limit inside vessel (See 3.6.4.4 below)	**25 ppm**
Temperature: Shall not exceed 100F* nor rise more than 5 degrees in any 15-minute period (See 3.5.4.4.1.4 & 3.5.4.4.2 below).	**Temperature: N/A**
Inert Gas Back Pressure (Catalyst removal Only) – No buildup during entry (See 3.5.4.6 below)	**N/A**

NOTE:
This monitoring is performed by the Inert Entry Contractor to continuously confirm that the atmosphere inside the inerted confined space remains at acceptable levels. This monitoring is also performed to continuously confirm that the level of respiratory protection being worn by the outside attendant(s) is appropriate for the hazards and would alert them of potential IDLH conditions and to prevent exposure above the PEL for any of the toxics which may be present.

3.6.4.3. The Inert Entry Contractor must document mid-shift gas test results inside the confined space on the confined space entry permit.

3.6.4.4. Potential Formation of Nickel Carbonyl – Note that there is a potential for formation of Nickel Carbonyl, a highly toxic material, when carbon monoxide in the purge gas reacts with a nickel containing catalyst. This would present a hazard to unprotected personnel outside the confined space. Carbon monoxide shall be kept to a minimum in the inert gas used.

3.6.4.4.1. Monitoring must be conducted to determine if carbon monoxide levels are exceeding 10 ppm inside the vessel or 25 ppm outside the vessel.

3.6.4.4.2. The inerted vessel shall not be cooled below 400° if more than 10ppm carbon monoxide is present.

3.6.4.4.3. If the CO levels are greater than 10 ppm, the inerted vessel must be purged further.

3.6.4.4.4. If carbon monoxide levels exceed 10 ppm inside the vessel, personnel must exit the vessel until the source of carbon monoxide is determined and the levels return to below 10 ppm.

3.6.4.5. The temperature of the inerted vessel must be continuously monitored to ensure the temperature limit of 100 degrees is not exceeded and to detect any unusual rise in temperature.

3.6.4.5.1. If the temperature rises more than 5 degrees F in a 15-minute period, personnel must be immediately removed until the cause of the temperature rise is determined and controlled.

3.6.4.5.2. Temperature can be monitored in the control room using installed internal temperature sensors in the confined space, if such temperature sensors are installed.

3.6.4.6. The temperature of the inerted vessel (catalyst) must be continuously monitored by the contractor conducting the inert entry to detect any unusual rise in temperature due to reaction of residual oxygen with the pyrophoric catalyst.

3.6.4.6.1. If the temperature rises more than 5 degrees F in a 15-minute period, personnel must be immediately removed, and the cause of the temperature rise determined and controlled.

3.6.4.6.2. Temperature can be monitored in the control room using installed internal temperature sensors in the confined space, if such temperature sensors are installed.

3.6.4.7. Before entry, the inert gas flow pressure must be monitored using a Grubb's manifold, or equivalent, to ensure that the minimum inert gas back pressure has been established.

3.6.4.7.1. This pressure shall be monitored throughout entry to ensure that no increase in pressure occurs.

3.6.4.7.2. Personnel must evacuate the inerted space when a pressure increase is noted and not re-enter until the case is resolved.

3.6.5. Evacuation

3.6.5.1. The confined space attendant shall continuously monitor the atmospheric conditions of the confined space and must direct all entrants to evacuate the space immediately if the conditions change from established and permitted requirements outlined in 3.6.4, or in the event any other hazardous condition becomes apparent (e.g., loss of inert gas supply).

3.6.6. Adequate Ventilation

3.6.6.1. If an enclosure or partial enclosure (e.g. shelter, tent) is built over the point of entrance, (e.g. manways), the enclosure must:

3.6.6.1.1. Be designed to ensure adequate ventilation

3.6.6.1.2. Continuously monitored so that inert gases do not accumulate.

3.6.6.1.3. Always have the bottom and at least two sides open.

3.6.7. Protection of Restricted Area

3.6.7.1. When the inerted vessel is left unattended (e.g. lunch breaks, shift changes), the open manways must be covered with a physical barrier (e.g. nylon rope lockout device, plywood bolted to manway) and a sign warning of the inert atmosphere hazards.

