Breaking into Hazardous Pipelines

Number	CSBP-GM-11-036-02				
Reasons for Creating or Amending Document	New or Amended Process				
Actual Change Details	Update to section 2.4 and Appendix 1 - removal of Fertiliser intermediate melts ands slurries and replaced with Fertiliser solution with a pH between 5 and 9. Also removal of Fertiliser scrubber liquors and replaced with Fertiliser solution with a pH outside of 5 and 9.				
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1. INTRODUCTION

This guide manual describes the process to manage the risks of breaking into hazardous pipelines. This guide has been developed to reduce the risk of injury or incident when breaking into a pipeline.

2. DEFINITIONS

2.1 BREAKING INTO HAZARDOUS PIPELINE

Breaking into a hazardous pipeline is any process that may allow the contents of the pipeline to escape. This includes but is not limited to:

- unbolting a flange,
- uncoupling a hose,
- unbolting in-line components such as valve stems,
- cold cutting the pipe with a saw,
- hot cutting with oxy acetylene equipment; and
- hot tapping.

2.2 COMMENCEMENT OF BREAKING INTO HAZARDOUS PIPELINE

Breaking into a hazardous pipeline is deemed to commence:

- immediately after a spanner or similar tool is fitted to start loosening the studs or bolts prior to the separation of a flange joint; or
- immediately after force is applied in the first movement of a mechanism which may lead to the escape of the pipeline contents; or
- the cutting of the pipe is commenced.

2.3 HAZARDOUS PIPELINE

A hazardous pipeline is any pipeline or inline equipment item (both fixed and portable) that could potentially contain:

- Stored energy
- A hazardous substance. A hazardous substance refers to any chemical or material that possesses a classification under the NOHSC criteria and which possess any of the following characteristics:
    - toxicity,
    - corrosive or reactive state,
    - human sensitivity, and/or
    - explosive or combustible state.
- Temperature less than -10°C

- Temperature more than 60°C

2.4 HAZARDOUS SUBSTANCE CLASSES

Recommended standards of PPE for each class of hazardous material are defined in Personal Protective Equipment (CSBP-GM-11-031-01) and Appendix 1.

CLASS 1 - substances are hazardous because of their physical condition, e.g.:

Ammonium nitrate melt and solution

Aqueous ammonia

Fertiliser solution with a pH between 5 and 9

Hot coating agent oil

Hot fuel oil,

Molten coating wax

Steam and hot condensate

Ammonium Nitrate Emulsion

CLASS 2 - substances are hazardous because of their chemical properties, e.g.:

Fluorosilicic acid

Hydrochloric acid

Phosphoric acid

Nitric acid / depressurised NOx systems

Sodium hydroxide (caustic soda)

Sodium hypochlorite (hypo)

Sulphuric acid

Fertiliser solution with a pH outside of 5 and 9

Sodium cyanide solution and slurry

Sodium cyanide powder

Methyldiethanolamine (MDEA)

Water treatment chemicals

Oxidiser Solution Additives (for AN Emulsion)

CLASS 3 - substances are hazardous because of the possibility that they may produce toxic gas in high concentrations, e.g.:

Anhydrous ammonia

Hydrogen cyanide gas

NOx gas

2.5 HOT TAPPING OPERATIONS

Hot tapping operations shall include the following:

a. Welding of a flanged spool piece to a pipe or vessel that cannot be depressurised of gas or liquid or verified as sufficiently as gas or liquid free.

b. Cutting a hole through the wall of a pipe or vessel using a hot tapping machine when the pipe or vessel cannot be depressurised of gas or liquid or verified as sufficiently as gas or liquid free.

2.6 PIPELINE MARKING

Pipeline marking shall be by using the Break In Location Tag (Appendix 2). The tag contains relevant information about the break in including:

a. work permit number;

b. hazardous material in the pipe,

c. name and signature of Permit Authoriser or Isolating Person placing the tag;

d. date tag is hung;

e. date tag is valid to; and

f. name and signature of the Permit Holder.

The tags will always be completed with a permanent marker pen.

Pipeline marking is required for all isolation and de-isolation break ins (e.g. spade installation and removal).

2.7 STANDBY PERSON

A person appointed to assist if an adverse situation was to arise. Duties may include:

a. Raising alarm and seeking aid,

b. Assisting in the use of safety showers, and

c. Keeping unnecessary personnel out of the work area.

