

## LINE BREAK SAFETY PROGRAM

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### PURPOSE / SCOPE

Worker received first degree burn when chemical in piping system dripped out onto their clothing while installing a pancake. The vessel had been drained, steam purged for 12 days, and was thought to be empty. However, there was residual chemical in the line that was pitched downward.

Serious incidents can occur at industrial plants when inadequately isolated or de-pressurized piping systems or vessels are opened up for maintenance or cleaning. Hazards include chemicals, pressure, heat and cold, and the potential for a flammable or toxic atmosphere. Risks need to be mitigated for activities such as opening drained or undrained pipelines or equipment by disconnecting flanges, opening valves, breaking pipe joints, removing blanks or opening ports and penetrating a line by mechanical or other means such as hot taps. Workers can be seriously injured or killed if they fail to use a safe line break procedure.

A line break is to be used for the initial opening of a process system (temporary or permanent) or equipment other than by designed access. A designed access may be a sample port, tank lid or inspections doors/panels.

### HAZARDOUS PIPELINE

A hazardous pipeline is any pipeline or inline equipment item that could potentially contain:

- ✚ Stored energy
- ✚ A hazardous substance. A hazardous substance refers to any chemical or material that possesses a classification under the NIOSH 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 14° F (-10° C)
- ✚ Temperature more than 140° F (60° C)

### HAZARD IDENTIFICATION

During line breaks, employees must be trained to identify and understand the potential hazards involved such as dangerous gases, hot dusts, toxic atmosphere, steam, temperature, flammable or combustible liquids, and corrosives. It is essential that all workers, including contract employees, are familiar with the line breaking policy in order to avoid confusion, accidents, damage, and injury. Additional potential hazards such as asbestos wrapping and lead coating are also identified.

### HAZARDOUS SUBSTANCE CLASSES

**CLASS 1 - SUBSTANCES HAZARDOUS BECAUSE OF THEIR PHYSICAL CONDITION, E.G.:**

- ✚ Ammonium nitrate melt and solution
- ✚ Aqueous ammonia
- ✚ Fertilizer intermediate melts or slurries
- ✚ Hot coating agent oil
- ✚ Hot fuel oil,
- ✚ Molten coating wax
- ✚ Steam and hot condensate

**CLASS 2 - SUBSTANCES HAZARDOUS BECAUSE OF THEIR CHEMICAL PROPERTIES, E.G.:**

- ✚ Fluorosilicic acid
- ✚ Hydrochloric acid
- ✚ Phosphoric acid
- ✚ Nitric acid
- ✚ Sodium hydroxide (caustic soda)
- ✚ Sodium hypochlorite (hypo)
- ✚ Sulphuric acid
- ✚ Scrubber liquors
- ✚ Sodium cyanide solution and slurry
- ✚ Sodium cyanide powder
- ✚ Methyldiethanolamine (MDEA)
- ✚ Water treatment chemicals
- ✚ Biocides i.e. Intake

**CLASS 3 – SUBSTANCES HAZARDOUS BECAUSE OF THE POSSIBILITY THAT THEY MAY PRODUCE TOXIC GAS IN HIGH CONCENTRATIONS, E.G.:**

- ✚ Anhydrous ammonia
- ✚ Hydrogen cyanide gas
- ✚ Nitrogen oxides (NOx) poisonous gases

**COMMON SUBSTANCES WINGER EMPLOYEES MAY BE EXPOSED TO:**

- ✚ Acetic acid, FP = 104°F
- ✚ Acetic anhydride, FP = 120°F
- ✚ Acetone
- ✚ Acetylene
- ✚ Ammonia
- ✚ Benzene
- ✚ Butane
- ✚ Carbon Monoxide
- ✚ Chlorine Dioxide
- ✚ Citric Acid
- ✚ Dowtherm RP
- ✚ Ethane
- ✚ Ethanol
- ✚ Ethanol, FP = 57°F
- ✚ Ethelene

