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1.0 Purpose

In-service welding and hot tapping are potentially hazardous activities because of the hazardous nature of the materials present. Therefore, every reasonable effort must be made to minimize the use of in-service welds and hot taps and to ensure that they are made safely. The purpose of this procedure is to establish requirements for safely performing these activities. For detailed in-service weld and hot tap engineering requirements, refer MPC Refining specification SP-50-24, "Procedures for In-Service Welding or Hot Tapping on Piping and/or Equipment.

2.0 Scope

1.1 This procedure will allow evaluation of the need to perform an in-service weld and/or hot tap, as well as establish a specific sequence of steps to be followed when performing the work.

1.2 This procedure identifies specifications, forms, and authorizations that must be utilized in order to safely grind, burn, weld, and/or drill on piping or equipment (except drill and tap of valve packing and seat, that is covered by RSP-1150-050, "Valve Drill, Tap, and Injection." Management of Minor Leaks and Clamp/Wrap Life Cycle Management is covered under RSP-1150-040.

1.3 This procedure applies to all work performed on equipment owned by Marathon Petroleum Company's (MPC) Galveston Bay Refinery (GBR) by contractors and/or employees.

3.0 Procedure

3.1 DOCUMENTATION AND FORM REQUIREMENTS FOR IN-SERVICE WELDS AND HOT TAPS

3.1.1 Requesting an In-Service Weld or a Hot Tap

3.1.1.1 In order to use the proper order of forms required for an in-service weld, utilize the Process Flow/Decision Logic for an In-Service Weld/Hot Tap located in Attachment G.

3.1.1.2 A Management of Change (MOC) shall be initiated by the requestor and progressed to the implementation stage prior to proceeding with any paperwork. A copy of the MOC's documentation shall be attached to the In-Service Weld/ Hot Tap Request Form (Attachment A) prior to its approval. All hot taps and in-service welds require an MOC.

3.1.1.2.1 Each individual in-service weld and each individual hot tap will require individual MOC numbers. For example, a in-service weld and hot tap combination will require two MOC numbers. This can be accomplished by using child MOC's.

3.1.1.3 A request for an in-service weld will be initiated by a Galveston Bay Refinery (GBR) Asset Coordinator, Maintenance Coordinator, Responsible Engineer, or other originator using the In-Service Weld/Hot Tap Request Form.

3.1.1.3.1 A tie-in requiring both an in-service weld and a hot tap may be formally requested through the use of one In-Service Weld/Hot Tap Request Form if the hot tap will be performed within 28 days of the in-service weld.

3.1.1.3.2 Hot taps that are performed later than 28 days from the associated in-service weld require the completion of a separate Hot Tap Request Form.

3.1.1.4 Once in-service welding is deemed necessary, the approved location will

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be marked and tagged with an In-Service Weld/Hot Tap Location Tag found in (Attachment E) or other project-specific tie-in tag containing the same information on the pipe, tank, vessel, or other equipment. This location will be approved by the Operations or Product Control Day Foreman or delegate and then the location tag will be hung.

3.1.1.5 The Engineering portion of the In-Service Weld/Hot Tap Request Form will be completed and verified by the Responsible Engineer and then forwarded to the Engineering Manager for approval.

3.1.1.6 The appropriate Process Engineer and Owning Department Supervisor, will complete and approve the Owning Department/Process Engineering portion of the Request form. The Owning Department Manager or his designee must give final approval of the In-Service Weld/Hot Tap Request Form.

3.1.1.7 Once completed and approved, a copy of the In-Service Weld/Hot Tap Request Form will be returned to the Responsible Engineer and attached to the MOC for in-service welds and hot taps. Retain a copy of this form to attach to the In-Service Weld/Hot Tap Approval Form.

3.1.2 Obtaining Approval for an In-Service Weld or Hot Tap

3.1.2.1 An in-service weld must be formally requested through the use of the In-Service Weld/Hot Tap Request Form as described in Section 3.1.1 prior to proceeding with the approval process.

3.1.2.2 The approved and processed In-Service Weld/Hot Tap Request Form will be attached to the In-Service Weld/Hot Tap Approval Form (Attachment B) prior to proceeding.

3.1.2.3 The originator will initiate an In-Service Weld/Hot Tap Approval Form then ensure that the Responsible Engineer completes the appropriate portion of the form and that the Engineering Manager approves the form.

3.1.2.3.1 One In-Service Weld/Hot Tap Approval Form may be used to gain approval for both the in-service weld and the hot tap associated with a tie-in if the hot tap is completed within 28 days of the associated in-service weld.

3.1.2.3.2 Hot taps that are performed later than 28 days from the associated in-service weld require the completion of a separate Hot Tap Approval Form.

3.1.2.4 The form is then forwarded to the Inspection Department to complete and verify the requested information. The Inspection Department will inspect the site, specify the weld procedure, and note any limitations or requirements for additional testing on the In-Service Weld/Hot Tap Approval Form.

3.1.2.5 The appropriate Responsible Engineer (Reliability Engineer, Maintenance Engineer, Area Engineer, Project Engineer), Inspection Coordinator, Engineering SME, Engineering Supervisor, Engineering Manager, Maintenance Manager, Area Team Leader, and Owning Department Manager must give final approval of the In-Service Weld/Hot Tap Approval Form.

3.1.2.6 Any variance from this procedure requires variance request and approval of Maintenance Manager, Owning Department Manager, and Refinery Manager.

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3.1.2.7 Once completed and approved, a copy of the In-Service Weld/Hot Tap Approval Form will be returned to the Responsible Engineer and filed as necessary. attached to the MOC within the MOC database for hot taps and in-service welds. Retain a copy of this form with any attachments to attach to the In-Service Weld Site Review Checklist.

3.1.3 Job Site Meeting and Completion of the In-Service Weld Site Review Checklist

3.1.3.1 An in-service weld must be formally requested and approved through the use of the In-Service Weld/Hot Tap Request Form and In-Service Weld/Hot Tap Approval Form respectively prior to proceeding with the In-Service Weld Site Review Checklist and job site review.

3.1.3.2 A copy each of the approved and processed In-Service Weld/Hot Tap Request Form and In-Service Weld/Hot Tap Approval Form will be attached to the In-Service Weld Site Review Checklist (Attachment C) prior to proceeding. Copies of the Weld Procedure and completed Job Safety Analysis are also required to be attached to this document prior to the job occurring.

3.1.3.2.1 The Weld Procedure shall be provided by the MPC Maintenance Coordinator and shall be approved by the GBR's Inspection Department prior to the in-service weld.

3.1.3.3 The originator will initiate an In-Service Weld Site Review Checklist then ensure that the Owning Department completes and verifies the requested information on the first page of the form. The Owning Department Supervisor will give his or her initial approval for this portion of the form.

3.1.3.4 The form is then forwarded to the Responsible Engineer who completes and verifies the requested information on the first page of the form prior to giving his or her initial approval for this portion of the form.

3.1.3.5 A meeting will be held at the job site of the in-service weld and attended by the appropriate Safety Representative, Responsible Engineer, Asset Coordinator, Maintenance Coordinator, Owning Department Supervisor, Contractor Foreman, and the welder performing the In-Service Weld in order to go over the "AT THE SITE" portion and give their approval for the in-service welding to occur.

3.1.3.6 The PSSR for the in-service weld MOC shall be completed and the MOC progressed to the ready to start-up stage prior to initiating the in-service welding in the field.

3.1.3.7 Approval is required from the individuals listed on the In-Service Weld Site Review Checklist as required by the nature of the job. Approvals cannot be given if any of the In-Service Weld Site Review Checklist answers are marked "NO."

3.1.3.8 Once completed and approved at the site, this In-Service Weld Site Review Checklist along with any attachments shall be attached to the Safe Work Permit. It is at this time that a Safe Work Permit can be issued. This entire packet of information is considered to be the "Additional Permit" required by the Safe Work Permit for in-service welding. It is only once the completed paperwork is attached to the completed Safe Work Permit that the in-service welding can occur.

3.1.3.9 This packet will stay with the permit at the job site while the welding takes place and then will be turned in with the permit for proper retention

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as required through the Safe Work Permit retention process.

