Overview

Purpose

Provide the basis for safe entry, work in, and rescue from confined spaces.

Scope

The scope of this standard applies to all employees working on Michigan Refining Division property.

Records Retention

Printed copies of this document should not be retained more than 12 months. Any revision to this document will be retained indefinitely.

1.0 Reference

1.1 Refining/MPC References

The table below lists the Refining and MPC references used with this document

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Number	Description
RSP-1121-010	Blinding and Energy Isolation
RSP-1121-020	Safe Entry Into Inert Atmospheres
RSP-1128-000	Safe Work Permit
RSP-1127-000	Confined Space Entry
SAF-4005	Confined Space Entry
RSW-SAF-025-DT	Contaminant Thresholds and Conditions
RSW-SAF-006-DT	Safe Work Permit
RSW-SAF-054-DT	Inert Confined Space Entry Procedure
RSW-SAF-002-DT	Energy Isolation
RSW-SAF-034-DT	Portable Gas Detection Equipment Calibration
RSW-SAF-008-DT	Blinding
RSW-SAF-070-DT	Respiratory Protection

1.2 Industry References

The table below lists the industry references used with this document.

Number	Description
American Society of Safety Engineers (ASSE)	
ASSE Z117.1	Safety Requirements for Confined Spaces
American Petroleum Institute (API)	
API RP 2016	Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks
API PUBL 2026	Safe Access/Egress Involving Floating Roofs of Storage Tanks in Petroleum Services
API STD 2015	Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks
API STD 2217A	Guidelines for Safe Work in Inert Confined Spaces in the Petroleum Industry

1.3 Regulatory References

The table below list the regulatory references used with this document

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Number	Description
CFR 1910.146	Permit Required Confined Spaces
CFR 1910.147	Control of Hazardous Energy (LOTO)
CFR 1910.119	Process Safety Management
CFR 1910.1200	Hazardous Communication
CFR 1926 Subpart AA	Confined Spaces in Construction
MIOSHA Part 90	Confined Space Entry

2.0 Roles and Responsibilities

2.1 Roles and Responsibilities

2.1.1 MPC will assume the role of both Host Employer and Controlling Contractor in all Confined Space Entries. As such, MPC will be responsible for assigning an Entry Supervisor which will be identified on the Safe Work Permit

2.1.2 The table below lists the required specific roles and responsibilities in this document.

Roles	Responsibilities
Attendants	**(a)** Consults SDS as needed. **(b)** Ensures a Safe Work Permit has been issued for the confined space assigned. **(c)** Makes certain that the Safe Work Permit: – Signed by Permit Writer – Identifies Entry Supervisor – Lists current date, time and location – Is posted at the entrance of the space and is maintained at job-site. – Precautions have been noted on the permit and have been satisfied. – Specifies continuous atmospheric monitoring – Has a current atmospheric test recorded **(d)** Remains outside the space at all times during entry operations. **(e)** Ensures the confined space is never left unattended. **(f)** Understand and communicate with the communication plan to entrants during entry operations to monitor status. (e.g. voice, rope, signals, radio, visual observation, etc.). **(g)** Posts the green "Approved for Entry" sign when on duty and the yellow "Do Not Enter – Attendant not on Duty." Sign when not on duty. **(h)** Ensures all entrants are tracked accurately by legal name and time in/out of the confined space with times. **(i)** Ensure authorized entrants have proper PPE as required by the Safe Work Permit. **(j)** Review requirements and conditions of the Safe Work Permit. **(k)** Sign on under Section VI "Work Crew" and on the Confined Space Log under attendant with legal name and times. **(l)** Must be familiar with and capable of understand what the last known chemical hazard in the confined space was and how it will enter the body. Must also be able to recognize potential confined space hazards, signs and symptoms of exposure (including behavioral effects) and consequences of exposure. **Note:** See Confined Space Attendant Reference Sheets **(m)** Observe activities inside and outside the confined space to determine if it is safe for Authorized Entrants to remain in the space. Order entrants to evacuate immediately if any of the following occurs: – Detection of behavioral effects of exposure. – A prohibited condition arises or uncontrolled hazard arises. – A situation exists outside the space that could endanger entrants. – Attendant must leave the monitoring location or is unable to perform required duties. – Ventilation system fails. – The plant alarm is activated. – The time limitation on atmospheric monitoring has expired. – A condition is observed which is not allowed by the Safe Work Permit. – Lighting system fails **(n)** Keeps lifelines orderly, untangled, and connected securely to a retrieval device or anchor outside the space; if lifelines are required. **(o)** Must be trained on all applicable atmospheric monitoring equipment that will be used.

2.0 Roles and Responsibilities, Continued

2.1 Roles and Responsibilities (continued)

Roles	Responsibilities
Attendants *continued*	**(p)** Summons rescue and emergency services when authorized entrants need assistance. **(q)** Performs non-entry rescue. **Note:** Attendant is not required to be trained to perform entry rescue. If a rescue retrieval system is required; the attendant needs to be trained and capable of using that equipment. **(r)** Does not allow unauthorized persons to enter the confined space. – Advises unauthorized person that they must exit immediately if they have entered to permitted space. – Informs the Authorized Entrant(s) and Entry Supervisor if unauthorized persons have entered the permit space. **(s)** Observe atmospheric monitoring equipment frequently to be certain atmosphere remains safe. **(t)** Returns Safe Work Permit and any additional paperwork to Permit Writer. Upon completion of the job, or when work will not be performed on the next shift, the field copy of the work permit located at the job-site will be removed and turned over to the Permit Writer. **(u)** If the Permit Writer or Owning Department is unable to update the atmospheric monitoring, remove entrants from space and contact operations for a gas check. **(v)** Preform no other duties that might interfere with primary duty to monitor and protect entrants. **(w)** Notifies all vested parties of any problems involved with the entry operation.
Contract Employees	**(a)** Must follow all MRD and contractor company safety procedures and regulatory standards. **(b)** Uses and maintains all safety and air monitoring equipment in compliance with manufacturer's recommendations. **(c)** Ensures contractor Entrant's representative informs the Permit Writer when they have completed their entry and completes the debriefing section on the back of the Safe Work Permit. **(d)** Must be certified by employers to have requisite training and experience. **(e)** During multi-craft work, the crafts creating any hazards must properly notify the Entry Supervisor and take measures to evacuate the space as necessary so that corrective actions can be implemented to mitigate hazards.
Contract Supervisors	**(a)** Informs MPC representative of any hazards encountered during the entry. **(b)** Verifies that the specified conditions on the Safe Work Permit are adequate and have been met and are understood and followed. **(c)** Informs the MPC representative or other authorized personnel if and when the nature of the job changes the conditions under which the confined space entry was originally authorized. **(d)** Ensures that Attendants are competent with all equipment they are required to use (e.g., atmospheric monitoring, communications, etc.). **(e)** **(e)** Require their entrants, attendants, and entry supervisors to be trained on this procedure and must provide proof of training.

2.0 Roles and Responsibilities, Continued

2.1 Roles and Responsibilities (continued)

Roles	Responsibilities
Authorized Entrants	**(a)** Knows entry hazards, including mode, signs, symptoms, and consequences of exposure. **(b)** Follows Safe Work Permit requirements as well as other appropriate confined space entry work practices. **(c)** Complies with the requirements and conditions set forth on the Safe Work Permit. **(d)** Exits from the space immediately when: – Requested by the Attendant or Entry Supervisor, – A prohibited condition exists, – A change in behavior is detected, – There are warning signs or symptoms of exposure, – A situation takes place outside the space that endangers entry, – There is an uncontrolled hazard inside the space, – The Attendant leaves, – The plant alarm is activated, or – Lighting system fails. **(e)** **Note**: When a hazard condition is suspected, the Safe Work Permit should be revoked and the Permit Writer notified. **(f)** Exits the confined space and notifies the Attendant or other appropriate personnel when a prohibited condition exists or when there are any warning signs or symptoms of exposure. **(g)** Understands communication plan and maintains communication (e.g., voice, rope signals, telephone, radio, visual observation, etc.) with the Attendant to enable the Attendant to monitor the Entrant's status. **(h)** Uses the equipment specified for the entry in the proper manner. **(i)** Verifies prior to entry that such equipment is free of defects including but not limited to: – Atmospheric monitoring equipment – Ventilation – Communication equipment – Lighting – Barriers – Emergency Rescue Equipment – PPE **(j)** Ensures that an Attendant is on duty before entering a confined space. **(k)** Reports to the Permit Writer any case where an Attendant has abandoned his/her post during an entry. **(l)** Reviews the Safe Work Permit for changes following lunch and other breaks prior to re-entry. **(m)** Successfully completes required training courses. **(n)** Respects and does not alter barriers, lockouts/tagouts, or other confined space equipment. **(o)** Does not distract the Attendant when not involved in the entry or work. **(p)** Provides signature on sign-in/out log when entering/exiting a confined space.