2.8 ZERO ENERGY

A zero energy state is defined in Section 6.5 of the Work Permit Procedure (CSBP-GM-11-031-51).

3. BREAK INS CONDUCTED UNDER A WORK PERMIT

3.1 IDENTIFICATION OF BREAK IN LOCATION

The exact location of the break in must be identified prior to work commencing and the undertaking of a risk assessment. The following must occur:

- The Permit Authoriser (or Isolating Person for the Permit) and the Permit Holder must go to the break in location.
- The Permit Authoriser (or Isolating Person for the Permit) must attach the pipeline marker to the pipe at the exact location where the pipe is to be broken into.
- The Permit Holder must witness this marking and agree that this is the designated break in point by signing the break in location tag.

3.2 JOB SAFETY ANALYSIS (JSA)

A Job Safety Analysis (JSA) is required before breaking into any hazardous substance pipeline. Those developing the JSA must include a person that understands the process in the area and the hazardous materials involved. If the risk is assessed as extreme, then a Team Based Risk Assessment (TBRA) must be conducted.

If an extreme risk is identified the line break must not occur.

The work permit can only be issued after a TBRA is conducted and the resulting risk deemed acceptable (via written consent) by the Business Unit Manager or delegate.

The JSA should include reference to identification of the break in point and the appropriate level of PPE for the hazardous substance. Refer to section 2.4 and Appendix 1 to determine the required class of PPE.

3.3 HAZARDOUS SUBSTANCE PIPELINE ISOLATION

A Work Permit must be issued for all hazardous pipeline break ins. Isolations for line breaks must be completed in accordance with the Work Permit System (CSBP-GM-11-031-51).

DANGER

If a zero energy state cannot be proven, then the break in must not occur and the work permit must not be issued.

RESPONSE

The work permit can only be issued after a TBRA is conducted and the resulting risk deemed acceptable (via written consent) by the Business Unit Manager or delegate.

3.4 BREAKING INTO HAZARDOUS SUBSTANCE PIPELINE

When opening any pipeline by breaking a flange, always work defensively and take all the following precautions:

a. Obtain and wear the correct class of PPE and ensure its condition is suitable for use.

b. Barricade the area.

c. Test the safety showers in the area and consider having additional running water at the job site.

d. Radio contact is required if safety shower is not alarmed or if breaking into lines alone. Whenever practicable and in all cases in which Class 3 PPE is worn work should not be conducted alone.

e. Check that drain valves are not passing, check for heat, vibration and other tell tales of live equipment. IF THERE IS ANY DOUBT **STOP.**

f. Plan to collect any residual liquid and how to dispose of it correctly.

g. Work out of the line of fire (i.e. up-wind of flange).

h. Ensure the correct PPE is worn. This is the last line of defence and is MANDATORY.

i. Beware of sudden release of gasses or liquids when and after the line is broken.

j. Break the flange (if applicable) away from your body by slackening the far side of the join first.

k. Clean up any spillage immediately.

l. Decontaminate all tools and equipment used.

m. Leave the job site in a safe condition.

3.5 HOT WORK

Breaking into a hazardous pipeline using hot work methods will require a Hot Work Certificate as well as the Work Permit. Refer Guide Manual Hot Work (CSBP-GM-11-036-06).

Before opening or breaking into any pipeline using methods involving a possible ignition source, i.e. grinding or oxy cutting, ensure that the residual contents or atmosphere within the pipe is not flammable or explosive, for example: hydrogen in dormant sulphuric acid pipelines, ammonia gas, ammonium nitrate emulsion residue or dry ammonium nitrate deposits.

If there is any doubt about presence of flammable or explosive substances inside the pipeline, do not use hot work methods.

RESPONSE

Refer to **Hot Work (CSBP-GM-11-036-06)**

Note: For method of gas testing at location where pipeline is to be cut, refer to Guide Manual Gas Testing (CSBP-GM-11-031-33).

3.6 PROCEDURE FOR HOT TAPPING

To perform a hot tapping operation at CSBP the following conditions will apply:

a. The line does not contain Ammonium Nitrate Solution or Ammonium Nitrate Emulsion.

b. The hot tapping operation is acceptable only after all the risks have been considered and mitigated and the work scope and risk assessment signed off by a mechanical engineer.

c. In addition to a Hot Work Certificate, a hot tapping operation shall use one of the two hot tapping checklists CSBP-SF1158 and CSBP-SF1159. Refer to Section 5.1 for Record Keeping Table.

d. The pipe or vessel involved shall have its contents confirmed circulating and sufficiently full.

e. If it is deemed required as a condition of any hot work, then a competent person with a suitable fire extinguisher shall be present during the entire hot-work stage of the hot tapping operation.

f. The Permit Holder, with personnel working under their direction, that supervises the hot tapping operation shall be recognised as sufficiently experienced and competent to perform the task.

