1. PURPOSE AND BENEFITS

1.1 To establish a controlled procedure for installing Hot Taps and Stopples in plant piping systems. Hot taps on pressure vessels are excluded from this procedure.

2. DEFINITIONS

2.1 Contractor
2.1.1 The company that supplies the hot tap machine and its operating personnel.

2.2 Coupon
2.2.1 The part of the pipe that is removed by the hot tap machine.

2.3 Hot Tap
2.3.1 The attachment of a branch connection to piping that cannot be isolated, depressurized, or cleared.

2.4 Job Coordinator
2.4.1 The individual requesting the hot tap and shall have overall responsibility for the job.

2.5 Stopple
2.5.1 The installation of a flow blocking device in a piping system that cannot be isolated, depressurized, or cleared.

3. SCOPE

3.1 This procedure applies to all hot taps and stopples performed on piping systems at the Geismar Site.

3.2 “Cadwelding” of cathodic protection attachments is excluded from this procedure.

3.3 Hot taps on ASME coded pressure vessels are excluded from the scope of this procedure. Should it become necessary to install a nozzle on a pressure vessel or tank by means of a hot tap, such installation shall be designed by the TES Pressure Vessel Engineer who shall detail a procedure based on API Recommended Practice 2201 “Procedures for Welding or Hot Tapping on Equipment in Service”, Latest Edition. The procedure shall provide a finished installation that is in compliance with all safety and code requirements.
4. **PROCEDURE**

4.1 Hot Taps shall not be installed on piping that can be shut down for sufficient time to allow other methods of making tie-ins, or where the hot tap can be delayed until an upcoming shutdown. To ensure compliance with OSHA's Lockout/Tagout Standard under 1910.147, the hot tap must be justified. The OSHA standard stipulates that hot tap operations are exempt from the requirements of the standard if the employer could demonstrate that:

4.1.1 Continuity of service is essential;
4.1.2 shutdown of the system is impractical;
4.1.3 documented procedures and special equipment are utilized which will provide effective protection for employees.

It must be recognized that no hot tap is trivial; even if the fluid is not hazardous, a hot tap represents a potential danger to personnel and to plant operations.

4.2 Hot taps are **not permitted** on lines containing:

4.2.1 Acetylene
4.2.2 Amines
4.2.3 Ammonia
4.2.4 Caustic
4.2.5 Chlorides that decompose on heating
4.2.6 Chlorine
4.2.7 Materials that may decompose, polymerize, explode, or detonate upon severe heating (such as chlorides, peroxides etc)
4.2.8 Oxygen
4.2.9 Combustible vapor/air/oxygen mixtures within flammable and/or explosive ranges

4.3 Hot taps shall not be made on lines that are clad or lined

4.4 Hot taps shall not be permitted on lines where stress relieving is required.

4.5 Hot taps made on breathing air or potable water lines must be reviewed to ensure downstream users will not be affected by metal shavings which may enter the lines.

4.6 Hot taps made upstream of machinery, that is not adequately protected by filters and cannot be isolated, should be carefully considered and "loss of coupon" procedures must be developed since metal shavings or the coupon can enter the line.

4.7 Hot taps made upstream of instrumentation should be carefully considered as the instrumentation may be damaged by shavings or the coupon entering the line.

4.8 The hot tap shall be located:

4.8.1 at least 18 inches from all flanges or threaded connections
4.8.2 at least 3 inches from any weld seams.

4.9 The location of the hot tap shall provide for:
4.9.1 Clearance for the machine
4.9.2 Support for the machine
4.9.3 Bending moments applied to the piping by the machine
4.9.4 Support requirements for the pipe being hot tapped due to additional weight of the fittings and branch line
4.9.5 Availability of air or electric power for the hot tap machine
4.9.6 Easy and safe egress for personnel making the hot tap, and easy access for emergency personnel.

4.10 Thickness measurements shall be taken in the location of the hot tap and extending out to either side for a minimum of 12 inches or the diameter of the pipe, whichever is greater. Calculations shall be made to determine suitability for hot tapping if any of the following conditions exist:

4.10.1 Thickness is less than 3/16”
4.10.2 Thickness is greater than 1.0”
4.10.3 Thickness is less than nominal thickness minus corrosion allowance.

