Approved

ORNL WORK PLAN

Operations, Maintenance and Services

Work Plan Name / Rev: FAB/CVS/LASER WELDER / 4
Expiration Date: 1/16/2026

53205

WORK SCOPE/DESCRIPTION	
Requester (Name/Badge/Division):	Varner, Tim / 00695470 / X207
Location of work (Bldg/Rm/Other):	2525 / 115 /
Work Plan Title:	Laser Welding
Description of Service/Work Needed: Laser welding iridium alloy frit vent assemblies.	
Charge Number, if required:	
Work Plan Grade/Worktype:	3 / 0
Author (Name/Badge):	Varner, Tim / 00695470
File Attachments:	

Badge	Name	Attachment Desc	File Name
00695470	Varner, Tim	Exposure Assessment	QEA -- CVS, Laser Welding, Welder.pdf

INSTRUCTIONS

Prerequisites/Precautions:
Task specific training required.(OJT and laser safety) Documentation required. Safety glasses required.

All employees are expected to familiarize their self with equipment prior to using it. This familiarization includes but is not limited to reading and understanding manufacturers warning labels and cautions posted on the equipment. If safe operations are not understood see your supervisor.

Questions for craftsmen prior to performing work for particular job and work location:

1. Will I be exposed to hazards at the work location that are not associated with the job?

2. Will I use chemicals or materials for which I do not understand the hazards?

3. Will the job require PPE that I do not normally use or have not been trained to use?

4. Will bystanders or passerby be exposed to job hazards?

5. Will additional permits be required?

6. Is there any aspect of the work that I do not feel safe performing?

NOTE: **Any YES answer** – contact Supervisor for further instructions before starting work.

Directions:
Follow CVS procedures GPHS-OP-004 & GPHS-K-9752 when performing task. If scope of work exceeds this work plan, stop work and notify task leader.Refer to the product detail sheet in CREAS or SDS for information about chemicals used with this work plan. Contact Waste Management for proper chemical disposal.

Post Work Testing:

Closeout:
Complete required documentation. All usable chemicals are to be stored properly. All waste is properly staged and/or removed for proper storage and disposal. Ensure that work area is clean and free of hazards prior to leaving the work area. Do not eat or drink in work area.

JOB HAZARD EVALUATION

HAZARDS	PERMITS / CONTROLS

Welding/burning/hot work	ı Welding/Burning/Hot Work Permit ı Exposure Assessment: Enter or attach justification to classify exposure scenario as low risk, qualitative exposure assessment (QEA), or requirement to conduct quantitative exposure monitoring (QEM)
Electrical Equipment and Tools: Lumonics Laser Welder	ı Not NRTL listed ¡ Has Equipment Labels or ¡ Have made provision for Electrical Equipment Inspector (EEI) review and Electrical Safety Officer (ESO) approval or ¡ Equipment poses no or little hazard (see Exhibit) : Approval requested for Lumonics Laser Welder
Lasers: Laser welder	ı Eye protection: Optical filter ı Interlocks: System interlock prohibits laser from operating when door is open. ı Class I cabinet.
Chemical/Rec ID 1: Isopropanol	ı Ventilation: General room ventilation ı No ignition sources
Argon -directed at workpiece only	ı Low volume - dissipates quickly, chamber is vented
Pinch Points	ı Ensure that body parts are free from exposure to pinch points

DOCUMENTATION REVIEW AUTHORIZATION (Approvals are certification of hazards assessment)		
Reviewer/Approver Roles	Signature	Date
Accountable Management (Service Provider, Line, Equipment Owner, or Facility Management)	Brewer, Eric	6/11/2024
Author	Williams Jr, Sam	6/10/2024
IS/IH	Helton, Zach	6/10/2024
Other Subject Matter Experts (SMEs)	Faraone, Kevin	6/11/2024
Project Lead	Varner, Tim	6/28/2024
Review Team Member	Leffew, David	1/16/2025
Task Leader	Cox, Greg	6/11/2024
Work Package Concurrence		
Facility Manager		
Operations Supervisor		
Facility Manager Approval To Start Work		
Facility Manager		
Work Start Authorization		
Task Leader		
Work Acknowledged Complete		
Task Leader		
Worker Feedback:		

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PRE-JOB SAFETY REVIEW GUIDE

ID: 53205

Scope of Work: Review work package/plan to ensure all participants understand the work activity.

Hazards: Review the hazards identified in Job Hazard Evaluation (JHE) / work plan (IOP).