3.1.3.10 A copy of the completed In-Service Weld/Hot Tap Approval Form shall be provided to the Inspection Department in order to be inserted into the piping's quality assurance/quality control (QA/QC) documentation.

3.1.4 Documentation Required for the Request and Approval of Hot Taps

3.1.4.1 The formal hot tap request process and hot tap approval process is the same as is listed in Section 3.1.1 and Section 3.1.2 for an in-service weld. Refer to the referenced sections for requirements and completion of these forms.

3.1.4.2 The following items must be completed before the Hot Tap Site Review Checklist can be initiated:

3.1.4.2.1 Once a hot tap is deemed necessary, the Process Engineer will verify the line or vessel contents are stable during welding.

3.1.4.2.2 The Operations/Products Control Day Foreman or delegate will have the location identified with the location tag (Attachment E) and will approve the location.

3.1.4.2.3 The PSSR for the hot tap MOC shall be completed and the MOC progressed to the ready to start-up stage prior to initiating the hot tap cutting process.

3.1.4.2.4 The in-service welding requirements for the tie-in can only be completed as described in Section 3.2 after the In-Service Welding/Hot Tap Request Form, the In-Service Welding/Hot Tap Approval Form, and the In-Service Weld Site Review Checklist have been completed and approved as described in Section 3.1 as well as attached to the Safe Work Permit.

3.1.4.2.5 Hot taps that are performed later than 28 days from the associated in-service weld require the completion of a separate hot tap request and approval. Refer to sections 3.1.1.3 and 3.1.2.3 for more information.

3.1.5 Job Site Meeting and Completion of the Hot Tap Site Review Checklist

3.1.5.1 A Hot Tap Site Review Checklist (Attachment D) must be completed for all hot taps. The Hot Tap Site Review Check List covers the mechanical and safety requirements for making the hot tap. The following documentation process applies to the Hot Tap Site Review Checklist:

3.1.5.1.1 A hot tap must be formally requested and approved through the use of the In-Service Weld/Hot Tap Request Form and In-Service Weld/Hot Tap Approval Form respectively prior to proceeding with the Hot Tap Site Review Checklist and job site review.

3.1.5.1.2 A copy each of the approved and processed In-Service Weld/Hot Tap Request form and In-Service Weld/Hot Tap Approval Form will be attached to the Hot Tap Site Review Checklist prior to proceeding. Diagram 1: Hot Tap Location and Travel Distance of Hot Tap Machine (Attachment I) must be attached to the In-Service Weld/Hot Tap Approval Form. Copies of the Weld Procedure and a completed Job Safety

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Analysis are also required to be attached to this document prior to the job occurring.

3.1.5.1.3 The originator will initiate a Hot Tap Site Review Checklist then ensure that a meeting will be held at the job site of the hot tap and attended by the appropriate Inspector, Safety Representative,-Responsible Engineer, Maintenance Coordinator, Owning Department Supervisor, Contractor Foreman, and GBR Asset Coordinator in order to go over the “AT THE SITE” portion and give their approval for the hot tap to occur.

3.1.5.1.4 Approval is required from the applicable individuals as required by the nature of the job. Approvals cannot be given if any of the Hot Tap Site Review Checklist answers are marked “NO.”

3.1.5.1.5 Once completed and approved at the site, this Hot Tap Site Review Checklist along with any attachments shall be attached to the Safe Work Permit. It is at this time that a Safe Work Permit can be issued. This entire packet of information is considered to be the “Additional Permit” required by the Safe Work Permit for hot tapping. It is only once the completed paperwork is attached to the completed Safe Work Permit that the hot tapping can occur.

3.1.5.1.6 This packet will stay with the permit at the job site while the hot tapping takes place and then will be turned in with the permit for proper retention as required through the Safe Work Permit retention process.

3.2 IN-SERVICE WELDING REQUIREMENTS

3.2.1 In-Service Welding Considerations

3.2.1.1 It will be the responsibility of Operations/Products Control and Maintenance Representative to properly assess the benefits versus risks of in-service welds. The following alternatives must be considered.

3.2.1.1.1 Installation delay must be seriously considered, so that connections can be made at a time when equipment or piping is not in service.

3.2.1.1.2 Alternate locations for connections should be investigated to prevent the need for in-service welding.

3.2.1.1.3 Every attempt possible must be made to isolate equipment or process systems when it is decided to make connections which would otherwise require in-service welding.

3.2.1.1.4 While making the necessary drawings, bills of materials, and completing the required forms, the following items should be carefully considered. Design details are outlined in Engineering Specification SP-50-24 which proves to be a very useful reference.

3.2.1.2 It will be the responsibility of the GBR person who is coordinating the in-service weld to remain on site to oversee the in-service weld throughout its duration.

3.2.1.3 *Base Metal is Suitable* for Welding and Hot Tapping- The following

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conditions must be met prior to in-service welding:

3.2.1.3.1 The base metal thickness must be approved and be heavy enough to support the new connection and the hot tap machine or other equipment.

3.2.1.3.2 The Inspector will indicate the minimum metal thickness and mark the thickness on the piping or equipment at the location of the in-service weld or hot tap. This measurement must have been taken no longer than 28 days prior to the in-service weld/hot tap. The thickness must also be documented on the In-Service Weld/Hot Tap Location Tag (Attachment E).

3.2.1.3.2.1 The measurement shall be recorded on the equipment after any paint has been removed from the weld area.

3.2.1.3.3 Welding onto thin material could result in overheating and burn-through. Depending on the service, it is sometimes possible to temporarily reduce the pressure and/or temperature within the equipment to provide an additional safety factor while welding takes place.

3.2.1.3.4 If the piping thickness is greater than 0.75" (¾"), and/or the equipment is greater than 1.25" (1-1/4"), the Inspection Department must give their approval.

3.2.1.3.5 The base metal must be free of laminations and hydrogen or caustic attack (fissuring). Consideration must be given to the contained commodity where the weld connection is to be made. Be sure there are no other defects that would preclude making a sound weld.

3.2.1.4 *Metal Temperature* – The following items must be considered prior to performing an in-service weld:

3.2.1.4.1 In-service welding shall not be performed on lines or equipment when the metal temperature is less than 50°F unless special consideration is given to the base metal characteristics, electrodes, and method of metal preheating and is approved by the Engineering Department.

3.2.1.4.2 If the metal temperature is less than 50°F, preheating of the weld area prior to welding per the Welding Procedures in Section IX of the ASME Boiler and Pressure Vessel Code of ASME/ANSI B31.3, Part 330 shall be considered.

3.2.1.4.3 Similarly, no welding shall be done if the metal temperature exceeds process temperature of 450°F prior to welding unless approved by the Engineering Department.

3.2.1.4.4 When metal temperatures are below the atmospheric dew point, preheating or other steps are desirable to reduce the moisture content in the weld area. Moisture inclusion could result in weld porosity and underbead cracking.

3.2.1.5 *Risk of Burn-Through*- the following items should be considered prior to in-service welding:

3.2.1.5.1 The risk of burn-throughs can be minimized if:

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3.2.1.5.1.1 The equipment is properly inspected for adequate wall thickness and absence of defects,

3.2.1.5.1.2 Controlled welding techniques are done by experienced welders to prevent overheating, and

3.2.1.5.1.3 Other appropriate safety procedures are followed.

3.2.1.5.1.4 The metal thickness at the hot tap/in-service welding location is Prohibited when less than 3/16 inch (0.187 inches) thick for pressures and temperatures given in the chart located in Section 4.2 of SP-50-24.

3.2.1.5.2 A thorough and complete inspection of each connection area must verify that the metal thickness is adequate for the pressure and temperature involved and that there are no laminations or other defects. Welding can only be made in lamination-free areas.

3.2.1.5.3 To minimize the possibility of burn-through, the first weld pass to the equipment shall be made with a 3/32-inch diameter welding electrode and the remaining passes shall be made with electrodes not to exceed 1/8 inch diameter if actual metal thickness does not exceed 1/2 inch.

3.2.1.5.4 For heavier wall thickness (1/2") where burn-through is not a primary consideration, larger diameter electrodes may be used to compensate for the larger mass. This will minimize the potential for fusion defects.