2.0 Roles and Responsibilities, Continued

2.1 Roles and Responsibilities (continued)

Roles	Responsibilities
Entry Supervisor ***This role must be filled by MPC Personnel and will either be the <u>Permit User Supervisors for MPC Employees</u> or <u>MPC Contract Coordinators for contract servicing groups</u>.** **Note:** MPC employees may only sign as one of the Required Signatures in Section V of the SWP. **Note**: Entry Supervisors must be on MRD property.	**(a)** Coordinates entry operations when more than one group will enter the confined space. **(b)** Ensures entry operations remain consistent with the Safe Work Permit and acceptable entry conditions are maintained. **(c)** Verifies that Entrants and Attendants understand the scope, requirements, and limits of the work defined in the Safe Work Permit. **(d)** Reports, at the end of entry operations, any hazards confronted or created during entry. **(e)** Knows the hazards that may be faced during entry including the mode, signs, symptoms, and consequences of exposure. **(f)** Verifies by checking that: – Appropriate entries have been made on the Safe Work Permit, – All atmospheric testing/air monitoring specified by the Safe Work Permit have been conducted, – Ongoing air monitoring required by the Safe Work Permit is being conducted as specified, and – All procedures, precautions, hazards, and equipment specified by the Safe Work Permit are in place. **(g)** Terminates the entry if all entry operations covered by the Safe Work Permit are complete. **(h)** Terminates entry if a condition not allowed by the Safe Work Permit arises in the area or in or near the confined space. **(i)** Verifies with the Owning Department that rescue services are available and a means to summon is operable. **(j)** Removes unauthorized individuals who enter or attempt to enter a confined space after being notified by Attendants. **(k)** Provides appropriate briefing when responsibility for a confined space entry operation is transferred to ensure that the operations remain consistent with the Safe Work Permit. **(l)** Field verifies that energy isolation is complete. **(m)** Ensures job completion is communicated to the Permit Writer. **(n)** Follows instructions as in Owning Department, which states to provide appropriate instructions for preparation of the space for entry including cleanup and isolation. **(o)** Reports, at the end of entry operations, any hazards confronted or created during entry. **Note**: Directly Supervised Contractors (DSC) may fill the role of Entry Supervisor as long as they have received proper training.
MPC Contractor Coordinators	Apprises the contractor of any precautions or procedures that have been implemented to protect employees in or near the confined space.
Owning Department	**(a)** Knows the confined space hazards including information on the mode and the consequences of exposure. **(b)** Verifies that MPC's section of the master isolation list is complete and signed. **(c)** Identifies potential hazards associated with the confined space and specify the testing and precautionary measures required to ensure the safety of the entry. **Reference:** See Appendix E **(d)** Specifies the testing and precautionary measures required to ensure the safety of the entry and the work to be done. **Reference**: For contaminant thresholds and conditions, see RSW-SAF-025-DT

2.0 Roles and Responsibilities, Continued

2.1 Roles and Responsibilities (continued)

Roles	Responsibilities
Owning Department *continued*	**(e)** Contacts the Safety Department for initial entry requests into process related equipment and assistance, as necessary. **(f)** Performs initial entries for vessel skirts, frac tanks, and secondary containment areas. **(g)** Reviews requirements and signs Safe Work Permits for all entries. **(h)** Ensures Attendants have adequate communications methods with both Entrants and rescue services. **(i)** Provides appropriate instructions for preparation of the space for entry including cleanup and isolation**.** **(j)** Ensures that the Safe Work Permit is maintained at the job site during the entry operation. **(k)** Validates that Safe Work Permit conditions are acceptable, signs the Safe Work Permit and helps enforce Safe Work Permit conditions. **(l)** Ensures adequate Attendant personnel are present and that proper emergency/rescue equipment and other personal protective equipment are specified by the Safe Work Permit. **(m)** Ensures that the names of assigned rescuers are available within the refinery and have been notified that they are assigned rescue duties. **(n)** Coordinates through the Entry Supervisor that the specified conditions on the Safe Work Permit have been satisfied. **(o)** Notifies direct Supervision of any problem involved with the confined space entry. **(p)** Cancels and removes the Safe Work Permit when the work is completed or if a prohibited work condition occurs. **(q)** Ensures that required atmospheric testing is conducted prior to entry, as required. **(r)** Ensures that air-monitoring equipment (e.g., LEL/O2 meters, gas monitor, etc.) has been bump tested/calibrated and is properly maintained per manufacturer's recommendations. **(s)** Ensures that all energy isolation requirements pursuant to RSW-SAF-002DT – Energy Isolation and RSW-SAF-008DT – Blinding have been satisfied. **(t)** Informs the confined space entry work party of any area or operational conditions that may impact the confined space entry operation (e.g., nearby hot work, sewer draining operations). **(u)** Communicates in a timely manner to the Entry Supervisor the existence, location and potential hazards of each Confined Space (e.g., Joint Job Site Visit). **(v)** Contact Inspection Department to addresses mechanical integrity issues relative to the confined space prior to entry (e.g., tank roof metal thickness, stability of refractory). **(w)** Ensures a sign is posted such as "Danger – Permit Required Confined Space Do Not Enter" or a similar barrier as soon as the confined space is opened. **(x)** Maintains the assigned rescue team listing on the Safe Work Permit, especially when confined space jobs may continue past a rescuers shift. **(y)** Completes the debriefing section on the Safe Work Permits. **(z)** Coordinates entry operations with the contractor, nearby operations, and any MPC employees working in or near the confined space. **(aa)** Acquire all required signatures on the Safe Work Permit.
Rescue/ERT	**(a)** Performs assigned rescue functions. **(b)** Performs at least one confined space rescue drill every year. **(c)** Ensures that confined space rescue equipment is maintained and ready for immediate deployment. **Reference:** For additional details, see Section 6.0.

2.0 Roles and Responsibilities, Continued

2.1 Roles and Responsibilities (continued)

Roles	Responsibilities
Safety Department	**(a)** Develops, administers, and updates the local confined space procedure/work instructions. **(b)** Co-signs all initial entries into process related equipment and conducts additional atmospheric monitoring as requested by Permit Writers. **(c)** Ensures that at least one rescue team member is currently certified in first aid and CPR. **(d)** Reviews requirements and authorizes initial Safe Work Permits involving IDLH and inert entry. **(e)** On at least an annual basis, reviews the Safe Work Permits to evaluate the overall confined space program effectiveness, and revises the program to correct any deficiencies found prior to authorizing subsequent entries. Examples of circumstances that may indicate a deficiency requiring a revision to the confined space program include, but are not limited to: – any unauthorized entry of a permit required confined space, – detection of a CS hazard not covered by the permit, – detection of a condition prohibited by the SWP permit, – a near-miss or injury occurs during entry, or – a change in use or configuration of a permit required CS. **(f)** Post the yellow "Do Not Enter – Initial Entry Approved but No Attendant on Duty" after completing the initial entry verification. **(g)** Periodically audit job-sites to determine compliance with procedure. Suspend Safe Work Permit until corrective measures have been implemented to protect employees.
Training Department	With assistance from the Safety Department, develops, implements, logs, and administers local training programs to ensure safe confined space entry and work **(a)** provides and or facilitates permit writer training, and **(b)** maintains annual training certifications for the local rescue service personnel.

3.0 Written Confined Space Entry Procedure

3.1 Identifying Confined Space

4.1.1 A confined space which is normally open and could be entered inadvertently must have a "danger" sign posted.

4.1.2 A confined space that is opened or intended to be occupied must be clearly marked with the proper sign on or near entry points until the space is closed.

(a) Signs will be maintained in control rooms and provided by Owning Department.
(b) All personnel will follow directions printed on each sign.
(c) The red "Do Not Enter" sign will be posted at the beginning of the entry operation and removed at the completion of the entry operation by the servicing groups

3.2 Identifying Confined Space Hazards

The Contractor Coordinator, Maintenance Planning, and Owning Department, if applicable, shall identify and evaluate any hazards associated with a confined space prior to opening such space.

Reference: Hazards which should be considered are located in Appendix F and G.

3.0 Written Confined Space Entry Procedure, Continued

3.3 Confined Space Hazards and Control Methods

The table below describes confined space hazards and control methods

NOTE: A MPC Representative shall inform any servicing group, via the Safe Work Permit and Joint Job Site Visit, of the hazards identified with a particular confined space.

Hazard	Control Description
Multiple Compartment or Coupled Vessels	When multi-compartment or coupled confined spaces are to be entered, additional precautions are as follows: **(a)** Atmospherically test the entire space. **(b)** Verify that the space has been isolated and that engulfment, mechanical, and internal configuration hazards have been addressed. **(c)** Position an Attendant at each active entrance/exit location (e.g., Man ways, at internal man ways of floating roof tanks when work is taking place above and below, work inside cyclones inside the Regen, etc.). **Note:** It may not be necessary to have an Attendant at each entrance/exit provided they can adequately monitor the Entrants. **(d)** Prepare a single Safe Work Permit for the entire space unless the confined space warrants otherwise (e.g., a catalytic regenerator). **(e)** Coordinate, maintain, and control sign-in/sign-out sheets for multiple active entrance/exit locations by an assigned Attendant to ensure that all Entrants are accounted for at the completion of entry operations. **(f)** The alerting device to warn entrants to evacuate a confined space due to an unsafe condition must be sufficient to alert all entrants. The alerting device selected shall consider the size and/or configuration of the confined space and the work being performed in the confined space. The standard compressed air or hand pumped air horns may not be sufficient to alert entrants of an evacuation. In these situations, other more effective or louder alerting systems must be used (e.g., CS Monitoring System with audible and visual alerts, strobe light, etc.). **Note**: Whistles shall not be used, as they are utilized to signal crane lifts. In most cases, air horns will be utilized for alerting devices at MRD. If additional alerting devices are warranted an MPC Safety Representative will determine acceptable method during the planning phase.
Oxygen	**(a)** Determine the oxygen concentration in the atmosphere by testing with an oxygen analyzer. **(b)** For oxygen concentrations below 16.0% follow RSW-SAF-054-DT Inert Confined Space Entry Procedure. **(c)** Oxygen levels between 16.0% and 19.5% require the use of a self-contained breathing apparatus (SCBA) or positive pressure airline respirator equipped with an escape cylinder. **(d)** No entry is permitted if oxygen levels exceed 23.5% **(e)** If oxygen levels are less than 20.4% or more than 21.4%, the reason must be determined to assure that the conditions can not worsen during work activities.
Flammable Vapors	**(a)** Entry shall not be permitted unless atmospheric monitoring indicates that the LEL is less than or equal to 10%. **(b)** For hot work, the atmosphere must be 0% LEL. **(c)** For cold work, the atmosphere must be less than or equal to 10% LEL, if the entrants wear the appropriate PPE (e.g. additional respiratory protection), the source of LEL is known, and every effort has been made to reduce the LEL to 0%.

