WCD 69254.0 Facility Hazard Analysis-Beam Line, Hutches, and Common Areas

Hazard Level: Moderate M

WCD Status:	**Approved**	**Status Date:**	06/25/2020
Authorization Status:	See Authorization Package		
Responsible Individual:	Fries, Michael Nicholas		
Work Planner:	Fries, Michael Nicholas	ESH Coordinator:	Rossi, Paul
Approving Division:	PSC	Approver:	Rossi, Paul
Review Interval:	1 Years	Annual Review:	06/25/2021

Scope

The following WCD covers routine activities and instrumentation within beam lines, experimental hutches and associated control and common areas. In addition to the experiment enclosures, beam line instrumentation is used to transport x-ray beams from the APS shield wall to the experimental enclosures.

Typical beam line activities include:

-vacuum work
-alignment & mechanical adjustments
-electronic interfacing on equipment such as slits, mirrors, monochromators, beam position monitors, cryo-cooled optics, and the associated motion control, vacuum, robotic, laser, mechanical and electrical systems

Scope Limits

This WCD does not cover high hazards or tasks that are considered non-routine or high risk. The WCD is limited to routine beam line, experimental hutch, and common area activities.

Work covered under an approved ESAF is outside the scope of this module.

Radiation protection provided through shielding, RSS components, and the Personel Protection System (PSS) are not included within the scope of this module, but are considered within the APS Accelerator SAD.

WCD 69254.0 Facility Hazard Analysis-Beam Line, Hutches, and Common Areas

Hazard Level: Moderate M

WCD Status: **Approved** **Status Date:** 06/25/2020

Authorization Status: See Authorization Package

Task Summary

Task 1	Beam Line, Experimental Hutches, and Common Areas	
	OJT	-A continuing training program allows highly skilled beamline staff to work with new employees and lesser skilled staff, in providing the opportunity to develop expertise and skills in the wet lab activities. -APS Sector Specific Orientation

Hazard Summary

Campus

Potential exposure due to Pandemic

1	When cleaning and disinfecting potentially contaminated surfaces	
1	When close contact CANNOT be avoided, but a barrier can be installed	
1	When close contact CAN be avoided (distancing > than 6 feet, other than “incidental” contact)	

Chemicals

Cylinders

1	Use or storage of cylinders	

Using Chemicals in Research

1	< 5 gal in use	Low

Using Chemicals not for Research

1	Using chemicals	Moderate

Electrical

Hazard Class 1.x, 50-60 Hz Nominal Power

1	Non-QEW	Low

Hazardous Materials

Beryllium

1	Work with manufactured articles	Low

Cryogenics

1	In a closed system	Moderate
1	Transfer between vessels	Low
1	Transport and storage of dewars using a tilting dewar cart	Low

Lead

1	Handling lead bricks and pieces, less than 20 bricks or equivalent	Low

Hazard Level: Moderate M

WCD Status: Approved **Status Date:** 06/25/2020

Authorization Status: See Authorization Package

Hazard Summary

Quality

1	Measuring and testing equipment	Low

Workplace

Crush hazard

1	Crush for hand	Moderate
1	Crush or entangled by moving parts	Moderate

Ergonomics

1	Lifting, lowering, carrying, pushing, pulling, or reaching < 30 lbs	Low
1	Lifting, lowering, carrying, pushing, pulling, or reaching, 30-50 lbs	Moderate

Falling Object or Bump Hazard

1	Bump hazard	Low

Hand Tools

1	Powered Hand Tool	Low
1	Non-Powered Hand Tools	Low

Hot or Cold surfaces

1	Hot surfaces >100C (212 F)	Moderate
1	Cold Surfaces ≤-100° C (-148°F) – Potential for oxygen deficiency	Moderate

Ladders, scaffolds, elevated platforms

1	Portable ladders	Low

Material Handling

1	Hoist	Moderate

Non-Ionizing Radiation

1	Static Magnetic field- Non-posted area w/ IH assessment	Low

Pinch or nip hazard

1	Pinch or nip	Low

Sharps

1	Use of scalpels, razor blades, and similar tools	Low

Stored Energy

1	DOT cylinders	
1	Differential Vacuum Vessels Category I	Low
1	Differential Vacuum Vessels Category II	Moderate
1	Differential pressure system (excluding vacuum)	Moderate

