

## Hazard Analysis Form

This form can be used by Fermilab Employees, Fermilab Supervisors, Fermilab Task Managers, Construction Coordinators, Service Coordinators, Work Planners and Fermilab Subcontractors. This is a dynamic document which may require modification as the project moves from start to finish and should be readily available at the site where the work is being performed.

**Note: Not all sections of the first page are applicable to every job or task, complete what is necessary for your specific job or task.**

Job Title Connecting pneumatic air pressure to QT valve AV11

Job Location NM4

Contract/Work Order # \_\_\_\_\_

### ***TO BE COMPLETED FOR WORK INVOLVING SUBCONTRACTORS***

#### **Subcontractor (if applicable)**

#### **Fermilab**

Company \_\_\_\_\_

Project Eng/C.M. SpinQuest

Project Manager \_\_\_\_\_

Phone \_\_\_\_\_

Phone \_\_\_\_\_ Page \_\_\_\_\_

TM/CC/SC \_\_\_\_\_

ESH Rep. \_\_\_\_\_

Phone \_\_\_\_\_ Page \_\_\_\_\_

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ES&H Rep. \_\_\_\_\_

Phone \_\_\_\_\_ Page \_\_\_\_\_

### ***AT LEAST TWO SIGNATURES ARE REQUIRED***

TM/CC/SC/Work Planner \_\_\_\_\_ Date \_\_\_\_\_

Print Name \_\_\_\_\_

Authorizing Supervisor \_\_\_\_\_ Date \_\_\_\_\_

Print Name \_\_\_\_\_

Accepted as noted \_\_\_\_\_ Date \_\_\_\_\_

Print Name \_\_\_\_\_

**Description of Work: rout bypass from pressurized pneumatic air to AV11 to open during LN2 evacuation: blowing warm He gas through LN2 fill to boiloff LN2 to cleanout purifier**

**COVID-19 Protective Measures:** (Check all that are required for the job.)

- Maintain 6 ft. or greater social distance when possible
- Face Covering (Cloth Face Mask or Disposable Face Mask)
- Face Shield
- Safety Glasses / Goggles
- Impervious Gloves
- Clean Surfaces Used
- Wash/Sanitize Hands
- Other Protective Measures Not Listed Above

**Industrial Hazards:** (Check all that apply to the job.)

- |   |  |
|---|--|
| <input type="checkbox"/> Flammable Gas Areas                              | <input type="checkbox"/> Steel Erection  |
| <input type="checkbox"/> Heat Stress / Cold Stress                        | <input type="checkbox"/> Fall Exposures > 4ft (>6ft for construction)              |
| <input type="checkbox"/> Structural Demolition                            | <input type="checkbox"/> Heavy Equip. Ops. (crane, boom lift, excavator)           |
| <input type="checkbox"/> Excavation                                       | <input type="checkbox"/> Critical Crane Lift                                       |
| <input type="checkbox"/> Scaffold Erection / Scaffold Use                 | <input type="checkbox"/> Rotating Equipment  |
| <input type="checkbox"/> Ladder Use                                       | <input checked="" type="checkbox"/> High Pressure air / fluids                     |
| <input type="checkbox"/> Non-ionizing radiation (lasers, RF, UV, magnets) | <input type="checkbox"/> Welding / Cutting / Brazing / Grinding                    |
| <input type="checkbox"/> Confined Space                                   | <input type="checkbox"/> Lead (paint, bricks, cutting sheets, soldering)           |
| <input type="checkbox"/> Silica   | <input type="checkbox"/> Chemical Use (cleaners, solvents, adhesives, etc.)        |
| <input type="checkbox"/> Asbestos (presumed or suspected materials)       | <input type="checkbox"/> Ergonomics (overexertion, repetition, lifting)            |
| <input type="checkbox"/> Nanomaterial (1-100nm, 3D print, etc.)           | <input type="checkbox"/> Loud Noise (continuous, instantaneous)                    |
| <input type="checkbox"/> Beryllium  | <input checked="" type="checkbox"/> Potential Oxygen Deficiency – ODH 1 or 2 areas |

**Electrical Hazards:** (Check all that are required for the job.)

- |   |   |
|---|---|
| <input type="checkbox"/> Manipulative Energized Work                | <input type="checkbox"/> Diagnostic Energized Work (LOTO verification)    |
| <input type="checkbox"/> Working within 10 ft of overhead utilities | <input type="checkbox"/> Working within 25 ft of 345kV overhead utilities |

**Environmental Hazards:** (Check all that are required for the job.)

- Impact or release to surface, sanitary, or ground water
- Impact to new or existing air emission sources, including equipment/generators
- Generation of regulated waste (hazardous, special, universal)
- Use of refrigerants
- Use of Oil (> 55 gal) or new oil filled equipment
- Release of a chemical or use of a new chemical
- Impact to a naturally sensitive area or historical site

