Hot Work

Overview

Purpose

The purpose of this Refining Standard Work Practice (RSW) is to provide minimum requirements to ensure that Attended Hot Work and Non-Attended Hot Work is performed safely within the refinery to prevent injury, loss of life, and loss of property from fire or explosion.

Scope

This RSW for Hot Work Authorization represents a composite of petroleum industry safe practices and the OSHA requirements for this type of task.

Because Hot Work can encompass so many different situations and applications this RSW does not attempt to address every possible situation. If a special need or problem is encountered during Hot Work activities, consultation between Maintenance and the Safety Department should be conducted before proceeding. Any alternative procedures must be at least as effective as the requirements in this RSW.

Note: Hot-taps and in-service welding require specialized procedures and additional review and authorization. This refinery has specific procedures in place for these activities.

Objective

This hot work procedure must be followed by all Louisiana Refining Division (LRD) employees and contractors to ensure that all work conditions and equipment are safe, and will remain so, while hot work is being performed and to ensure compliance with all applicable standards and regulations, including Marathon Petroleum Company's (MPC) Refining Hot Work(RSP 1715-000).

For additional information on work permitting requirements see RSW 0102 GV 'Work Permit Standard Practice'.

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1.0 References

1.1 Refining References The table below lists the Refining references used with this document

Number	Description
PSA 13-08	E/M Refinery Exchanger Fire
PSA 16-02	Galveston Bay Refinery Fire at Temporary Pump Installation
RRD-1323-000	Safe Equipment Preparation Guidelines
RSP-1128-000	Safe Work Permit
RSP-1127-000	Confined Space Entry
RSP-1715-000-FORM01	Elevated LEL Hot Work Approval Form
RSP-1715-000-FORM02	PMOC Form for Temporary Portable Pumps
RSW-0102-GV	Work Permit Standard Practice
RSW-0106-GV	Confined Space Entry Standard Practice
RSW-0109-GV	Blinding and Energy Isolation

1.2 Industry References The table below lists the Industry references used with this document

Number	Description
American Petroleum Institute (API)	
API RP 2009	Safe Welding, Cutting, and Hot Work Practices in the Petroleum and Petrochemical Industries
API RP 2201	Safe Hot Tapping Practices in the Petroleum & Petrochemical Industries
API RP 2207	Safe Work Permit
ASME PCC-2-2015	Repair of Pressure Equipment and Piping

1.3 Regulatory References The table below lists the Industry references used with this document

Number	Description
29 CFR 1910.252	General Requirements for Welding, Cutting, and Brazing
29 CFR 1926 Subpart J	Welding and Cutting

Continued on next page

1.0 References, Continued

1.4 Terms The following terms are used in this document:

- Attended Hot Work
- Battery Powered Equipment
- Class A Combustible Material
- Cold Work
- Hazardous Atmosphere
- Hot Tapping (Pressure Tapping)
- Hot Work
- In-Service Welding
- Joint Job Site Visit
- Non-Attended Hot Work
- Owning Department
- Oxygen Deficient Atmosphere
- Safe Work Permit
- Servicing Representative

Reference: For details, see Appendix A: Terms and Definitions.

2.0 Roles and Responsibilities

The table below describes the roles and responsibilities related to this document.

2.1 Roles and Responsibilities

Roles	Responsibilities
Fire Watch	The following are minimum requirements for the fire watch, when required: **(a)** The fire watch must be trained to understand the inherent hazards of the work site and hot work, and the hot work permit. **(b)** Ensure the conditions of the Safe Work Permit are met before hot work and maintained during hot work. **(c)** The fire watch shall print their legal name on the space provided on the reverse side of the Safe Work Permit. **(d)** Have the authority to stop work and do so if unsafe conditions develop. Stop all activities when an emergency siren is activated, when a deviation from provisions set forth in the Safe Work Permit is observed, or when changing conditions are observed that would adversely affect employees and/or equipment. **(e)** Have fire extinguishing equipment readily available and be trained in use of that equipment including extinguishing small fires. **(f)** Identify escape routes of welders and other affected personnel and ensure that fire extinguishing equipment will cover their escape. **(g)** Know how to sound an alarm (air horn) and/or contact emergency personnel in the event of a fire or changing conditions. **(h)** Ensure sewers within 35 feet of the Attended Hot Work area are covered and spark containment is adequate. **(i)** Remain at the site of Hot Work for at least 30 minutes after Hot Work is complete when there is a potential for smoldering fires (e.g., Class A combustible materials within 35 feet of the Hot Work area.) **(j)** The Fire Watch shall wear a high-visibility vest while performing Fire Watch duties.
Permit Writer	The Owning Department employee who prepares and issues the Hot Work Permit shall: **(a)** Be responsible as a representative of the owning department for safe operation of hot work activities. **(b)** Inspects the work site and prepares the hot work permit and presents it to the servicing department. **(c)** Conduct a Joint Job Site Visit (JJSV) with the employee(s) or contractors who will perform the work. If contractors are involved, the permit writer shall discuss the hazards with the servicing representative or elect to discuss with servicing representative employees directly. **(d)** Determines if a fire watch is required. **(e)** Determines the site-specific flammable materials, hazardous processes, and other potential fire hazards that are present or likely to be present at the hot work location. Ensure these hazards are mitigated prior to issuing a Safe Work Permit. **(f)** Conduct atmospheric monitoring per Section 3.2 of this RSW. **(g)** Determines and documents any fire extinguishing equipment requirements on the Safe Work Permit. **(h)** Ensure sewers, manholes and vent pipes within 35 feet of the Attended Hot Work area are covered, sealed and spark containment is adequate