3.2.1.6 *Line or Vessel Contents are Suitable* for Welding or Hot Tapping- The following conditions must be met:

3.2.1.6.1 Contents of the line or vessel being hot tapped will not preclude welding as per Section 3.2.1.7.

3.2.1.6.2 The oxygen level within the equipment will be controlled to preclude the formation of a vapor/air mixture within the flammable or explosive range.

3.2.1.7 *Chemical Considerations* - In-service welding cannot be performed if the equipment contains:

3.2.1.7.1 Oxygen service

3.2.1.7.2 Plant or instrument air service (compressed air receivers, etc.)

3.2.1.7.3 Hydrofluoric (HF) or Sulfuric acid service (hot tapping restricted only; other in-service welding shall be managed with Specification Waiver)

3.2.1.7.4 Hydrogen, unless the Responsible Engineer conducts a review to ensure that the equipment has not operated above the Nelson Curve Limits for the particular steel involved because of the possibility of hydrogen embrittlement of the metal (see API Publication 941 - Steels for Hydrogen

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Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants);

3.2.1.7.5 Services containing flammables below atmospheric pressure or containing a mixture within the flammable range and operating at any pressure, expect as approved by MPC Engineering;

3.2.1.7.6 Caustic, amine, or chloride-containing service with austenitic material as the carrier pipe;

3.2.1.7.7 Certain unsaturated hydrocarbons that may experience exothermic decomposition reactions (acetylene, ethylene, butadiene for example) if the metal temperature, resulting from the heat of welding, could initiate such a reaction at the maximum expected pressure. Such reactions could have the potential for causing localized hot spots on pipe walls that could lead to failure.

3.2.1.8 *Compressed Air Line or Vessels* - welding shall NOT be performed on compressed air lines or air receivers under pressure. Such equipment may contain a residue of lubricating oil or carbon, which may ignite. Even when depressured, welding should be done on air lines only after thorough cleaning. Steps shall be taken to ensure that combustible material is not present inside the line or that oxygen has been excluded.

3.2.1.9 *Flow in Lines* - In certain cases where there may be insufficient or interrupted flow, such as a flare line, it may be necessary to continually purge or flood the line with steam or inert gas to ensure that the line or equipment does not contain a flammable mixture during the welding operation. Suggested product velocities during welding are:

3.2.1.9.1 *Liquids* - See Table 1: In-Service Welding Flow Requirements - Liquids (Attachment H) for flow rates that are based on the minimum velocity to achieve turbulent flow. Velocity should not exceed 4 ft./sec. to prevent excess heat removal, which could give a brittle weld.

3.2.1.9.2 *Gas* - See Table 2: In-Service Welding Flow Requirements - Gases (Attachment H) for flow rates which are based on minimum velocities depending on line size.

3.2.1.9.3 Consult the Process Engineer for the unit to determine the meter units of flow required to meet these velocities.

3.2.1.10 *Selecting the Weld Fitting* - Care should be taken to select the proper fitting for the connection. Many types of connecting fittings are available, such as welded outlet fittings (weld-o-lets), weld-ends, split tees, saddles, and nozzles. Connections shall be designed to the applicable code, i.e., ASME Boiler and Pressure Vessel Code; API RP 2201, API 650, Welded Steel Tanks for Oil Storage; or ASME B31-3, Pressure Piping Code. Be sure the fittings are the proper size to accommodate the hot tapping requirements.

3.2.1.10.1 Full encirclement saddles are required for size to size hot taps

3.2.1.11 *Closeness to Other Connections* - Weld seam location closer than 3 inches to an existing weld seam or is closer than 18 inches to a flange or threaded connection is Prohibited. Important:

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3.2.1.11.1 The 3 inches minimum dimension should be observed between the two closes points of adjacent weld seams.

3.2.1.11.2 Similarly, the 18-inch dimension shall be measured from the flange face to the nearest hot tapped weld seam (not the center of the hot tap)

3.2.1.11.3 Instances where these dimensional requirements may not be met shall be evaluated by MPC Engineering and Inspection Departments on a case-by-case basis.

3.2.1.11.4 The piping system shall be checked for expansion, loading, support, etc.

3.2.1.12 *Air Temperature* - Welding should not be performed on lines or equipment when the wind chill factor is -50°F or less. Hot tap machines should also be checked for suitability at low temperatures (below 32°F).

3.2.1.13 *Alloys and Stress Relieving* - Some equipment is unsuitable for in-service welding because the metallurgy or thickness of metal requires stress relieving, which normally cannot be done while the equipment is pressurized. Special treatment is required for high tensile strength alloy steels and special welding electrodes must be used. Fitting and weld rod metallurgy must be compatible with the equipment, piping, and vessels. These are managed on a case-by-case basis and require MPC Engineering and Inspection Department approval.

3.2.1.14 *Lined Piping or Equipment* - In-service welding should not be done on lines or equipment with cladding or linings, such as lead, strip lining, glass, plastic and so forth. Welding on refractory lined equipment requires approval of Engineering and Inspection.

3.2.1.15 *H_2S or Toxins* - Special safety precautions will be required when the equipment contains H_2S or toxins. (Refer to MSDS for toxic information.)

3.2.1.16 *Means of Personnel Exit* - For work above and below grade or in congested areas, a means of personnel exit shall be provided.

3.2.1.17 *Atmospheric Monitoring and Controls* - To ensure that excavations are safe for entry and hot work, tests for the presence of flammable and toxic material should be made. If either of these are present, an air mover or some other positive means of ventilation shall be provided. Air breathing equipment shall be used if atmospheric monitoring indicates that it is necessary.

3.2.1.18 Personnel are Qualified

3.2.1.18.1 Qualified personnel will do the welding. Welders must be qualified to the weld procedure to be used.

3.2.1.18.2 Welders must be approved by Marathon's Inspection Department.

3.2.1.18.3 Welders shall read and understand the welding procedure prior to signing the In-Service Weld/Hot Tap Site Review Checklist and Safe Work Permit.

3.2.1.18.4 He or she shall also be instructed on the requirements in this In-Service Welding and Hot Tapping Procedure.

3.2.1.19 Any comments or special considerations must be indicated on the In-Service Welding Approval Form.

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3.2.2 Performing the In-Service Welding

Before proceeding with the welding, the following conditions must be satisfied:

3.2.2.1 The area to which a connection is to be made has been identified, physically marked, and the metal thickness measured and marked on the equipment and on the In-Service Weld/Hot Tap Location Tag (Attachment E).

3.2.2.2 The In-Service Weld/Hot Tap Request Form, In-Service Weld/Hot Tap Approval Form, and the In-Service Weld Site Review Checklist must be completed, approved, and attached to the Safe Work Permit along with other required attachments as discussed in Section 3.1.

3.2.2.3 An Operations or Products Control Representative will be present until the first pass of the welding operation is completed.

3.2.2.4 A suitable fire extinguisher (dry chemical or pressurized fire hose) has been provided and a fire watch has been established.

3.2.2.5 A Safe Work Permit has been secured, and all necessary gas tests have been made to ensure a safe environment.

3.2.2.6 The fitting must be properly positioned.

3.2.2.7 The base metal temperature must be in accordance with Section 3.2.1.4 of this procedure.

3.2.2.8 The product must be moving at the desired velocity as specified in Tables 1 or 2 (see Attachment H).

3.2.3 In-Service Welding on Tanks

3.2.3.1 *Liquid Level Changes* - Never pump into or out of a tank while hot work is in progress. Close and lock and tagout all valves on liquid lines at the tank and all mechanical tank mixers. Install the In-Service Weld/Hot Tap Do Not Operate Tag located in Attachment F to the valves and mixers.

3.2.3.2 *Heating Coils* - Turn off all heating coils during the in-service welding procedure.

3.2.3.3 *Liquid Level Above the Weld Area* - Maintain at least three feet of liquid head above the weld area. A hand tape gauge of the tank contents shall be made immediately prior to the In-Service Weld Site Review Checklist is approved since automatic or remote reading gauges may not be reliable enough for the measurement. No attempt shall be made to weld on atmospheric pressure petroleum storage tanks above the liquid level, i.e., in the vapor space or on the roof, because of the danger of an explosive atmosphere inside the tank. The liquid level shall be periodically monitored throughout the welding process.