3.6.8. Inert Entry Personnel

3.6.8.1. Any contractor entrant shall be trained and qualified as an Inert Entrant. Such personnel must:

3.6.8.1.1. Be trained in this procedure.

3.6.8.1.2. Have practical experience in actual inert entry.

3.6.8.1.3. Have been deemed qualified by the contractor to perform such entry.

3.6.8.1.4. Be trained in the use of all protective equipment and must be knowledgeable of the hazards involved in entering inert atmospheres.

3.6.8.2. Any MPC personnel overseeing the contractor inert entry procedure must be trained in this procedure.

3.6.8.2.1. This training does not qualify them to be an inert entrant.

3.7. Personal Protective Equipment

3.7.1. During inert entry operations, a positive pressure (helmet style), full face piece, airline supplied respirator with an auxiliary self-contained escape unit shall be utilized by all entrants and attendants.

3.7.1.1. The escape unit shall have adequate supply to allow emergency escape.

3.7.1.2. The air supply shall have a primary and back-up source.

3.7.1.2.1. The back-up source shall be connected and be immediately available to pressurize the system.

3.7.1.2.2. The primary and secondary supply shall have sufficient capacity to supply the work for the duration of the entry of associated duties.

3.7.2. The supplied air helmet shall be secured to prevent inadvertent removal.

3.7.2.1. All breathing air shall be Type I/Grade D or better and supplied from cylinders, not compressors.

3.7.3. A trained person must continually monitor the breathing air supply of all inert entrants and attendants in supplied breathing air equipment and be available to switch to the alternate supply.

3.7.4. In sub-freezing temperatures, measures must be taken to ensure the proper operation of supplied air equipment (e.g., equipment warmers or heaters).

3.7.5. All personnel in or near the inert confined space shall be evacuated immediately if the air supply is compromised or interrupted in any way.

3.8. Communication Equipment

3.8.1. A hardwire or radio form of communication between the workers in the vessel the personnel stationed on platforms or at manways, and the personnel on the ground must be assured.

3.8.2. The communication system shall be installed in the helmet worn by the entrants and attendants.

3.8.3. The Inert Entry Supervisor and nitrogen truck driver shall be issued enough MPC radios for employees to maintain communications with Operations so that they can take action such as switching to the backup inert gas supply.

3.8.4. All personnel are to be evacuated from the confined space if the communication system is interrupted.

3.9. Rescue and Emergency Services

3.9.1. Provisions for rescue of personnel from an inert confined space will be the responsibility of the contractor.

3.9.1.1. The contractor's rescue service must be evaluated to ensure they have the capability to reach a victim within an appropriate time frame and they are equipped and proficient in performing the needed rescue services.

3.9.2. GBR's rescue team will be available on site to supplement (non-entry rescue or entry rescue if trained and equipped) the contractor's rescue team and provide medical assistance.

3.9.3. At a minimum, the following emergency rescue equipment shall be immediately available at the inerted vessel and provided by the contractor:

3.9.3.1. Hoisting device to extricate personnel from the confined space

3.9.3.2. Extra and independent supplied air respirators as required by the scope of the work and rescue pre-plan.

3.9.3.3. Harnesses, ropes, tools, etc. needed to extricated personnel

3.9.3.4. Medical response equipment (e.g. trauma kit, first aid kit)

3.9.3.5. Stretcher and means to lower injured personnel to ground

3.9.3.6. Provisions for summoning assistance

3.9.3.7. Personnel protective equipment required for entry

3.9.4. A written rescue pre-plan shall be developed by the contractor performing inert entry operations.

3.9.4.1. The plan shall include, as a minimum, Emergency Rescue of an Injured Person from Within the Vessel, Rescue Equipment Placement, Emergency Management Responsibilities, Rescue Personnel Assignments.