Servicing Group	**(a)** Comply with all conditions specified on the Safe Work Permit. **(b)** **STOP** Hot Work activities if conditions of the Safe Work Permit can no longer be met. **(c)** Ensure tools and equipment to be used are in good-working condition and are safe to use. **(d)** Verify atmospheric monitoring has been completed. **(e)** Ensure gasoline or diesel-powered equipment is shutdown in the event of an emergency/evacuation. **(f)** Ensure sewers within 35 feet of the Attended Hot Work area are covered and spark containment is adequate

3.0 **Requirements**

3.1 **Welding and Cutting General Requirements**

3.1.1 **General Process Equipment and Piping Preparation:**

3.1.1.1 If possible, equipment and piping that will be involved in any Hot Work must be

3.1.1.1.1 Isolated and/or disconnected,

3.1.1.1.2 Cleaned, gas free, and tested, and

3.1.1.1.3 Vented to prevent over-pressurization.

3.1.1.2 If the equipment and piping cannot be cleaned and gas freed, cold cutting methods must be used for initial cuts so adequate atmospheric monitoring can be conducted to ensure the equipment/piping is gas free.

3.1.1.3 Welding on utility lines (e.g., steam, condensate, etc.) under pressure shall require all precautionary measures taken for similar work on oil and gas lines (e.g., in –service welds).

3.1.1.4 Demister pads in vessels shall be removed prior to Hot Work if they pose a hazard due to the work activity being performed.

3.1.1.5 Structured packing shall be removed prior to Hot Work if it poses a hazard from Hot Work activity (or precautions must be in place to mitigate sparks or slag from contacting the packing).

3.1.1.6 Refer to RRD-1323-000 for other equipment preparation recommendations.

3.1.1.7 For hot taps and in-service welds see In-Service Welding and Hot Tapping Procedure (RDP-E200-GV)

3.1.2 **Welding and Cutting Equipment Requirements:**

3.1.2.1 All welding and burning equipment (e.g., leads, grounds, hoses, cables, gauges, regulators, etc.) shall be visually inspected daily, and prior to hot work occurring, to ensure the equipment is in good working condition.

3.1.2.2 Effort should be made to locate weld machines outside of process and dike areas. Weld machine placement will be assessed to minimize risk to personnel and equipment.

3.1.2.3 Grounding should be achieved by attaching welding grounds as close to the work as possible. When welding on pumps, turbines, or compressors, to eliminate welding machine grounding through bearings or seals, the ground lead should be adjacent to the work. Welding ground lead should be grounded at the equipment being welded on to eliminate electrical and instrument process signal interferences that could possibly shut down process equipment.

3.1.2.4 Effort must be made to route leads and hoses overhead and/or out of walkways to prevent creating tripping hazards.

3.1.3 **Hot Work on Used Containers and Out of Service Equipment:** Hot Work shall not be performed on used drums, barrels, tanks, or other containers until they have been thoroughly cleaned to make sure there is no flammable materials present or any substances such as greases, tars, acids, or other materials that when subjected to heat, might produce flammable or toxic vapors. Any piping or connections to the drum or vessel shall be disconnected or blinded.

3.1.4 **Special Precautions While Hot Work is in Progress:** When performing Hot Work activities the Servicing Group and Permit Writer shall take the following into consideration:

3.1.4.1 Wind direction.

3.1.4.2 Potential upstream hazards when performing Hot Work adjacent to drainage basins, separators, and open ditches,

3.1.4.3 Other work activities in the adjacent area, and

3.1.4.4 Sewers, oily water sumps, equipment, combustibles, personnel, etc. below, when performing Hot Work from an elevated location.

3.2 **Atmospheric Monitoring for Hot Work:** Apply the following requirements for atmospheric monitoring for hot work:

3.2.1 Atmospheric monitoring must be conducted in the immediate work area per the Safe Work Permit RSW and the results of the monitoring shall be recorded in the appropriate section of the Safe Work Permit.

