Process Safety Management of Highly Hazardous & Explosive Chemicals

Safe Work Practices
Safe Work Practices

1910.119(f)(1)

The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.
Safe Work Practices

- Are They Really Important

- Video...
Develop and implement safe work practices* to provide for the control of hazards during operations such as:

- Lockout/tagout;
- Confined space entry;
- Line Opening process equipment or piping; and
- Control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel

*These safe work practices apply to contractor employees as well
Safe Work Practices

- Safe Work Practices, Programs & Procedures must:
  - Be specific to the Covered Process
  - Follow Procedures & Recommendations in the PHA’s
  - Follow Procedures in the Operating Procedures
  - Must be Able to be Tracked
  - Follow Form
Safe Work Practices
Control Over Entrance into the Facility

- First,
- How do We Control Who Enters the Covered Process?
- What Type of Security Controls are in Place
- What Training is Required Before Entry?
ACCESS CONTROLLED AREA

ALL PERSONNEL ENTERING THIS AREA MUST IMMEDIATELY COORDINATE WITH THE HPG FACILITY SUPERVISOR, EXTENSION 2320 OR 2338, IN B-3305.

IN THE EVENT OF AN EMERGENCY THAT THREATENS PERSONNEL OR EQUIPMENT, CALL 911, AND NOTIFY THE SUPERVISOR.
Safe Work Practices
Control Over Entrance into the Facility

- Remember...

- "and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel"
Safe Work Practices
Control Over Entrance into the Facility

- NASA Security Gate & Why…
Safe Work Practices
General Hazardous Materials & Fire Prevention

- Many Times, when covered process hazards include flammable liquids or gases, the control of ignition sources becomes critical. This may require testing of the atmosphere before any device not deemed “intrinsically safe” are introduced into the covered process area.
Safe Work Practices
General Hazardous Materials & Fire Prevention
Safe Work Practices
General Hazardous Materials & Fire Prevention

- Simple Safety Procedures that Become Critical Near a Covered Process Such as Cylinder Storage
Safe Work Practices
General Hazardous Materials & Fire Prevention

- Ensuring the Correct Gas is Marked & Secured
Safe Work Practices
General Hazardous Materials & Fire Prevention

- And A Procedure for Marking Historical Areas of Minor Gas Leaks
Safe Work Practices
The Control of Hazardous Energy - Lockout Tagout

- Lockout Tagout - One of the Most Important Procedures in PSM
- Must be Written Carefully & Follow all Procedures (PHA’s, Operating Procedures)
- Must be Followed to the Letter!
Control of Hazardous Energy (Lockout/Tagout)

Equipment Name
Logo
Lockout Notification
Column Location
Graphic Representation
Placard Location
Energy Sources
Specific Procedures
Facility Name and/or Logo
Bar Code Tracking System
Equipment
Safe Work Practices
The Control of Hazardous Energy - Lockout Tagout

- Lockout/Tagout in PSM
- Why not Use Digital Imaging in Your Procedures to Identify Critical Lockout /Tagout Positions
Safe Work Practices
Permit Confined Space Entry Program

- The Mirror Standard to Lockout Tagout
- No Mistakes Allowed Here
- Must be Specific to the Covered Process
Safe Work Practices
Permit Confined Space Entry Program

- A Confined Space is Defined as A Space That:
  - Has limited or restricted means of entry or exit
  - Is large enough for an employee to enter and perform assigned work, and
  - Is not designed for continuous occupancy by the employee.
Safe Work Practices
Permit Confined Space Entry Program

- A Permitted Confined Space is a confined space with a serious hazard of any kind.
- Or a space that a serious hazard of any kind is introduced into the space.