- Since the work package / plan was written: 1) Have conditions changed? 2) Are there new hazards? Refer to Field Notes and Focus Areas.

Hazard Controls / Permits: Review:

- Written permits for the work activity.
- Precautions, step warnings, Hold Points ...
- Personal Protective Equipment (PPE)
- Work instructions for information - e.g., steps where hazards are introduced.
- ORNL subject area requirements - e.g., non-permit hazard controls.

Performing Work:

- Discuss group/individual responsibilities for safe & effective work.
- Follow work instructions & safety procedures.
- Availability/location of materials, tools, etc.
- Any previous experiences / lessons learned?
- Response if work cannot be performed as planned.
- What is the worst thing that could happen?
- Are there *Potential error traps* with the job? → →
- Take a minute before: work start & leaving work area.
- Work Hand-off / Turnover - workers & Task Leader

→ Potential Error Traps:

- Time pressures
- Distractive environment
- High workload
- First time evolution
- First day back
- Vague guidance
- Over confidence
- Imprecise communications
- Work stress

Abnormal Situation Response:

- *Stop Work*: Observe an unsafe act, activity or condition that creates an imminent danger.
- *Emergency Response*: Discuss egress paths or other responses if problems are encountered.

Field Notes and Focus Areas: (Use this area as a work space to record notes related to new hazards identified in the field or changed conditions. Record feedback in work package/plan information systems.)

By signing below, I am indicating that I have been briefed on the potential hazards associated with completing this job.

Signature / Badge	Date	Signature / Badge	Date

Qualitative Exposure Assessment – Multiple Hazard Form

Project Information

☐ No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task

☐ QEA could not be conducted at the time the RSS/Work Plan was reviewed/approved due to inadequate information provided by the PI, Work Planner/Package author on some or all agent(s)/hazard(s). List the agent(s) for which a QEA could not be conducted: ☐ All Agents (see below) or Specific Agent(s) that could not be assessed: . Discuss controls incorporated into *Work Control* to assure EA is conducted in the future: _____

Process/Job/Task: (SEG/SET Name) Fabrication / Welder / Laser Welding (CVS Project)

Work Description: Laser welding iridium alloy frit vent assemblies. Class 4 laser enclosed in an interlocked Class 1 enclosure. The enclosure is vented outside the building. Small amounts of isopropanol are used to intermittently clean the assemblies.

Facility #: 2525 **Room/Lab/Shop #:** 115

Organization: Fabrication Complex, FMD **RSS/Work Plan #:** FAB/CVS/LASER WELDER / 2

Agents and Control Information

	Process/Job/Task	Agent	Quantity or Magnitude	[1]Potential Routes of Entry	Primary Exposure Forms	Frequency of Exposure	Duration of exposure per exposure Event	[2]PPE (including Respiratory Protection)	[3]Engineering and Administrative Controls	*OEL	Health Severity Rating 1-4	Exposure Rating 1-4	Certainty Rating 1 - 3	[4]QEA Rating 1-24	[5]Exposure Decision
1	Fabrication / Welder / Laser Welding	isopropanol	<< 1 pt./day	Inh	Vapor	Variable	2 - 6 hours	EP	GV, T, P,	200 ppm (TWA); 400 ppm (STEL)	2	1	1	3	Acceptable (2 - 7)
2	Fabrication / Welder / Laser Welding	iridium	< 0.5 mg/m3 R (TWA)	Inh	Fume	Variable	2 - 6 hours	EP	I/E, S, T, P	5 mg/m3 R (TWA)	1	1	1	2	Acceptable (2 - 7)
3															
4															
5															
6															

1. Routes of entry codes: Inh – Inhalation, P – Penetration, Ing – Ingestion, S – Splash; A – Absorption; **2. PPE Codes**: COV – Coverall (e.g. Tyvek, Saranex, etc.), CV- Cooling vest , EP – Eye protection, FR – Flame Resistant Clothing, FS – Face Shield; G – Gloves, HPD – Hearing Protection Device, LC – Lab Coat, WH – Welding Helmet , APR – Air Purifying Respiratory , PAPR – Powered Air Purifying Respiratory, SAR – Supplied Air Respirator or SCBA; **3. Engineering Control codes:** GB – Glovebox, GV – General Ventilation, Hood – Other LEV Hood, I/E – Isolate or Enclose Hazard, LH - Lab Hood S – Shielding, W – Wet Methods; **Administrative Control Codes:** T –Training, L/P – Labeling or Postings, P – Written procedure/plan; LT – Limited Stay Time; W/R – Modified Work/Rest Cycle, BEI – Biological Monitoring, MS – Medical Surveillance; **4. QEA Rating** = (Health Severity Rating + Exposure Rating) X Certainty Rating; **5. Exposure Decision:** Acceptable (2-7), Uncertain (8-15), Unacceptable (16-24) * Optional field