3.2.3.4 *Pontoon Decks* - Welding shall not be permitted on the deck of a floating-roof tanks in service except under very carefully controlled conditions and approval from MPC Engineering and Inspection Department. Each situation could be unique to hazards that would be encountered, including exit from the tank in the event of an emergency, flammability within the pontoon or between the deck and liquid surface, and flammability in the seal area. Extreme caution is advised.

3.2.4 Weld Machine Requirements:

3.2.4.1 Welding machines must have a proper ground connection at all times

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and shall be connected as close as possible to the weld. Welding machines must have a ground attached to the work when welding on pumps, turbines or compressors to eliminate welding grounding through bearings or seals. Ground attachment to the preceding equipment is prohibited when welding elsewhere.

3.3 HOT TAP REQUIREMENTS

3.3.1 It will be the responsibility of Operations/Products Control and Maintenance to properly assess the risks and benefits of Hot Taps. The following alternatives must be considered:

3.3.1.1 Installation delay must be seriously considered so that connections can be made at a time when equipment or piping is not in service.

3.3.1.2 Alternate locations for connections should be investigated to prevent the need for hot tap.

3.3.1.3 Every attempt possible must be made to isolate equipment or process systems when it is decided to make connections that would otherwise require hot tapping.

3.3.2 It will be the responsibility of the GBR person who is coordinating the in-service weld to remain on site to oversee the in-service weld throughout its duration.

3.3.3 *Work Above and Below Grade or in Congested Areas* - For work above and below grade or in congested areas, provide an easy personnel exit. To ensure that excavations are safe for entry and hot work, tests for the presence of flammable and toxic material should be made. If either of these are present, an air mover or some other positive means of ventilation should be provided. Air breathing equipment shall be used to protect personnel from toxic atmospheres.

3.3.4 *Flow in Lines* - In certain cases where there may be insufficient or interrupted flow, such as a flare line, it may be necessary to continually purge or flood the line with steam, inert gas to ensure that the line or equipment does not contain a flammable mixture during the hot tap operation. Suggested product velocities during welding are:

3.3.4.1 Liquids - (See Table 1 for Flow Rates) (attachment H)

3.3.4.2 Gas - (See Table 2 for Flow Rates) (attachment H)

3.3.5 *Hot Tap Machine Suitable* - The hot tap machine can be considered suitable if the pressure and temperature of the material inside the line or vessels falls within the working limits of the hot tap machine.

3.3.6 *Base Metal is Suitable* - The base metal thickness must be approved and be heavy enough to support the new connection and the hot tap machine.

3.3.7 *Line or Vessel Contents are Suitable* - The oxygen level within the equipment will be controlled to preclude the formation of a vapor/air mixture within the flammable or explosive range.

3.3.8 *Personnel are Qualified* - Trained personnel will operate the tapping machine and can provide training documentation if requested.

3.3.9 *Hot Tap Connection is Suitable* - The connection through which a hot tap will be made must be designed in accordance with the appropriate code. The design shall cover the specifications of gaskets, pipe, valve, and bolts. Hot tap fitting length must accommodate the machine, but there must also be sufficient clearance for the cutter or drill. Clearance to install and remove the hot tap machine shall be provided.

3.3.10 Responsible Engineer Responsibilities

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3.3.10.1 Reviews the composition of the material in the line or vessel for stability while welding. While making the drawings, bills of material, and completing the forms, the following should be carefully considered. Design details are outlined in Engineering Specification SP-50-24.

3.3.10.2 *Selecting the Weld Fitting* - Care should be taken to select the proper fitting for the connection. Many types of connecting fittings are available such as weld-o-lets, weld-ends, split tees, saddles, and nozzles. Connections should be designed to the applicable code, i.e., ASME Boiler and Pressure Vessel Code; API 650, Welded Steel Tanks for Oil Storage; or ANSI B31.3, Pressure Piping Code. Be sure the fitting is the proper size to accommodate the hot tap machine.

3.3.10.3 Full encirclement saddles are required for size to size hot taps. For example, saddles are required for a 6" tap on a 6" line.

3.3.10.4 Ensure the correct equipment or line has been selected and tagged at in-service weld or hot tap location (Attachment E)

3.3.10.5 The piping system should be checked for expansion, loading, support, etc.

3.3.10.6 *Lined Piping or Equipment* - Hot tapping on lines or equipment with cladding or linings such as lead, strip lining or refractory lined equipment requires approval of Engineering and Inspection.

3.3.10.7 *Downstream Equipment* - Avoid hot tapping upstream of rotating equipment, control valves, and/or instrument orifices unless such equipment is protected from the cutting by means of filters or traps.

3.3.10.8 Any comments or special considerations should be indicated on the "In-Service/Hot Tap Approval Form", "Hot Tap Connection Form" and drawing and the Engineering Manager may then approve it.

3.3.11 Operations/Products Control Responsibilities

3.3.11.1 The Operations/ Products Control Manager shall make the final approval. No hot tap shall be made without the required departmental signatures.

3.3.11.2 Operations/Products Control Day Foreman or delegate will verify the location of the In-Service Weld or Hot Tap

3.3.11.3 Ensure that the specified flow rate is established or the tank is at adequate level.

3.3.11.4 Operator / Product Control Operator will attach a hot tap tag (Attachment F) to valves utilized to control flow. For tanks, ensure isolation using the Energy Isolation procedure PR-14 during the hot tap or in-service weld. The hot tap tag will read "Hot Tap or In-Service Weld in Progress - Do not Operate" (Attachment F).

3.3.11.5 Notify other affected department or Areas.

3.3.12 Performing the Hot Tap: Before proceeding with the hot tap, the following conditions must be satisfied:

3.3.12.1 The In-Service Weld/Hot Tap Request Form, In-Service Weld/Hot Tap Approval Form, and the Hot Tap Site Review Checklist must be completed, approved, and attached to the Safe Work Permit along with other required attachments as discussed in Sections 3.1 and 3.3.

3.3.12.2 A hydrostatic test of the welded attachment will be conducted in

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accordance with the applicable code before cutting. If the temperature of the metal is 50°F or below, the transition temperature of the metal should be considered to preclude brittle fracture.

3.3.12.2.1 Hot tap connection valve body shall be tested at same pressure as the hot tap connection

3.3.12.2.2 Nitrogen test at25 psig with “snoop” or soap solution on the welds of reinforcement pads or split tees,

3.3.12.2.3 The valve seats shall be tested from both directions

3.3.12.3 Additional in-process non-destructive examination (NDE) is required prior to any pneumatic testing being performed. The need for magnetic testing (MT), penetrate testing (PT), and/or ultrasonic testing (UT) on root and/or final welds should be identified by the GBR Inspection Department in the Inspection comments section of the In-Service Weld Approval Form.

3.3.12.4 The position of the hot tap must be on Diagram 1 (ATTACHMENT I)

3.3.12.5 A Operations/Products Control Representative will be present during the final cut through of the hot tap operation.

3.3.12.6 A Safe Work Permit has been secured, and all necessary gas tests have been made to ensure a safe environment.

3.3.12.7 A suitable fire extinguisher (dry chemical or pressurized fire hose) has been provided and a fire watch established.

3.3.12.8 The product must be moving at the desired velocity. See Attachment H for the desired velocities.

3.3.12.9 Check tightness of bolts, packing, packing nuts, and bypass line, if required, to avoid possible leakage.

3.3.12.10 On a non-vertical hot tap, a gate valve must be provided to be able to flush the valve seat of any cuttings

3.3.12.11 Installing *the Machine* - Follow the instructions of the manufacturer and check the following items:

3.3.12.11.1 Before installing the hot tap machine, the hot tap valve must be closed, this is to ensure the valve can be closed following the hot tap after the cutter is fully retracted

3.3.12.11.2 Be sure the valve on the connection nozzle is a full-opening gate valve, centered on the flange, and clean.

3.3.12.11.3 Run the boring bar through the main valve opening several times to be sure the cutter does not jam or drag.

3.3.12.11.4 Carefully calculate and log the travel of the cutter on diagram 1 to ensure that it can be retracted through the valve, particularly in small size pipe, and to ensure that the opposite side of the pipe will not be cut.

3.3.12.11.5 Check that the bleed-off valve will hold pressure and is not plugged.

3.3.12.12 *After Cutting* - Besides the measurement, as determined by the machine stop setting, it is possible to tell when the cut is complete by the reduced resistance to the hand cranking or by the speed up of the air or hydraulic

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motor. The manufacturer's instructions should be followed when retracting the bore and closing the valve.