3.0 Written Confined Space Entry Procedure, Continued

3.3 Confined Space Hazards and Control Methods (continued)

Hazard	Control Description
Toxic Materials	**(a)** Conduct tests when there is a possibility of toxic materials being present. **(b)** When the Owning Department is unable to perform the tests, the Permit Writer or Area Supervisor contacts the Safety Department for assistance. **(c)** Any concentration in excess of the recognized exposure limits renders the atmosphere hazardous. Excess Concentration Examples: Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL). **REFERENCE:** See RSW-SAF-025-DT Contaminant Thresholds and Conditions for exposure limits for common refinery contaminants.
Combustible Dust	**(a)** Airborne combustible dusts (for example, sulfur) in high enough concentrations can be explosive. **(b)** Use ventilation, utilizing wet methods, or other means as needed to control combustible dusts in confined spaces as to not create an explosive atmosphere. **(c)** If dust obscures vision within five feet, the atmosphere is considered hazardous and mitigation is required reference RSW-SAF-070-DT Respiratory Protection.
Non-Isolated Engulfment Hazards	Physical hazards must also be considered and precautionary measures implemented to alleviate their impact on a confined space entry. **(a)** Any non-isolated engulfment hazard (e.g. Catalyst) shall have an early-warning system that continuously monitors for the non-isolated engulfment hazard. **(b)** The system shall alert Authorized Entrants and Attendants in sufficient time for the Authorized Entrants to safely exit the space. **Example**: Remote Camera Monitoring System for Catalyst removal with Entrants attached to lifelines. Non-Isolated Sewer Entry with a monitor upstream to monitor water flow. **Note**: See RSW-SAF-054-DT-020 for all Inert Confined Space Entries.

3.0 Written Confined Space Entry Procedure, Continued

3.4 Confined Space Safeguard Methods

The table below describes confined space safeguarding methods.

NOTE: Servicing groups will be informed, via Safe Work Permit and Joint Job Site Visit, of any precautions or procedures MRD has taken for the protection of the employees in or around the spaces where personnel are working.

Safeguards	Control Description
Ventilation	Continuous forced air ventilation is required for all confined space entries. Except for the following scenarios: 1. Equipment has sufficient natural draft (e.g. Heaters with dampers locked open) 2. Excavations or Secondary Containment areas where non-invasive work is performed. **(a)** Use of compressors or dedicated systems should be used to supply air movers **IMPORTANT: Plant air system is backed-up by nitrogen and shall not be used for confined space ventilation. Failure to comply may result in serious injury or death.** **(b)** Ventilation equipment must be grounded or bonded to the vessel with an approved grounding strap. **(c)** Attendants shall require all entrants to immediately leave the space if the ventilation system fails. **(d)** To prevent accidental disruptions or disconnections in confined space ventilation, the source end of either utility hoses or power cords, for electrically driven equipment, used to supply air movers for confined space entry ventilation shall be tagged with the following verbiage "Caution – Do Not Disconnect – In use for Confined Space Entry". **(e)** Air flow indicators shall be hung at all open man ways to verify adequate ventilation inside the space during entry operations. **(f)** The Permit Writer, Entry Supervisor and Attendant shall ensure that inducted air does not present a health concern from sources such as vehicle exhaust or process emissions. **(g)** (g) Dependent on the size and configuration of the equipment, confined space ventilation shall be turned off for a minimum of 15 minutes before conducting atmospheric monitoring.
Blinding and Energy Isolation	Each piece of equipment to be entered must be properly isolated in accordance with RSW-SAF-002-DT-Energy Isolation and RSW-SAF-008-DT-Blinding
Initial Atmospheric Monitoring	**(a)** The Marathon Safety Department will conduct initial atmospheric monitoring for entry into process related confined spaces (e.g. tanks, vessels, drums, fin fans) and excavations. Additionally, MPC Safety Department will complete the following: – Verify the master isolation list matches the application of lock and blinds. – Verify the permit is filled out correctly. – Check ventilation set up and requirements. – Ensure ventilation has been turned off for a minimum of 15 minutes prior to monitoring. – Complete the Safe Work Permit Confined Space Tracking Log for confined space entries. **(b)** The Owning Department Shift Foreman or designee will conduct initial entries into vessel skirts, frac tanks and secondary containment areas. **(c)** Initial atmospheric monitoring is required: – The first time a space is opened – If the space is closed, latched and re-opened – After any situation that could lead to new, unexpected hazards in the space (e.g. welding that liberates hydrogen sulfide). – When the size of the excavation has exceeded the dimensions stated on the Pre-Analysis Excavation Checklist. – When requested by Safety Department, Owning Department or Servicing Group. **(d)** When the initial atmospheric testing results are acceptable and representative, determine if they work to be done in the space will introduce additional hazards. **(e)** All confined spaces are considered hazardous atmospheres until pre-entry testing and verification demonstrates otherwise,

3.0 Written Confined Space Entry Procedure, Continued

3.4 Confined Space Safeguarding Methods (continued)

Safeguards	Control Description
Atmospheric Monitoring	**(a)** All confined space atmosphere must be tested prior to entry. Refinery and contractor personnel will conduct testing and monitoring of these atmospheres. **(b)** Based on the configuration of the confined space, it may be necessary to enter and perform additional testing to ensure that contaminates are below acceptable levels. Conduct this entry testing after all other conditions of the safe work permit are satisfied. Atmospheric testing must be conduct as the space is entered. **(c)** Testing equipment shall be calibrated, use and maintained in accordance with RSW-SAF-034-DT Portable Gas Detection Equipment Calibration Procedure and the manufacturer's recommendations. **(d)** The servicing group has the right to be present for atmospheric monitoring before entry into a confined space. The servicing group also retains the right to request atmospheric testing at any time regardless of whether it is prior to entry or during a job in which the space has already been entered. **(e)** Continuous atmospheric monitoring equipment with the proper alarms shall be used at all times whenever an Entrant is inside a confined space. The Permit Writer must clearly indicate the sampling point of the Safe Work Permit. This sampling point must be representative of entrants breathing zone. **(f)** Continuous monitoring instruments must be direct-reading instruments that have a visual readout and audible alarm which can be set to alarm at unacceptable entry conditions. The monitors must alarm for high levels of LEL, H2S, and CO (SO2 if applicable). They must also alarm for low concentrations of oxygen. NOTE: Continuous monitoring is not required when the monitors are not commercially available for a specific toxic substance (e.g. lead, hexavalent chromium, asbestos, etc.). If continuous monitoring equipment is not commercially available, periodic monitoring using Industrial Hygiene methods must be conducted for the hazards at intervals adequate to detect potential changes. **(g)** All confined spaces shall be tested for the following materials in the order listed: – Oxygen, – flammable gases and vapors, – potential toxic contaminants, and – other potential hazards as necessary, such as, radiation, explosives, combustible dust, heat stress, pH. **(h)** **IMPORTANT:** The indicated order is important. Some test instruments for flammable gases and vapors do not work properly if sufficient oxygen is not present and some test instruments for toxic materials do not work properly in flammable atmospheres**.** **(i)** Always test the air at various levels to ensure the entire space is safe. Contaminants with different vapor densities will settle at different levels within the space. **REFERENCE:** See RSW-SAF-025-DT Contaminant Thresholds and Conditions for exposure limits for common refinery contaminants.

3.0 Written Confined Space Entry Procedure, Continued

3.4 Confined Space Entry Safeguarding Methods (continued)

Safeguard	Control Description
Continuous Monitoring	**(a)** Continuous atmospheric monitoring equipment with the proper alarms shall be used at all times whenever an Entrant is inside a confined space. The Permit Writer must clearly indicate the sampling point of the Safe Work Permit. This sampling point must be representative of entrants breathing zone. **(b)** Continuous monitoring instruments must be direct-reading instruments that have a visual readout and audible alarm which can be set to alarm at unacceptable entry conditions. The monitors must alarm for high levels of LEL, H2S, and CO (SO2 if applicable). They must also alarm for low concentrations of oxygen. **(c)** Hand aspirators are not permitted for use in confined spaces. Note: Consideration must be given for confined space inside of confined spaces, which may require personal multi-gas monitors.
Atmospheric Re-testing	**(a)** After the initial permit is issued, the Owning Department will continue to require the same precautions (e.g. PPE, rescue equipment, etc.) in subsequent permits until MPC Safety Department has given approval to change the requirements. See RSW-SAF-006-DT Safe Work Permit Procedure. **(b)** The following schedule shall be applied by the Owning Department after the initial atmospheric monitoring. This atmospheric monitoring shall include testing of oxygen, flammable gases and toxic vapors. – Test the interior of the confined space immediately prior to entry. – Test the interior of the confined space every four hours afterwards, at minimum. – Test the interior of the confined space after an event that may have changed the conditions in the space. – Consider re-testing for other hazards on a case-by-case basis and specify on the Safe Work Permit, if required.

