1 Status

1.1. Update of existing policy, effective 06/03/11.

2 Purpose

2.1. To outline minimum requirements for personnel who perform line breaking or equipment and vessel opening activities.

3 Applicability

3.1. This policy applies to all subsidiary companies and departments of the Cianbro Companies.

4 Definitions

4.1. Blanking or Blinding: The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore opening and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

4.2. Cleared Lines: Pipelines or equipment that have been drained, vented, flushed, and verified to be clear of any hazardous residue, plugs, or pressure.

4.3. Double Block and Bleed: The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

4.4. First Line Break: The initial opening of lines or equipment after appropriate preparation.

4.5. Hot Tap: Mechanical methods of adding a new tie-in or drain point to an existing piping service or equipment without interrupting the existing service.

4.6. Immediately Dangerous to Life and Health (IDLH): An atmospheric concentration of any substance that:
- Poses an immediate threat to life or
- Would cause irreversible or delayed adverse health effects or
- Would interfere with an individual's ability to escape from a dangerous atmosphere.

4.7. Line Break: Opening of drained or undrained lines or equipment by disconnecting flanges, opening valves, breaking pipe joints, removing blanks or opening ports and penetrating a line by mechanical or other means.

4.8. Line Breaking: The physical opening or breaking apart of a portion of a process system which contains/or is suspected to contain hazardous or unknown materials.

4.9. Undrained Lines: Any line or equipment system that has not been drained or flushed clear through existing drains, vents, or bleed valves.
5 Policy

5.1. These requirements of this policy will be followed anytime a line, vessel, or equipment must be penetrated or opened.

6 Responsibilities

6.1. The Corporate Safety Officer or designee is responsible for providing approval for deviations from this policy.

6.2. The Manager of the job site is responsible for the implementation of this policy on the job site.

6.3. Corporate Safety is responsible for maintaining this document.

6.4. The line break supervisor is responsible for filling out and getting approval of the line break permit.
7 Line Breaking/Equipment Opening Procedure Index

7.1 Planning ...............................................................................................................................................3
7.2 Training ................................................................................................................................................3
7.3 Emergency Procedures .......................................................................................................................3
7.4 Double Block and Bleed Requirements ..............................................................................................4
7.5 Line Breaking Procedure .....................................................................................................................4
7.6 Changes to Plan ..................................................................................................................................8
7.7 Ending the Permit ................................................................................................................................8
9 Related Documents .............................................................................................................................8

7.1 Planning

7.1.1 Activity Plan
A detailed activity plan is required that addresses the line break or line breaks that will be performed that day with a thorough hazard analysis and hazard controls identified. In addition to engineering and administrative controls, the activity plan will detail the area to be barricaded and what PPE will be required. Hazards include chemicals, pressure, heat and cold, flammable atmosphere, and potential for IDLH atmosphere.

7.1.2 Identification of initial Break Point
The break points must be clearly identified in the activity plan. They must also be marked at the actual point the break or tap will take place or as close as humanly possible by attaching a visual indicator or tag. Show the break point to all team members who will be participating in the activity.

7.1.3 Line Break/Equipment Opening Permit
A completed and signed permit is required before any initial line breaking, flange breaking, hot tap, or vessel opening of any new system. See form SD839 available out on Cianbro.net/Resources/Forms.

7.1.4 Exceptions to this policy: Equipment maintenance, propane tanks, all temporary compressed gas cylinders (oxygen, acetylene, map gas, chemtane shielding gases, etc.), all temporary compressed air lines, all temporary water lines. All water and air lines that can be locked out and drained and certified zero energy.

7.1.5 Vessel exceptions: If a visual observation of the tank or vessel can be done, and proven empty and a drain can be kept opened.