Welding-related hazard, (Brazing, soldering, torch-cutting)

1	Soldering, Non-flame small scale electrical.	Low

Hazard Level: Moderate M

WCD Status: **Approved** **Status Date:** 06/25/2020

Authorization Status: See Authorization Package

PPE Summary

TASK	PPE
1	Bump cap
1	Clothing
1	Eye protection
1	Foot protection
1	Footwear
1	Gloves
1	Hard hat
1	Safety glasses with side shields
1	Shoes that cover the entire foot
1	Use radiant heat shielding garments when practical
1	cryogenic gloves
1	full face shield
1	long sleeves
1	long trousers without cuffs over shoe tops
1	safety glasses with sideshields (ANSI Z87.1)
1	safety glasses with sideshields (ANSI Z87.1) or safety goggles
1	shoes made of nonabsorbent material uppers, e.g., leather, and cuffless trousers
1	work gloves (leather or equivalent)

Training Summary

TASK	COURSE	COURSE NAME
1	COVID100	Guidance to Working Safely in a COVID-19 Environment
1	ESH117	Ladder Safety
1	ESH171	Lead: Hazards and Controls Training
1	ESH211	Beryllium Hazard Awareness
1	ESH246	Safe Handling of Carcinogens
1	ESH377	Recognizing NRTLs
1	ESH433	Tilting Dewar Cart Training
1	ESH433PR	Tilting Dewar Cart Practical Factor
1	ESH436	Chain Fall Operator Training
1	ESH810	Argonne Pressure Systems Safety Manual Information

Permit Summary

TASK	PERMIT
1	Written procedure

WCD 69254.0 Facility Hazard Analysis-Beam Line, Hutches, and Common Areas

Hazard Level: Moderate M

WCD Status: **Approved** **Status Date:** 06/25/2020

Authorization Status: See Authorization Package

WCD Attachments

TASK	DATE	FILE NAME	DESCRIPTION

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Response to unplanned events:

Stop work immediately and dial 911

Locations:

400	Beam Lines, Hutches, and Common Areas

Task Scope:

Experimental work activities associated with the experiments and instrumentation used on beam lines. The scope covers activities and instrumentation within beam lines, experimental hutches and associated control and common areas. In addition to the experiment enclosures, beam line instrumentation is used to transport x-ray beams from the APS shield wall to the experimental enclosures. Typical beam line activities include vacuum work, alignment & mechanical adjustments, and electronic interfacing on equipment such as slits, mirrors, monochromators, beam position monitors, cryo-cooled optics, and the associated motion control, vacuum, robotic, laser, mechanical and electrical systems.

Task Scope Limits:

Limited to low or moderate hazard tasks, that are considered routine and fall within the skill level of the personnel assigned.

Work covered under an approved ESAF is outside of the scope of this module.

Radiation protection provided through shielding, RSS components, and the Personel Protection System (PSS) are not included within the scope of this module, but are considered within the APS Accelerator SAD.

Work Instructions:

Use the skills and training developed by your JHQ to do work safely. Perform work within the ISM guidelines. You have the authority and responsibility to suspend or stop work. When in doubt, suspend work and notify your supervisor.

Hazard Analysis and Controls

Campus

Potential exposure due to Pandemic

/Campus/ Potential exposure due to Pandemic / For SARS-CoV-2 (COVID-19)

When close contact CAN be avoided (distancing > than 6 feet, other than “incidental” contact)	

Task-Hazard Relationship

Workers may be in a shared workspace, but to the greatest extent possible, will maintain > 6 ft from one another during most activities.