4.11 If the flow in a line being hot tapped is within the following velocity ranges:
4.11.1 Liquid: 1.5 – 15.0 feet per second,
4.11.2 Gas or vapor: 25.0 – 200.0 feet per second,
then no engineering review is required. For liquid or gas velocities outside these ranges, the Piping and Pressure Vessel Engineer will review the hot tap as per API Recommended Practice 2201 "Procedures for Welding or Hot Tapping on Equipment in Service", Latest Edition.

4.12 Engineering review or mechanical calculations are not required if a weldment can be selected from Table 1. If a selection is not made from Table 1, the weldment will be designed by a pressure vessel engineer who will ensure compliance with all safety and code requirements, and recommend testing procedures.

4.13 Dye penetrant examination of the surface of a stainless steel pipe is required to ensure no stress cracking of the surface. If stress cracking exists, ultrasonic determination of suitability of pipe for hot tap shall be done by the Materials Engineer.

4.14 All welds on pressure containing parts shall be made using ASME Code certified welders.

4.15 To minimize the possibility of burn through when material thickness is ½” or below, the first weld pass shall be made with a 3/32” diameter welding electrode. Subsequent passes shall be made with a 1/8” electrode. Low hydrogen (E-7018) rods shall be used to reduce the chance of burn through. The E-7018 low hydrogen electrode is specified since flux gives the weld the characteristics of being lower penetrating than the conventional E-6010 electrode common for making pipe root passes. While E-6010 electrode is recognized as having advantages in field welding of piping, the concern over burn through has been weighted as more significant than the ease of welding. As an alternative, the GTAW (TIG) process may be used if the welding procedures are first approved by the Site Materials Engineer.

4.16 To ensure adequate strength in the welded fittings, only standard fittings that meet or exceed the strength requirements of the pipe specification shall be used.

4.17 Inspection of the welds and the weldment shall consist of the following:
4.17.1 Where conditions permit, for all hot taps, 100% of the root pass and 100% of the final pass of all welds shall be dye penetrant examined.

4.17.2 If dye penetrant examination is not possible, alternate testing methods will be determined by the TES Inspector and approved by the Staff Materials Engineer.

4.17.3 All weldments, complete with flange and valve, shall be pressure tested to assure integrity. Branch connections which utilize a re-pad or split tee reinforcement shall be hydrotested before installation of the re-pad or split tee. A hydro test at 150% of design pressure is preferred. When water contamination of the product is a concern, all water shall be removed subsequent to the hydrotest.

4.17.4 If a hydrotest is not possible due to operating temperatures, a pneumatic test at 110% of design pressure shall be performed. The pressure shall be raised in discrete steps, and held for a suitable period of time to relieve stress at each step. After the test pressure is achieved, the pressure will be reduced to design pressure prior to examination of the weldment.

4.17.5 Pneumatic testing of the re-pad or split tee is not required.

4.18 Full port gate or ball valves shall be used for all hot taps. Valves will be furnished by BASF and shall meet all requirements of the BASF Technical Standards. The valves shall be tested and certified leak-free by the Alliance Valve Test Shop. Special valves needed for stopples will be purchased by BASF and shall be tested by the Alliance Valve Test Shop prior to being issued to the contractor.

4.19 The Contractor is responsible for the safe operation of the hot tap machine. Drilling through the opposite side of the line is a serious concern. Contractor shall perform measurements and calculations to verify that the cutter or the pilot drill shall not penetrate through the opposite wall of the line being hot tapped; preferably the drill should not penetrate beyond the center of the pipe. For size-on-size or one size smaller connections, where the drill tip will have to move further into the pipe, measurements must ensure that drill will not contact the inner surface of the other side of the pipe. The Job Coordinator shall review these calculations.

4.20 Coupon retrieval shall be verified by the Job Coordinator. The Job Coordinator shall mark the coupon with the hot tap tie-in number and shall send the coupon to the Site Materials Engineer.

5. **RESPONSIBILITIES**

5.1 The TES Director is responsible for administering this Hot Tap Procedure.

5.2 The Job Coordinator is responsible for implementing this procedure. He may be a Project Engineer, Construction Engineer or TES Mechanical Engineer. He is responsible for obtaining all permits, in-house work and Contractor work. He is also responsible for verifying removal of the coupon.

5.3 Approvals shall follow the Management of Change guidelines given in TES Administrative Procedure No. 8 “Change Approval Procedure”.

5.4 The TES Inspector shall verify line thickness and surface condition prior to hot tapping. He shall inspect welds while the weldment is being installed, and verify pressure testing of the weldment.