Welding in a Confined Space
Safe Work Practices
Permit Confined Space Entry Program

- Program Element Summary:
  - Written Program
  - Worksite Hazard Evaluation
  - Marking of Permit Spaces
  - Space Specific Entry Procedures
  - Entry Permit Procedure
  - Training
  - Demonstration of Competency
  - Rescue Procedures
  - Periodic Inspections
Safe Work Practices
Line Opening or Breaking Procedures

- A Hazard Review Must Completed for All Line/Equipment Hazards Including:
  - HAZARDOUS MATERIALS IN SYSTEM
  - POTENTIAL PHYSICAL HAZARDS
  - BARRICADING AS REQUIRED
  - FIRST AID IF EXPOSED
  - LOCATION OF SAFETY EQUIPMENT
  - PPE REQUIRED FOR LINE OPENING
Safe Work Practices
Line Opening or Breaking Procedures

- Special PPE may be required
  - Example - NASA Hydrogen Gas & Nitrogen High Pressure Gas Plant
  - Cryogenic Gas

Requires Special PPE
Safe Work Practices
Line Opening or Breaking Procedures

- Cryogenic Protective Footwear
- Hardhat
- Face shield
- Safety Glasses
- Protective Clothing
- Special Gloves

NASA High Pressure Gas-Nitrogen
Safe Work Practices
Line Opening or Breaking Procedures

- LOP Program May Take the Form of Many Types
- A Combination of Written Procedures and Graphic Illustrations Work Well

Let’s review an example...
Line and Equipment Opening

No Person may break into, open, or disassemble any equipment which MIGHT contain hazardous material, pressure or temperature until a L.E.O. permit has been completed.

**REVIEW**

1. Hazardous Material
2. Potential Physical Hazards
3. Barricading
4. First Aid if Exposed
5. Location of Safety Equipment

**DO**

1. Isolate
2. Drain
3. Purge (If Appropriate)
4. Flush (If Appropriate)
5. Lockout / Tagout
6. Heat Trace De-Energized
7. Pipe Support As Needed

**WEAR**

1. Rubber Gloves
2. Protective Boots
3. Chemical Goggles
4. Face Shield
5. Chemical Suit
6. Respirator

CONSULT L.E.O. CARD
PROCEDURE OVERVIEW

1. SCOPE
WESTVACO POLICY:
No person may break into, open, or disassemble any equipment which might contain hazardous material, pressure or temperature until a L.E.O. permit has been completed.

2. LINE and EQUIPMENT OPENING PERMIT
WESTVACO has established a permit system to be followed during line breaking and process equipment opening which might contain hazardous material, pressure or temperature.

3. HAZARD REVIEW
   *Knowledge needed of:
   1. Hazardous material in system
   2. Potential physical hazards
   3. Barricading as required
   4. First aid if exposed
   5. Location of safety equipment

4. PREPARATION and ISOLATION
   *Prior to initiating line and equipment opening operations/maintenance shall insure the following is complete.
   1. Isolated
   2. Drained
   3. Purged
   4. Flushed
   5. Lock out/Tag out
   6. Heat tracing de-energized
   7. Pipe supports as needed
   8. Other   (special instructions supplied by supervision)

5. PROTECTIVE EQUIPMENT PACKAGE REQUIRED
   *Hard hat/safety glasses/safety shoes required in all areas.
   PACKAGE A:   PACKAGE B:   PACKAGE C:

   | Rubber Gloves | Rubber Gloves | Rubber Gloves |
   | Protective Boots | Protective Boots | |
   | Chemical Goggles | Chemical Goggles | Chemical Goggles |
   | Face Shield | Face Shield | Face Shield |
   | Chemical Suit | Chemical Suit | |
   | Respirator | | Respirator |

   PACKAGE D:   PACKAGE E:   Other:

   | Rubber Gloves | | To Be Specified |
   | Chemical Goggles | Chemical Goggles | |
   | Face Shield | Face Shield | |

6. PROCEDURE
   Follow above steps for LINE AND EQUIPMENT OPENING.

7. START UP:
   Inspect work area to verify completion of work before start-up.
PROTECTIVE EQUIPMENT

1. RUBBER GLOVES
   ![Glove]
2. PROTECTIVE BOOTS
   ![Boot]
3. GOGGLES
   ![Goggles]
4. FACE SHIELD
   ![Face Shield]
5. CHEMICAL SUIT
   ![Chemical Suit]
6. RESPIRATOR
   ![Respirator]

* HARD HAT/SAFETY GLASSES/SAFETY SHOES REQUIRED IN ALL AREAS.