3.5 Preparatory Work and Precautions

3.5.1 Initial entry requests must come from the Owning Department to ensure preparatory work is completed.

3.5.2 All vertical and horizontal man ways with a fall hazard greater than or equal to 6 foot shall be protected with temporary fall protection barriers.

3.5.3 All preparatory work and precaution, such as, purging, energy insolation, excavation shoring, etc. must be complete before an entry permit can be issued.

3.5.4 The confined space must be purged, steamed, washed, etc., as necessary to properly free it of contaminants. Special attention and preparation must be given to the removal of liquid product, sludge and residue.

3.5.5 While clearing confined spaces, it is essential to control escaping gas and vapor in the surrounding area, prevent unauthorized personnel in the area, control all sources of ignition in the area, monitor atmosphere and don the appropriate PPE for work in and around such areas.

3.0 Written Confined Space Entry Procedure, Continued

3.6 Energy Isolation

3.6.1 Lines to the confined space must be blinded or physically disconnected as close to the equipment as practical to effectively prevent any material from entering the confined space. Any blind location or disconnect other than at the first flange from the confined space will be reviewed and approved by a Safety Department representative and the Owning Department.

3.6.2 Several pieces of equipment can be isolated with common blinds provided that the separate pieces of equipment are treated as a single confined space and the following conditions can be met.

- **(a)** The entire space shall be atmospherically tested and continuously monitored.
- **(b)** The space must be isolated and all engulfment, mechanical, and internal configuration hazards must be addressed.
- **(c)** All lines and bleeders must be purged, cleared and drained as required.
- **(d)** The piping between the equipment and blind locations must be free draining with no pockets or low point traps.
- **(e)** When working on multiple pieces of equipment, hot work may not be performed on any of the equipment between the blind locations until the equipment can be isolated from the rest of the system, the personnel are cleared from the other spaces or until it can be ascertained that the personnel not performing the hot work are protected.
- **(f)** There are no branch connections between the equipment to be entered that cannot be properly isolated.
- **(g)** An attendant shall be positioned so that they can adequately monitor the entrants.
- **(h)** A single permit shall be prepared for the entire space unless the confined space warrants otherwise, for example, a catalytic regenerator.
- **(i)** Entrant Sign-in/sign-out sheets for multiple active entrance/exit locations shall be coordinated, maintained and controlled by an assigned attendant to ensure that all entrants are accounted for at the completion of entry operations

3.7 Written Safe Work Permit

3.7.1 Before any person physically enters any confined space at the Michigan Refining Division, a confined space entry permit must be issued in accordance with RSW-SAF-006-DT Safe Work Permit.

3.7.2 All confined space entries require an entry supervisor and attendant(s), in addition to the entrants to be logged into the appropriate section on the back of the Safe Work Permit.

3.7.3 All confined space entries will require a minimum of one attendant for the duration of the entry operation. The number of attendant(s) required will be documented on the Safe Work Permit.

- **(a)** Attendants are required to wear a red or orange high visibility vest for identification purposes.
- **(b)** Attendants shall be equipped with radio or siren to summon rescue services.
- **(c)** If Authorized Entrants are out of sight of the attendant, at least one Authorized Entrant must be similarly equipped.

3.7.4 Additional Confined Space Sign in/Sign Out for Authorized Entrants may be used when the back of the Safe Work Permit does not provide enough space to track the entrants. This form(s) must be turned in with the Safe Work Permit when it is closed out.

REFERENCE: RSW-SAF-010-DT-FORM01 Confined Space Sign In/Sign Out

3.0 Written Confined Space Entry Procedure, Continued

3.7 Safe Work Permit (continued)

3.7.5 After the initial permit is issued, the Owning Department will continue to require the same precautions in subsequent permits until MPC Safety has given the approval to change the requirements.

3.7.6 A servicing group representative must inform the Owning Department and/or Permit Writer when they have completed their entry and must complete the debriefing section regarding hazards confronted on the Safe Work Permit.

REFERNECE: RSW-SAF-006-DT Safe Work Permit Procedure

3.7.7 Confined Space Tracking Logs shall be completed for entry operations anticipated to last longer than on shift.

RERFENCE: Safe Work Permit Confined Space Tracking Log

3.8 Confined Space Reference Sheets

3.8.1 Confined Space Reference Sheet shall be developed, maintained and distributed by the MPC Safety Department.

3.8.2 Confined Space Attendant Reference Sheets will be developed for all Confined Spaces and include at the minimum:

- **(a)** Unit Name,
- **(b)** Equipment Name & Number,
- **(c)** Picture of Equipment,
- **(d)** Equipment drawing (if available),
- **(e)** Previous Material in Vessel (utilize the vessel SDS & decontamination procedure to populate),
- **(f)** Signs and Symptoms of Exposure,
- **(g)** Non-Entry/Fall Protection Plan, and
- **(h)** Emergency Contact Information.

3.8.3 Confined Space Attendant Reference Sheets shall be posted at all active entry points (e.g., man ways) to the Confined Space

EXCEPTIONS: Vessel Skirts, Frac Tanks, Fin Fans, Secondary Containment Areas and Excavations will not require reference sheets. Any last known chemicals shall be documented on the Safe Work Permit.

3.9 Respiratory Protection and PPE

3.9.1 Respiratory protection must be used when entering a confined space where concentrations of airborne contaminants exceed the allowable limits in RSW-SAF-025-DT Contaminant Thresholds and Conditions , Steps such as ventilation must be taken to reduce the concentration of the airborne contaminants.

3.9.2 If respiratory protection was deemed necessary at the initial approval of the confined space entry, at the point where it is felt that the respiratory protection is no longer necessary, approval is required from the Safety Department and the Owning Department to reduce the respiratory protection requirements.

3.9.3 Atmospheres that contain or could contain corrosive materials or materials that are toxic through skin absorption will require personal protective equipment to prevent skin and/or eye contact.

3.0 Written Confined Space Entry Procedure, Continued

3.10 Records Retention

3.10.1 Confined Space Safe Work Permits will be retained for 30 years plus the life of the facility.

3.11 Job Completion

3.11.1 Ensure the job completion is communicated to the Permit Writer.

3.11.2 A Contractor entrant's representative must inform the permit writer when they have completed their entry and must complete the debriefing section on the back of the permit.

4.0 Facilitating Non-Entry Rescue

IMPORTANT: Only trained personnel may enter a confined space for rescue purposes. Non-entry rescue may be performed provided the rescuer is trained to properly use such equipment.

4.1 Retrieval Systems

4.1.1 Retrieval systems or methods shall be utilized whenever an Authorized entrant enters a permit space; unless the retrieval equipment would:

- **(a)** increase the overall risk of entry, or
- **(b)** not contribute to the rescue of the Authorized Entrant.

4.1.2 MPC Safety Department (including DSC) shall be involved in the determination of retrieval equipment increasing the overall risk of entry or unable to contribute to the rescue of the Authorized Entrant.

4.1.3 MPC Safety Department (including DSC) may waive requirement

4.2 Retrieval System Requirements

4.2.1 Each Authorized Entrant shall use a chest or full body harness, with a retrieval line attached at the center of the Entrant's back near shoulder level, above the Entrant's head or at a point which presents a profile small enough for the successful removal of the entrant.

4.2.2 The use of wristlets or anklets may be used in lieu of the chest or body harness if:

- **(a)** use of a chest or full body harness is infeasible or creates a greater hazard, and
- **(b)** use of wristlets or anklets is the safest and most effective alternative.

4.2.3 Attach the other end of the retrieval line to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

4.2.4 A mechanical device must be available to retrieve personnel from a vertical type permit space more than 5 feet deep.

3.3 Examples of When Not to Use a Retrieval System

The following are examples of when retrieval systems would increase the risk of entry or would not contribute to the rescue of the entrant.

- **(a)** The space has obstructions or turns that prevent pull on the retrieval line from being transmitted to the Entrant.
- **(b)** Use of the retrieval system would injure the Entrant due to forceful contact with projections in the space, or
- **(c)** the retrieval line cannot be controlled so as to prevent entanglement hazards with the equipment or airlines utilized by Entrant

5.0 Rescue Services and Equipment

5.1 Rescue and Emergency Services

5.1.1 MPC Rescue Personnel will not enter into Inert Confined Spaces.

REFERENCE: RSW-SAF-054-DT Inert Confined Spaces

5.1.2 MPC employees who are designated Confined Space Rescue Team Members must:

- **(a)** Be trained in basic first aid and CPR and
- **(b)** Practice making permit space rescues, in representative permit spaces, before attempting an actual rescue in refining/process confined spaces, and at least once every 12 months, by means of simulated rescue.

5.1.3 MRD or designated personnel will oversee, assist or conduct all rescue operations.

5.1.4 On all shifts where an active confined space entry occurs, a Confined Space Rescue Team of three trained confined space rescuers shall be assigned and must be available within the refinery. The Permit Writer will ensure that all members are notified prior to entry and documented on the Safe Work Permit.

5.1.5 Emergency/rescue personnel

- **(a)** operate according to the site emergency response plan and
- **(b)** can only enter the confined space with unknown or hazardous atmospheres when equipped with
  - SCBA, or
  - positive pressure airline respirator equipped with escapes bottles and other appropriate PPE, and
  - only when an Attendant is stationed by the confined space.

5.1.6 In an emergency situation, the attendant or entry supervisor shall contact the Owning Department and rescue team. The attendant or entry supervisor shall then state his/her name, the complex number, and the exact location of the confined space.

- **(a)** The owning department will contact Complex 5 Board Operator/Chief Pumper, who will use the all-call radio channel to cease all confined space entries in the refinery.
- **(b)** When the emergency situation is resolved, the owning department or rescue team will notify Complex 5 Board Operator/Chief Pumper, who will announce the all clear and confined space entries may resume.