3.2.2 As a minimum, the atmospheric monitoring must use a calibrated/bump tested combustible gas indicator to determine oxygen and flammable vapor concentrations before hot work is started.

Note: Ensure there is adequate atmospheric oxygen inside the monitoring area, per the manufacturer's recommendation, for correct operation of the combustible gas indicator.

Cold work is allowed only if the atmosphere contains less than 10% of the lower explosive limit. Hot work may not be performed above 0% LEL. Any deviation to this requires the use of the Safety Variance Form 01-GV accompanied by an Owning Department approved control strategy and identification of the source of flammable vapors.

3.2.3 **Initial Atmospheric Monitoring:**

3.2.3.1 Gas tests will be made after all preparatory work has been completed and in as short a time as practical prior to the start of work. This includes all applicable blinding, disconnecting, and steaming. In every instance a test must be taken within two hours prior to the start of work.

3.2.3.2 When work is not started within two hours of the time the gas tests were taken, another test must be made by the owning

Department with results shown and signed by the person making the second test

Hot Work Atmospheric Monitoring Limits	
Oxygen	19.5% - 23.5%
LEL	0%

3.2.4 **Mid-Shift Atmospheric Monitoring:**

3.2.4.1 Additional tests must be made at least midway through the maintenance shift after the initial Safe Work Permit has been issued and more frequently if there is any doubt that conditions might have changed.

3.2.4.2 Additional atmospheric monitoring must be conducted after a change in conditions that could affect the work or safety of personnel. Atmospheric monitoring is also available upon request of the servicing group.

3.2.5 Continuous Atmospheric Monitoring: The Permit Writer may require continuous atmospheric monitoring at their discretion for any Hot Work activity.

Note: Mid-shift atmospheric monitoring is still required when continuous atmospheric monitoring is conducted.

3.2.6 **Confined Space Atmospheric Monitoring:** For Confined Space atmospheric monitoring requirements, see RSW-0106-GV.

3.3 **Hot Work in Confined Spaces:** Proper entry procedures in accordance with Confined Space Entry Standard Practice RSW-0106-GV shall be followed in addition to the following considerations/ requirements for hot work.

3.3.1 Welding, cutting and grinding in a Confined Space shall be conducted in accordance with the LRD Work Permit Standard Practice, and OSHA (welding, cutting, brazing) which includes the following precautions.

3.3.2 Continuous monitoring for LEL, Oxygen (O_2), Hydrogen Sulfide (H_2S), and Carbon Monoxide (CO and Sulfur Dioxide (SO_2) if applicable, is required for welding or cutting in a confined space.

3.3.3 When there is potential for burn hazards to workers, the welder shall barricade the welded area to alert other workers of possible hot surfaces.

3.3.4 All combustible material shall be removed from a confined space before Hot Work begins.

3.3.4.1 Combustible material should be moved at least 35 feet from the hot work job. If the material cannot be removed and should be properly shielded.

3.3.4.2 Provisions shall be made to ensure adequate ventilation for each person conducting Hot Work in the confined space. Cutting or

welding operations must be performed such that an additional hazard to personnel is not created.

3.3.4.2.1 Ventilation shall be provided to pull all fumes and vapors away from workers, and to keep any vapors and fumes from collecting in the confined space.

3.3.4.2.2 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 measure to limit personnel exposure.

3.3.4.3 An increase in oxygen and/or flammable gases could occur from leaking cutting torch or hoses.

3.3.4.3.1 Compressed gas cylinders shall never be staged, stored, or located inside a confined space.

3.3.4.3.2 To eliminate the possibility of gas escaping through leaks or improperly closed valves, cutting or welding hoses shall be disconnected from the gas supply or removed from the space when left vacated for more than 15 minutes. Also, all hoses and torches shall be inspected for leaks prior to use.

3.3.4.4 When welding is suspended and the space is vacated for more than 15 minutes (e.g., lunch, breaks, shift change, etc.) all electrodes are to be removed from their holders and the machine turned off and/or disconnected from its power source.

3.3.4.5 If the hot work in the confined space involves the use of gas welding/burning and the work is stopped and the space vacated for more than 15 minutes (e.g., lunch, breaks, shift change, etc.), the

3.3.4.5.1 torches and hoses must be removed, or

3.3.4.5.2 hoses (oxygen and fuel gas or inerting gasses) disconnected from the regulators.

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

3.3.4.7 All electrical wiring and welding leads shall be maintained to not create a tripping hazard. Electrical wiring and welding leads shall not obstruct the openings of a confined space.