3.3.12.12.1 Retract the boring bar and close the main valve.

3.3.12.12.2 Depressurize the hot tap machine and ensure the main valve is not leaking before removing the hot tap machine.

3.3.12.12.3 If the blank or coupon is lost:

3.3.12.12.3.1 No attempt should be made to fish for it.

3.3.12.12.3.2 A notice shall be circulated to all Department Managers

3.3.12.12.3.3 If feasible, the coupon shall be located and removed at the first opportune time. In some cases, it will be necessary to shut down the equipment and depressure the line to recover a lost blank.

4.0 Definitions

4.1 ***Hot Tapping*** – This refers to the procedure to be followed when a special tool called a "Hot Tap Machine" is fastened to a valve attached to a new connection that was welded onto pipe or equipment which is in service containing hydrocarbons or other materials. The "Hot Tap Machine" is totally enclosed so that the cutter can drill through the connection and into the pipe or equipment without allowing the contents of the pipe or equipment to escape to the atmosphere. The cutter or drill can be retracted back into the "Hot Tap Machine", the valve closed, and the "Hot Tap Machine" removed.

4.2 ***Hydrostatic Test*** – A test of the piping, equipment or system under pressure to give proof the welds and material will withstand expected stresses and that the system is leak-tight.

4.3 ***In-Service Welding*** – This refers to the procedure to be followed when welding on pipe or equipment which is in service containing hydrocarbons or other materials. This includes grinding (other than surface cleanup), burning, and welding for any purpose such as adding brackets, shoes, backwelding, adding weld-o-lets, adding studs, etc., in addition to new connection or revisions.

4.4 ***Owning Department*** – The term "owning department" refers to the department that owns and operates process, process-related, and/or utility equipment, machinery, building, and/or systems. This term is also applied for individuals that are assigned ownership of outlying areas per Permitting Ownership Area Maps

4.5 ***Responsible Engineer*** – The Responsible Engineer can be the Reliability Engineer, Area Engineer, or Project Engineer.

4.6 ***Stoppling*** – "Stoppling" is using a device called a "stopple" to isolate a section of pipe while the line contains hydrocarbons or other materials.

4.7 ***Tightness Test*** – A test under pressure for leaks after system re-assembly.

4.8 ***Owner Supervisor*** – The Marathon owning department's supervisor. This is typically, although not always, a Shift or Unit Supervisor.

4.9 ***Maintenance Coordinator*** – The Maintenance Coordinator is a coordinator that works in the maintenance department.

5.0 References

Printed copies should be used with caution. The user of this document must ensure that the current approved version of the document is used.

5.1 ASME Boiler and Pressure Vessel Code Section VIII: “Construction of Pressure Vessels”

5.2 ANSI ASME B31.3Process Piping Code

5.3 API RP 2201 “Procedures for Welding or Hot Tapping on Equipment Containing Flammables”

5.4 API 650, “Welded Steel Tanks for Oil Storage”

5.5 API 941 “Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants”

5.6 MPC Refining specification SP-50-24, “Procedures for In-Service Welding or Hot Tapping on Piping and/or Equipment.” – Revision 17

5.7 GBR PR-14 Energy Isolation

5.8 API 510 “Pressure Vessel Inspection Code: In-service Inspection, Rating, Repair, and Alteration”

5.9 API 570 “Inspection Repair, Alteration, an Rerating of Inspection Piping Systems”

5.10 API 577 “Welding Inspection and Metallurgy”

5.11 API STD 653 “Tank Inspection, Repair, Alteration, and Reconstruction”

6.0 Attachments

6.1 Attachment A: Hot-Tap / In-service Weld Request Form

6.2 Attachment B: In-service Welding/Hot Tap Approval Form

6.3 Attachment C: In-service Weld Site Review Checklist Form

6.4 Attachment D: Hot-tap site Review Checklist Form

6.5 Attachment E: In-service Weld/Hot Tap Location Tag

6.6 Attachment F: Hot Tap / In-service Weld “Do Not Operate” Tag

6.7 Attachment G: Process Flow/Decision Logic for Hot Tap/In-service Weld

6.8 Attachment H: Table 1 – In-service Welding Flow Requirements – Liquids

6.9 Attachment I: Table 2 – In-service Welding Flow Requirements – Gases

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7.0 Revision History

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original issue. New integrated site procedure replaces GBR-HESS-PR-24 and RSW-0029-TC under MOC 68003.	A. Collier	S. R. Levy	12/18/2019	1/16/2020
1	Added references to the “Do Not Operate” tags to Attachments C and D checklists.	A. Collier	S. R. Levy	10/8/2020	10/12/2020
2	Added requirement for MOC to be in “Ready to Startup” status prior to initiating in-service welding field work.	R. McCabe	M. Mahler	12/12/2023	3/28/2024

ATTACHMENT A: IN-SERVICE WELD/HOT TAP REQUEST FORM (Page 1 of 1)

(Attach a copy of the Management of Change (MOC))

Work Order No. _____ In-Service Weld MOC No._____ Hot Tap MOC No. _____ Date _____

Request for: ◉ In-Service Weld Only ○ Hot Tap Only ○ In-Service Weld and Hot Tap Combination*

Size and Description of In-Service Weld/Hot Tap _____

_____

Justification for this In-Service Weld/Hot Tap _____

_____

Line/Tank and Product _____

** Select the In-Service Weld and Hot Tap Combination option if a tie-in's hot tap will be performed within 28 days of its in-service weld. Otherwise, separate forms for each task are required.*

Originator: _____
Mtce Coord./Asset Coord./ or Resp. Eng Date

****

ENGINEERING – *Initial the appropriate YES or NO column*	**YES**	**NO**
The chemical composition of the contents in the line or vessel has been considered to avoid welding on equipment containing vapor/air flammable mixtures, hydrogen or chemicals, which could affect metal strength?	_____	_____
Alternate locations for connections were investigated to prevent the need for a hot tap?	_____	_____
A review of design criteria has been made to ensure all conditions to proper mechanical design will be met?	_____	_____
An In-Service Weld/Hot Tap Location Tag has been hung on the In-Service Weld / Hot Tap location?		

What is the design pressure of the line to be hot tapped? _____ psig Intended (designed) thickness? _in

Comments: _____

Originator: _____ APPROVAL: _____
Resp. Engineer Date Engineering Manager Date

****

OWNING DEPARTMENT/PROCESS ENGINEERING – *Initial the appropriate YES or NO column*	**YES**	**NO**
Installation delay was seriously considered, so that connection could be made at a time when equipment or piping is not in service?	_____	_____
Alternate locations for connections were investigated to prevent the need for an in-service weld or hot tap?	_____	_____
Consideration was made to isolate equipment or process system?	_____	_____
Has the exact location been identified and marked with the tag found in Attachment E?	_____	_____

Process Temperature _____ °F Pressure _____ psig Flow Rate _____ ft/sec Contents_____

Comments:_____

APPROVAL: _____ APPROVAL: _____
Owning Department Supervisor Date Process Engineer Date

****

OWNING DEPARTMENT MANAGER – *Initial the appropriate YES or NO column*	**YES**	**NO**
This in-service weld and/or hot tap can be made after the In-Service Weld/Hot Tap Approval Form(s) and appropriate In-Service Weld or Hot Tap Site Review Checklist has been signed and approved.	_____	_____

Comments_____

APPROVAL: _____
Owning Department Manager Date

Return this form to the Responsible Engineer. The Responsible Engineer will file the original in the Hot Tap Documentation file and return a copy to the originator. Attach a copy of this approved form to the In-Service Weld Approval Form or the Hot Tap Approval Form.

Printed copies should be used with caution. The user of this document must ensure that the current approved version of the document is used.

ATTACHMENT B: IN-SERVICE WELD/HOT TAP APPROVAL FORM (PAGE 1 OF 1)

(Attach a copy of the appropriate approved/processed In-Service Weld/Hot Tap Request Form, its attachments, and the Weld Procedure. For Hot Tap Approval forms, also attach the completed Diagram 1: Hot Tap Location and Travel Distance of Hot Tap Machine.)