5.5 The Area TES mechanical Engineer shall do mechanical design of the weldment, if required. If desired, he will be assisted by the Piping and Pressure Vessel Engineer.
5.6 The individual requesting the Hot Tap shall serve as the Job Coordinator and shall complete Section One of the Hot Tap Initiation Form. This section provides the basic requirements of the hot tap. An approved P&ID with the hot tap shown as a “tie-in” is required and the exact location of the hot tap must be marked in the field.

Note: The Job Coordinator shall review all other means of tie-ins prior to requesting a hot tap.

Note: If a weldment is not selected from Table 1, the Area TES Mechanical Engineer and the TES Piping and Pressure Vessel Engineer will assist with the design.

5.7 The Job Coordinator shall obtain the approval signatures required in Section Two of the Hot Tap Initiation Form. The Job Coordinator will send a copy of the completed first page of the form to the Safety Department to ensure that they are aware of the work. Hot taps installed on any lines covered by the OSHA PSM Standard require completion of a Process Change Authorization (or Management of change) using the format and approval procedure required by the process area in which the work is being performed.

5.8 Section Three of the form shall be completed by the Operations Engineer. This section will detail the required permits, any special procedures and any protective equipment required for performing the hot tap. The Operations Engineer will verify the field marking of the hot tap is correct.

5.9 Section Four shall be completed by the TES Inspector to verify the condition of the existing line prior to hot tap.

5.10 Section Five shall be completed by the Construction Engineer, with assistance from the Contractor. This section shall detail the space and utility requirements of the hot tap machine.

5.11 Section Six shall be completed by the TES Inspector to verify the weld quality of the branch connection prior to drilling of the hot tap.

5.12 Section Seven shall be completed by the Construction Engineer to verify the pressure testing of the weldment. The branch connection is to be pressure tested prior to installation of the repad or reinforcement tee.

5.13 Section Eight requires the Contractor to record the machine dimensions and calculations to ensure that the travel of the boring bar has been set such that it will not drill through the opposite side of the pipe being hot tapped. The Contractor is responsible for the retrieval of the coupon; however, the Job Coordinator shall verify that the coupon has been retrieved, marked with the tie-in number, and sent to the TES Inspector.

6. RELATED DOCUMENTS

6.1 The latest edition of the following codes and standards shall be used where applicable:

6.1.1 ASME Boiler & Pressure Vessel Code, Section VIII, Division 1, Pressure Vessels.

6.1.2 ANSI B31.3 Chemical Plant and Petroleum Refinery Piping

6.1.3 API Recommended Practice 2201 “Procedures for Welding or Hot Tapping on Equipment in Service”


6.1.5 Maintenance Administrative Procedure No.8 “Change Approval Procedure”.
### TABLE 1 - FITTING SELECTION TABLE

This table is to be used to select hot tap fittings for pipelines only. A selection from this table does not require engineering review or mechanical calculations.

<table>
<thead>
<tr>
<th>HEADER PIPE SIZE</th>
<th>BRANCH SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&quot; 1-1/2&quot; 2&quot; 3&quot; 4&quot; 6&quot; 8&quot; 10&quot; 12&quot; 14&quot; 16&quot; 18&quot; 20&quot; 24&quot;</td>
</tr>
<tr>
<td>1&quot; T or W</td>
<td></td>
</tr>
<tr>
<td>1-1/2&quot; T or W T or W</td>
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<td>2&quot; T or W T or W</td>
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</tr>
<tr>
<td>8&quot; W W W P T T T</td>
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</tr>
<tr>
<td>10&quot; W W W P P T T</td>
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<tr>
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<tr>
<td>14&quot; W W W P P P P T T T T</td>
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<tr>
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</tr>
<tr>
<td>24&quot; W W W P P P P P P P P P P P T T T T T T</td>
<td></td>
</tr>
</tbody>
</table>

**SYMBOLS**

- **W** - Integrally reinforced fitting (weldolet).
- **T** - Full encirclement split tee.
- **P** - Reinforcement pad is required. Pad width shall equal half of branch nominal size, and thickness shall be no less than the header pipe wall thickness.