Note: If the conditions in this section (3.3) are not met, then the confined space must be re-monitored for LEL, Oxygen (O_2), Hydrogen Sulfide (H_2S), and Carbon Monoxide (CO)(and Sulfur Dioxide (SO_2) if applicable) prior to re-entry.

3.4 Designated Hot Work Shops & Fabrication Areas

3.4.1 LRD has designated permanent locations designed or approved for Hot Work operations. Designated permanent Hot Work locations/buildings shall:

3.4.1.1 Be naturally and/ or mechanically ventilated to prevent an accumulation of toxics,

3.4.1.2 Not allow the presence of combustible materials within 35 feet of the welding/cutting area,

3.4.1.3 Store any flammable liquids present in an approved flammable liquids storage cabinet,

3.4.1.4 Be equipped with appropriate fire extinguishing equipment, and

3.4.1.5 Have appropriately marked exits.

Notes:

(1) Additional atmospheric monitoring may be required (up to continuous monitoring) if the fabrication area has the potential to build-up toxic or flammable gases and/or fumes.

(2) The site Industrial Hygienist shall be notified of the construction of new Hot Work locations/buildings in order to determine if ventilation is appropriate for the intended use.

3.4.2 Any fabrication area within 35 feet of process equipment shall require a Fire Watch when performing work covered by the definition of Attended Hot Work per this RSW. Temporary fabrication areas shall:

3.4.2.1 Be naturally and/ or mechanically ventilated to prevent an accumulation of toxics,

3.4.2.2 Not allow the presence of combustible materials,

3.4.2.3 Not allow the storage of flammable liquids without an approved flammable liquids storage cabinet, and

3.4.2.4 Have two means of egress available from the fabrication area.

3.4.3 Fabrication areas established outside of the battery limits and away from other process hazards including live process piping (e.g., laydown yard, remote fabrications area, etc.) may not require a Safe Work Permit based on a hazard assessment conducted with both Operations and Safety personnel.

3.5 **Fire Suppression Equipment**

3.5.1 Fire suppression equipment is required at all Attended Hot Work sites ready to be used in the event of an incipient fire.

3.5.2 The following is the minimum acceptable fire suppression to be maintained at the site of the Hot Work activity:

3.5.2.1 20lb. dry chemical fire extinguisher, and/or

3.5.2.2 Charged water hose

3.5.3 The Permit Writer can require additional fire protection based on the surrounding conditions and other fire risks. This additional fire protection may include:

3.5.3.1 150lb/300lb.. dry chemical fire extinguisher,

3.5.3.2 Multiple charged fire hoses,

3.5.3.3 Multiple fire extinguishers

3.6 Temporary Portable Pumps

3.6.1 The use of portable pumps to pump hydrocarbons must be managed to control potential ignition sources, releases, and fires.

3.6.2 The site PMOC/MOC used must contain, at a minimum, the following:

3.6.2.1 PMOC/MOC duration,

3.6.2.2 Product and pump specifications,

3.6.2.3 Hazard review,

3.6.2.4 Approvals,

3.6.2.5 Implementation actions

3.6.3 Pre-start up safety review(PSSR) Temporary non-intrinsically safe pumps used to pump hydrocarbons that are located inside tank dikes or unit battery limits must be manned at all times while in operation and equipped with a remote shutdown device (e.g., lanyard, electronic shutoff, disconnect switch, fuel shutoff valve, etc.).

3.6.3.1 These temporary portable pumps that are commonly used for sewer work in the pipe rack areas and are not transferring hydrocarbons or flammable materials are exempt from PMOC.

Note: Temporary portable pumps shall not be used for pumps in HF Service.

3.7 Ventilation

3.7.1 Localized ventilation shall be considered to reduce or eliminate the hazards of weld fumes. Any accumulation of gases must be vented to a safe location, away from the Hot Work.

3.8 Bolted Process Equipment and Hot Work

3.8.1 Bolting descriptions

3.8.1.1 Bolt Replacement- is the removal and replacement of bolts on flanged joints in a sequential order while under reduced operating pressure. Unless otherwise justified by an engineering and risk analysis, hot bolting may only be performed when the operating pressure is equal to or less than 50% of the flange MAWP as determined by a mechanical engineer. Pressure reduction is not needed for non-hazardous service (i.e. air / water).

3.8.1.1.1 This removal of bolts is to be carried out one bolt at a time in a prearranged cross pattern sequence.

3.8.1.2 Half Bolting/skip bolting) is the removal of every other bolt on equipment that is depressured, idle, or undergoing preparatory type operations such as steaming, purging, cleaning or controlled depressuring.

3.8.2 Spark producing Hot Work (e.g., torch cutting, grinder with a cut-off wheel, reciprocating saw) is sometimes required to remove bolts/studs on bolted connections of process equipment. In order to prevent the ignition of flammable or combustible vapors and liquids inside process equipment, the seal on the gasket of the process equipment must be maintained.