Work Order No. _____ In-Service Weld MOC No. _____ Hot Tap MOC No. _____ Date _____

Request for: ○ In-Service Weld Only ○ Hot Tap Only ○ In-Service Weld and Hot Tap Combination*

Size and Description of In-Service Weld/Hot Tap _____

_____

Justification for this In-Service Weld/Hot Tap _____

_____

Line/Tank and Product _____

** Select the In-Service Weld and Hot Tap Combination option if a tie-in's hot tap will be performed within 28 days of its in-service weld. Otherwise, separate forms for each task are required.*

Originator _____
Mtce Coord/Asset Coord/ or Resp. Eng Date

****

ENGINEERING – *Initial the appropriate YES or NO column* YES NO

Has a drawing been made?

Has a bill of material been made?

Do the flanges, bolts, gasket, pipe and valve to be installed meet the piping code for the line or vessel for the in-service weld/hot tap?

Piping/equipment is strong enough to safely hold the weight of the hot tap machine?

Full encirclement saddles are required for size-to-size hot taps in accordance with the Core Specification. Is proposed hot tap size-to-size, for example, 6" tap on a 6" line?

If the original Hot Tap scope has changed or if there exists any special considerations that were evaluated, this document must be resubmitted for management and technical approvals.

Comments: _____

APPROVAL: _____ Engineering SME Date

APPROVAL: _____ Engineering Supervisor Date

APPROVAL: _____ Engineering Manager Date

APPROVAL: _____ Resp. Eng (Reliability Eng, Area Eng, Project Eng) Date

****

INSPECTION – *Initial the appropriate YES or NO column* **YES** **NO**

Has the location of the in-service weld/hot tap on the line or vessel been identified, tagged, and marked, and does it agree with the location identified by operations/engineering?

Has the area to be welded or tapped been inspected for thickness and freedom from lamination or hydrogen embrittlement?

Has the need for stress relieving the welded area been considered and provided for, if required?

Can the base metal temperature be maintained above 50 °F for carbon steel or °F for other base metals? (Refer to Section 3.2.1.4)

Has the weld procedure (attached) and type of welding rod to be used been approved?

NDE requirement has been addressed for final test (hydro, pneumatic, or MT/PT/UT root, final)?

The minimum thickness measurement taken within 6 months time of the weld at the in-service weld/hot tap is _____ inches. The intended thickness or designed thickness (from the In-Service Weld/Hot Tap Request Form) is _ inches. Minimum required thickness is 3/16 ".
Thickness readings within 20% of 3/16" (.226" or below) shall require UT scanning 360° and radiography.

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Comments: _____

APPROVAL: _____ Inspector Date

APPROVAL: _____ Inspection Coordinator Date

APPROVAL: _____ Maintenance Manager Date

APPROVAL: _____ Owning Department Manager Date

APPROVAL: _____ Area Team Leader Date

Forward form to the Originator for processing and retention.

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ATTACHMENT C: IN-SERVICE WELD SITE REVIEW CHECKLIST Page 1 of 2)

(Attach completed/processed In-Service Weld Request, In-Service Weld Approval Form, Weld Procedure, and completed Job Safety Analysis to this document.)

Work Order No. _____ MOC No. _____ Date _____

Size and Description of In-Service Weld _____

_____

Justification for this In-Service Weld _____

_____

Line/Tank and Product _____

** Select the In-Service Weld and Hot Tap Combination option if a tie-in's hot tap will be performed within 28 days of its in-service weld. Otherwise, separate forms for each task are required.*

Originator _____
Mtce Coordinator/Asset or Resp. Engineer Date

****

OWNING DEPARTMENT/PROCESS ENGINEER – *Initial the appropriate YES or NO column*	**YES**	**NO**
Is the material in the line stable under heated conditions and free of oxygen?	_____	_____
Is the flow through the line of the required velocity as established by Engineering?	_____	_____
Is the area to be welded located below the liquid level (three feet minimum) of a tank or on a line or piece of equipment in which flow has been established?	_____	_____
Has the exact location been identified and marked with the location tag in Attachment E?	_____	_____
Temperature _____°F Pressure _____ psig Contents_____		
Flow rate has been established at correct velocity in accordance with Tables 1&2 and control is in place to maintain for in-service welding?	_____	_____
Flow Rate _____ft/sec		
Has the "Do not Operate" tags, attached in Attachment F, been installed on the control device(s)?	_____	_____

APPROVAL: _____
GBR Owning Department Supervisor Date

****

RESPONSIBLE ENGINEER – *Initial the appropriate YES or NO column*	**YES**	**NO**
Has a chemical composition of the contents of the line or vessel been considered to avoid welding on equipment containing flammable mixtures, hydrogen or chemicals, which could affect metal strength? (Attach any associated data or studies conducted to ensure metal strength).	_____	_____

APPROVAL: _____
Responsible Engineer Date

****

AT THE SITE – *Initial the appropriate YES or NO column*	**YES**	**NO**
Is the MOC for the In-service weld in the Ready to Startup Status? MOC# _____	_____	_____
Has overhead clearance been reviewed/verified for applicable material, stopple or hot tap machine installation?	_____	_____
Do the flanges, bolts, gasket, pipe, and valve to be installed meet the requirements of the drawings or piping code for the line or vessel to be hot tapped?	_____	_____
Is the material on site?	_____	_____
Has the weld procedure (attached) been specified, and is the welder qualified for the procedure?	_____	_____
Is the correct diameter welding rod specified in the welding procedure being utilized?	_____	_____
Have the personnel doing the welding been qualified by the Inspection Department?	_____	_____
Has the welder been instructed on the In-Service Weld Procedure?	_____	_____
The Safe Work Permit explains all required activities by the Operations/Products Control Department as well as the personnel doing the work.	_____	_____

ATTACHMENT C: IN-SERVICE WELD SITE REVIEW CHECKLIST (Page 2 of 2)

	YES	NO
Has consideration been given to the location of the weld to assure that there are personnel exits and that the area will not trap flammable and/or toxic vapors?		
The use of breathing equipment has been considered and provided for if required?		
Are all the safety rules for working in this area being followed?		
Are suitable fire extinguishers available?		
Has the Inspection Department performed a thickness measurement within 6 months of the time the weld is to take place?		
Has a Job Safety Analysis (JSA) been reviewed and attached to this document?		

IF ANY OF THE ABOVE ITEMS ARE MARKED "NO," DO NOT SIGN THIS FORM!

APPROVALS: *Obtain the Galveston Bay Refinery or Project Signatures below.*

GBR Asset Coordinator Date

GBR Responsible Engineer Date

Contractor Foreman Date

GBR Maintenance Coordinator Date

Welder Performing the Weld Date

GBR Safety Representative Date

Once the above signatures are obtained, the Owning Department Supervisor has the final approval right.

GBR Owning Department Supervisor Date

Signed form to be kept at job site with the Safe Work Permit. At job completion, this form along with any other applicable documents is to be attached to and turned in with the Safe Work Permit.

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ATTACHMENT D: HOT TAP SITE REVIEW CHECKLIST (Page 1 of 2)

Attach completed/processed Hot Tap Request Form, Hot Tap Approval Form, Diagram 1: Hot Tap Location and Travel Distance of Hot Tap Machine, and Job Safety Analysis to this form.

Work Order No. _____ MOC No. _____ Date _____

Size and Description of Hot Tap _____

_____

Line/Tank and Product _____

NOTE: Before the hot tap can be made, the nozzle is to be welded on under the authorization of an In-Service Welding Site Review and associated Safe Work Permit.