**NOTES**

1. For branch diameters greater than 2", reinforcement is required - either repad or split tee as shown in Table 1. 1/8" NPT tapped holes shall be provided in pad or tee and shall be sealed with RTV sealer. A hydrotest/pneumatic test of the pad or split tee is not required.
2. All branch fittings must meet or exceed main pipe schedule.
SECTION ONE

**Existing Line To Be Hot Tapped**

Line Number: _______ Pipe Specification: _______ Pipe sch./ thickness: _______

Pipe Material: _______ Process Fluid: _______ Operating Pressure: _______ psig

Temperature: _______ deg F Corrosion Allowance: _______

Fluid Flow velocity: _______ ft./sec. ( ) Liquid ( ) Gas/vapor

**Branch Connection**

Line Number: _______ Size _______ P&ID Number _______

Tie-in Number: _______ Is a Sketch attached? ( ) Y ( ) N

Type of full port (ball/gate) valve desired (see TS 12-130-03)

Location of Branch Connection has been marked in field? ( ) Y ( ) N

Orientation of Branch Connection:

   Horizontally (North = 0 deg) _______ Vertically (Top = 0 deg) _______

Weld fitting: Chosen from Table? ( ) Y ( ) N

If not chosen from table name of design engineer:

( ) Weldolet ( ) Socolet ( ) Threadolet ( ) Saddle ( ) Full encirclement split Tee Other _______

Fitting Size _______ Material _______ Schedule _______ Rating _______

Flange Size _______ Material _______ Rating _______ psig

Full port valve Type _______ (per 12-130-03) Valve Spec. _______ Size _______

Gasket Material _______ Bolting Material _______ Distance OD of pipe to face of flange _______

Butt weld Location _______ Size _______ Location _______ Size _______ WPS# _______

Fillet weld Location _______ Size _______ Location _______ Size _______ WPS# _______

NDE required ( ) Root pass dye check ( ) Final pass dye check ( ) Radiography ( ) Ultrasonic

( ) Hydrostatic test @____ psig ( ) Pneumatic test @____ psig

Hydrotest dry out by ( ) Nitrogen ( ) Dry air ( ) Vacuum pump. Allowable water vapor content _____ ppm

**Hot Tap location has been marked in the field** ( ) Y

Name of Requestor ____________________________ Department/Ext. ____________________________

Signature ____________________________ Date ____________________________
To ensure compliance with OSHA’s Lockout/Tagout Standard under 1910.147, the hot tap must be justified. The OSHA standard, as proposed, stipulated that hot tap operations would be exempt from the requirements of the standard if the employer could demonstrate that: (1) Continuity of service is essential; (2) shutdown of the system is impractical; and (3) documented procedures and special equipment are utilized which will provide effective protection for employees.

Details of Requirement for continuity of service and/or impracticality of system shutdown:

_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________

NOTE: Operation Signatures signify that the Hot Tap location and size are correctly identified, that the risks of performing a hot tap and the alternatives to a hot tap have been reviewed, and that performing a hot tap is necessary.

___________________________________  ___________________________________
Operation Engineer               Date

___________________________________  ___________________________________
Operation Manager                Date

NOTE: TES Signatures signify that the hot tap design and installation plan meets all code and BASF technical requirements.

___________________________________  ___________________________________
TES Mechanical Engineer              Date

___________________________________  ___________________________________
TES Technology Manager              Date

NOTE: Safety Signature indicates that Safety Department is aware the hot tap is being performed.

____________________________________________
Safety Department Representative
SECTION THREE  Special Procedures  To be completed by Operations Engineer

Hot tap position is marked in the field and the location marked is verified correct. ( ) Yes

Permits Required: ( ) Work Release  ( ) Hot Work  ( ) Line Breaking  ( ) Fire Watch  ( ) Tag Outs

Other Special Procedures Required

____________________________________________________________________________________________

____________________________________________________________________________________________

____________________________________________________________________________________________

Personal Protective Equipment Contractor will be Required to Provide

____________________________________________________________________________________________

____________________________________________________________________________________________

At time of welding or drilling of hot tap
Can Line be depressurized or pressure reduced? ( ) Y ( ) N  Line Pressure _____psig  Temperature _____deg F

Contingency Plan for

Loss of coupon

Weld burn through

Emergency access/egress

Operations Engineer  Date

SECTION FOUR  Line Inspection  Before Welding  To be completed by TES Inspector

NOTE: Do not perform inspections or sign this form unless the exact location of the hot tap is marked in the field.