3.9.4.2. The completed rescue pre-plan shall be attached to the inert confined space entry permit.

3.9.5. The contractor shall have CPR trained personnel, AEDs, and resuscitators available for immediate use at each inert CSE job site. Examples of acceptable resuscitators include a Bag-Valve-Mask (BVM) or O2 demand/resuscitator kit.

3.9.6. All inert confined space entrants shall wear a full body harness with a life line attached to a retrieval device outside of the vessel.

3.9.6.1. In some cases, a retrieval line may not be practical, such as when a reactor contains multiple trays. In these cases, the rescue pre-plan must address this issue.

3.10. Catalyst Removal – Vertical Reactors/Vessels

3.10.1. Differential Pressure Measurement

3.10.1.1. If entry into the vessel is made during the catalyst unloading process, the pressure of the inert gas supply shall be monitored to ensure that a blockage of the gas passing through the reactor is not occurring.

3.10.1.1.1. If such blockage develops, this may indicate crusting and potential formation of pockets in the catalyst bed below the crust.

3.10.1.1.2. A Grubb's Manifold or equivalent method must be used to measure back pressure and determine whether crusting is a potential problem.

3.10.1.1.3. Personnel cannot enter the confined space until such a determination is made and the hazard is eliminated or mitigated.

3.10.2. Due to the potential for crusting and entrant engulfment in the catalyst bed, at no time during the inert entry process shall work be performed that puts the Inert Entrant in a position where they are supported by the catalyst.

3.10.2.1. Initially, entry will only be allowed on the top distributor tray, if so equipped, to remove the manway.

3.10.3. As much catalyst as possible shall then be removed utilizing non-entry methods such as gravity flow or vacuum.

3.10.4. When the catalyst level has reached the bottom of the vessel, Inert Entrants may walk on the bottom of the vessel to remove the last catalyst at the bottom of the vessel.

3.10.5. In vertical reactors with multiple beds and tray levels, as much catalyst as possible shall be removed utilizing non-entry methods before allowing entry to remove residual catalyst and open the next manway.

3.10.5.1. Additional attendants shall be positioned on the trays above the entrants to ensure their safety is maintained.

3.10.6. Other means (flushing with neutralized water, vibrator, lance, etc.) may be necessary to remove non-flowing catalyst.

3.10.7. Catalyst must never accumulate to the point where there is a possibility of a cave-in.

3.10.7.1. Any bridging or catalyst sticking together must be addressed.

3.10.7.2. No one is allowed on a bed of catalyst that is free flowing out.

3.10.8. Inert Entrants may enter the inerted vessel to dislodge stuck catalyst or to vacuum catalyst from vessels that are not equipped with bottom dump nozzles if the entrant is supported above the catalyst level by lifeline so that any engulfment hazard is eliminated.

3.10.8.1. In this scenario the inert entry contractor shall notify MPC Safety of the condition. MPC Safety shall then come to the job site at least once a shift to verify via the inert entry contractor's video camera that catalyst is being removed from the walls of the reactor. This is to ensure that there is no potential for catalyst boulders to accumulate on the reactor walls. At no time will catalyst be allowed to accumulate on the reactor walls higher than the waist of the entrant(s).

3.10.8.2. This requirement may be eliminated once only residual catalyst remains and the engulfment and boulder hazards no longer exist.

3.10.8.3. The Inert Entrant's lifeline must remain taut while working in a vessel which still has an engulfment hazard

3.11. <u>Catalyst Removal – Horizontal Reactors/Vessels</u>

3.11.1. Prior to entry into an inerted horizontal vessel, as much catalyst as possible must be removed from outside the manway. This will typically be accomplished by vacuuming.

3.11.2. Entrants may enter the inerted vessel to remove (e.g. vacuum) residual catalyst whenever the possibility of engulfment no longer exists.

3.12. Catalyst Loading

3.12.1. If the confined space vessel is inerted during catalyst loading, all previously stated requirements must be adhered to.

3.12.2. When the loading operation requires entry, the entrant may stand/walk on the catalyst if there is no slack in the lifeline and it remains taut.

3.12.3. If catalyst bags are used for loading, the lifting straps on each bag shall be inspected prior to the bag being lifted to ensure that straps are secure.

