



WCD 69218.0 Facility Hazard Analysis-Wet Lab Activities

Hazard Level: Moderate



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

Authorization Status: See Authorization Package

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Approving Division: PSC Approver: Rossi, Paul

Review Interval: 1 Years Annual Review: 06/25/2021

Scope

Routine wet-lab work in a chemical laboratory space to support experimental activities at the APS. The wet labs at the APS are primarily used for sample preparation for user experiments.

Accordingly, this WCD covers:

- cleaning samples using common solvents
- mounting of samples using various common adhesives
- grinding of metallic powders using a mortar and pestle
- loading sample cells or mounts.

The laboratory is also used for testing of beam line components. Typical work conducted in this area involves:

- the usage of common solvents such as acetone, ethanol or methanol
- heating of samples and/or adhesive mixtures using a hot plate or kiln
- testing new beam line equipment such as sample cooling refrigeration units
- unpacking and assembly of beam line components and user-provided instrumentation

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 wet lab activities.

This WCD does not cover the use of pyrophorics or explosives as this is considered work that is beyond incidental inside of the lab and would require an approved ESAF or separate SOP.

This WCD also does not cover metal powder grinding processes.

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

In case of an emergency dial 9-1-1 From your cell phone: 630-252-1911



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Task Summary

Task 1	Routine Wet Lab Activities in Support of APS Experimental Activities	
	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)	

General Site Hazard

1	In a laboratory	Low
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Chemicals

Cylinders

1	Use or storage of cylinders	
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Using Chemicals in Research

1	Chemical safety level 1	Low
1	< 5 gal in use	Low

Using Chemicals not for Research

1	Using chemicals	Moderate
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Electrical

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

1	Non-QEW	Low
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Hazardous Materials

Cryogenics

1	Transfer between vessels	Low
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Quality

1	Measuring and testing equipment	Low
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Hazard Summary



Workplace

Ergonomics

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

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
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Pinch or nip hazard

1	Pinch or nip	Low
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Sharps

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

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

PPE Summary

TASK	PPE
1	Clothing
1	Eye protection
1	Foot protection
1	Footwear
1	Gloves
1	Shoes that cover the entire foot
1	Use radiant heat shielding garments when practical
1	safety glasses with sideshields (ANSI Z87.1) or safety goggles



WCD Status: **Approved**

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Training Summary

TASK	COURSE	COURSE NAME
1	COVID100	Guidance to Working Safely in a COVID-19 Environment
1	ESH115	Laboratory Safety Training
1	ESH117	Ladder Safety
1	ESH377	Recognizing NRTLs

Permit Summary

TASK	PERMIT
1	Written procedure

WCD Attachments

TASK	DATE	FILE NAME	DESCRIPTION
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**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**

Response to unplanned events:

Stop work immediately and dial 911

Locations:

400 All wet labs located in the 400 area.

Task Scope:

Routine wet-lab work in a chemical laboratory space to support experimental activities at the APS. The wet labs at the APS are primarily used for sample preparation for user experiments.

Accordingly, this WCD covers:

- cleaning samples using common solvents
- mounting of samples using various common adhesives
- grinding of metallic powders using a mortar and pestle
- loading sample cells or mounts.

The laboratory is also used for testing of beam line components. Typical work conducted in this area involves:

- the usage of common solvents such as acetone, ethanol or methanol
- heating of samples and/or adhesive mixtures using a hot plate or kiln
- testing new beam line equipment such as sample cooling refrigeration units
- unpacking and assembly of beam line components and user-provided instrumentation

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.

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)	
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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.