3.7 MAKING THE HAZARDOUS SUBSTANCE PIPELINE SAFE

To maintain a safe system of work after the pipeline has been broken into the following extra steps shall be considered in addition to isolations previously implemented:

a. Installing blanks on open pipes.

b. Maintaining area barricade while the line is open.

c. Plugging instrumentation tubing.

Note: Removing any blanks or plugs is the same as breaking into the pipeline and therefore this same procedure shall be followed.

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4. BREAK INS CONDUCTED UNDER OPERATIONAL PROCEDURES OR TASKS NOT REQUIRING A PERMIT

4.1 APPLICABLE SCOPE

Hazardous pipeline break in activities conducted as operational tasks or tasks not requiring a work permit are limited to the following activities when conducted on hazardous pipelines as defined in Section 2.3:

a) Disconnection of hoses or flexible couplings.

b) Disconnection of portable pumps.

c) Opening fixed drain, sample or fill lines (including cap removal).

d) Opening fixed inspections points or hatches.

4.2 TASK REQUIREMENTS

When opening any pipeline by the methods detailed in Section 4.1, always work defensively and take all of the following precautions:

a. Obtain and wear the correct class of PPE following the Personal Protective Equipment Procedure CSBP-GM-11-031-01 or applicable task exposure assessment and ensure its condition is suitable for use.

b. Ensure personnel are clear of the work area and if requires, barricade the area off.

c. Ensure clear access safety showers in the area and consider having additional running water at the job site.

d. Radio contact is required if safety shower is not alarmed or if breaking into lines alone.

e. Check that isolation valves are not passing, check for heat, vibration and other tell tales of live equipment. IF THERE IS ANY DOUBT **STOP.**

f. Plan to collect any residual liquid and how to dispose of it correctly.

g. Work out of the line of fire i.e. up-wind of break in point.

h. Plan for the potential sudden release of gasses or liquids when and after the line is broken.

i. Open the hazardous pipeline away from your body.

j. Clean up any spillage immediately.

k. Decontaminate all tools and equipment used.

l. Leave the job site in a safe condition.

5. BLOCKED AMMONIUM NITRATE (AN) LINES

As ammonium nitrate liquid can form blockages in lines and valves when allowed to cool, extreme caution should be taken to ensure effective protection is in place from hot solutions that may be released from equipment if any blockage or plugs dissolve or melt. It is acknowledged that it will not be possible to prove a zero energy state due to these blockages and a TBRA is not required however the following precautions must be undertaken:

a) lines and equipment to be flushed with demineralised water in an attempt to ensure blockages are not present prior to breaking into a pipeline that has contained ammonium nitrate;

DANGER

Steam should never be used to manually clear a blocked ammonium nitrate (an) line due to the risk of overheating the AN under confinement.

RESPONSE

Clear blocked ammonium nitrate (an) lines by flushing with warm condensate or demineralised water. Steam can only be used in an Ammonium Nitrate pipeline via the automated plant processes.

b) where a blockage is identified (water is not visually confirmed to be exiting a drain point in the line or equipment) it shall be reflected in the JSA for the task taking into account the quantity and temperature of AN which could be held up by a plug or blockage;

c) always break the flange away from yourself whilst wearing the correct PPE;

d) Class 1 PPE must be worn;

e) work must NOT be conducted alone;

f) barricade off all areas in which the AN could spill to ensure other personnel are not affected;

g) safety showers in the proximity of the work are to be checked to ensure they are functioning correctly. If safety showers are not present, then an additional adequate source of cool water (i.e. running hose) must be available at the break in location; and

h) expect a sudden release of hot AN at any time. Due to blockages hot AN may reside in pipe work behind frozen AN; if the frozen portion gives way or is cleared it may suddenly release the hot solution.

6. AMMONIUM NITRATE EMULSION LINES

As ammonium nitrate emulsion (ANE) exhibits very poor flow properties, residual material is likely to remain in lines following flushing. It is acknowledged that it will not be possible to prove a zero energy state due to the presence of residue and a TBRA is not required however the following precautions must be undertaken:

a) lines and equipment are to be flushed with plant air supplied from the ANE plant to remove the majority of the ammonium nitrate emulsion;

Steam or incompatible liquids should never be used to clear ammonium nitrate emulsion line due to the risk of overheating or sensitising the ANE.