3.8.3 To ensure that the seal on the gasket is maintained during hot work removal of studs/nuts, at least four bolts must always be able to be removed via mechanical means (e.g., impact wrench, hand tools) for the final break on process equipment connections.

3.8.4 Four bolt flanges require a new bolt be replaced as each bolt is cut.

Notes:
(1) The Fixed Equipment Engineer should be contacted when gasket stress is needed for larger pieces of equipment with a large amount of bolting.
(2) Refer to **Appendix B:** Bolting Management Process for detailed information.

3.8.5 **Tightening**

3.8.5.1 If flange is smoking but not leaking hydrocarbon in amounts enough to give a combustible reading (LEL), a hot work permit will be issued, to ensure a gas check is conducted. Utilize Appendix B 'Bolting Management Process' and follow Leaking Flange work requirements. The use of brass, or non-sparking tools is required.

3.8.5.2 If the flange or connection is leaking hydrocarbon liquid or vapor and an LEL reading is detected (above 0% LEL) on the combustible meter, a cold work permit must be issued, and the following precautions must be utilized.

3.8.5.2.1 Lower the LEL in the immediate work area to acceptable limits utilizing steam, ventilation, nitrogen, etc.

3.8.5.2.2 If LEL cannot be lowered to acceptable limits (less than 10%) in the immediate work area, the use of intrinsically safe or non-sparking tools such as

- Brass wedges
- Brass maul with a metal wrench, and
- Any torqueing/tensioning equipment (i.e. rad gun, j gun, hydraulic tensioners, nut splitters etc.)

3.8.5.2.2.1 Fire watch with continuous monitoring, steam hose, fire extinguisher, etc., on hand.

3.8.5.2.2.2 Area barricaded and secured against non-essential traffic.

3.8.5.2.2.3 Sewers covered in case of possible ignition.

3.8.5.3 If a flange or connection is leaking but not enough to create an explosive or ignitable atmosphere but is in a unit or process area where gas has escaped from some other source, then a hot work permit is necessary and again, all conditions listed under 3.8.5.2 must be followed.

3.8.5.4 If a hazardous but non-combustible leak develops, such as steam, acid, caustic, amine, chemical injection, etc., other special precautions are required, such as but not limited to acid suits, gloves, face shields, goggles, rubber boots and possibly breathing air.

3.8.6 **Loosening**

3.8.6.1 If the unit is shut down, hydrocarbon free or not, a hot work B permit will be necessary for any 4-Bolting, Half Bolting, Bolt Replacement or loosening of flanges. The hot work B permit must stipulate what tools (brass or non-sparking, etc.) are allowed to be used and any other special safety precautions. Appendix B Bolting Management Process shall be followed when removing bolts.

3.8.6.2 The final break shall be done mechanically (impact gun, hydraulic nut splitter, hand tools, etc.). Grinding, torch cutting, arc gouging and similar hot work processes for the purpose of bolt/stud removal on equipment will not be conducted on the final break.

3.8.6.3 Examples:

3.8.6.3.1 If hydrocarbon is present at the exterior of man ways or flanged connections to be ~~hot bolted~~ loosened, ~~again~~ a hot work B permit will be necessary stipulating what tools can be used, etc. Refer to 3.8.5 tightening flanges.

3.8.6.3.2 If no hydrocarbon is detected at the work site but the vessel or flange contains hydrocarbon, a hot work B permit ~~again~~ will be necessary due to area conditions, but impact wrenches and/or hammer wrenches can be utilized for four bolting. When removing the last four bolts, or the number of bolts specified by Operations Supervision, other methods of unbolting that do not create spark may be necessary.

3.8.6.3.3 If equipment cannot be adequately de-pressured or it cannot be verified as de-pressured the conditions specified under 3.10.3.2 should be followed, handling this with a hot work B permit and a Safety Variance shall be obtained.

3.9 **Welding PPE;** Welding and cutting operations will require additional Personal Protective Equipment (PPE).

3.9.1 See RSW-A-003-GVLRD Exposure Control Measure Requirements for Maintenance/Construction Operations for detailed information.

3.10 **Spark Containment**

3.10.1 Stray sparks from Hot Work activities create a major fire risk in a refinery. Every effort must be made to contain sparks as best as practicable to prevent fires from Hot Work

3.10.2 The following minimum requirements must be implemented:

3.10.2.1 Remove or cover any combustible material within 35 feet of the Hot Work.

3.10.2.2 Water filled covers should be placed on sewers and manholes within 35 feet of the Hot Work site to prevent emission of flammable vapors from the sewer and conduct appropriate atmospheric monitoring to verify.