****

AT THE SITE – *Initial the appropriate YES or NO column*	**YES**	**NO**
1. Is the MOC for the hot tap in the Ready to Startup Status? MOC# _____	_____	_____
2. Has the In-Service Weld/Hot Tap Approval Form been signed by all parties?	_____	_____
3. Is the drawing and material on site? Drawing No. _____	_____	_____
NOTE: No hot taps are to be done without an Engineering drawing.		
4. Has the exact location been identified and marked with the location tag in Att E? Temperature _____°F Pressure _____ psig Contents_____	_____	_____
5. A _____*(type)* hot tap machine will be used for this hot tap.	_____	_____
6. The hot tap machine and packing is suitable for the service.	_____	_____
7. The clearance for the hot tap machine is large enough.		
8. Has overhead clearance been reviewed/verified for stopple or hot tap machine installation?	_____	_____
9. Do the flanges, bolts, gaskets, pipe and valve to be installed meet the requirements of the drawings or piping code for the line or vessel to be hot tapped and the piping and equipment is strong enough to safely hold the weight of the hot tap machine?	_____	_____
10. The connection has been hydrostatically tested at _____ psig.	_____	_____

Witnessed by: _____
Inspector's Signature Date

11. The hot tap machine pressure vent will be tested to be sure it is clear and holds the proper pressure.	_____	_____
12. The outside diameter of the drill bit has been checked and will clear the smallest diameter of the connection (usually the inside valve diameter). A trial run has been performed where the bit has been fitted through the smallest diameter of the connection.	_____	_____
13. The travel of the hot tap machine drill has been checked and marked on the hot tap machine. It is long enough to completely penetrate the pipe but not go through the other side or penetrate the equipment wall and will extract completely back through the valve. Reference Diagram 1 for the exact travel distance.	_____	_____
14. When the hot tap machine is attached to the connection, the connection and machine have been tested for tightness at _____ psig with _____ *(material)*. If the hot tap machine is tested with the connection, then both must conform to the hydrostatic testing requirements (see question #7).	_____	_____

Witnessed by: _____
Contractor's Signature Date

Witnessed by: _____ _____
GBR Maintenance Coordinator's Signature Date

15. Consideration has been given to the location of the hot tap to assure that there are personnel exits and that the area will not trap flammable and/or toxic vapors.		
16. The use of supplied air and other appropriate personal protective equipment has been considered.		

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ATTACHMENT D: HOT TAP SITE REVIEW CHECKLIST (**Page 2 of 2**)

		YES	NO
17.	Is there sufficient flow in the line? (Refer to Tables 1 or 2) List flow: ft/sec		
18.	Has the "Do not Operate" tags, attached in Attachment F, been installed on the control device(s)?		
19.	If hot tapping a tank, is the liquid level three feet or more above the hot tap area, and has the liquid level been checked by a hand gauge? NOTE: Do not pump into or out of the tank while the hot tap is in progress.		
20.	Are all the safety rules for working in this area being followed?		
21.	Are suitable fire extinguishers available?		
22.	Personnel have been instructed on this Hot Tap Safety Procedure?		
23.	Have pressure and temperature been verified immediately prior to the actual hot tap?		
24.	Have all the comments been read and understood on the In-Service Weld/Hot Tap Approval Form?		
25.	Consideration has been given to the possibility of safely back flushing the completed hot tap to remove cuttings from the connection.		
26.	The Safe Work Permit explains all required activities by the Operations/Products Control Department as well as the Mechanic doing the work.		
27.	Has a Job Safety Analysis (JSA) been reviewed and attached to this document?		
28.	Has the contingency plan been reviewed, and a copy is available on site?		

IF ANY OF THE ABOVE ITEMS ARE MARKED "NO," DO NOT SIGN THIS FORM!

APPROVALS: *Obtain the Galveston Bay Refinery or Project Signatures below.*

GBR Asset Coordinator	Date	GBR Maintenance Coordinator	Date
GBR Responsible Engineer	Date	Machinist Performing the Hot Tap	Date
Contractor Foreman	Date	GBR Safety Representative	Date

Once the above signatures are obtained, the Owning Department Supervisor has the final approval right.

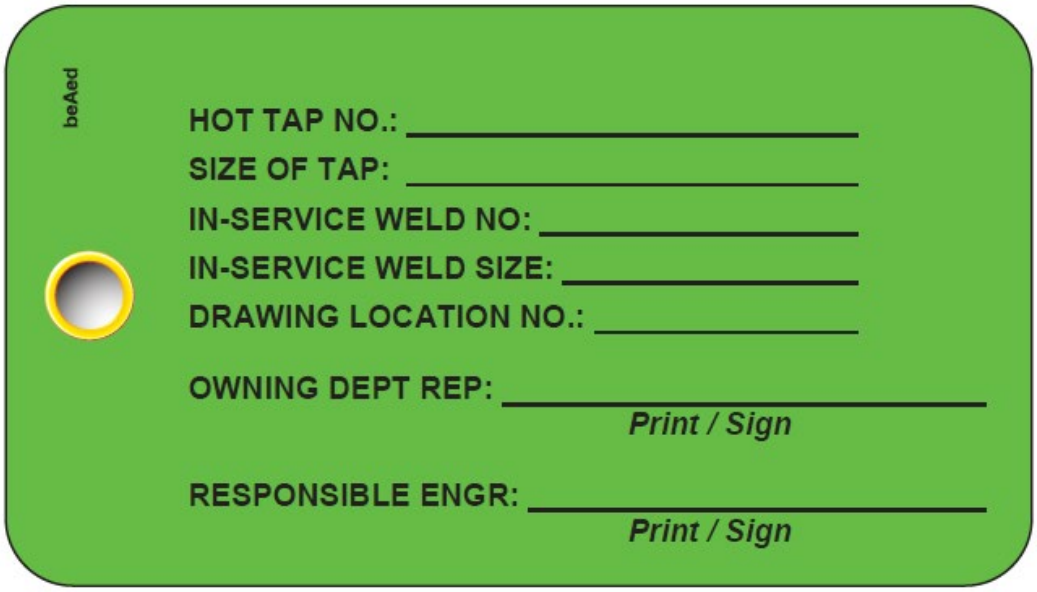
GBR Owning Department Supervisor Date

Signed form to be kept at job site with the Safe Work Permit. At job completion, this form along with any other applicable documents is to be attached to and turned in with the Safe Work Permit.

Printed copies should be used with caution. The user of this document must ensure that the current approved version of the document is used.

ATTACHMENT E: IN-SERVICE WELD/HOT TAP LOCATION TAG

SAP# 90240132



ATTACHMENT F: IN-SERVICE WELD/HOT TAP "DO NOT OPERATE" TAG

SAP# 90240131

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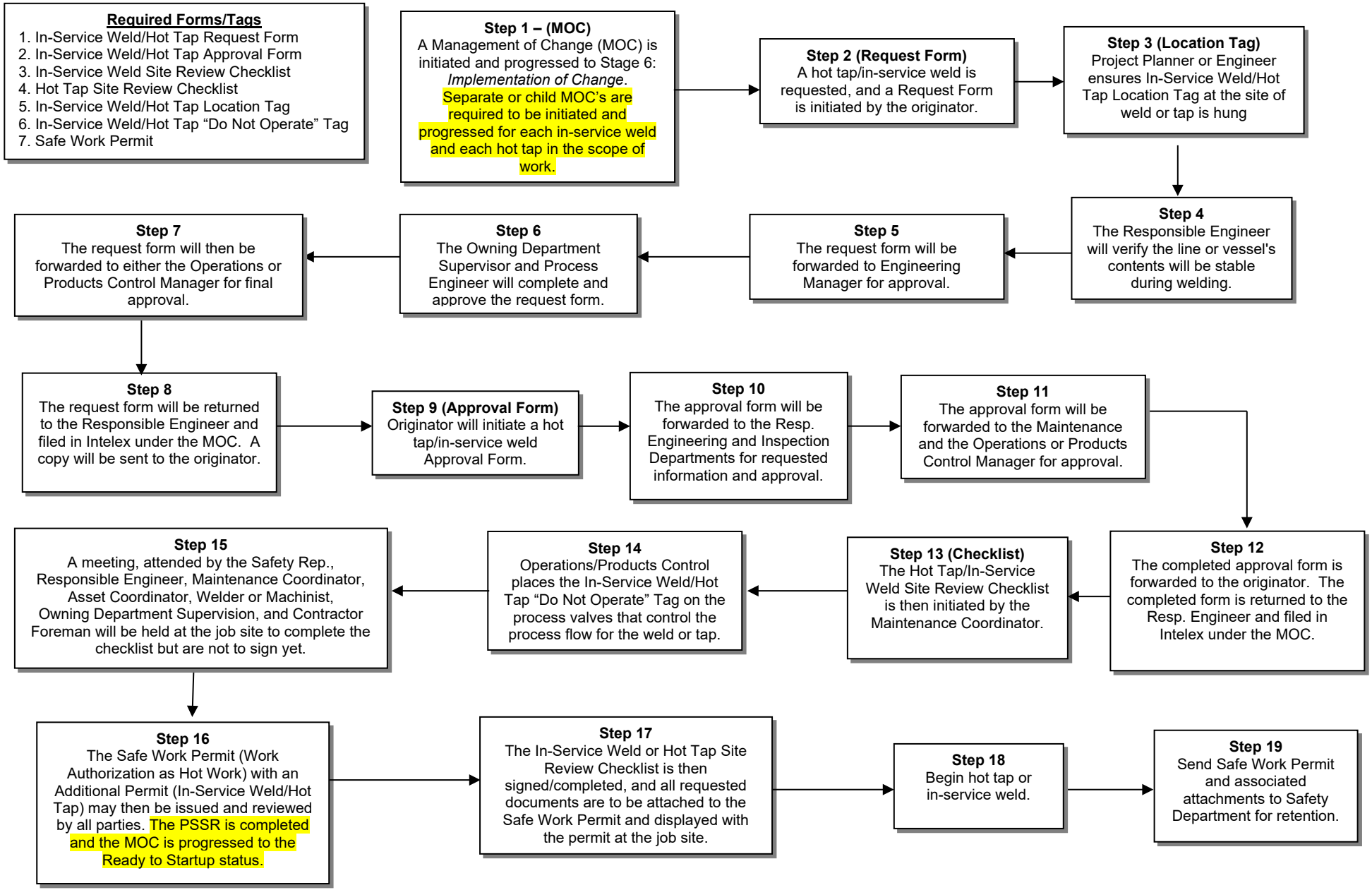
ATTACHMENT G: PROCESS FLOW/DECISION LOGIC FOR A HOT TAP/IN-SERVICE WELD