EQUIPMENT PACKAGES

- A=(1-6)
- B=(1-5)
- C=(1,3,4,6)
- D=(3,4)
- E=(1,3,4)
- OTHER=(To be specified)

**NOTE**

IF CONTENTS OF LINE OR EQUIPMENT ARE NOT LISTED ABOVE, OR ARE UNKNOWN, CONTACT FOREMAN FOR PROTECTIVE EQUIPMENT REQUIRED.
Safe Work Practices

- **Line Opening Permits**
  - Identify Procedures for Opening any Process Line in a Covered Process
  - Must Include Hazards of the Line Opening
  - PPE Required
Safe Work Practices
Hot Work Program

Hot Work is any work involving burning, welding, or similar operations that are capable of initiating fires or explosions. This program shall cover the following hot work processes:

- Welding and Allied Processes
- Heat Treating
- Grinding
- Thawing Pipe
- Powder-Driven Fasteners
- Hot Riveting
- Any Other Spark, Flame or Heat
Management Responsibilities

- providing employees with adequate training including the inherent risks involved, the emergency procedures in the event of a fire, instructions on all equipment and processes, as well as the provisions of this program

- recognizing responsibility for the safe usage of cutting and welding equipment on Covered Process Equipment and ensuring only approved equipment is used
Safe Work Practices
Hot Work Program

- Remember...Hot Work Program Could be Used to Control the Introduction of Non-Intrinsically Safe Devices into a Covered Process
Safe Work Practices
Hot Work Program

- Controlling all Other Ignitions Sources is also Difficult Such As:
  - Electrical
  - Static Electricity
  - Lightning
  - Truck/Cars
Safe Work Practices - Hot Work

A Program Must be Developed for the Covered Process That Requires:

- A Hot Work Permit be Issued for ALL Hot Work Performed in the Plant by Employees or Contractors
- A Permit must be Posted at the Location of the Hot Work
- A Fire Watch Is Required
- A Fire Extinguisher or Other Appropriate Fire Fighting Equipment Must Be Present, Fire Watch must be Trained in its use
Paper Mill Explosion & Fire Caused by Failure to Follow Hot Work Procedures
Safe Work Practices

- Must be Specific for the Covered Process
- May Require Additional Program other than Lockout Tagout, Line Opening & Hot Work…such as Confined Space, Electrical Safe Work Practices, Combustible Dust
NASA High Pressure Gas Plant

Operating Procedures & Safe Work Practices
Case Study
Team Exercise
LIQUIFIED HYDROGEN
FLAMMABLE GAS
NO SMOKING
NO OPEN FLAMES

WARNING: CELL PHONE USE IS STRICTLY PROHIBITED IN THE LHX AREA
Team Exercise

- With the Information to Follow in The NASA Case Study Video, Presentation & Notebook,

- With Your Team Members, Perform the Following Exercises & Answer the Following Questions:
Case Study Exploration

2. What are Potential Ignition Sources to Control at the Hydrogen Gas Plant?
3. What are the hazards of Cryogenic Gas?
4. What PPE is required to work around Cryogenic Gas?
5. Why can’t you use your cell phone near the gas plant?
6. Why are Vehicles Kept at least 100 ft. away from the Hydrogen Gas Plant?
7. List the Safe Work Practices Required in the PSM Standard?
8. With the information learned, write a simple one page hot work program for the Hydrogen Gas Plant.

We will Discuss the Findings of Each Team in Class
What’s Next

Now That We’ve Developed Operating Procedures & Safe Work Practices
We Have to Train