3.10.2.3 Construct spark containments of fire blankets and/or fire-resistant tarps to prevent sparks and slag from impacting live process equipment or other areas where flammable vapors or liquids could accumulate.

3.10.2.4 Prevent or mitigate emissions of flammable vapors from tank vents, pit vents, oily water sumps, and seal/packing vents on pumps/compressors within 35 feet of Hot Work and conduct the appropriate atmospheric monitoring to verify.

3.11 **Special Hot Work Requirements for Above Ground Storage Tanks (ASTS):** Because of the unique hazards of conducting Hot Work on ASTs the following additional requirements must be taken into consideration on top of the normal Hot Work items identified on the Safe Work Permit. This section applies to out-of-service ASTs undergoing maintenance and turnaround activities. A safety plan for AST work is required to contain, at a minimum, address the following, where applicable:

3.11.1 **AST Floor Hazard Assessment:**

3.11.1.1 Hydrocarbons of other previously stored flammable materials may be present under AST floors which need repair. This is more probable if there has been a breach in the floor. Prior to performing hot work, the Servicing Group shall take appropriate precautions to ensure that flammables are not present under the AST floor. Refer to API RP 2207.

3.11.1.2 The AST must be checked for the presence of a double bottom or sketch plates welded to the perimeter of the AST. Where this condition exists, refer to the precautions outlined in API RP 2207.

3.11.1.3 The floor area must be inspected for patch plates and verify the condition of wear pads. Where there are suspect areas, holes should be drilled in the floor to verify there is no product underneath.

3.11.2 **AST Shell Hazard Assessment:**

3.11.2.1 AST shell surface must be inspected for the presence of product residue, wax, ignitable rust or scale in the areas where hot work may be performed.

3.11.2.2 Historically, equipment in contact with amines, hydrogen fluoride or “sour” (hydrogen sulfide containing) materials has been susceptible to hydrogen blistering. This occurs more often in areas which have been welded. If the AST contained one of these products or if hydrogen blistering is suspected for any other reason, an evaluation by a qualified person (e.g., metallurgist) must be included in the determination of whether it is safe to perform hot work.

3.11.3 **AST Roof Structure Hazard Assessment:**

3.11.3.1 Verify that product residue is not present on the upper surfaces of the roof rafter.

3.11.3.2 Some ASTs were constructed using piping as structural support columns. Where this is the case, verify that mouse holes were cut at the base of the columns so they can be free draining.

3.11.4 **AST Floating Roof Hazard Assessment:**

3.11.4.1 **Deck:**

3.11.4.1.1 The underside of the floating roof must be inspected for the presence of product residue, wax, ignitable rust or scale in the areas where hot work could be performed.

3.11.4.1.2 The floating roof must be inspected to verify there are no pockets of hydrocarbon that could be trapped between the decks plates due to the underside of the floating roof being seal welded.

3.11.4.2 **Seals:**

3.11.4.2.1 If the AST is equipped with either a primary or secondary resilient urethane foam log, it must be removed or protected from hot sparks prior to hot work being performed in the area. These seals can leak and trap hydrocarbon.

3.11.4.2.2 Mechanical shoe-type seals need to be inspected for liquids and must be cleaned prior to hot work being performed in the area. The area between the top side of the primary fabric and the bottom side of the secondary seal fabric or underside of wiper must be clean. Outer rim plates, shoe seals, springs and other seal hardware must be clean and vapor free prior to any hot work activity.

3.11.4.3 **Pontoon & Double Decks:** All deck and pontoon covers must be opened and each compartment free of hydrocarbon, ignitable rust, scale or wax, prior to any Attended Hot Work on or near the float roof.

3.11.4.4 **Floating Roof Deck Penetrations:**

3.11.4.4.1 All leg sleeves, vacuum breaker sleeves, gauge wells, column and ladder wells must be inspected for cleanliness and verified that they are hydrocarbon free.

3.11.4.4.2 Floating roof and vacuum breaker legs can hold product. Prior to hot work, each leg must be cleaned and free draining.

3.11.4.4.3 Gauge poles must be inspected to verify that they are free draining and clear of wax, product residue and scale.

3.11.4.5 **AST Nozzle and Piping Hazard Assessment:**

3.11.4.5.1 Verify that jet and internal distributors are clean and both vapor and liquid free.

3.11.4.5.2 Foam lines must be checked for hydrocarbons. The frangible diaphragms often break allowing for product vapor to leak from the ASTs.

3.11.4.6 **Hazard Assessment for Areas Adjacent to ASTs:**

3.11.4.6.1 Combustible materials that could be affected by the Hot Work within the tank dike area shall be kept 35 feet away.