Administrative Control

Avoid sharing PPE - Follow shared PPE guidelines

Base-level controls are in place

Distancing control - Specify tape floors, stagger shifts

Using disposable PPE - Dispose of used PPE in regular trash, and then immediately wash/sanitize hands

When close contact CANNOT be avoided, but a barrier can be installed	

Task-Hazard Relationship

Some work activities may require brief interactions of workers spaced <6 ft apart from one another.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Campus

Potential exposure due to Pandemic

/Campus/ Potential exposure due to Pandemic / For SARS-CoV-2 (COVID-19)

When close contact CANNOT be avoided, but a barrier can be installed	

Additional Requirements

Inform ESH Coordinator if such tasks must be carried out and seek additional controls. An HAC specific to the task will need to be completed and attached to the WCD.

No Engineering, Administrative or PPE Controls identified for this hazard

When cleaning and disinfecting potentially contaminated surfaces	

Task-Hazard Relationship

Surfaces, tools, and equipment will need to be cleaned after use.

Administrative Control

Do not mix disinfectant

Evaluate surface, the cleaning solution, and disinfectant being used to ensure compatible - For example, using stainless steel for high temperature service, chlorine and other halogens can contribute to stress corrosion cracking

Follow label requirements - For the cleaner and the disinfectant

No spark or heat operation near by

Use EPA-approved disinfectant to clean

Use in a well-ventilated area

Personal Protective Equipment

Eye protection - Safety glasses with side shields

Gloves - Nitrile gloves

Chemicals

Cylinders

Use or storage of cylinders	

Task-Hazard Relationship

High pressure gas cylinders are used in various applications to supply non-hazardous gases to experimental equipment including detectors, beam line sections, chambers, etc.

Additional Requirements

-gas pressure regulators inspected

-verify piping/tubing in compliance

-ensure cylinder is secured in vertical position with chains or straps in such a way that it cannot be knocked over.

-verify piping/tubing rated for operating temperature and pressure simultaneously.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Chemicals

Cylinders

Use or storage of cylinders	
Engineering Control verify pressure relief devices have ASME "UV" certification mark or documentation of operability tests demonstrating function and flow capacity available Administrative Control Ensure gas pressure regulator has not exceeded required inspection period based on application Personal Protective Equipment Shoes that cover the entire foot - safety-toe shoes highly recommended work gloves (leather or equivalent)	

Using Chemicals in Research

/Chemicals/Using Chemicals in Research/Flammable or combustible, liquid or solid

< 5 gal in use	Low
Task-Hazard Relationship Common industrial chemicals such as solvents, detergents, aerosols, paints, adhesives, epoxies, etc. are often required for routine use in this area. Additional Requirements Follow SDS recommendations. Engineering Control Containment - specify type of container requirements (e.g. glass, original container, approved safety can) Administrative Control Storage and usage limits - must not have > 5 gallons in use and/or in UL listed refrigerator AND must not exceed 120 gallons total per flammable liquids cabinet and 120 gallons for class 1A or 480 gallons for all others total for a fire area (combined in use and in storage cabinets) Personal Protective Equipment safety glasses with sideshields (ANSI Z87.1) or safety goggles	

Using Chemicals not for Research

Using chemicals	Moderate
Task-Hazard Relationship Common chemicals such as solvents, aerosols, paints, adhesives, epoxies, etc. are often required in small quantities for routine use in this area. Some of these materials may be flammable or combustible. Additional Requirements Follow SDS recommendations	

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Chemicals

Using Chemicals not for Research

Using chemicals	Moderate

Engineering Control

- Storage requirements - Flammables must be in flammable cabinets, corrosives in corrosive cabinets, oxidizers must also be separated from flammables and organics
- ventilation (specify type) - Normal room ventilation unless otherwise specified in the SDS

Administrative Control

- Review and/or complete a waste determination and for RCRA waste identify an appropriate waste storage area
- Signage - specify (e.g. PHS, hydrogen, flammable, none)

Personal Protective Equipment

- Eye protection - Chemicals that can cause acute eye damage (as specified by the SDS) warrants goggles or face shield use
- Gloves - For gloves, refer to the SDS and contact ESH coordinator or Industrial Hygiene if assistance is needed.
- Shoes that cover the entire foot

Electrical

Hazard Class 1.x, 50-60 Hz Nominal Power

/Electrical/Hazard Class 1.x, 50-60 Hz Nominal Power/Mode: All.