- ✚ FAME (Fatty Acid Methyl Esters)
- ✚ FFA (Free Fatty Acids)
- ✚ Formaldehyde
- ✚ Formaldehyde/Formalin, FP = 158°F
- ✚ Gasoline
- ✚ Glycerol
- ✚ Hexane
- ✚ Hot Condensate
- ✚ Hot Oil Systems
- ✚ Hydrochloric Acid (different strengths)
- ✚ Hydrogen (gas) in process, (liquid) in storage, FP = N/A Flammable gas/liquid
- ✚ Hydrogen Sulfide
- ✚ IsoPar K
- ✚ Isopropanol
- ✚ Methane
- ✚ Methanol
- ✚ Methanol, FP = 52°F
- ✚ Morpholine, FP = 95°F
- ✚ MTBE (methyl-tert-butyl ether), FP = -18.4°F
- ✚ Nitrogen (Cryogenic Storage)
- ✚ NMM (N-methyl morpholine), FP = 75°F
- ✚ Paraformaldehyde
- ✚ Paratherm NF
- ✚ Pentane
- ✚ Potassium Chloride
- ✚ Propane
- ✚ SDD (Soybean Deodorizer Distillate)
- ✚ Sodium Chloride
- ✚ Sodium Dioxide
- ✚ Sodium Hydroxide
- ✚ Sodium Hypochlorite
- ✚ Solvents
- ✚ Steam
- ✚ Sterols
- ✚ Styrene
- ✚ Sulfur Dioxide
- ✚ Sulfuric Acid
- ✚ Tocopherol
- ✚ Toluene
- ✚ Water Treatment Chemicals
- ✚ Xylene

## **SAFE WORK PROCEDURE**

### **PREPARE FOR WORK**

- ✚ Know what is or was in the system. Was it air, water, steam, hydrochloric acid, sulfuric acid, bleach, resin, corn syrup, etc.? What strength?
- ✚ Many of our industrial customers utilize permit systems. Along with a Safe Work Permit, Line Breaks may include a Hot Work, and possibly Ignition Source Permits as well.
- ✚ Before the start of any line breaking procedure, it is critical to communicate with the customer, obtain the applicable permits, if necessary, place barricades to warn all personnel within the area, double verify the system has been locked out, check for pitched lines, ensure proper flushing and drainage, etc.
- ✚ All workers must be trained in the customer's emergency evacuation procedure and emergency response plan. Employee must understand the use of equipment such as scaffolds, ladders, air quality monitors, alarms, fall protection equipment, fire extinguishing devices, neutralizing agents, and air moving equipment.
- ✚ Before any equipment opening can occur, a worker must have proper training and knowledge of the chemicals that are used at the facility they are working at. Employees need to know how to gather the appropriate information with the use of Safety Data Sheets, and how to use the information correctly as it pertains to the work. There is an emphasis on using the proper solvents and solutions as prescribed by the company as using the wrong mixtures can be hazardous, and even lethal.
- ✚ 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 or dry ammonium nitrate deposits.
- ✚ Perform a Pre-Job Hazard Analysis (PJHA) before breaking into any hazardous substance pipeline or vessel. Those developing the PJHA must include a person who understands the process and the hazards involved.
- ✚ Test and flush eye wash stations and safety showers in the area before the work begins. Some facilities allow the eye wash and safety showers to continually run until after the line break. Some locations have alarm systems on their eye wash and safety showers. Always follow the customer's safe work procedures at their location.
- ✚ Barricade the area and maintain the barricade while the system is open.