3.11.4.6.2 Process valve bonnets and flanges located in the tank dike must be checked for leakage.

3.11.4.6.3 All drain and vent valves for major lines located in the tank dike must be inspected to ensure there is a plug installed.

3.11.4.6.4 The ground around the AST must be inspected to check for the possibility of an underground line leak.

Appendix A: Terms and Definitions

A.1 **Attended Hot Work** -is hot work that requires a fire watch. Some examples of attended hot work are: burning, welding, brazing, electric arc welding, annealing (electric or gas), electric soldering, stress relieving, use of open flames, use of non-process propane or gas fired heaters, cutting and grinding, CAD welding, and if combustible materials are within 35 feet of worksite. This type of hot work requires the placement of covers on sewers within 35 feet. These listings are not all-inclusive. Each refinery must determine attendance locations during hot work

A.2 **Battery Powered Equipment** - Use of unclassified, Battery-Powered Equipment (e.g., cordless drills, computers, cell phones) requires a hot work permit.

Personal devices (e.g., hearing aids, watches, and other medical devices) with button batteries are exempt from the Hot Work permit requirements.

A.3 **Class A Combustible Materials** –are ordinary combustibles such as wood, cloth, or paper.

A.4 **Cold Work -** Maintenance repair, cleaning, or construction activity, not requiring the use of fire, hot surfaces, spark producing equipment, or electrical equipment that's not classified for use in the area. Also, see the definition of "Hot Work." Examples of cold work include:

- Hand tools
- Brass wedges
- Brass maul
- Any torqueing / tensioning equipment (i.e. rad gun, j gun, hydraulic tensioners, nut splitters, etc.)

A.5 **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.

A.5.1 See RSW-0102-GV Safe Work Permit Standard Practice and RSW-0106-GV Confined Space Entry Standard Practice for detailed information.

A.6 **Hot Tapping (Pressure Tapping)** is the practice of installing a valve connection and then drilling or cutting into the pipe or equipment, through the valve connection, while the pipe or equipment is in service or has not been purged (hydrocarbon gas free).

A.7 **Hot Work**-is repair, maintenance, or construction activity, which requires the use of spark-producing equipment or may create an ignition source.

A.8. **Internal Combustion Engines (ICEs)** as an Ignition Source: A motor vehicle or other equipment (e.g., light plants, compressors, welding machines, etc.) are considered potential ignition sources.

A.9 **In-Service Welding** -is the practice of welding on pipe or equipment (for example, tank, vessels, exchangers, etc.) which is in-service. This includes grinding, burning, and welding for any purpose, such as adding brackets, shoes, boxing in leaks, adding weld-o-lets and back welding fittings.

Note: For detailed permit requirements for in-service welds, see the site specific In- Service Welding and Hot Tapping Procedure (RDP-E200-GV).

A.10 **Joint Job Site Visit**- is a meeting between an Owning Department representative and at least one servicing representative of all parties working off of the permit at the specific location where the job will be conducted. The meeting discussion will address the work scope and all safety aspects of the permit. The servicing representative that attends the Joint Job Site Visit must convey the information covered in the discussion to all members of their work party

A.11 **Non-Attended Hot Work (Hot Work B)** – Hot work that does not need a designated fire watch with a dedicated means of extinguishment. Examples include (not all inclusive):

A.11.1 Vehicle entry

A.11.2 Breaking concrete

A.11.3 Use of non-explosion proof electric equipment (heaters, coils, extension cords, tools, lights, etc.).

A.11.4 Devices with a heat source

A.11.5 Battery-operated non-explosion proof equipment, e.g., cameras, flashlights, drills

A.11.6 Sandblasting

A.11.7 Impact Wrench

A.11.8 Use of internal combustion engines

A.11.9 Opening explosion-proof enclosures

A.11.10 Use of pneumatic drills, saws, pencil type grinders, water cutting

A.11.11 Grass cutting in dike area.

A.12 **Owning Department** – The term “owning department” refers to the department that owns and operates an area, either process, or non-process related, this includes utility equipment, machinery, building, and/or systems.

A.12.1 For process areas the owners are Operations/Product Control.

A.12.2 In non-process areas such as buildings, designated fabrication shops, lay-down yards this will generally be the Maintenance and/or Engineering department.

A.12.3 The Electrical Department has ownership of all electrical substations within the refinery.

A.12.4 For the Sulphur Loading Rack, Coke Drum, Coker Belts, Docks and the Thermal Desorption Unit this will be performed by Contractor acting as Owners.

A.13 **Oxygen Deficient Atmosphere** is any atmosphere containing less than 19.5% oxygen by volume.

A.14 **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:

- It authorizes a specific scope of work for a specific time frame and is a prerequisite for performing work.
- 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, critical lift), emergency communications, and other potential hazard mitigation means and methods.