Was the hot tap location marked in the field?  Y ( )

Inspections Results before welding:

Indications of surface stress corrosion cracking

Measured wall thickness ________"

Additional Remarks:

____________________________________________________________________________________________

____________________________________________________________________________________________

____________________________________________________________________________________________

____________________________________________________________________________________________

____________________________________________________________________________________________

Inspector Signature  Date
SECTION FIVE  Hot Tap Machine Requirements  To be completed by Const Eng with Assistance from Contractor

Hot Tap Machine Model No _____  Size _____  Weight _____ lb  Requires ( ) Air  ( ) Elect. Power

Support required for: ( ) Line  ( ) Branch connection  ( ) Hot Tap Machine  ( ) Sketch attached  Sketch No. __________

MAWP of attachment by Mech Calcs _____ psig at _____ deg F.  Nozzle pad OD _____"  Thickness _____"

Weld burn through preventive procedure  ( ) Y  ( ) N  Procedure: ____________________________________________

Special Concerns
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________

WPS Approved by __________________________

Construction Engineer               Date

SECTION SIX  Inspection of Weldment  To be completed by TES Inspector

Root pass dye check  ( ) Passed  ( ) Failed  Inspector ________________  Date ________________

Final pass dye check  ( ) Passed  ( ) Failed  Inspector ________________  Date ________________

( ) Radiography  ( ) Other _______ ( ) Passed  ( ) Failed

Remarks ____________________________________________________________________________________

TES Inspector Signature               Date

SECTION SEVEN  Testing of Weldment  To be completed by Const Eng with Assistance from Contractor

Welder: Code Certified?  Y ( )  Welder’s Name ________________________________________________

Valve Tested Before Installation?  Y ( )  Name of Shop performing Test __________________________

Pressure Test of branch weld:  ( ) Hydro  ( ) Pneumatic  Test Pressure _________ psig  ( ) Passed  ( ) Failed

( ) Radiography  ( ) Other ____________________  ( ) Passed  ( ) Failed

Contractor Supervisor Signature ________________  Date ________________
SECTION EIGHT  Hot Tap Machine Operation  To be completed by Contractor

Hot Tap Machine Used _____ Wt _____ lb  Supports required? ( ) Y ( ) N

Max Working pr _____ psig  Test date ________________

Complete Dimensional Checks (see machine dimension sheet)

Boring bar travel set at _____ "  Do-Not-Exceed dimension _____ " to prevent drill through.

Coupon holding pins on cutter ( ) Y ( ) N  Number __________

Coupon Retrieved.  Verified by Job Coordinator, marked with tie-in number and sent to Site Materials Engineer on

(Date) __________________________.

___________________________________________________________________________________________

Contractor Supervisor Signature  Date
### HOT TAP MACHINE DIMENSION & CALCULATION SHEET

<table>
<thead>
<tr>
<th>BRANCH SIZE &quot;</th>
<th>TAP SIZE &quot;</th>
<th>FLANGE RATING lb</th>
<th>DIMENSION 'A' MAX &quot;</th>
<th>DIMENSION 'B' MIN &quot;</th>
<th>DIMENSION 'C' MIN &quot;</th>
<th>TOPAZ MODEL</th>
<th>WEIGHT lbs</th>
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<td>82 (106)</td>
<td>31</td>
<td>660 (760)</td>
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</tr>
</tbody>
</table>

**NOTE:**
- These are dimensions/weights for a typical (Topaz or T D Williamson) machine for planning purposes only. These parameters may vary for a different machine.
- Values given in parentheses are for a heavier and larger machine.
Hot Tap Machine Used
Pipe OD to face of valve flange (A) _____"
Machine end to adapter flange (B) _____"
Machine width (C) _____"
Check Clearance to operate machine ( ) Y
Valve flange to plug/gate (D) _____"
Header pipe inside radius (R) _____"
Header pipe nominal thickness (T) _____"
Retract boring bar: adapter flange to drill tip (E) _____"  E < D to allow valve to close ( ) Y
Drill tip projection from cutter (F) _____".  F < R to prevent contact with back of pipe ( ) Y.
Boring bar travel - Drill to touch pipe OD (A-E) _____ - _____ = _____"
Cutter to touch pipe OD (A-E+F) _____ - _____ + _____ = _____"
To prevent drill from going through other side of pipe:
  Do not exceed (A-E+R+T) _____ - _____ + _____ + _____ = _____"
Only for size-on-size and one size smaller:
  Do not exceed (A-E+T+2R) _____ - _____ + _____ + 2 X _____ = _____"
Boring bar travel stops set to limit travel to ______"
Boring bar travel is less than Do-not-exceed dimension? ( ) Y