REFERENCE: RSW-ERP-005-DT Emergency Communications

5.1.7 SDSs shall be made available to medical facilities treating exposed employees, if applicable.

5.2 Emergency Rescue Equipment

For entries, at a minimum, ensure the following emergency rescue equipment is immediately available at the refinery:

- **(a)** hoisting device to extricate personnel from the confined space,
- **(b)** extra and independent supplied air respirators as required by the scope of the work and the rescue pre-plan,
- **(c)** harnesses, ropes, tools, etc., needed to extricate personnel,
- **(d)** medical response equipment for use by trained MPC medical personnel,
- **(e)** stretcher and means to lower injured personnel to ground,
- **(f)** provisions for summoning assistance, and
- **(g)** PPE required for entry.

5.0 Rescue Services and Equipment, Continued

5.3 Confined Space Equipment

As the Host Employer, MPC must ensure the following equipment is in place and functioning as required prior to entry:

(a) Testing and Monitoring Equipment,
(b) Ventilation Equipment,
(c) Communication equipment necessary for Attendant(s) assessing Authorized Entrant's status in confined spaces,
(d) Personal Protective Equipment (PPE), if feasible engineering and work-practice controls do not adequately protect the Authorized Entrant(s),
(e) Lighting equipment,

Important:
1) Lighting equipment shall be approved for ignitable/combustible properties for the potential hazards of the confined space (i.e., gases, vapors, dust).
2) Lighting equipment shall be sufficient to allow Authorized Entrants to see well enough to work safely and exit the space quickly in the event of an emergency.
3) Lighting equipment shall meet the minimum illumination requirement of 5-foot candles.

(f) Emergency egress lighting,

Important:
1) Emergency egress must meet requirements listed below lighting equipment (e).
2) Battery powered back-up lighting systems shall be used when feasible. If these systems are not feasible, head lamps approved for the potential hazards of the confined space shall be worn on the hard hat. Hand held flashlights may be permitted in cases where welding or other PPE prevents use of head lamp and in situations where only portions of the Authorized Entrant's body will pass into the space.

(g) Electrical Equipment

Important:
1) Power should be brought into a vessel through an opening other than that used by personnel, if possible. If this is not feasible, well-grounded flexible or rigid metallic conduit or an equally effective means of conductor protection must be provided so as to prevent wiring damage and subsequent possible injury to personnel.
2) Lighting fixtures must have substantial guards to protect the lamp from both liquid contact and physical impact. Explosion-proof lighting is preferred.
3) Lighting fixtures must not be hand held. They should instead be mounted on stands or suspended via non-electrically conductive means.
4) All cords and connections should be routed and/or securely suspended with non-conductive supports, well away from potential damage caused by work in the space or damp areas.

(h) Barriers and shields shall be used to protect Authorized Entrants from hazards outside the space (e.g. Jersey barrier for CSE along roadway).
(i) Ladders, needed for safe entry and exit by Authorized Entrants,
(j) Rescue Equipment that is not supplied by the rescue service, and
(k) Any other equipment necessary for safe entry into, safe exit from and rescue from permit required confined spaces.

6.0 Special Situations

6.1 Inert Entry / Immediately Dangerous to Life and Health (IDLH) Atmospheres

6.1.1 Due to the extreme hazardous nature and additional requirements for inert entries use the following:

REFERENCE RSW-SAF-054-DT Inert Entry Confined Space

6.1.2 Atmospheres with IDLH concentrations may be entered only in emergency situations. The following requirements shall be discussed with Servicing Group, Safety Department, Fire Chief, and Owning Department Manager.

- **(a)** Alternatives way to complete the task (e.g. engineering controls, delay task, etc.).
- **(b)** Development of an entry plan including rescue
- **(c)** Need for stand by rescue personnel
- **(d)** PPE requirements
- **(e)** Qualifications/Training for entry

6.2 Sewer Entries

6.1.1 Sewer entry differs from other Safe Work Permit entries in that there is rarely exists any way to completely isolate the space to be entered.

Exceptions: Plugging and ballooning with materials of construction that are compatible with the hazards.

6.2.2 Atmospheres may suddenly and unpredictably become lethally hazardous.

6.2.3 Additional hazard assessment and advance planning are necessary.

REFERENCE: 29 CFR 1910.146 Appendix E
MIOSHA Part 90 Permit Required Confined Space

6.3 Floating Roof Tanks: Covered Internal Floater

6.3.1 Owning department must issue a Safe Work Permit.

IMPORTANT: Under no conditions shall permission be given to enter a covered internal floater with a plastic, Petrex, aluminum or fiberglass roof while tank is in service or has product in in.

6.3.2 A Safe Work Permit may be issued for entry into a covered internal floater with a steel plan or pontoon roof if all of the conditions in the table below are met.

6.0 Special Situations, Continued

6.3 Floating Roof Tanks: Covered Internal Floater (continued)

Requirements
The preference is that the pan be not more than ten feet below the fixed roof. In all cases it should be as high as possible. **NOTE**: This requirement may be waived if clean water only is in the tank (such as during hydrostatic testing).
All lines to and from the tank must be locked out/tagged out at the tank.
All mixers must be shut off and isolated in accordance with the Energy Isolation procedure.
When entering onto floating roof in tanks, use the listed respiratory protection, (a) for Class I flammable liquids (e.g., gasoline), use a SCBA or supplied air respirator with five minute escape provisions on ALL entries, and (b) as directed by the Safety Department, for Class II Liquids (e.g., distillates) and hydro-test water.
A winch with fall protection capability must be in use when ascending and descending into the tank.
Entrants shall wear a full-body harness and lifeline. If there is an entanglement hazard (a) the Entrants may remove the lifeline after reaching the pontoon or floating roof, provided one person stays at the bottom of the ladder with the lifeline as an observer for the others, and (b) the lifeline must be reattached before exiting back up the ladder. **IMPORTANT**: A breathing apparatus harness is not acceptable as a full body harness.
An SCBA or supplied air respirator must be available to the attendant on the roof, if required for entrants. **IMPORTANT**: The Attendant cannot use the SCBA or supplied air respirator for entry rescue purposes.
An outside Attendant must be stationed on the top platform with immediate communications and non-entry rescue capabilities (e.g. radio, back-up person, etc.)
Entrants shall not be allowed to descent onto an internal floating roof, which is out of floatation (sitting on legs) until (a) the space below the roof has been opened and ventilated, (b) atmospheric testing has been conducted both above and below the open-top floating roof, and (c) conditions allow the issuance of the Safe Work Permit.
Continuous monitoring by Entrants and Attendants

6.0 Special Situations, Continued

6.4 Floating Roof Tanks: Open Top Floating Roof Storage Tanks

6.4.1 A Confined Space Entry Permit must be issued by the owning department

6.4.2 Entry onto a storage tank's external-floating roof is a confined space when the roof is more than four feet from the top of the tank regardless of the hazards above/below the external-floating roof (i.e., whether product is or is not below the floating roof).

6.4.3 A pre-job meeting shall be conducted with owning department and contractor personnel which includes the following personnel to review the purposed work, potential hazards, entry conditions, and emergency plans:

- **(a)** Designated Entry Supervisor
- **(b)** Permit Writer,
- **(c)** Authorized Entrant(s)
- **(d)** Attendant(s),
- **(e)** Designated Rescue Team (if needed)

6.4.4 All lines to and from the tank must be locked out/tagged out at the tank so that the possibility of pumping in or out of the tank is eliminated.

6.4.5 All mixers must be shut off and isolated in accordance with the Energy Isolation procedure.

6.4.6 Prior to descent visually inspect the open-top floating roof from the platform for potential physical hazards and stability.

IMPORTANT: if there is any doubt about integrity of a floating roof, contact the Inspection Department to ensure the metal thickness is within API specifications for personnel access.

6.4.7 Entrants shall not be allowed to descent onto an open-top floating roof, which is out of floatation (sitting on legs) until

- **(a)** the space below the roof has been opened and ventilated,
- **(b)** atmospheric monitoring has been conducted both above and below the open-top floating roof, and
- **(c)** conditions allow the issuance of a Safe Work Permit.

6.4.8 Entry onto external floating roofs for tasks of short duration (e.g. gauging and sampling) conducted by Product Control is permitted without the use of a confined space permit with the following requirements

Requirement
Product receipts must have ceased one (1) hour prior to any entry onto the roof.
Notification to the appropriate personnel with control over product movement that an entry on to an external floating roof is being made by Products Control Department personnel.
Entry is conducted using the "Buddy System", meaning that one Product Control Department employee enters on the roof and one stays at the top of the tank acting as the attendant.
Initial air monitoring for oxygen and LEL and toxics as appropriate is conducted within five feet of the tank roof prior to any employee entering onto the roof
The entrant is equipped with a continuous air monitoring device which will alarm if conditions change while the entrant is on the roof.
The entrant leaves the roof if conditions change or the continuous air monitoring device alarms.
Notification is made to the appropriate personnel with control over product movement that the entry is complete and that all employees have exited the roof.

IMPORTANT: Entry into API Forebays shall follow all requirements of entry onto storage tanks with external floating roofs.

6.0 Special Situations, Continued

6.5 Tunnels

6.5.1 Tunnel entry differs from other Safe Work Permit entries, in that atmospheres may suddenly and unpredictably become lethally hazardous.

6.5.2 Additional hazard assessment and advanced planning are necessary.

6.5.3 Two attendants are required for "7 foot tunnel", one must be placed outside the tunnel entrance and one must be placed at the base of the tunnel.