Non-QEW	Low

Task-Hazard Relationship

- NRTL approved/DEEI inspected electrical equipment may be used inside these areas.

Administrative Control

- See training

Hazardous Materials

Beryllium

Work with manufactured articles	Low

Task-Hazard Relationship

- Be window materials are widely used on APS beam lines as vacuum barriers, detector covers, etc... In normal use, these do not present significant potential for exposure. However, Be is a brittle metal, and may fracture into small pieces if dropped or mishandled. The broken Be fragments may pose exposure risk.

Additional Requirements

- If Be article has been broken, immediately evacuate and close off area. Call ESH Coordinator to coordinate clean-up of particle.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Hazardous Materials

Beryllium

Work with manufactured articles	Low

Administrative Control

Review and/or complete a waste determination and for RCRA waste identify an appropriate waste storage area

Personal Protective Equipment

Eye protection - safety glasses with side shields

Gloves - Nitrile or equivalent

Cryogenics

Transport and storage of dewars using a tilting dewar cart	Low

Task-Hazard Relationship

Liquid cryogens are used for various experimental activities including cooling samples, detectors, and x-ray optical components.

Administrative Control

Avoid awkward body position

No persons in elevators with cryogens.

Transport and storage in well ventilated areas.

Working alone prohibited

Personal Protective Equipment

Clothing - Long trousers without cuffs over shoe tops.

Eye protection - Safety glasses w/ side shields (ANSI Z78.1) or full face shield.

Foot protection - Shoes that cover the entire foot.

Transfer between vessels	Low

Task-Hazard Relationship

Dewars are commonly refilled for processes that support experimental processes.

Additional Requirements

All personnel must undergo the proper OJT prior to working with carcinogens and filling the dewars.

Engineering Control

ventilation (specify type) - Normal room ventilation

Ventilation - To prevent oxygen deficiency. Normal room ventilation

Administrative Control

Avoid awkward body position

Working alone prohibited

Personal Protective Equipment

Eye protection - Safety glasses w/ side shields (ANSI Z78.1) or full face shield.

Foot protection - Shoes made of nonabsorbent material uppers that cover the entire foot(e.g. leather).

Footwear - Long trousers without cuffs over shoe tops and long-sleeved shirts.

Gloves - Waterproof cryogenic gloves.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Hazardous Materials

Cryogenics

Transfer between vessels	Low

Permits

Written procedure

In a closed system	Moderate

Task-Hazard Relationship

Liquid cryogens are used for various experimental activities including cooling samples, detectors, and x-ray optical components. For example, many beam lines use a closed loop, liquid nitrogen cryo-cooler to supply liquid cryogen to beam line optical components. Direct contact with cryogenic materials can result in frostbite and serious bums or damage to eyes and other tissue. In addition, release into confined spaces may
result in oxygen deficient atmosphere, and confined liquid or solid cryogens may produce explosive expansion upon warming.
The activities addressed here include non-flammable, inert cryogens such as liquid nitrogen and helium that are are used to cool components such as detectors and the monochromator crystals contained in the beam line.

Additional Requirements

Pouring or cooldown transfers of LN2 can cause rapid boil-off. Use of >10 L in a space of >2000 cubic ft. should be evaluated for oxygen displacement (asphyxiation) potential.