7.2 Training
All team members taking part in the activity must be trained in the following:
• The requirements of this procedure
• How to interpret the requirements on the line breaking permit
• Required PPE
• Hazcom – specific hazards of the chemicals that could be encountered during the activity including a review of the MSDS sheet(s)

7.3 Emergency Procedures
(must be included in the activity plan)

7.3.1 Locations of nearest emergency eyewash stations and showers

7.3.2 Methods to summon emergency services

7.3.3 Evacuation routes and procedures

7.3.4 Any pertinent emergency first aid measures
7.4 Double Block and Bleed Requirements

7.4.1 Whenever we are performing line breaking on a system containing acid (ph > 5), caustic (ph > 10), high heat (> 200 degrees), high pressure (> 100 lbs.), flammable materials (flash point < 120 degrees), or IDLH atmospheres; double block and bleeding is required on each side of the line break location (if it is physically possible). If it is not physically possible, methods must be identified and implemented to provide the same level of protection.

7.5 Line Breaking Procedure
Regardless of the initial planning and precautions taken, the initial checking done and the instruments employed to test the lines or equipment, it must always be assumed that at the point where the line is to be broken contains product or gas that will spurt out. Anticipate the unknown and unplanned cross connection.

7.5.1 Scope
Line breaking operations include, but are not limited to, the opening of or working on any process lines, their connected fittings or valves, gauges, sight glasses, pumps or vessels that contain or have ever contained hazardous liquids or gases. The replacing of packing in pumps in place, or on the agitator shafts of pressure vessels are also considered to be line breaking operations.

7.5.2 Line Break Permits
A line breaking permit must be completed by the supervisor in charge of the work. A properly completed line breaking permit must be attached to the activity plan and reviewed with all team members. The permit must be reviewed and hazardous conditions identified at the start of each shift in the new activity plan when new personnel take over and continue the job. The new incoming supervisor must sign off on the permit. Each crew member must sign off on the activity plan.

7.5.3 Personal Protective Equipment

A. The required PPE must be identified in the activity plan and line break permit. In the case of potential IDLH atmospheres, the PPE will include SCBA or supplied air respirators with an escape bottle. All team members must be trained in the PPE to be used. For respiratory protection refer to 005 Respiratory Protection Program Policy and Procedure.

B. For each of the hazardous materials listed below, the following minimum protective gear and clothing is required for line breaking jobs. All jobs must be evaluated for additional protective gear and clothing requirements and any additions should be recorded on the permit. (List is not inclusive, PPE and clothing must be identified for any hazardous situation not listed below)

1. All items include a hard hat. All items include safety glasses with side shields unless otherwise specified (e.g. chemical safety goggles).
2. Corrosive Materials: (Acid, Oleum, and Caustic)
   a. Chemical resistant suit: Coat and overalls made of rubber, neoprene, or PVC.
   b. Face shields
   c. Goggles
   d. Gloves: gauntlet type made of neoprene, PVC or an equally resistant material
   e. Rubber boots with steel toes
   f. Respirator if needed. (Worn in accordance with the written site specific respirator plan)
3. Petroleum Materials: (Gasoline, Propane, Diesel, Butane, LNG, etc)
   a. Nomex coveralls: Rain Coat, overalls - rubber, neoprene, or PVC
b. Rain hood (e.g. Overhead Work, jobs that take place above the waist.)
c. Face shields
d. Goggles
e. Gloves: gauntlet type made of neoprene, PVC or an equally resistant material
f. Rubber boots with steel toes
g. Respirator if needed. (Worn in accordance with the written site specific respirator plan)

4. Hazardous Material: (Sewage, Sanitary and Mold)
a. Tyvek suit: Coveralls (Coated if liquid materials)
b. Face shields
c. Goggles
d. Gloves: gauntlet type made of neoprene, PVC or an equally resistant material
e. Rubber boots with steel toes
f. Respirator if needed. (Worn in accordance with the written site specific respirator plan)

