Manual Section 7	Issue Date 11/25/09	Revision Date 01/01/24	Policy Number LLCP-078
	Hot Tapping		

Purpose
This Standard Operating Procedure provides basic guidance in the performance of hot taps. The job pre-planning based on hazard analysis determines the requirements for each project.

Scope
All LLC Companies including, Blanchard Industrial, LLC, GIS Engineering, LLC, Grand Isle Shipyard, Inc., and GWIS, Mack Steel, NuWave, Sun Industries, Valvemax, Discovery Industries, Inc.; hereafter identified as "Company".

General
Tapping of oil and gas lines is a specialized operation and shall not be performed without a job-specific written procedure from a certified engineer. The procedure shall be written and approved for the specific task at hand.

- The customer shall provide company with the written procedure approved by an engineer for the specific task to be performed.
- Hot Tapping will not be performed without approval from a company Department Manager or above.
- The welder shall be qualified and experienced in tapping operations.
- All non-essential personnel should be restricted from the work area.
- All tapping activities to be provided by company shall require a Hot Work Permit authorized, documented and signed by an on-site facility supervisor who has a thorough knowledge of the facility.
- The company Supervisor should communicate with the on-site facility supervisor/customer representative to determine if any additional safety precautions shall be taken to ensure compliance before Hot Work begins.
- All requirements specified in the Hot Work Permit and the written procedure shall be adhered to or the work shall not be performed.
- Procedures for emergency evacuation & communication shall be established prior to start of permitted work.

Hot Tapping shall never be performed without acquiring the following:

- Procedures and Engineering Specifications calculated for the specific tap to be performed shall be developed by an engineer and followed at all times.
- Shall acquire customer approval of the calculations and procedure. The customer's on site facility supervisor shall insure that all available safety precautions have been implemented prior to performing the task.
- Written job plan approved by customer and customer engineer.
- Approved from company's Department Manager or above and/or HS&E Manager shall be acquired prior to performing the task.
- Review and follow related Correct Behavior Inventory (CBI) (i.e. Hot Work, Piping)

NOTE: **All five of the above stated items shall have occurred prior to performing any Hot Tapping Operation.**

METALLURGY

Vessels or lines to be hot tapped must be properly inspected for adequate wall thickness and the absence of imperfections to prevent the risk of burn-through. Controlled welding techniques are also necessary and must be conducted by qualified welders to prevent overheating.

A thorough inspection of each connection area must confirm that the metal thickness is proper for the pressure and temperature involved. There must be no laminations or other imperfections. Hot taps shall only be made in lamination-free areas with adequate metal thickness.

BURN THROUGH PREVENTION

To minimize the possibility of burn-through, the first weld pass on the equipment should be performed using a 3/32-inch diameter, welding electrode. Subsequent passes should be made with a 1/8-inch diameter electrode or less, if the metal thickness does not exceed 2 inches. In many situations, low hydrogen rods may be preferable to reduce the possibility of burn-through.

For a wall thickness greater than 2 inches, where burn-through is not a primary concern, larger diameter welding electrodes may be used.

METAL THICKNESS

Generally, a minimum base metal thickness of 3/16 inches is recommended for hot tapping. Exceptions to this recommended thickness may be permitted when metallurgical requirements and pressure limitations specified by company authorities are achieved. Welding on thin material can result in overheating and burn-through. If practical, temporarily reduce the pressure and/or temperature within the equipment to provide an additional safety factor while welding takes place.

METAL TEMPERATURE

If the metal temperature is less than 500^{O} F, heating of the weld area before actual welding should be considered. Generally, welding should not be performed on lines or equipment when the atmospheric temperature is less than -50^{O} F, unless special consideration is given to the base metal characteristics, welding electrodes, and a method of metal preheating. Hot tap machines should also be reviewed for suitability of use at low temperatures. Without exception, all hot tapping shall be limited to the pressure/temperature rating of the hot tap machine.

STRESS RELIEF

Some equipment is unsuitable for hot tapping because the metallurgy or thickness of metal requires stress relieving, which normally cannot be performed while the equipment is pressurized. Special treatment is required for high tensile strength alloy steel, in addition to the use of special welding electrodes. The hot tap fitting and welding rod metallurgy must be compatible with the metallurgy of equipment to be tapped.

CHEMISTRY OF LINE OR VESSEL CONTENTS

The oxygen level within the line or vessel must be controlled to prevent the formation of a vapor/air mixture within the flammable or explosive range. In addition, the contents of the line or vessel being hot tapped must not contain:

- Hydrogen, if the equipment has operated above the Nelson curve limits, due to the possibility of hydrogen attack on the pipeline or vessel metal. (Refer to API RP 941, “Steels for Hydrogen

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

- Acids, chlorides, peroxides, or other chemicals likely to decompose or become hazardous from welding heat.
- Caustic or amine, if the concentration and temperature are such that the fabrication specifications call for stress relieving.
- Certain unsaturated hydrocarbons that may result in exothermic decomposition reactions (example: ethylene), if the metal temperature change from the result of welding could initiate such a reaction at the maximum expected pressure. Such reactions can result in localized hot spots on pipe or vessel walls, which could lead to failure.