3.13. Miscellaneous

3.13.1. Pneumatic tools used inside the confined space shall be powered with nitrogen to prevent the introduction of air into the inert atmosphere.

3.13.1.1. All tools shall be equipped with nitrogen service fittings.

3.13.2. All electrical devices must be appropriately classified. Generally, they shall be intrinsically safe or explosion proof.

3.13.2.1. One exception is when using cameras to examine the reactor, noting that most cameras are not explosion proof or intrinsically safe.

3.13.2.2. When using non-explosion proof or non-intrinsically safe equipment, the oxygen concentration must be less than 4% by volume and flammable vapors less than 10% LEL.

3.13.3. Adequate lighting shall be provided inside the inerted vessel to ensure that work can be performed in a safe manner.

3.13.3.1. Adequate lighting is defined to be enough lighting for the workers inside the vessel to see vessel walls and all parts of the catalyst bed.

3.13.3.2. Lights must remain out of the catalyst beds

3.13.4. Entrants and others associated with the unloading process may be exposed to air contaminants above the permissible exposure limits. The contractor must comply with the requirements of the appropriate OSHA and MPC regulations such as air monitoring, biological monitoring, warning signs, wash facilities, etc.

4.0 DEFINITIONS

4.1. **Acceptable Inert Atmosphere** – For the purposes of this standard, a maximum of four percent oxygen (4 % O2), by volume, is considered the maximum acceptable oxygen concentration for preventing ignition of flammable hydrocarbon vapors or spent catalyst.

4.2. **Catalyst Replacement Process –** The work wherein an operating reactor vessel is shut down, cooled, and opened, so that spent catalyst can be removed, the interior of the vessel inspected, and fresh catalyst placed in the vessel. Due to the pyrophoric nature of the spent catalyst, the work requires that the process be accomplished under an inerted atmosphere and that inert gas be continuously fed into the vessel, with the resultant vapors vented at access openings. The process requires that workers enter the vessel under an inert atmosphere. Potential hazards of high temperature, inert atmosphere, pyrophoric spent catalyst, and high concentrations of flammable and toxic vapors exist. In addition, the physical hazards of a confined space entry are present

4.3. **Confined Space** – A space that is large enough and so configured that an employee can enter, has limited means for entry and exit and is not designed for continuous employee occupancy.

4.4. **Grubbs Manifold** – A device used to determine if inert gas back pressure is present, is developing or has developed, as a result of crusting or formation of pockets within the catalyst while inert gas is being fed into a process vessel (confined space). Crusting and pocketing presents a potential engulfment and release of energy hazard in the confined space to entrants while being supported by the catalyst.

4.5. **Immediately Dangerous to Life or Health (IDLH)** – Any condition that poses an immediate or delayed threat to life or would cause irreversible adverse health effects or interfere with an individual's ability to escape from a confined space.

4.6. **Inert Atmosphere** – An atmosphere where the vapor phase contains insufficient oxygen to support combustion. Such atmospheres cannot support life (IDLH).

4.7. **Inert Confined Space** – A confined space where the existing atmosphere is intentionally displaced with an inert gas such as nitrogen. The intent is to reduce the oxygen concentration to low levels to prevent ignition of spent catalyst and residual flammable gases. Such an atmosphere is IDLH.

4.8. **Inert Entrant** – Inert Entrants are contractor personnel who have been trained and qualified in inert entry. Such personnel must be Inert Entry Trained personnel, but in addition, must have practical experience in actual inert entry, and have been deemed qualified by MPC or the contractor to perform such entry. MPC personnel shall not enter inert confined spaces.

4.9. **Inert Entry** – Whenever a person passes through an opening into a confined space having an inert atmosphere. Entry occurs whenever any part of the entrant's body breaks the plane of the confined space opening.

4.10. **Inert Entry Attendant** – The Inert Entry Attendant is the attendant required by OSHA regulations and GBR Policy. This person shall be fully suited up in PPE equivalent to an Inert Entrant and be immediately available to assist in an emergency.