IMPORTANT: 10 minute escape pack is required for entry into "7 foot tunnel".

6.6 Large, Complex and High Density Work Confined Spaces

6.6.1 Additional hazard assessment and advanced planning are necessary for very large Confined Spaces that have any of the following characteristics or scenarios:

(a) 50 or more entrants simultaneously per shift,

Note: This is based upon all entrants/companies performing work in the space.

(b) Confined Space Entry inside the Confined Space (e.g., work inside cyclones inside a Regen vessel, large diameter piping between FCC and Regen vessel), or

(c) Complex scaffold systems which include seal decks that separate the confined space.

6.6.2 The additional hazard assessment must be documented and consider at least the following:

(a) Personnel (Entrant) accountability in the event of an emergency,

(b) Personnel protection from falling debris, tools, and equipment,

(c) Alerting systems that can be heard and seen by all entrants in the event of an emergency,

Note: Consider the noise levels when air movers and all work is conducted in the CS.

(d) Additional Fire Watches and Hole Watches (Attendant) stationed inside the confined space,

(e) Additional Fall Protection Requirements (e.g., Tripod System for internal aligned man ways on trays greater than 12 inches, Fall Protection for work inside Cyclones inside the Regen, adequate tie-off points on scaffolding),

(f) Adequacy and quantity of access/egress locations based on the number of Entrants

(g) Complexity of air movement system(s) and any hazards the system itself would introduce to the confined space,

(h) Consideration of a confined space monitoring system that has Closed-Circuit TV (CCTV), air monitoring, audio & visual alarms and voice communication system,

(i) Enhanced fire prevention/protection systems/equipment including charged fire hoses.

Note: For Cold Weather, the hose maybe ran to the confined space but not charged this would require a person staged at the hydrant for immediate activation.

6.6.3 The Large, Complex and High Worker Density Confined Spaces Hazard Assessment Checklist (Appendix D) shall be completed when the Confined Space meets any one of the requirements above are meet. The Large, Complex and High Worker Density Confined Spaces Hazard Assessment Checklist will be completed by an MPC Safety Professional and MPC Maintenance

6.0 Special Situations, Continued

6.7 Hot Work Inside Confined Spaces

6.7.1 Provisions shall be made to ensure adequate ventilation for each person conducting Hot Work in the confined space. Cutting and welding operations must be performed such that an additional hazard to personnel is not created.

6.7.2 Mechanical ventilation shall be required when welding occurs inside of confined spaces. Certain large and/or open air confined spaces may be exempt from this requirement provided there is adequate natural ventilation.

6.7.3 Welding and cutting hoses and torches must be inspected for leaks prior to use inside a confined space.

6.7.4 A multi-gas continuous monitor is required in all confined spaces. The location of the sample hose must be representative of the Entrant's breathing zone. Fumes can be created by cutting or welding on surfaces which are galvanized, contain chromium, or lead contaminated and may require additional respiratory protection or other control measures to limit exposure.

6.7.5 When welding is suspended and the space is vacated for more than 15 minutes all electrodes are to be removed from their holders and the machined turned off and/or disconnected from its power source.

6.7.6 If the Hot Work in the confined space involves the use of gas welding/burning and the work is stopped for and the space is vacated for more than 15 minutes the

- **(a)** torches and hoses must be removed, or
- **(b)** hoses (oxygen and fuel gas or inerting gas) disconnected from the regulators.

6.7.7 Any gas cylinder used in welding or cutting process must be stored, staged or located outside the vessel or confined space.

6.7.8 Consideration must be given to the effect on the vessel's atmosphere of introducing non-breathing air quality air into the vessel. Do not supply air powered tools with plant air as it is backed up by nitrogen. Compressed air exhausted from tools may contain significant concentrations of carbon monoxide or oil mist

6.7.9 Fire extinguishers shall be positioned in close proximity to all hot work operations inside the confined space.

6.7.10 Confined spaces that have large quantity of combustible materials must have a charged fire hose or other water source available to immediately extinguish a combustible fire.

NOTE: For cold weather the hose may be ran to the confined space but not charged, this would require a person to be staged at the fire hydrant for immediate activation.

6.8 Refractory Work Inside Confined Spaces

Additional hazard assessment and advanced planning are necessary to determine the refractory materials and potential work exposures (e.g., pH, arsenic, free silica). Reference RSW-SAF-090-DT Silica Handling Plan

IMPORTANT: Include Safety Department involvement prior to entry.

6.9 Inclement Weather Conditions

See RSW-SAF-001-DT General Safety Rules for weather restrictions.

6.0 Special Situations, Continued

6.10 Temperature Extremes Inside Confined Spaces

6.10.1 Confined space entry is not permitted if the dry bulb temperature exceeds 110 degrees Fahrenheit.

Notes:

1) The 110 degree F limit is based on industry experience.
2) There is no formal OSHA standard relating to heat stress limits.
3) The use of this limit needs to be applied in conjunction with procedures that involve proactive employee feedback and Supervisor oversight.

6.10.2 Workers should be rotated as necessary to prevent heat stress. Rotated workers shall have access to cool areas and fluids for re-hydration.

6.10.3 When temperatures in the confined space exceed 70 degree F, consideration to heat stress prevention for workers entering the confined space and any personnel in protective clothing outside the confined space.

6.10.4 The use of cooling vests or venture tubes should be considered where heat stress is more apt to occur

9.11Multi Craft Work Coordination

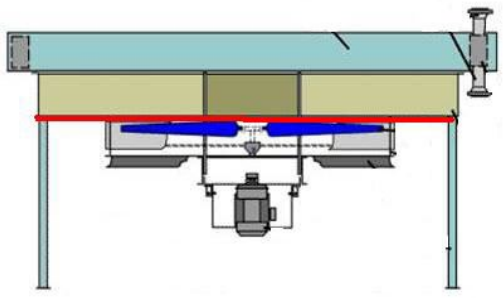
9.11.1 When multiple servicing groups will be working in the same confined space, all crafts/employers shall convene and utilize the Safe Work Permit as a means of developing and implementing procedures to coordinate entry operations. Considerations shall include:

(a) Equipment preparations, energy isolation, electrical and general precautions,
(b) PPE
(c) Hot Work precautions
(d) Communication plan
(e) Atmospheric monitoring
(f) Hazard identification of work scope that may affect other entrants

9.11.2 The considerations must be documented on the Safe Work Permit. Acknowledgement of the considerations by employees will be verified by listing on the Safe Work Permit. Entry Supervisors must ensure all Entrants under their control understand these considerations.

6.12 Fin Fans

6.12.1 Confined space entry is required when personnel enter and perform work above the fan hub. Any work performed on or below the fan hub (fan blades, motor, pulleys, and gearbox) is not considered a confined space entry.



IMPORTANT: The Red Line indicates the confined space plane. All work above the red line (fan hub) will require confined space entry. All work on or below the Fan hub (Fan blades, motor, pulleys, gearbox) will NOT require confined space entry.

6.0 Special Situations, Continued

6.13 Piping

6.13.1 Piping (16" or greater in diameter) connected to the process and/or in the process of being welded that is not capped shall be considered confined spaces.

6.13.2 Pipe assemblies, no matter their location, should not be entered. Consult a safety professional for assistance. A confined space permit may be required.

6.14 Use of Toxic and/or Flammable Materials Inside Confined Spaces

6.14.1 Work in confined spaces frequently requires the use of toxic or flammable materials. These include but are not limited to coatings, linings, paints, cements, and solvents.

REFERENCE: Chemicals must be approved for use. See RSW-SAF-026-DT Catalyst and Chemical Change procedure.

6.14.2 Quantities of toxic or flammable materials brought into or used in confined spaces must be limited to the smallest amount consistent with efficient use.

6.14.3 Containers will be designed to minimize evaporation and spillage. Safety cans or small squeeze bottles shall be used when applicable.

6.14.4 Continuous ventilation must be provided in sufficient quantity and designed to control fire and health hazards.

6.14.5 Atmospheres shall be tested and/or evaluated to provide positive assurance that hazards do not exist.

6.14.6 Airborne contaminants greater than the allowable levels require mitigation.

REFERENCE: RSW-SAF-025-DT Contaminant Thresholds and Conditions

6.14 Trailer Skirting

6.14.1 The space underneath trailers is not classified as a confined space if 8 foot sections (at a minimum) of skirting on 2 opposing sides are removed.

6.15 Reclassification of a Permit Required Confined Space to a Non-Confined Space.

6.15.1 Tanks and excavations located outside of active/current process areas may be reclassified as non-confined spaces by the MPC Safety Department. Other types of confined spaces cannot be reclassified, including trenches. Although a reclassified space is no longer considered a permit required confined space, Safe Work Permits are required, per RSW-SAF-006-DT Safe Work Permit. However, the SWP does not need to indicate the Confined Space Rescue Team Members, Confined Space Attendants, and the section of the SWP for Confined Space Entry & the entry and exit log are no longer required.

6.15.2 The following requirements for reclassification of a permit required confined space to a non-confined space:

(a) A meeting with a Marathon Safety Department representative, MPC Maintenance Representative, Servicing Group Representative and Operations Supervision will take place to make the final determination of reclassification. Their reclassification meeting will address the following items at a minimum.

6.0 Special Situations, Continued

6.15 Reclassification of a Permit Required Confined Space to a Non-Confined Space (continued)

- For Tanks:

- A door sheet with 10' x 8' dimensions shall be cut in the side of the tank.
- The tank must be cleaned and gas freed of residues and materials. The survey will assess all parts of the tank including pontoons, roof seals, roof legs and/or gauge poles which are sealed to the floor, and residues on the floor, walls and roof.