5. Steam Lines:
a. Face shield
b. Leather gloves

6. High Pressure Air Lines or Natural Gas Lines:
a. Face Shield
b. Leather Gloves

7. Nitrogen Lines:
a. Face Shield
b. Leather Gloves
c. Respirator if needed. (Worn in accordance with the written site specific respirator plan)

7.5.4 Safe Precautions and Methods For Line Breaking

A. Breaking a line is in essence breaking into a closed system. You cannot guarantee that all piping systems and equipment are completely drained, contain no plugs, or are free of pressure even after the first connection has been broken. There is an added hazard that when cooling occurs, vacuums, which may be holding liquids in pockets, often break without warning and liquid is released to run to the lowest point. Plugs, particularly solidified process materials, can move and release materials well after the first connection has been broken.

All systems must be considered as having the potential to discharge hazardous liquid from open ends of line or broken flanges at any time, even after the line has been drained and vented.

B. The following requirements must be met for all line breaks:

1. A completed line break permit will be filled out and in the possession of the job foreperson.

2. When deemed necessary by the Cianbro project manager. The Client/Owner or his/her designee competent supervision (e.g. Production Supervisor, Maintenance Foreman or Lead Person) will approve and sign-off on the line breaking permit prior to starting the work.
3. Client/Owner or designee shall flush, neutralize or, at a minimum, drain systems (i.e. - washout, steam, clear blockages, open drains and vents, depressurize, lockout/tagout, etc.) prior to Cianbro beginning line breaking. They should make sure to contain any residual product and remove it from the work area.

4. When performing a line break on a system which contains a hazardous substance, a water hose or a suitable dilution agent will be stretched to the point of the line breaking, with the water running or charged and isolated at the end. Take necessary precautions if the hose could freeze.

5. Conduct lockout following Cianbro’s Zero Energy State Policy and Procedure. In addition, in cases where pumps are actuated only by a float valve, or where it is not possible to make a positive check on the lockout, the equipment will be isolated by either pulling the fuses, disconnecting wires or by some other means to deactivate the source of energy.

6. If such pumps, motors or equivalent are activated by mechanical devices such as floats, the devices will be operated manually to insure that the system has been deactivated by client/owner or his/her designee.

7. The portion of the line being worked on will be isolated from the rest of the system in the most effective way.

8. This will usually consist of either blanking or shutting valves and locking them. Where applicable, a client/owner department process foreman or a process operator, who is familiar with the individual valve, will be the judge of whether a valve is in the closed position. The supervisor will inspect the valve and determine that it is closed.

9. Prior to the actual line breaking, the area will be barricaded for maximum protection to passersby and nearby workers with red danger tape. A funnel or suitable container to collect the drainage will be used where applicable. Where floor openings are near, insure that liquids are isolated to prevent possible exposures on other floors below.

10. It is difficult to prescribe a general set of rules covering the precise and safest way to accomplish all line openings. All breaks will be thoroughly planned with a completed permit.

11. When dismantling or opening closed pressurized or gravity fed systems, internal pressure shall be relieved or other methods utilized to prevent sudden release of pressure or spraying of liquid. These will include:
   a. Loosen the bolts of a flange that are farthest from the team member first.
   b. Replace potentially corroded bolts one at a time prior to the actual line breaking.
   c. Shield wherever possible. Stand aside to avoid any spray.
   d. Flange spreaders or flange jacks should be used for opening flange joints whenever the use of such tools is possible and practical to minimize team member exposure.
   e. Where the use of such tools is impossible or impractical due to close quarters or size of pipe, standard wedges will be used as an alternate. In such cases, a suitable chain or a strong flexible wire must be attached to the wedge and the pipe line or other fixed objects so as to prevent the wedge from flying in the event it slips out of the joint.
   f. Wherever possible, old flange bolts will be removed one at a time and replaced with new bolts that can be gradually backed off as the wedge is being inserted. This will prevent sudden openings of the joint, particularly where it is under stress.
g. The use of drift pins, cold chisels, spud wrenches and similar tools as alternatives is not allowed.