## **PIPELINE MARKING - 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 specific location for the line break must be positively identified using yellow caution tape prior to the initial opening of the system. This can be easily accomplished during the Lockout/Tagout walk down. The tags will be completed with a permanent marker pen. The tag contains relevant information about the break including:
  - Work Permit Number (if applicable)
  - Hazardous Material in the Pipe
  - Name and signature of Permit Authorizer or Isolating Person placing the tag
  - Date tag is hung
  - Date tag is valid to
  - Name and signature of the Permit Holder
  - Any other information and requirements by customer

- ✚ The line break does not need to be marked if it occurs immediately after confirmation, the system is deemed de-energized and the crew is there at the work site. However, if the crew is not there, the line must be marked to prevent human error.
- ✚ The Permit Authorizer (or isolating person for the Permit) and the Permit Holder must go to the break in location.
- ✚ The Permit Authorizer (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.
- ✚ If the crew has any doubt whatsoever, they are to STOP and ask questions before continuing.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

Obtain and wear the appropriate personal protective equipment and ensure its condition is suitable for use. Winger Companies, herein referred to as Winger, policy states:

- ✚ For ALL line breaks, obtain and read the chemical SDS before performing ANY line break or work where the hazard of chemical exposure exists. Make sure you wear the appropriate chemical PPE. Hardhat, chemical suits (i.e. Dominator, Ty-Chem, etc.), appropriate gloves (nitrile, butyl rubber, etc.), goggles, splash faceshield, and possibly a full-face respirator or Powered Air Purifying Respirator (PAPR) and chemical boots, MUST be worn as determined by the chemical manufacturer's SDS. Suits should be taped over the glove cuff and boot to prevent chemicals from touching your skin. Chemical PPE may be removed after the line break is completed and having been determined that is safe to do so.
- ✚ Know how to use, don and doff PPE correctly.
- ✚ Be aware of heat stress potential when wearing chemical PPE. Stay hydrated, take breaks and rotate job tasks between crew members as needed.
- ✚ Inspect your chemical suit, gloves and boots before donning, even new out of the package. Make sure there are not any perforations, tears or rips.
- ✚ Once the chemical is inside your suit, gloves, or boots, it can become very irritating. The PPE can actually trap and hold the substance against your skin.
- ✚ Do not cheat by taking off your gloves to adjust your equipment, scratch, wipe off sweat, or hold your breath while exposed to a chemical.
- ✚ Step out of the area and into a safe area, if your safety goggles, faceshield, or respirator fogs over to clean them off.
- ✚ Do not wipe your gloves on your clothing.
- ✚ Take your gloves and suit off wrong side out.
- ✚ Fasten the collar of your suit.
- ✚ Some Tyvek chemical suits are designed with a hood and footies to provide extra protection.
- ✚ Do not tuck the jacket into your pants. The jacket is designed to be worn outside your pants/bibs and extend well below your waist.
- ✚ If the chemical suit you are wearing has an attached hood, a faceshield, full face mask, PAPR is to be worn, under the hood. Make sure your face gear is seated and comfortable then carefully pull the hood up over your head seating the elastic edge in its proper position.
- ✚ Each layer of clothing under the chemical suit also provides another layer of protection and another layer of air.

- ✚ If a suit becomes contaminated, get to a safety shower immediately. Depending on where the chemical is penetrating your suit, start from the top down and remove your PPE.
- ✚ A second person can assist removal of chemical PPE. They should have at a minimum, chemical PPE suitable to the chemical contaminant so they themselves do not come in contact with the wearer or their PPE.
- ✚ Wash your hands and face and if necessary, your whole body thoroughly after removing your chemical PPE.
- ✚ Flush for at minimum of 20 minutes. Read the SDS ahead of time so you know the correct procedure. Contact your foreman and safety team as soon as possible.
- ✚ For further information see “OSHA’s Chemical Protective Clothing at [https://www.osha.gov/dts/osta/otm/otm\\_viii/otm\\_viii\\_1.html](https://www.osha.gov/dts/osta/otm/otm_viii/otm_viii_1.html).

## LOCKOUT / TAGOUT

Follow Winger lockout procedure to achieve a zero-energy state. Flush or neutralize systems as required. Knowledge of the appropriate lockout/tagout procedures is vital when it comes to line breaking. Following the permit carefully, and warning all personnel of which machines will be deactivated will prevent potential accidents from occurring. An important part of this procedure also includes careful de-pressurization and draining of the lines, equalizing pressure, washing and purging, blinding, blanking, and removing pipes. At this point, each step must be double verified and signed off by a qualified person.