- **IMPORTANT** Entry into pontoons will still require a confined space entry permit.

- A representative of the Marathon Safety Department shall test and monitor the atmosphere to ensure that no actual or potential atmospheric hazards exist
- Continuous atmospheric monitoring with a four-gas monitor is required inside the tank once it has been de-classified
- Additional precautions (PPE, additional monitors, barriers, shields, lighting requirements, rescue equipment, etc.) will be determined during the reclassification meeting.
- The Safe Work Permit Confined Space Tracking Log will be updated to state that the space has be reclassified.
- All work preceding reclassification will occur as outlined elsewhere in this procedure. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated, it may be re-classified as long as the hazards remain eliminated.

  NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards

- For Excavations:
- The excavation must have a sufficient protective system (e.g., sloped, benched, or sheeting) and should have at least two sloped vehicle ramps (i.e., large enough to support a full size truck).
- Excavations outside of active/current battery limits may be reclassified if the excavation does not have "limited or restricted means for entry or exit."
- The excavation must have ladders or ramps at least every 25 feet along perimeter.
- Continuous monitoring is still conducted
- All hot work in a de-classified excavation requires initial and periodic atmospheric tests following the hot-work requirements of RSW-SAF-006-DT Safe Work Permit. Depending on the nature of the situation, continuous monitoring may be required in de-classified excavations.
- Besides the atmospheric tests, other hot-work requirements are necessary only if the work being performed is considered hot work.
- Trenches cannot be de-classified.

6.0 Special Situations, Continued

6.15 Reclassification of a Permit Required Confined Space to a Non-Confined Space (continued)

(b) Working in a Reclassified Non-Confined Space shall require the following:

- A notice to be posted at the job site (e.g. Tank entrance, Excavation entrance) once the space has been determined a Non-Confined Space. The notice shall state the following:
  - Date and Time the space was reclassified, and
  - Individuals involved in make the reclassification determination.
- All entrants shall leave a reclassified space any time an uncontrolled hazard arises.
- Reclassified space that have been evacuated because of an uncontrolled hazard must be re-evaluated, to determine if they can remain reclassified as a non-confined space, by a representative of the MPC Safety Department before they can be re-entered.

Appendix A: Terms and Definitions

Acceptable Entry Conditions	***Acceptable Entry Conditions*** means the conditions that must exist in a permit space, before an employee may enter that space, to ensure that employees can safely enter into, and safely work within, the space.
Attendant	***Attendant*** is an individual stationed outside one or more permit spaces who assesses the status of authorized entrants and who must perform the duties specified in §1926.1209.
Authorized Entrant	***Authorized Entrant*** means an employee who is authorized by the entry supervisor to enter a permit space
Barrier	***Barrier*** means a physical obstruction that blocks or limits access.
Blinding or Blankng	***Blinding or Blanking*** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet 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.
Competent Person	***Competent Person*** means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.
Confined Space	A ***Confined Space*** **a)** is large enough and so configured that an employee can bodily enter and perform assigned work, **b)** is not designed for continuous employee occupancy, and **c)** has limited or restricted means for entry or exit. **Examples of spaces that may have limited means of entry:** Tanks, vessels, towers, sewers, excavations four feet deep, vessel skirts, vaults and pits.
Control	***Control*** means the action taken to reduce the level of any hazard inside a confined space using engineering methods (for example, by ventilation), and then using these methods to maintain the reduced hazard level. Control also refers to the engineering methods used for this purpose. Personal protective equipment is not a control.
Controlling Contractor	***Controlling Contractor*** is the employer that has overall responsibility for construction at the worksite. **Note:** If the controlling contractor owns or manages the property, then it is both a controlling employer and a host employer.
Early-Warning System	***Early-Warning System*** means the method used to alert authorized entrants and Attendants that an engulfment hazard may be developing. Examples of early-warning systems include, but are not limited to: alarms activated by remote sensors; and lookouts with equipment for immediately communicating with the authorized entrants and Attendants.

Appendix A: Terms and Definitions, Continued

Emergency	***Emergency*** means any occurrence (including any failure of power, hazard control or monitoring equipment) or event, internal or external, to the permit space that could endanger entrants.
Engulfment	***Engulfment*** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, crushing, or suffocation.
Entry	***Entry*** means the action by which any part of a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space, whether or not such action is intentional or any work activities are actually performed in the space.
Entry Employer	***Entry Employer*** means any employer who decides that an employee it directs will enter a permit space.
Entry Permit	***Entry Permit (Permit)*** means the written or printed document that is provided by the employer who designated the space a permit space to allow and control entry into a permit space and that contains the information specified in §1926.1206 of this standard.
Entry Rescue	***Entry Rescue*** occurs when a rescue service enters a permit space to rescue one or more employees.
Entry Supervisor	***Entry Supervisor*** means the qualified person fulfilling responsibilities as outlined in Section 2.1 of this standard practice. **Note:** The duties of Entry Supervisor may be passed from one individual to another during the course of an entry operation provided it is documented appropriately on the Safe Work Permit
Hazard	***Hazard*** means a physical or hazardous atmosphere. **Reference:** See Hazardous Atmosphere definition below

Appendix A: Terms and Definitions, Continued

Hazardous Atmosphere

Hazardous Atmosphere is an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (i.e., escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(a) flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL),
(b) airborne combustible dust at a concentration that meets or exceeds its LEL (**Note:** This concentration may be approximated as a condition in which the dust obscures vision at a distance of five feet (1.52 m) or less.),
(c) atmospheric oxygen concentration below 19.5%or above 23.5%
(d) atmospheric concentration of any substance for which a permissible exposure limit is published in Subpart Z, Toxic and Hazardous Substances of **29 CFR 1000** and which could result in employee exposure in excess of the permissible exposure limit (**Note:** An atmospheric concentration of any substance that is not capable of causing death, incapacitation, and impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.), and/or
(e) any other atmospheric condition that is immediately dangerous to life or health

Note: For air contaminants for which OSHA has not determined a permissible exposure limit, other sources of information, such as Safety Data Sheets that comply with the OSHA Hazard Communication Standard, **29 CFR 1910.1200**, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions..

Host Employer

Host Employer means the employer that owns or manages the property where the construction work is taking place.

Hot Work

Hot Work means operations capable of providing a source of ignition (e.g., riveting, welding, cutting, burning and heating).

Immediately Dangerous to Life or Health (IDLH)

Immediately Dangerous to Life or Health (IDLH) is any condition that
(a) poses an immediate or delayed threat to life,
(b) would cause irreversible adverse health effects, or
(c) would interfere with an individual's ability to escape unaided from a permit space.

Unnoticed Affects: Some materials, including hydrogen fluoride gas and cadmium fumes
(a) may produce immediate transient effects,
(b) even if severe, may pass without medical attention, and
(c) are followed by sudden, possibly fatal collapse 12-72 hours after exposure.

The victim "feels normal" from the recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Inerting

Inerting means displacing the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Note: This produces an IDLH oxygen-deficient atmosphere. For specific requirements for entering an inert confined space, refer to RSW-SAF-054-DT

Appendix A: Terms and Definitions, Continued

Isolation or Isolate	***Isolation or Isolate*** is the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: **(a)** blanking or blinding, **(b)** misaligning or removing sections of lines, pipes, or ducts, **(c)** lockout of all sources of energy, or **(d)** blocking or disconnecting all mechanical linkages. **Reference:** For minimum requirements for isolation, see RSW-SAF-002-Energy Isolation-DT
Limited or Restricted Means for Entry or Exit	***Limited or Restricted Means for Entry or Exit*** means a condition that has a potential to impede an employee's movement into or out of a confined space. Such conditions include, but are not limited to, trip hazards, poor illumination, slippery floors, inclining surfaces and ladders.
Line Breaking	***Line Breaking*** means the intentional opening of a pipe, 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
Lockout	***Lockout*** means the placement of a lockout device on an energy isolating device, in accordance with RSW-SAF-002-Energy Isolation-DT ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
Lower Explosive Limit (LEL)	***Lower Explosive Limit (LEL)*** means the minimum concentration of a substance in air needed for an ignition source to cause a flame or explosion.
Monitor or Monitoring	***Monitor or Monitoring*** means the process used to identify and evaluate the hazards after an Authorized Entrant enters the space. This is a process of checking for changes that is performed in a periodic or continuous manner after the completion of the initial testing or evaluation of that space.
Non Entry Rescue	***Non-Entry Rescue*** occurs when a rescue service, usually the Attendant, retrieves employees in a permit space without entering the permit space.
Non-Permit Confined Space	***Non-Permit Confined Space*** means a confined space that meets the definition of a confined space, but does not meet the requirements for a permit-required confined space.
Oxygen Deficient Atmosphere	***Oxygen Deficient Atmosphere*** is an atmosphere containing less than 19.5% oxygen by volume
Oxygen Enriched Atmosphere	***Oxygen Enriched Atmosphere*** is an atmosphere containing more than 23.5% oxygen by volume.