4.11. **Inert Entry Attendant Back-Up** – The Inert Entry Attendant Back-Up is an additional person required by MPC in addition to the Inert Entry Attendant. This person shall assist the Inert Entry Attendant. The Inert Entry Attendant Back-Up need not be suited up but will have all equipment immediately available to suit up in PPE similar to an Inert Entrant.

4.12. **Inert Entry Trained Person** – MPC employees trained on this standard. Such personnel will also have been trained on the MPC Confined Space procedure. Such personnel are not qualified as Inert Entrants

4.13. **Oxygen Deficient Atmosphere** – Any atmosphere containing less than 19.5 oxygen by volume

4.14. **Restricted Area** – This is defined as the immediate area outside an opening of an inerted confined space where vapors from the confined space are being vented. This area has the potential to be oxygen deficient and/or contain elevated concentrations of flammable or toxic vapors vented from the confined space.

5.0 REFERENCES

5.1. MPC RSP-1121-020, Safe Entry into Inert Atmosphere

5.2. API Publ 2217A , Guidelines for Work in Inert Confined Spaces

5.3. MPC RSP-1121-020, Confined Space Entry

5.4. Occupational Safety and Health Administration, 29 CFR 1910.146, "Permit-required Confined Spaces"

5.5. GBR-HESS PR-01 Confined Space Entry

6.0 ATTACHMENTS

6.1. Attachment A – Safe Entry into Inert Atmospheres Pre-Entry Checklist – RSP-1121-020-FORM01

7.0 REVISION HISTORY

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original issue. Integrated GBR and TRD Procedures, incorporated RSP revisions under MOC 49915 (M20182833-001).	S. P. Streacker	D. C. Staats	3/12/2019	4/1/2019
1	Adds hold point requirement to address REC 168114 under MOC 80882.	C. T. Lamb	E. R. Kaysen	9/18/2020	10/1/2020

Attachment A: Safe Entry into Inert Atmospheres Pre-Entry Checklist

Reference: For the most up-to-date, working copy of the pre-entry checklist, go to: http://cbgrs20/red/copyout.aspx?lib_no=32&doc_no=3553

Personnel participating in the completion of Pre-Entry Checklist	
Name	**Department / Position**
	HES Professional - Leader
	Area Operations Foreman or Designated Representative
	Area Maintenance Coordinator or Designated Representative
	Inert Entry Contractor Representative
	Nitrogen Contractor Representative

Section 1 - Work Preparation and Planning

Question	Answer		Comments/Findings
	yes	no	
(1) Has a pre-job planning meeting been conducted prior to beginning inert entry operations?	☐	☐	
(2) Have the training records for all personnel involved in the inert entry been verified as current by MPC personnel?	☐	☐	
(3) Does the inert entry contractor understand the requirement to video record and monitor 100% of the inert entry work?	☐	☐	
(4) Does the work permit accurately reflect the requirements and conditions of the inert entry operations?	☐	☐	

Section 2 - Inert Gas

Question	Answer		Comments/Findings
	yes	no	
(5) Has the inerting gas been verified to contain less than 0.5% oxygen?	☐	☐	
(6) Is the inert gas supply adequate to maintain an inert atmosphere of less than 4% oxygen?	☐	☐	
(7) Is there an adequate back up supply of inert gas immediately available and connected to the primary inert gas supply manifold?	☐	☐	

(8) Is a qualified person monitoring the inert gas supply and available to immediately switch to the back supply if necessary?	☐	☐	

Section 3 - Attendant and Back Up Attendant			
Question	**Answer**		**Comments/Findings**
	yes	**no**	
(9) Has the restricted area outside of the opening of the inerted confined space been defined by MPC personnel?	☐	☐	
(10) Is the inert entry attendant designated on the permit and will they be positioned at the vessel opening during entry operations?	☐	☐	
(11) Has a back-up inert entry attendant been designated and will they be controlling access to the restricted area?	☐	☐	
(12) Is the back-up entry attendant designated to maintain a log of workers entering and exiting the restricted area?	☐	☐	