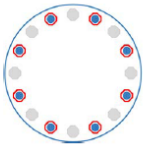
- The authorization coordinates and controls the work and is a form of agreement between the Safe Work Permit issuer and all personnel involved with the work.

A.15 **Servicing Representative(s)** are the people who are working on the equipment/process. This may include Operations, Blending, Shipping, Maintenance, Contractors, and Salaried Employees.

Appendix B: Bolting Management Process

BOLTING MANAGEMENT PROCESS

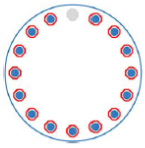
Not Isolated
Decon Phase (Steam/N2)
No Process



HALF BOLTING

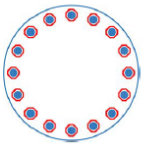
- Half Bolting can only be performed on equipment that is depressured, idle, or undergoing preparatory type operations such as steaming, purging, cleaning or controlled depressuring. **Half bolting cannot be performed while equipment is in full pressurized service.**
- Half bolting shall only be performed by removing one bolt at a time in an alternating or staggering sequence until 1/2 of the bolts have been removed. **Minimum of 8 Bolt Flange REQUIRED**
- Equipment which requires a Hot Work A Permit (i.e. cutting torch, grinder, etc.) shall not be used to perform half bolting. In such cases, bolt replacement should be conducted prior to half bolting.

Live Equipment



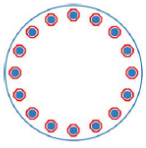
BOLT REPLACEMENT

- Unless otherwise justified by an engineering and risk analysis, bolt replacement may only be performed when the operating pressure is equal to or less than 50% of the flange MAWP as determined by a mechanical engineer. Pressure reduction is not needed for non-hazardous service (e.g. air, water). **Minimum 8 bolt flange required**.
- Bolt replacement shall be performed by removing one bolt at a time and immediately replacing with one of equal size and rating, ensuring that each bolt is fully lubricated and tightened before proceeding to the next step.
- For bolts that are difficult to break loose, cold work removal techniques (i.e. hacksaw, nut splitter) shall be attempted before proceeding to hot work methods.
- If bolts must be removed via hot work methods (i.e. cutting torch, grinder, etc.) the following requirements will apply.
  1. **CONTINUOUS ATMOSPHERIC MONITORING IS REQUIRED**
  2. If equipment is not in service, Operations shall introduce a slight steam or nitrogen purge into the equipment to eliminate air in the equipment before hot work methods are initiated
  3. Once bolt replacement has started, work must continue until completed.



LIVE TIGHTENING (HOT TORQUING / START-UP RETORQUE)

- Live Tightening (Hot Torquing) can be performed on live equipment with no leaks around the flange.
- This is performed in a star pattern.
- A Joint Job-site Visit (JJSV) must be performed prior to Live Tightening to determine the PPE requirements
- Live Tightening is not considered invasive work and therefore RAM score is not necessary. However, if the flange is leaking then look at "Leaking Flange" directions in this guideline.
- Start-up Re-Torque is tightening all bolts on a joint while the unit is coming up to operating temperature in a circular pass until the nuts no longer turn.



LEAKING FLANGE

- If work needs to take place on a leaking flange, the following need to be performed/evaluated:
  1. Must RAM Score as it is Invasive work
  2. Evaluate temperature of product and surrounding metal
  3. Evaluate the type of product by reviewing the SDS
  4. Evaluate the pressure the equipmet is under.
  5. Evaluate the LEL to determine what type of work can proceed
- Bunker gear and fresh air may be required to perform this work.

Marathon Petroleum LP — Louisiana Refining Division

For Reference Only

Document No. RSW-A-064-GV Revision Date:07/20/2022 Next Review Date 07/20/2027 Document Custodian: Environmental Safety ATTENTION: Printed copies should be used with caution.

Revision History

Document Revision History Complete the following table for each document revision.

Rev. No.	Description of Change	Author	Approved By	Rev. Date	Effective Date
0	First issue of document.	A. Fortie	VPP- 8/28/2017 RLT- 9/28/2017	9/28/2017	9/28/2017
1	Updated statement, sec. 3.1.2.3, cautions regarding welding ground lead placement. Intelex recommendation 159781	Todd Clement	PSM	5/17/2019	5/17/2019
2	Updated section 3.8 Bolted Equipment and Hot Work and Appendix B" Bolting Management Process". MOC# 71584	N. Bumstead	VPP – 2/20/2020 RLT – 3/30/2020	3/30/2020	3/30/2020
3	Routine triennial review, no changes	Jeremy Morgan	Safety	9/15/2020	9/15/2020
4	Routine triennial review, no changes	Shawn Scott	Safety	9/15/2023	9/15/2023