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



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)	
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. Additional Requirements Inform ESH Coordinator if such tasks must be carried out and seek additional controls. Engineering Control Physical barrier - Identify physical barrier Administrative Control Additional safe work practice - Specify additional safe work practices, or n/a Avoid sharing PPE - Follow shared PPE guidelines Base-level controls are in place Using disposable PPE - Dispose of used PPE in regular trash, and then immediately wash/sanitize hands	

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	

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Campus

General Site Hazard

In a laboratory	Low
<p>Task-Hazard Relationship Personnel will be working within a wet lab and must follow all sign postings and occupancy requirements.</p> <p>Additional Requirements Employees must follow all guidance and where appropriate PPE in designated areas.</p> <p>Administrative Control Signage - Verify entry requirements on signage prior to entry.</p> <p>Personal Protective Equipment Clothing - Long trousers without cuffs over shoe tops and 1/4 length or longer sleeves Eye protection - Safety glasses with side shields or safety goggles. Foot protection - Closed toe shoes (e.g., leather composite)</p>	



Chemicals

Cylinders

Use or storage of cylinders	
<p>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.</p> <p>Additional Requirements -gas pressure regulators inspected -verify piping/tubing in compliance -verify piping/tubing rated for operating temperature and pressure simultaneously. No Engineering, Administrative or PPE Controls identified for this hazard</p>	

Using Chemicals in Research

Chemical safety level 1	Low
<p>Task-Hazard Relationship Common carcinogenic chemicals such as solvents, adhesives, epoxies, etc. are sometimes required in small quantities in this area.</p> <p>Additional Requirements Follow SDS requirements.</p>	

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Chemicals

Using Chemicals in Research

Chemical safety level 1	Low
<p>Engineering Control</p> <ul style="list-style-type: none"> Eyewash station Safety shower Storage requirements - APS storage requirements. Flammables in flamm cabinet, corrosives in corrosive cabinet, separation of oxidizers from flammables Ventilation - Refer to SDS or ESH Coordinator regarding specific ventilation requirements when handling. <p>Administrative Control</p> <ul style="list-style-type: none"> Attach, reference, or describe risk assessment - quantity of use for scope of this work does not exceed threshold in Exhibit D table of LMS-PROC-341 Identify the designated area for PHS materials - Wet Labs. Will be stored per SDS recommendations and will also follow APS guidelines for PHS storage. Review and/or complete a waste determination and for RCRA waste identify an appropriate waste storage area Signage - as needed <p>Personal Protective Equipment</p> <ul style="list-style-type: none"> Eye protection - approved safety glasses or goggles with side shields Gloves - Refer to APS glove guide found on APS safety website or contact ESH Coordinator for guidance. Shoes that cover the entire foot 	

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

< 5 gal in use	Low
<p>Task-Hazard Relationship</p> <p>Common industrial chemicals such as solvents, detergents, aerosols, paints, adhesives, epoxies, etc. are often required for routine use in this area.</p> <p>Additional Requirements</p> <p>Follow SDS recommendations.</p> <p>Hot plates and stirrers used for flammables must be properly rated and used within manufacturers recommendations.</p> <p>Engineering Control</p> <p>Containment - specify type of container requirements (e.g. glass, original container, approved safety can)</p> <p>Administrative Control</p> <p>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)</p> <p>Personal Protective Equipment</p> <p>safety glasses with sideshields (ANSI Z87.1) or safety goggles</p>	

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Chemicals

Using Chemicals not for Research

Using chemicals	Moderate
<p>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.</p> <p>Additional Requirements Follow SDS recommendations</p> <p>Engineering Control Eyewash station Safety shower Storage requirements - flammables in flammable cabinets. ventilation (specify type) - Normal room ventilation unless otherwise specified in the SDS</p> <p>Administrative Control Review and/or complete a waste determination and for RCRA waste identify an appropriate waste storage area Signage - as needed.</p> <p>Personal Protective Equipment Eye protection - safety glasses or goggles with sideshields Gloves - Refer to APS Glove Guide on the Safety Webpage or consult your ESH Coordinator Shoes that cover the entire foot</p>	



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
<p>Task-Hazard Relationship NRTL approved/DEEI inspected electrical equipment may be used inside the wet labs.</p> <p>Administrative Control See training</p>	



Hazardous Materials

Cryogenics

Transfer between vessels	Low
<p>Task-Hazard Relationship Dewars are commonly refilled for processes that support experimental processes.</p>	