Clear ammonium nitrate emulsion lines by flushing with plant air supplied from the ANE plant to remove the majority of the ammonium nitrate emulsion.

b) zero energy is considered proven when air blows clear from the drain point and ceases when the air supply is shut off;

c) plan for the collection of purged ammonium nitrate emulsion using buckets, scrapers and cleaning rags including the safe disposal of the waste material; and

d) hot work methods for breaking into ammonium nitrate emulsion lines are not permitted. If hot work is to be performed on the equipment it should be removed from serviced and thoroughly cleaned before the work commences.

DANGER

If the line or equipment has previously contained ammonium nitrate emulsion, do not use hot work methods to break into the line or equipment.

RESPONSE

Remove the line or equipment from service through flange break or cold work methods, decontaminate to the appropriate standard and then perform the hot work tasks. Refer to Hot Work (CSBP-GM-11-036-06) and Ammonia Ammonium Nitrate Decontamination Procedure (CSBP-GM-11-037-07).

7. REFERENCE DOCUMENTATION

Gas Testing (CSBP-GM-11-031-33)

Hot tapping Checklist: Hot Tapping Machine Operation (CSBP-SF1159)

Hot tapping Checklist: Welding Operation (CSBP-SF1158)

Hot Work (CSBP-GM-11-036-06)

Decontamination of Process Equipment (CSBP-GM-11-031-62)

Ammonia AN Decontamination Procedure (CSBP-GM-11-037-07)

Personal Protective Equipment (CSBP-GM-11-031-01)

STOP and Job Safety Analysis Risk Assessment (CSBP-GM-11-031-23)

Team Based Risk Assessment (CSBP-GM-11-030-02)

Work Permit System (CSBP-GM-11-031-51)

7.1 RECORD KEEPING

RECORD IDENTIFICATION		STORAGE MEDIA	STORAGE LOCATION	INDEXING METHOD	RETENTION PERIOD	AUTHORISED DISPOSER	DISPOSAL METHOD
Form No.	Document Title						
CSBP-SF1158	Hot tapping Checklist: Welding Operation	Paper	Maintenance Planner	Date and Task	12 months	Team Leader Equip. Support	Bin
CSBP-SF1159	Hot tapping Checklist: Hot Tapping Machine Operation	Paper	Maintenance Planner	Date and Task	12 months	Team Leader Equip. Support	Bin

APPENDIX 1 – MINIMUM PPE FOR CLASS 1, 2 & 3 PRODUCTS

CLASS '1' PROTECTIVE CLOTHING

- Safety helmet
- Chemical goggles worn with a face shield
- Heat resistant jacket or PVC jacket and trousers as appropriate
- Appropriate gloves
- Safety footwear

- Ammonium nitrate melt and solution
- Aqueous Ammonia
- Fertiliser solution with a pH between 5 and 9
- Hot coating agent oil
- Hot fuel oil
- Molten coating wax
- Steam & hot condensate

CLASS '2' PROTECTIVE CLOTHING

- Safety helmet
- Chemical goggles worn with a face shield
- PVC waterproof clothing (jacket and trousers or overalls)
- Appropriate chemical gauntlet gloves
- Rubber boots

- Fluorosilicic acid
- Hydrochloric acid
- Phosphoric Acid
- Nitric acid
- Sodium hydroxide
- Sodium hypochlorite
- Sulphuric acid
- Ferts solution pH <5 or >9
- Sodium cyanide solution and slurry
- Sodium cyanide powder *
- Methyldiethanolamine (MDEA)
- Water treatment chemicals
- Oxidiser Solution Additives

CLASS '3' PROTECTIVE CLOTHING

- Supplied air (full face piece) or self contained breathing apparatus
- Full PVC overalls with elastic hood
- Appropriate chemical gauntlet gloves
- Rubber boots

- Anhydrous ammonia
- Hydrogen cyanide gas
- NOx gas

Note: *A Standby person in Class 3 PPE is required when Class 3 PPE is worn.*

** Full face mask with ABEK canister is required for Sodium Cyanide Powder and Aqueous Ammonia evolving strong fumes in this instance instead of chemical goggles worn with face shield.*

APPENDIX 2 – BREAK IN LOCATION TAG