Section 4 - Warning Signs			
Question	**Answer**		**Comments/Findings**
	yes	**no**	
(13) Have “Danger – Inert Confined Space” signs been posted at ladders and stairs leading to the restricted area and in the immediate area of the restricted area openings?	☐	☐	

Section 5 - Air Monitoring and Atmospheric Conditions			
Question	**Answer**		**Comments/Findings**
	yes	**no**	
(14) Does the inert entry contractor have a plan to continuously monitor the internal atmosphere of the inert confined space for O2, LEL, and temperature?	☐	☐	
(15) Does the inert entry contractor have a plan to continuously monitor the inert confined space effluent gases for LEL, H2S, CO?	☐	☐	

(16) Is the oxygen concentration in the inert confined space being maintained less than 4%?	☐	☐	
(17) Are all other atmospheric conditions of the inert confined space being met? (LEL, H2S, CO, temperature)	☐	☐	
(18) Has testing been completed to confirm that hazardous levels of nickel carbonyl do not exist?	☐	☐	Carbon Monoxide can be used as an indicator for the presence of nickel carbonyl. Not needed for aluminum catalysts.
(19) Has testing been conducted to ensure that inert gas back pressure does not reach hazard levels?	☐	☐	
(20) Has equipment used to analyze the confined space and effluent gases been properly calibrated for use in oxygen deficient atmospheres?	☐	☐	

Section 6 - Personal Protective Equipment and Emergency Rescue

Question	Answer		Comments/Findings
	yes	no	
(21) Will inert confined space entrants and attendants utilize a positive pressure helmet style full face piece airline supplied respirator with an auxiliary self-contained escape unit?	☐	☐	
(22) Is a back-up air supply of equal capacity to the primary supply immediately available to pressurize the airline system?	☐	☐	
(23) Does the back-up attendant have PPE similar to the inert entrant immediately available to don to assist in an emergency?	☐	☐	
(24) Will a trained person continually monitor the breathing air supply of all entrants and attendants and be immediately available to switch to the back- up supply?	☐	☐	
(25) Will a hardwired or radio communication system be used by the entrants, attendants, and personnel stationed on the platforms and ground to maintain communications between all personnel?	☐	☐	

(26) Has a communications radio been provided to the nitrogen truck operator so the inert entry supervisor can direct them to switch to the back-up inert gas supply?	☐	☐	
(27) Will all entrants wear a full body harness with a life line attached to a retrieval device outside the vessel?	☐	☐	
(28) Have rescue provisions been established by the inert entry contractor and has MPC personnel verified their rescue capabilities?	☐	☐	
(29) Is the facility's rescue team available on site to supplement the inert entry contractor rescue team?	☐	☐	
(30) Has a written rescue pre-plan been developed by the inert entry contractor?	☐	☐	

Section 7 – Catalyst Removal / Loading

Question	Answer		Comments/Findings
	yes	no	
(31) Is adequate lighting provided inside the inerted vessel?	☐	☐	
(32) If pneumatic tools are used, are they powered with nitrogen?	☐	☐	
(33) Are provisions in place to cover the openings of the inerted vessel with a physical barrier when left unattended?	☐	☐	
(34) Will catalyst be removed in a manner to prevent catalyst buildup on the walls or accumulation that could result in an engulfment/boulder hazard?	☐	☐	
(35) When vacuuming catalyst from the top or when dump nozzles become plugged is the inert entry contractor and MPC Safety aware that MPC Safety will have to visit the jobsite at least once a shift to verify that catalyst boulders are not accumulating on the reactor walls?	☐	☐	
(36) Are personnel prohibited from entering the inerted confined space and being supported by the catalyst during the removal process?	☐	☐	
(37) During inert entry, will the entrants remain above the catalyst and their lifeline remains taut?	☐	☐	

(38) For multiple bed reactors, will additional attendants be positioned on the trays above the entrants removing catalyst?	☐	☐	

Comments:

#	Recommendations, Corrective Actions, Opportunities for Improvement	Responsible Person	Due Date