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Hazardous Materials

Cryogenics

Transfer between vessels	Low
<p>Engineering Control ventilation (specify type) - Normal room ventilation</p> <p>Administrative Control Avoid awkward body position Working alone prohibited</p> <p>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.</p> <p>Permits Written procedure</p>	



Quality

Measuring and testing equipment	Low
<p>Task-Hazard Relationship Measuring and testing equipment will be used when performing receipt and technical inspection of equipment.</p> <p>Administrative Control Verify required calibrations are current prior to use</p>	



Workplace

Ergonomics

Lifting, lowering, carrying, pushing, pulling, or reaching < 30 lbs	Low
<p>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.</p> <p>Additional Requirements Stretch prior to lifting, ensure good posture. Request additional help if needed.</p> <p>Administrative Control Rest component - Specify: duration and frequency of rest</p>	
Lifting, lowering, carrying, pushing, pulling, or reaching, 30-50 lbs	Moderate
<p>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.</p>	

In case of an emergency dial 9-1-1 From your cell phone: 630-252-1911

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Workplace

Ergonomics

Lifting, lowering, carrying, pushing, pulling, or reaching, 30-50 lbs	Moderate
Additional Requirements Ensure good posture. Request additional help when needed.	
Administrative Control Rest component - Specify: duration and frequency of rest	

Hand Tools

Non-Powered Hand Tools	Low
Task-Hazard Relationship 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]	

**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Workplace

Hot or Cold surfaces

Cold Surfaces \leq 100° C (-148°F) – Potential for oxygen deficiency	Moderate
<p>Task-Hazard Relationship Experimental activities in this area often require extreme temperature environments and/or conditions.</p> <p>For example, beam line optics are cooled to liquid nitrogen temperatures, and displax coolers and cryo-pumps are used in various applications at the APS.</p> <p>Engineering Control Tongs or long-handled tools ventilation (specify type) - Normal room ventilation</p> <p>Administrative Control Working alone prohibited</p> <p>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.</p>	

Ladders, scaffolds, elevated platforms

Portable ladders	Low
<p>Task-Hazard Relationship Step ladders and step stools may occasionally be used in the lab to access tools and components necessary to assist in experimental activities.</p> <p>Administrative Control See training</p>	

Pinch or nip hazard

Pinch or nip	Low
<p>Task-Hazard Relationship Some of the beam line components can be potential nip or pinch hazards.</p> <p>Additional Requirements -Inspect components to become fully aware of potential nip or pinch hazards.</p> <p>Personal Protective Equipment Gloves - Sturdy leather work gloves</p>	

Sharps

Use of scalpels, razor blades, and similar tools	Low
<p>Task-Hazard Relationship Sharps such as box cutters and razor blades may be used for components supporting experimental activities.</p>	

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**TASK 1 Routine Wet Lab Activities in Support of APS
Experimental Activities**



Workplace

Sharps

Use of scalpels, razor blades, and similar tools	Low
<p>Administrative Control</p> <p>Storage - Store with sharp edge covered.</p> <p>Personal Protective Equipment</p> <p>Gloves - Cut resistant gloves when feasible.</p>	

Stored Energy

Differential Vacuum Vessels Category I	Low
<p>Task-Hazard Relationship</p> <p>Vessel systems will be commonly used in order to support experimental activities on the beam line.</p> <p>Administrative Control</p> <p>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</p>	

Differential pressure system (excluding vacuum)	Moderate
<p>Task-Hazard Relationship</p> <p>High pressure gas cylinders are used in various applications to supply non-hazardous gases to experimental equipment including detectors, beam line sections, chambers, etc.</p> <p>Additional Requirements</p> <p>Verify piping/tubing rated for operating temperature and pressure simultaneously.</p> <p>Administrative Control</p> <p>Pressure relief - Verify the pressure relief devices are documented, inspected and tested.</p> <p>Pressure system. - Verify that the pressure system is inspected and tested.</p> <p>Personal Protective Equipment</p> <p>Eye protection - Safety glasses with side shields.</p>	