BASE METAL SUITABILITY

The base metal thickness must be able to provide the required support for the new connection and the hot tap machine or shall be properly reinforced to assure such support. The base metal must be free of laminations, hydrogen attack, or stress corrosion cracking (fissuring). There must be no other imperfections that would prevent a sound and acceptable weld from being made. Stress relieving of the welded area must not be required.

SPECIAL CONDITIONS

Recognizing the variety of situations that can occur when performing hot taps, the following special conditions should be considered:

Tanks in Service:

- Never pump into or out of a tank while hot work is in progress.
- All valves on liquid lines at the tank should be closed, tagged, locked, or otherwise rendered inoperative.
- Discontinue operation of all mechanical tank mixers.
- Avoid any procedures associated with the operation of gas-blanketing valves or other valves, which could cause venting.
- Turn off all heating coils during the hot tap procedure.
- Maintain at least 3 feet of liquid above the actual hot work area when welding or hot tapping is being performed.
- A hand tape gage measurement of the tank contents should be made to positively confirm the liquid level, recognizing that automatic or remote reading gages may not always be reliable enough for this critical measurement.
- Never hot tap above the liquid level in an atmospheric pressure petroleum storage tank. To do so can result in a tank explosion.

Floating-Roof Tanks:

- Hot work should not be permitted on the deck of a floating-roof tank in flammable/combustible hydrocarbon service, except under approved and very carefully controlled conditions. Emergency exit plans and associated safety/fire precautions must be identified and in place prior to work on such tanks.
- Floating-roof tanks are typically subject to unique flammability hazards due to the potential for hydrocarbon liquid/vapor in the following areas:
  - Inside the pontoons

- Between the deck and liquid surface near the tank roof cage float compartment
- Near the roof seal vent
- Near the floating roof lift leg vent
- Between the primary and secondary seals

Work Above or Below Grade or in Congested Areas

- For work above and below grade or in congested areas, an easily accessible exit and personnel escape route must be provided.
- To ensure that excavations are safe for entry and hot work, tests for oxygen deficiency and the presence of flammable and toxic material should be performed in accordance with Corporate Standard, "Work Permit", or the facility/location equivalent.
- If the potential for oxygen deficiency or a toxic material is present, an air mover or similar positive means of ventilation shall be provided.
- Respiratory protective equipment may be necessary to protect personnel from potentially toxic atmospheres or from vapors/fumes because of welding.

Compressed Air in Lines or Vessels

- Welding will not be performed on compressed air lines or air receivers under pressure. Such equipment may contain a residue of lubricating oil or carbonaceous material, which can ignite or explode.
- Even when de-pressured, welding shall only be performed following thorough cleaning or when additional steps have been taken to assure that either oxygen or combustible materials are not present inside the line.
- Welding shall not be performed on lines or vessels containing pure oxygen or oxygen-enriched atmospheres.

Lined Piping or Equipment

Hot tapping shall not be performed on lines or equipment with cladding or with glass, lead, refractory, plastic, or strip linings.

Cased Lines

If an underground line runs through a casing, care must be taken to ensure that the welding is performed on the line and not on the casing, and that the annular space is gas-free.

Downstream Equipment

Avoid hot tapping upstream of rotating equipment or automatic control valves, unless such equipment is protected from the cuttings by filters or traps.

SAFETY/HEALTH PRECAUTIONS

Since hot tap operations are often performed on hydrocarbon or chemical lines, the following recommendations will be considered when performing such work:

- Review the MSDS for the product in the line that will be hot tapped.
- Minimize skin contact with liquid and the breathing of vapors.
- Keep the product away from your mouth. Liquids are typically harmful or fatal if swallowed.
- Keep work areas clean and well-ventilated.

- Clean up spills promptly.
- Use soap and water or waterless hand cleaner to remove any petroleum product that may contact the skin. Do not use gasoline or similar solvents to remove oil and grease from skin.
- Promptly wash oil-soaked clothes and avoid using oil-soaked leather goods.
- Utilize appropriate personal protective equipment

The toxicity of welding fumes depends on the composition and concentration of the welding fumes produced. The composition and quantity of fumes depend on the materials being welded, the welding rods used, and any coatings or paints present and the welding process used. Toxic fumes are generated from welding on metals coated with or containing alloys of lead, zinc, cadmium, beryllium, and certain other metals. Some paints may also produce toxic fumes when heated. The potential health effects vary significantly in type and severity and in the worst case can be extremely serious or fatal.

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