Appendix A: Terms and Definitions, Continued

Permit Required Confined Space	***Permit Required Confined Space*** is a confined space that has one or more of the following characteristics: **(a)** Contains or has a potential to contain a hazardous atmosphere, **(b)** Contains a material that has the potential for engulfing an entrant, **(c)** 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, or **(d)** Contains any other recognized serious safety or health hazard.
Permit Required Confined Space Program	***Permit Required Confined Space Program (Permit Space Program)*** means the employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.
Permit Writer	***Permit Writer*** is an individual designated to prepare and authorize the "confined space" portion of the Safe Work Permit as specified in this document
Physical Hazard	***Physical Hazard*** is an existing or potential hazard that can cause death or serious physical damage. Examples include, but are not limited to: **(a)** Explosives, **(b)** Mechanical, electrical, hydraulic and pneumatic energy, **(c)** Radiation, **(d)** Temperature extremes, **(e)** Engulfment, **(f)** Noise, or **(g)** Inwardly converging surfaces. Physical hazard also includes chemicals that can cause death or serious physical damage through skin or eye contact (rather than through inhalation).
Prohibited Condition	***Prohibited Condition*** is any condition in a permit space that is not allowed by the Safe Work Permit during the period when entry is authorized.
Qualified Person	***Qualified Person*** is one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
Representative Permit Spaces	***Representative Permit Space*** is a mock-up of a confined space that has entrance openings that are similar to, and is of similar size, configuration, and accessibility to, the permit space that Authorized Entrants enter.
Rescue	***Rescue*** means retrieving, and providing medical assistance to, one or more employees who are in a permit space.
Rescue Services	***Rescue Service*** is the personnel designed to rescue employees from permit spaces.

Appendix A: Terms and Definitions, Continued

Retrieval Systems	***Retrieval Systems*** mean the equipment used for non-entry rescue of persons from permit spaces. This equipment includes **(a)** a retrieval line, **(b)** chest or full-body harness, **(c)** wristlets/anklets, if appropriate, and **(d)** a lifting device or anchor.
Safe Work Permit	The ***Safe Work Permit*** is a work-authorizing process and record that is managed, prepared and issued by the Refining department that "owns" the equipment or is responsible for the area before certain work is conducted. *Notes:* (1) It authorizes a specific scope of work for a specific time frame and is a prerequisite for performing work. (2) It is used to assess hazards and to document requirements and conditions such as atmospheric monitoring results, personal protective equipment, confined space details, work requirements (e.g., hot tap, excavation and critical lift), emergency communications, and other potential hazard mitigation means and methods. (3) The authorization coordinates and controls the work and is a form of agreement between the Safe Work Permit issuer and all personnel involved with the work.
Serious Physical Damage	***Serious Physical Damage*** is an impairment or illness in which a body part is made functionally useless or is considerably reduced in efficiency. Such impairment or illness may be permanent or temporary and includes, but is not limited to: (a) loss of consciousness, (b) disorientation, or (c) other immediate and substantial reduction in mental efficiency. Injuries involving such impairment would usually require treatment by a physician or other licensed health-care professional.
Tagout	***Tagout*** is the placement of a tagout device on a circuit or equipment that has been de-energized, in accordance with RSW-SAF-002-Energy Isolation-DT to indicate that the circuit or equipment being controlled may not be operated until the tagout device is removed. The employer ensures that **(a)** tagout provides equivalent protection to lockout, or **(b)** lockout is infeasible and the employer has relieved, disconnected, restrained and otherwise rendered safe stored (residual) energy.
Test or Testing	***Test or Testing*** is the process by which the hazards that entrants may encounter in a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.
Vent or Ventilation	***Vent or Ventilation*** means controlling a hazardous atmosphere using continuous forced-air mechanical systems that meet the requirements of **OSHA 1926.57-Ventilaiton**.

Appendix B: Large, Complex and High Density Work Confined Space Hazard Assessment Checklist

Large, Complex and High Density Work Confined Space Hazard Assessment Checklist

- This form shall be completed and communicated to all parties involved in the entry operation.
- The original form shall be returned to the Safety Department and a laminated copy maintained at the job-site.

Equipment Number:		
Complex:		Date:
Affected Servicing Groups:		
Completed By:	MPC Safety Representative	MPC Maintenance Representative
Print:		
Sign:		
This space is determined to be Large, Complex and/or High Worker Density Confined Space due to the following:		
☐	50 or more Entrants per shift	
☐	Confined Space Entry Inside the Confined Space (e.g. Work inside cyclones inside a Regen Vessel)	
☐	Complex scaffold systems which include seal decks that separate the Confined Space.	
	Hazard	**Mitigation**
☐	Inability to account for Authorized Entrants in the event of an emergency.	
☐	Falling debris, tools, and equipment into Authorized Entrants work area.	
☐	Unable to hear and/or see the alerting system used to notify Authorized Entrants of an emergency evacuation.	
☐	Hot Work or Confined Space inside Confined Space not visible to exterior Fire Watch/Hole Watch.	
☐	Fall hazards inside the space (e.g. aligned internal manways, work inside cyclones, scaffolding construction/anchor points).	
☐	Limited egress locations based upon number of Entrants.	
☐	Hazards introduced into the confined space by ventilation systems (e.g. combustible material, high noise, etc.).	
☐	Attendant is unable to maintain communication with all Entrants.	
☐	Unable to verify the atmosphere at locations representative of all Authorized Entrants.	
☐	Radiography impact to the Authorized Entrants.	
☐	OTHER:	

Appendix C: Reclassification of Non-Confined Space Notice

Reclassification of Non-Confined Space Notice

This form shall be completed and posted at all active entrance to the reclassified confined space.

Equipment Name:			
Equipment Number:			
Location:			
Reclassification Date:		Reclassification Time	
Reclassification Team Members	Print		Sign
MPC Safety Representative			
MPC Maintenance Rep.			
Servicing Group Rep.			
Operations Supervision			

	Questions	Answers
1.	Continuous atmospheric monitoring shall be required inside the tank.	
2.	Continuous atmospheric monitoring may be required in reclassified excavations based upon work scope.	
FOR TANKS		
3.	A door sheet (approximately 10' x 8') has been cut in the side of the tank.	
4.	The tank has been cleaned and free of residues and materials.	
5.	Additional precautions (PPE, additional continuous monitors, barriers, shields, lighting requirements, rescue equipment, etc.) have been established, as needed.	
FOR EXCAVATIONS		
6.	The excavation has a sufficient protective system (e.g. sloped, benched, or sheeting) and has at least one sloped vehicle ramp (i.e. large enough to support a full sized truck).	
7.	The excavation is located outside active/current unit battery limits.	
8.	To achieve unrestricted entry or egress the excavation has ladders or ramps every 25 feet along the perimeter.	

If the permit space poses no actual or potential atmospheric hazards and if all fall hazards within the space are eliminated, it may be reclassified as long as the hazards remain eliminated.

NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of hazards.

Appendix D: Potential Confined Space Hazards

- **Chemicals**
  - Hydrocarbons (Naphtha, Benzene, Cracked Gas, Butane)
  - Distillates
    - typically do not release LEL but can when heated above their flashpoint (typically near 100° F)
  - Catalysts (Nickel, Molybdenum, Platinum)
  - Toxics (ammonia, H2S, SO2, CO)
  - Corrosives (Acids/Caustics)
  - Oily/Tank Sludge
    - trapped materials may not give readings initially but when but when warmed or disturbed, can begin to release flammable vapors, toxics, etc. (e.g. when cleaning tank bottoms, tanks warm from sun in summer, etc.)
  - Residual Scale (HF)
  - Refractory (arsenic, pH, silica)
  - Iron sulfide
  - Purge/Wash Materials
  - Chemical Additives/Treatments
  - Pyrophoric material
  - Inert Gases
- **Metallurgy**
  - Stainless Steel (various forms; 305, 315, etc.)
  - Inconel
  - Galvanized
  - Monel (nickel content)
- **Work Activity**
  - Arc Welding or Gouging
  - Oxy-fuel Welding
  - Refractory Chipping
  - Buffing
  - Water Blasting
  - Catalyst loading/unloading
  - Heat Treatment
  - Tank Cleaning
  - Release of toxic material due to physical disturbance within the vessel (e.g., cleaning, scraping, digging, etc.)
- **Internal Configuration**
  - Process or Steam Tubes
  - Refractory (structural integrity)
  - Distribution Tubes / Deflector Plates
  - Trays/Stools/Filters
  - Guide or Support Pins (for refractory, heater tubes)
  - Dampers
  - Obstructed Egress
  - Restricted work spaces
- **Miscellaneous**
  - Thermal Temperature Exposure
  - Walking/Working Surfaces
  - Nuclear Gauges
  - Electrical
  - Heat Stress
  - Combustible Dusts (example; sulfur)
  - Structural Failure
  - Discharge of steam, high pressure air, water or chemicals
  - Inadequate or faulty personal protective equipment
  - Failure to lockout/tagout, blind, isolate properly
  - Noise in excess of acceptable levels - 90 decibels (A) weighting
  - inclement weather (e.g., high winds, lightning)
  - Inadequate lighting

Appendix E: Entry Signs and Ventilation Tags

#90-500-105

#90-500-107

#90-500-106

#91-006-642

#91-006-643

Revision number	Description of change	Written by	Checked by	Effective date
23	Update of Section 3.9.1 Temperature extreme to 110 degrees Fahrenheit.	M. Styes	Safety Steering Committee	09/24/14
24	Added Program Review Section	M. Styes	Jennifer Rabideau	05/13/15
25	Added language to the Fin Fan section to match the Energy Isolation Procedure language for fin fans to be rack-out	B. Dibert	J. Rabideau	01/03/17
26	Re-formatted and updated for compliance with RSP-1127. Added Initial entries performed by operations, ventilation requirements and removed MFD for Rescue purposes.	W. Merrifield	Safety Steering Committee	01/03/18
27	Scheduled review, no updates	W. Merrifield	Al Morales	08/28/19
28	Removed language on energy isolation for fin fan CS.	W. Wright	Al Morales	1//21