Engineering Control

ventilation to prevent oxygen deficiency (may need to be calculated by an SME)

Administrative Control

follow ESH-4.10 Hazardous Materials - Cryogenic Liquid Safety

Personal Protective Equipment

cryogenic gloves

full face shield

long sleeves

long trousers without cuffs over shoe tops

safety glasses with sideshields (ANSI Z87.1)

shoes made of nonabsorbent material uppers, e.g., leather, and cuffless trousers

Lead

Handling lead bricks and pieces, less than 20 bricks or equivalent	Low

Task-Hazard Relationship

Pb is often used as a shielding material to reduce the background signal in x-ray measurements. Pb adhesive
tape, Pb sheets, or bulk Pb blocks are often used to improve experiment data quality. The Pb materials used
for these purposes are not highly dispersible. Pb materials such as bricks are also used in shielding and as counter-weights.

Additional Requirements

Pb handling will be performed in accordance with the APS Lead Handling Procedure

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Hazardous Materials

Lead

Handling lead bricks and pieces, less than 20 bricks or equivalent	Low

Administrative Control

Cleanup - No compressed air or dry sweeping. Cleanup with wet methods and/or HEPA vacuums.

Controlling work area - Establish a lead control area with barrier or tape.

Surface clearance sampling by IH prior to changing activities - or general release for non-lead use activities if shielding is not encased or is in poor condition

Personal Protective Equipment

Clothing - Argonne laundered work clothing, lab coat or disposable coveralls.

Eye protection - Safety glasses with side shields.

Gloves - Chemical resistant gloves, nitrile or similar (required). Additional anti-slip gloves (recommended).

Quality

Measuring and testing equipment	Low

Task-Hazard Relationship

Measuring and testing equipment will be used when performing receipt and technical inspection of equipment.

Administrative Control

Verify required calibrations are current prior to use

Workplace

Crush hazard

Crush or entangled by moving parts	Moderate

Task-Hazard Relationship

Operations of robotic equipment in "teach" mode.

Additional Requirements

Operate robotic equipment in accordance with manufactures instructions at the slowest possible speed. Ensure personnel remain clear of all ranges of the equipment.

Engineering Control

OSHA compliant guarding

Administrative Control

administrative control only - Operate robotic equipment in accordance with manufactures instructions at the slowest possible speed. Ensure personnel remain clear of all ranges of the equipment.

Crush for hand	Moderate

Task-Hazard Relationship

Operations of robotic equipment in "teach" mode.

Additional Requirements

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Crush hazard

Crush for hand	Moderate

Operate robotic equipment in accordance with manufactures instructions at the slowest possible speed. Ensure personnel remain clear of all ranges of the equipment.

Administrative Control

administrative control only - Operate robotic equipment in accordance with manufactures instructions at the slowest possible speed. Ensure personnel remain clear of all ranges of the equipment.

Ergonomics

Lifting, lowering, carrying, pushing, pulling, or reaching < 30 lbs	Low

Task-Hazard Relationship

Lifting, lowering, carrying, may be required when installing accelerator and beamline component support systems. In general, material handling equipment should be utilized to the extent possible.

Additional Requirements

Stretch prior to lifting, ensure good posture. Request additional help if needed.

Administrative Control

Rest component - Specify: duration and frequency of rest

Lifting, lowering, carrying, pushing, pulling, or reaching, 30-50 lbs	Moderate

Task-Hazard Relationship

Lifting, lowering, carrying, may be required when working on components and equipment to support experimental activities. In general, material handling equipment should be utilized to the extent possible.

Additional Requirements

Ensure good posture. Request additional help when needed.

Administrative Control

Rest component - Specify: duration and frequency of rest

Falling Object or Bump Hazard

Bump hazard	Low

Task-Hazard Relationship

Protruding objects or impalement hazard from beamline components and infrastructure.

Additional Requirements

Cushion protruding object and use warning tape.

Personal Protective Equipment

Bump cap

Safety glasses with side shields

Hand Tools

Non-Powered Hand Tools	Low

Task-Hazard Relationship

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Hand Tools

Non-Powered Hand Tools	Low

Experimental work activities in this area often require use of common hand tools

Additional Requirements

-Do not carry hand tools in pockets.
-Inspect tools prior to each use.