**Radiation Safety:** (Check all that are required for the job.)

- Posted Radiological Area (Radiation Area, HRA, Contamination, Airborne)
- Radioactive Material, Ionizing Radiation, Radiation Sources, RGDs, RAW systems, Exhaust Systems, Beamline Components - including targets & absorbers
- Area working in  $\geq 100$  mrem/hr
- Worker receiving  $\geq 50$  mrem for the job

**General Hazards:** (Check all that are required for the job.)

- |   |   |
|---|---|
| <input type="checkbox"/> Traffic Control    | <input type="checkbox"/> Working above others           |
| <input type="checkbox"/> Biological Hazards | <input type="checkbox"/> Other Hazards not listed here? |

**Personal Protective Equipment (PPE):** (Check all that apply to the job.)

- |   |   |
|---|---|
| <input type="checkbox"/> Hardhat  | <input type="checkbox"/> Bump cap                               |
| <input type="checkbox"/> Steel-toed boots                               | <input type="checkbox"/> Steel-toed shoes                       |
| <input type="checkbox"/> Gloves - leather                               | <input type="checkbox"/> Gloves - chemical                      |
| <input type="checkbox"/> Gloves - electrical                            | <input checked="" type="checkbox"/> Gloves - Cryogenic          |
| <input type="checkbox"/> Gloves - Nitrile                               | <input type="checkbox"/> Tyvek Coveralls                        |
| <input type="checkbox"/> Tyvek Boot Covers                              | <input type="checkbox"/> Earmuffs / Ear Plugs                   |
| <input type="checkbox"/> High visibility clothing                       | <input type="checkbox"/> Safety Glasses                         |
| <input type="checkbox"/> Safety goggles                                 | <input type="checkbox"/> Safety goggles - chemical              |
| <input checked="" type="checkbox"/> Safety goggles - impact/face shield | <input type="checkbox"/> Welding goggles/helmet                 |
| <input type="checkbox"/> Fall Protection                                | <input type="checkbox"/> Respirators (air purifying), cartridge |
| <input type="checkbox"/> Respirators - supplied air                     | <input type="checkbox"/> Long Sleeve Shirts                     |
| <input type="checkbox"/> Long Pants without Cuffs                       | <input type="checkbox"/> Arm - cut protection                   |
| <input type="checkbox"/> Leg - cut protection                           | <input type="checkbox"/> Apron - Cryogenic                      |
| <input type="checkbox"/> Whole body - electrical                        | <input type="checkbox"/> Whole body - Dust, chemical, heat      |
| <input type="checkbox"/> Other PPE not listed here?                     |   |

**Controls:** (Check all that are required for the job.)

- |   |   |
|---|---|
| <input type="checkbox"/> Danger tape & signage            | <input type="checkbox"/> Barricades - solid |
| <input type="checkbox"/> Barricades - soft (caution tape) | <input type="checkbox"/> Road Closure       |
| <input type="checkbox"/> Soil/erosion control             | <input type="checkbox"/> Site dust control  |

**Environmental Impacts (Required - check one):**

- Yes, I have thought about the potential environmental impacts (see Guidelines for Completing the HA on page 6) of this job and will document such impacts and mitigation steps within this document.
- Yes, I have thought about the environmental impacts of this job and no such credible impacts exist and therefore do not need to be written in this document.

**Equipment required for the job:** (List the tools needed to perform the job.)

N/A

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**Work Plan History Information:** (List any lessons learned from this job, tips from previous jobs)

N/A

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**Improvement/Feedback:** At the conclusion of the job, the Task Manager, Authorizing Supervisor, Work Planner or Project Leader shall work with those involved to consider lessons learned and receive feedback in order to improve future work plans.

If lessons have been learned to improve this or similar tasks, please update the Standard Operating Procedure or HA for future reference. If lesson learned has lab-wide implications please enter it into the [Lessons Learned Database](#).

**Check One:**

- Yes** we have considered lessons learned and accepted feedback on this job and will communicate such information so that future work plans may be improved.
- Yes** we have considered lessons learned feedback and determined that future work plans do not need to be improved.