## HOT TAP

A Hot Tap is a procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems. Hot-tapping operations shall include the following:

- ✚ Welding of a flanged spool piece to a pipe or vessel that cannot be depressurized of gas or liquid or verified as sufficiently as gas or liquid free.
- ✚ Cutting a hole through the wall of a pipe or vessel using a hot-tapping machine when the pipe or vessel cannot be depressurized of gas or liquid or verified as sufficiently as gas or liquid free.
- ✚ 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.
- ✚ The pipe or vessel involved shall have its contents confirmed circulating and sufficiently full.
- ✚ 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.
- ✚ The Permit Holder, with personnel working under their direction, that supervises the hot tapping operation, shall be recognized as sufficiently experienced and competent to perform the task.
- ✚ Never perform this work alone. An extra person appointed by the Permit Holder/Foreman to assist if an adverse situation was to arise. Duties may include:
  - Raising alarm and seeking aid,
  - Assisting in the use of safety showers,
  - Keeping unnecessary personnel out of the work area

## COMPLETING THE WORK

Upon completion of the work, the lines must be re-connected. Employee will use the proper procedure for joining the lines, removing supports and grounds, notification of a qualified person of work completion, receiving authorization to remove the lockout/tagout, and restarting the equipment.

To close out the procedure, the group is instructed on how to check the lines for leaks, remove the barricades and other safety equipment, record the time and date of completion, removal of PPE, and proper cleansing agents to be used. In addition, we stress the importance of completing the permit in full, including signing and dating the form, and filing the permit in the appropriate location. Always clean up the work area and contact your customer for final inspection before leaving the work area.

## REMEMBER

- ✚ Whenever conditions change from the original plan you must stop and reassess. If there is any doubt, stop!
- ✚ Ensure drain valves are not passing, and check for heat, vibration and other evidence of live equipment.
- ✚ Plan to collect or control any residual liquid and know how to dispose of it correctly and safely. Clean up spillage immediately.
- ✚ When walking the line, pay attention to the pitch. Is there a low point where residual matter can get trapped and not get purged? Has anyone leaned or stood on a small line which has caused it to sag? Is there a potential for product to be blocked or air lock to form, etc.
- ✚ Break the flange (if applicable) away from your body by slackening the far side of the joint first. Work out of the line of fire i.e. up-wind of flange. Use a spray screen if necessary.
- ✚ Expect a sudden release of gases or liquids once the line is broken at any time. Due to blockages, hot product may reside in pipe work behind frozen product. If the frozen portion gives way or is cleared, it may suddenly release the hot solution.
- ✚ Inspect and replace bolts, with an emphasis on the proper technique for maintaining integrity at the joint, and containment of hazardous residue. New bolts must be long enough to have at least 3 threads showing. If they are not the right size, contact your foreman.
- ✚ If applicable, bond the pipe to funnels and containers, clear blockages, controlling spills and flow, and applying pressurized agents safely.
- ✚ Radio contact is required if safety shower is not alarmed or if breaking into lines alone. Whenever practicable and in all cases in which chemical PPE is worn, work should not be conducted alone.
- ✚ Ensure the correct PPE is worn. This is the last line of defense and is MANDATORY.
- ✚ Decontaminate all tools and equipment used.
- ✚ Leave the job site in a safe, tidy condition.

## **SOURCE CREDITS**

U.S. Department of Labor, Occupational Safety and Health Administration, [www.osha.gov](http://www.osha.gov)  
Mechanical Contractors Association of America, [www.mcaa.org](http://www.mcaa.org)  
<http://www.thinksafety1st.com/>  
[http://www.worksafenb.ca/docs/HA\\_First-Line-Break](http://www.worksafenb.ca/docs/HA_First-Line-Break)  
CSBP Breaking into Hazardous Pipelines <https://www.csbp.com>  
Cargill Corn Milling <https://www.cargillcornmillingehs.com/PermitsandProcedures5.9/index.htm>

## **DOCUMENT CONTROL**

Initial Program June 21, 2017  
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