Personal Protective Equipment

Eye protection - Safety glasses with side shields.

Powered Hand Tool	Low

Task-Hazard Relationship

Powered hand tools may be used for light fabrication and assembly work.

Personal Protective Equipment

Eye protection - Safety glasses with side shields

Hot or Cold surfaces

Hot surfaces >100C (212 F)	Moderate

Task-Hazard Relationship

Experimental activities in this area often require extreme temperature environments and/or conditions.

For example, vacuum vessels often require bake-out to achieve acceptably low level.

Engineering Control

Grabber-type hand tools

Insulate hot surfaces and use shields to reduce radiant heat

Administrative Control

Allow object to cool before handling without gloves or tools

Signage - “CAUTION – HOT SURFACE”

Personal Protective Equipment

Gloves - Insulated gloves intended for hot surfaces.

Use radiant heat shielding garments when practical - [specify type or N/A]

Cold Surfaces ≤-100° C (-148°F) – Potential for oxygen deficiency	Moderate

Task-Hazard Relationship

Experimental activities in this area often require extreme temperature environments and/or conditions.

For example, beam line optics are cooled to liquid nitrogen temperatures, and displex coolers and cryo-pumps are used in various applications at the APS.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Hot or Cold surfaces

Cold Surfaces ≤-100° C (-148°F) – Potential for oxygen deficiency	Moderate

Engineering Control

- ventilation (specify type) - Normal room ventilation
- Tongs or long-handled tools
- Ventilation - To prevent oxygen deficiency [specify type]

Administrative Control

- Working alone prohibited

Personal Protective Equipment

- Clothing - Long trousers without cuffs over shoe tops and Long sleeves
- Eye protection - Safety glasses w/ side shields
- Foot protection - Shoes made of nonabsorbent material uppers that cover the entire foot (e.g. leather).
- Gloves - Cryogenic gloves.

Ladders, scaffolds, elevated platforms

Portable ladders	Low

Task-Hazard Relationship

Step ladders and step stools may occasionally be used in these areas to access tools and components necessary to assist in experimental activities.

Administrative Control

See training

Material Handling

Hoist	Moderate

Task-Hazard Relationship

Experimental hutches and optics hutches have permanently installed chain-fall hoists mounted to the enclosure that are used to secure and lift experimental equipment.

Additional Requirements

Hoisting and rigging activities can pose potential risks, so whenever practical, the services of rigging professionals provided through ANL-FMS will be used.
All hoisting and rigging activities shall have the approval of the sector's Hoisting and Rigging Coordinator.
The Sector Hoisting and Rigging Coordinator is appointed to supervise the safe operation of cranes and hoists throughout the sector. He or she is in charge of the pre-use inspection of all cranes and hoisting equipment and the training of the sector staff and users in the safe use of such equipment.
The Sector Hoisting & Rigging Coordinator provides qualified candidates with an orientation to the hoisting and rigging equipment they need to use and describes the applicable requirements and limitations.
Rigging equipment (for example hutch cranes and synthetic slings) that are not utilized on a regular schedule
may remain unavailable for use until inspected by the Hoisting and Rigging Coordinator.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Material Handling

Hoist	Moderate

Personal Protective Equipment

- Eye protection - Safety glasses w/side shield.
- Foot protection - Safety-toe protective footwear (e.g., composite or steel-toe).
- Gloves - Sturdy work gloves when handling rigging equipment or rough or sharp material.
- Hard hat - When overhead hazard exists.

Non-Ionizing Radiation

Static Magnetic field- Non-posted area w/ IH assessment	Low

Task-Hazard Relationship

Fields may be present from both high-field superconducting magnets and lower-field electromagnets. Stray fields can adversely affect personnel with pacemakers and can cause the inadvertent movement of loose hand tools and other metal objects.

Engineering Control

- Access Controls
- shielding as feasible

Administrative Control

- IH survey
- warning sign for medical implant wearers, supplied by ESQ-IH
- Controlling work area - Restrict access to work area to authorized personnel only.