12. Precautions in Breaking Lines with Explosive Mixture Hazards

a. Non-sparking tools must be utilized when breaking lines where there is potential for explosive mixtures. If bolts cannot be broken due to rust or corrosion, other means can be considered that minimizes the possibility for igniting the explosive mixture (e.g. Air or hydraulic operated impact wrenches).

b. When it is absolutely necessary to implement spark producing methods, the following procedures are mandatory:
   1. The line must be broken at the nearest flange where non-sparking tools can be utilized in order to vent the line.
   2. All flange bolts must be replaced one at a time without separating the flanged joint. Keep flange area cool. Use abrasive wheels as opposed to a torch to minimize heat and open flames.
   3. After all bolts have been replaced, the flange may be separated.
   4. The line must be separated and remain open to the atmosphere. The remaining portion of the line not being worked on must be blanked.
   5. Explosive meter tests must be taken by a qualified person.
   6. The person taking the explosive tests must insure that the meter used is properly calibrated and the calibration has been logged.
   7. If an explosive mixture is found, the line must be purged with air if a suitable inert gas can not be obtained (nitrogen) and then re-tested. This procedure is repeated until an explosive mixture is not found.
   8. A hot work permit must be issued to cover required hot work.
   9. If flange can not be pried apart easily then flange spreader, flange jack or wedges will be used.

13. Valve Bonnet Removal

a. When removing a valve bonnet, drain the line and place the valve in the open position before loosening the bonnet bolts.

b. Ball-and-plug valves may have pressure in the cavity under the stem packing and bonnet, regardless of the position of the valve and the pressure in adjacent lines.

c. Open, close, and re-open ball and plug valves that are to be removed from the system to relieve pressure after the line is drained.

14. Vessel/Equipment Opening

a. Vessel or equipment opening shall be treated the same as opening a large line. When access doors are to be removed, bolts and nuts will be left secured loosely until the hatchway has been loosened far enough to break the gasket seal. All team members must stand to the side of the hatchway opposite the direction in which it opens.

15. After Initial Line Breaking

a. After the initial break has been made, the work will proceed cautiously until the desired degree of dismantlement or replacement is effected.

b. Only one line breaking permit is needed for each individual system as long as the system can be verified 100% free from any additional hazardous material.

c. If system can not be verified hazard free then the original line breaking permit will be followed for each successive break in the same system.
16. Down Time After Line Breaking
   a. Where line breaking includes an extended period of down time following the breaking, such as in the replacement of a pump, the breaks in the system will be properly capped as with blind flanges or fry pans will be installed of the appropriate material of construction unless the lock out process zero energy policy can guaranty zero flow. In all cases, the blind flanges shall be of sufficient strength, and installed as to provide safe conditions of pressure, temperature and service.
   b. Safeguards such as locked switches and locked valves will be continued until the system is again a closed or continuous one.
   c. Where there is the possibility of a line refilling, a drain valve will be attached to the blank flange used.

7.6 Changes to Plan

7.6.1 Whenever conditions change from the original plan you must stop and reassess. If conditions are changed from those contained in the original permit, then a new permit must be completed and signed.

7.7 Ending the Permit

7.7.1 All openings of lines or systems made during the course of the job must be checked for closure before the job is considered to be complete and released for resumption of normal use. When the job is completed, the person performing the job should return the permit to the Cianbro safety specialist or designee and inform him/her that the job has been completed.

7.7.2 Safety personnel and/or location management will review the completed line breaking permits on a quarterly basis to ensure that suitable safety precautions are being taken in performing the work involved.

8 Budget / Approval Process

8.1 It is the responsibility of each jobsite to procure and provide all materials required and PPE requirements under this policy and to provide necessary training.

9 Related Documents

9.1 Document available on Cianbro.net>Standard Operating Procedures – on the SOP.

| Cianbro Corp Line Breaking Permit and Tag | SD839 |