Exposure Decision and Follow-up

Qualitative Exposure Assessment – Multiple Hazard Form

	Acceptable Exposure (LOW RISK)		Uncertain and Unacceptable Exposures			
	Was Agent Hazard Acceptable (Low Risk)?	If yes, describe justification for classification as acceptable	Follow-up Priority	Follow-up Schedule	Is Quantitative Monitoring Required?	Recommendations/Comments
1	YES	Professional judgment. The agent is used in quantities that would not present an exposure potential.	_____	_____	___	
2	YES	No realistic potential for inhalation exposure. Process is enclosed and vented outside the building.	_____	_____	___	
3	___		_____	_____	___	
4	___		_____	_____	___	
5	___		_____	_____	___	
6	___		_____	_____	___	

Qualified H&S Professional: M. Longpre **Date:** 04/04/2022

Qualitative Exposure Assessment – Multiple Hazard Form

QEA Rating Tables

Table 1: Health Severity Rating

Rating		Criteria
HSR		Effects from Over Exposure
1	Negligible	Negligible or **reversible** effects of little concern Note: This applies to chemical agents classified as a *Relatively Harmless Hazard.
2	Minor	Minor or reversible health concern Note: This applies to chemical agents classified as a *Slight Health Hazard. Examples for using this rating for physical agents include: heat fatigue, discomfort from repetitive stress tasks, minor skin burn not requiring medical treatment, etc.
3	Medium	Medium to severe, reversible health concern. Note: This applies to chemical agents classified as a *Moderate Health Hazard. Examples for using this rating for physical agents includes temporary threshold shift in hearing, heat exhaustion, reversible repetitive stress disorders requiring medical intervention, temporary or transient sight impairment, minor skin burns (UV or IR) requiring medical treatment, etc.
4	Major	Major or irreversible health concern. Includes unknown health effects Note: This applies to chemical agents classified as a *High Health Hazard or *Extreme Health Hazard. Examples for using this rating for physical agents include: standard threshold shift in hearing, heat stroke, permanent peripheral nerve or tendon damage, ruptured disc, permanent (total or partial) loss of sight, formation of cataracts, neurological effects, sterility, etc.

***From the *Hazard Classification Guide*, Appendix C, of ORNL Chemical Hygiene Plan**

Table 2: Exposure Rating

Rating		Criteria
1	Negligible/Remote	• Little to no exceedance of 10% of the OEL (i.e., 95th percentile exposure estimate is virtually always less than 10% of the OEL) • No signs or symptoms of exposure • There is sufficient quantitative exposure data to judge exposure • Very little skin contact with Agent is expected • Engineering and administrative controls are in place and functioning • Only diluted chemicals are used in the process • Very low intensity of energy source • Short exposure duration • The phase of the chemical does not allow for route of exposure
2	Low/Occasional	• Exposure >5% exceedance of 10% of the OEL (i.e., 95th percentile exposure estimate lies between 10% of the OEL and 50% of the OEL) • No specific signs or symptoms of exposure • Qualitative monitoring indicates insignificant levels of hazard • Only incidental skin contact with Agent • There is exposure potential • Engineering and administrative controls are available but effectiveness is questionable
3	Medium/Probable	• Exposure >5% exceedance of 50% of the OEL (i.e., 95th percentile exposure estimate lies between 50% the OEL and the OEL) • Air concentrations may exceed established action levels • Routine skin contact with chemical is expected
4	High/Likely	• Exposure >5% exceedance of the OEL (i.e., 95th percentile exposure estimate > OEL) • Signs and symptoms are evident • High generation of airborne particles or vapors

Table 3: Certainty Rating

Rating		Criteria
1	Certain	The environmental agent's exposure profile and health effects are well-understood. The industrial hygienist has high confidence in the acceptability judgment.
2	Uncertain	There is enough information to make a judgment, but further information gathering is warranted to verify the exposure assessment.
3	Highly Uncertain	The acceptability judgment was made in the absence of significant information on the exposure profile and/or health effects.

Qualitative Exposure Rating

QEA Rating = (Health Severity Rating + Exposure Rating) X Certainty Rating