Pinch or nip hazard

Pinch or nip	Low

Task-Hazard Relationship

Some of the beam line components can be potential nip or pinch hazards.

Additional Requirements

-Inspect components to become fully aware of potential nip or pinch hazards.

Personal Protective Equipment

- Gloves - Sturdy leather work gloves

Sharps

Use of scalpels, razor blades, and similar tools	Low

Task-Hazard Relationship

Sharps such as box cutters and razor blades may be used for components supporting experimental activities.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Sharps

Use of scalpels, razor blades, and similar tools	Low

Administrative Control

Storage - Store with sharp edge covered.

Personal Protective Equipment

Gloves - Cut resistant gloves when feasible.

Stored Energy

Differential Vacuum Vessels Category I	Low

Task-Hazard Relationship

Vessel systems will be commonly used in order to support experimental activities on the beam line.

Administrative Control

Verify that a vessel/system - Verify that a vessel/system is either (1) designed & rated for vacuum applications by a manufacturer, or (2) perform equivalency calculations

Differential Vacuum Vessels Category II	Moderate

Task-Hazard Relationship

Many experimental activities require vacuum conditions to reduce the influence of air on measurements, sample preparations, or characterization.

Additional Requirements

Pressure relief device.

Administrative Control

Verify that a vessel/system - Verify that a vessel/system is either (1) designed & rated for vacuum and pressure applications by a manufacturer, or (2) if maximum operating pressure is greater than 15 psig - that pressure vessel is ASME-stamped & rated for vacuum applications, or (3) perform equivalency-to-ASME calculations

Personal Protective Equipment

safety glasses with sideshields (ANSI Z87.1)

Differential pressure system (excluding vacuum)	Moderate

Task-Hazard Relationship

High pressure gas cylinders are used in various applications to supply non-hazardous gases to experimental equipment including detectors, beam line sections, chambers, etc.

Additional Requirements

Verify piping/tubing rated for operating temperature and pressure simultaneously.

Administrative Control

Pressure relief - Verify the pressure relief devices are documented, inspected and tested.

Pressure system. - Verify that the pressure system is inspected and tested.

Personal Protective Equipment

Eye protection - Safety glasses with side shields.

TASK 1 Beam Line, Experimental Hutches, and Common Areas

Workplace

Stored Energy

DOT cylinders	

Task-Hazard Relationship

High pressure gas cylinders are used in various applications to supply non-hazardous gases such as N2, He,
Ar, air, etc... to experimental equipment including detectors, flght paths, beam line sections, chambers, etc...

Additional Requirements

Only use two or four-wheeled carts with chains or strap downs when manually transporting cylinders that cannot be carried by hand.

Engineering Control

gas pressure regulators inspected in last 5 years

pressure relief device or rupture disk set at max allowable pressure for weakest portion of the segment, no more than max allowable working pressure (MAWP) of device

verify pressure relief devices have ASME "UV" certification mark or documentation of operability tests demonstrating function and flow capacity available

Administrative Control

Ensure gas pressure regulator has not exceeded required inspection period based on application

verify piping/tubing compliant with ESH 13.1 and ESH 13.2

verify piping/tubing rated for operating temperature and pressure simultaneously

Personal Protective Equipment

Shoes that cover the entire foot - safety-toe shoes highly recommended

work gloves (leather or equivalent)

Welding-related hazard, (Brazing, soldering, torch-cutting)

Soldering, Non-flame small scale electrical.	Low

Task-Hazard Relationship

Some soldering may be required to perform incidental repairs.

Additional Requirements

-Collect spend solder and dispose properly.

-Perform housekeeping tasks no less frequently than at the end of each shift.

-If lead soldering, frequently clean work station by wet wiping.

Engineering Control

Ventilation - Well ventilated area or local exhaust ventilation.

Administrative Control

collect spent solder and dispose properly

Personal Protective Equipment

safety glasses with sideshields (ANSI Z87.1)