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ATTACHMENT H
TABLE 1

IN-SERVICE WELDING FLOW REQUIREMENTS - LIQUIDS

PIPE SIZE (IN)	0"	1"	1½"	2"	3"	4"	6"	8"	10"	12"
SCHEDULE	80	80	80	80	40	40	40	40	40"	40"
PIPE ID	0.74	0.96	1.50	1.94	3.07	4.03	6.07	7.98	10.02	12.00
8.0 MINIMUM VELOCITY										
(FT/SEC)	0.90	0.70	0.50	0.40	0.30	0.20	0.20	0.10	0.10	0.10
9.0 MINIMUM FLOW										
(FT_3/MIN)	0.16	0.21	0.37	0.49	0.92	1.06	2.41	2.09	3.29	4.71
(GPM)	1.21	1.57	2.75	3.68	6.91	7.94	18.02	15.60	24.59	35.26
(BBL/DAY)	41.6	53.8	94.5	126.3	237.1	272.2	617.7	534.8	843.0	1209.0
10.0 MAXIMUM VELOCITY										
(FT/SEC)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

NOTE: For lines larger than 12-inch Nominal Pipe Size, a liquid velocity should be specified between 0.1 fps and 4 fps. Minimum velocity based on the minimum velocity to achieve turbulent flow with kerosene

TABLE 2

IN-SERVICE WELDING FLOW REQUIREMENTS - GASES

PIPE SIZE (IN)	0.75"	1"	1½"	2"	3"	4"	6"	8"	10"	12"
SCHEDULE	80	80	80	80	40	40	40	40	40"	40"
PIPE ID	0.74	0.96	1.50	1.94	3.07	4.03	6.07	7.98	10.02	12.00
MINIMUM VELOCITY (FT/SEC)										
	1.30	1.30	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50
MINIMUM FLOW (SCFM)										
	0.23	0.39	0.74	1.23	1.54	2.65	6.02	10.42	16.42	23.56
MINIMUM FLOW (SCFM)										
@ 50 PSI	1.0.	1.71	3.24	5.41	6.78	11.67	26.48	45.85	72.27	103.65
@ 100 PSI	1.83	3.04	5.74	9.603	12.01	20.68	46.94	81.28	128.12	183.75
@ 150 PSI	2.62	4.36	8.25	13.78	17.25	29.70	67.40	116.71	183.97	263.86
@ 200 PSI	3.42	5.69	10.75	17.96	22.48	38.72	87.86	152.15	239.82	343.96
@ 300 PSI	5.01	8.34	15.76	26.33	32.95	56.75	128.79	223.01	351.51	504.16
@ 400 PSI	6.60	10.99	20.76	34.69	43..43	74.78	169.71	293.87	463.21	664.37
@ 500 PSI	8.20	13.64	25.77	43.06	53.90	92.81	210.63	364.74	574.91	824.57

NOTE: For lines larger than 12-inch Nominal Pipe Size, a vapor velocity should be specified no less than 0.5 fps with no limit on maximum velocity.

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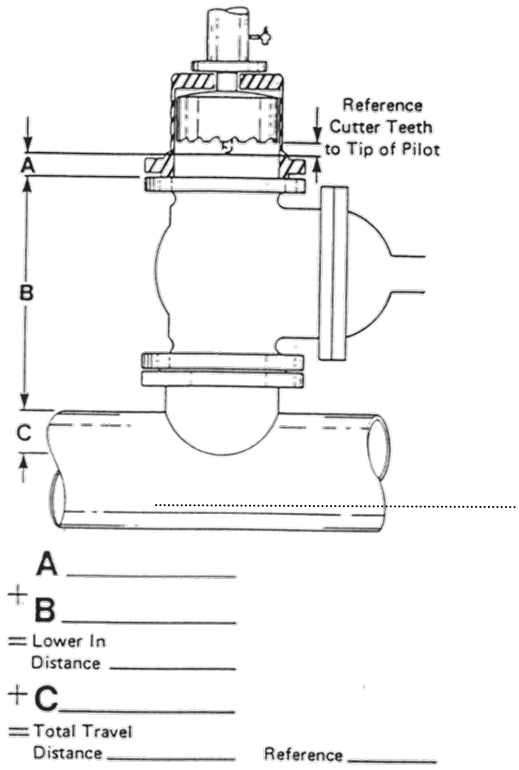
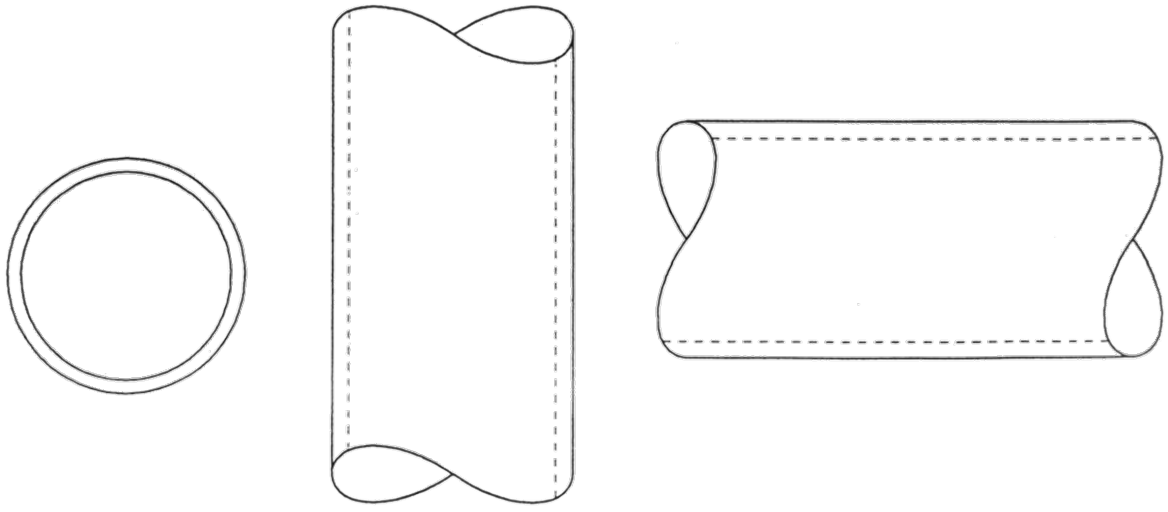
ATTACHMENT I

DIAGRAM 1: HOT TAP LOCATION & TRAVEL DISTANCE OF HOT TAP MACHINE



HOT TAP LOCATION



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