*Utilizing the format below, identify hazards and environmental aspects, and their corresponding safety precautions/procedures to mitigate hazards. Use as many sheets as necessary.*

### HAZARD ANALYSIS

Step	Description of Step	Safety Hazards/ Potential Impacts to Environment	Mitigations / Precautions / Safety Procedures / Controls
1	Rout bypass from pressurized pneumatic air to AV11 to open during LN2 evacuation	High pressure pneumatic lines	Connected or Terminated
2	Boiling-off LN2 in purifier in preparation to cleanout the He space in the purifier. Utilize vent already in-place for the purifier.	Cold N2 vapor, ODH, condensed water spill	All hazards previously addressed in HA 2022-12206
3	Cryogenic Training	Exposure to cryogenics	Personnel need to have general cryogenic safety training (FN000115), Large portable liquefied gas Dewar handling training (FN000475), use proper PPE for cryogenics
4	Connecting Dewar and vent lines to purifier	Accidental exposure to cryogenics, Release of cryogenics	Ensure the line going from Dewar to purifier, and vent-line have all fittings leak-tight. Line should be insulated. Check-valve must be attached to the end of the vent line to prevent back-flow of air. Vent line needs to be secured to railing.
5	Monitor purifier pressure	Possible over pressure of vessel and lifting of relief valves. Release of cryogenics	Purifier LN2 space pressure should be continuously monitored to ensure pressure does not increase beyond 10psig. Relief valve lift at 15psig. This is monitored via PTA_T in the PLC.
6	Monitor liquid level of purifier	Over filling of purifier	The liquid level of the purifier LN2 space should be continuously monitored. This is monitoring via the PLC.
7	Close portable dewar valve when filling is complete	Over filling of purifier, over pressurizing of purifier	Ensure that the portable dewars isolation valve is completely closed when done filling.

<b>8</b>	<b>Clean any condensation</b>	<b>Slipping/falling</b>	<b>Any condensation that has accumulated should be wiped up to prevent slipping and falling.</b>
<b>9</b>			
<b>10</b>			

### GUIDELINES FOR COMPLETING THE HAZARD ANALYSIS

Phase of Work	Safety Hazards/Potential Environmental Impacts	Mitigations / Precautions/Procedures/Controls
<p>Examining a specific job by breaking it down into a series of steps or tasks, will enable you to discover potential hazards employees may encounter.</p> <p>Each job or operation will consist of a set of steps or tasks. For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. To determine where a step begins or ends, look for a change of activity, change in direction or movement.</p> <p>Picking up the box from the conveyor and placing it on a hand truck is one step. The next step might be to push the loaded hand truck to the storage area (a change in activity). Moving the boxes from the truck and placing them on the shelf is another step. The final step might be returning the hand truck to the receiving area.</p> <p>Be sure to list <i>all</i> steps needed to perform the job. Some steps may not be performed each time; an example could be checking the casters on the hand truck. However, if that step is generally part of the job it should be listed.</p>	<p>A safety hazard is a potential danger to a person or equipment. An environmental impact is a change to the environment. The purpose of the Hazard Analysis (HA) is to identify ALL hazards- including those produced by the environment, those connected with the job procedure, and those with the potential to result in an environmental impact.</p> <p>To identify hazards, ask yourself these questions about each step:</p> <p>Is there a danger of the employee striking against, being struck by, or otherwise making injurious contact with an object?</p> <p>Can the employee be caught in, by, or between objects?</p> <p>Is there potential for slipping, tripping, or falling?</p> <p>Could the employee suffer strains from pushing, pulling, lifting, bending, or twisting?</p> <p>Is the work environment hazardous to safety and/or health (toxic gas, vapor, mist, fumes, dust, heat, or radiation)?</p> <p>Are there electrocution hazards?</p> <p>Will action require soil/erosion control?</p>	<p>Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the hazards that could lead to an accident, injury, or occupational illness.</p> <p>Consider the hierarchy of controls:</p> <ol style="list-style-type: none"> <li>(1) Elimination (physically remove the hazard)</li> <li>(2) Substitution (replace with something less hazardous)</li> <li>(3) Engineering controls (isolate the hazard)</li> <li>(4) Administrative controls (change the work)</li> <li>(5) Applicable / Specific PPE</li> </ol> <p>List the recommended safe operating procedures. Begin with an action word. Say exactly what needs to be done to correct the hazard, such as, “lift using your leg muscles.” Avoid general statements such as, “be careful”, “use caution”, and “be alert”.</p> <p>List the required or recommended personal protective equipment necessary to perform each step of the job.</p> <p>Give a recommended action or procedure for each hazard.</p>

<p>Close observation and knowledge of the job is important. Examine each step carefully to find and identify hazards- the actions, conditions, and possibilities that could lead to an accident. Compiling an accurate and complete list of potential hazards will allow you to develop the recommended safe job procedures needed to prevent accidents.</p>	<p>Will chemicals or petroleum products be used in an area where they could be released into the environment?</p> <p>Will action have the potential to affect storm water (drains, ponds, or streams in the vicinity)?</p> <p>Will action have the potential to affect the sanitary water system?</p> <p>Will action involve refrigerants?</p> <p>Will any regulated or recyclable waste be generated?</p>	<p>Serious hazards should be corrected immediately. The HA should then be changed to reflect the new conditions.</p> <p>Finally, review your input on all three columns for accuracy and completeness. Determine if the recommended actions or procedures have been put in place. Re-evaluate the job safety analysis as necessary.</p>
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