

Approved
ORNL WORK PLAN
 Operations, Maintenance and Services
 Work Plan Name / Rev: 5067727 / 0
 Expiration Date: 4/24/2025



WORK SCOPE/DESCRIPTION	
Requester (Name/Badge/Division):	Jinks, Michael / 03113830 / X126
Location of work (Bldg/Rm/Other):	/ / Pit 39
Work Plan Title:	PREAPPROVED WORK PLAN FOR THE STEAM DISTRIBUTION SYSTEM
Description of Service/Work Needed:	
<p>The objective of this work package is to perform routine maintenance activities on the STEAM DISTRIBUTION SYSTEM AND EQUIPMENT. These routine maintenance activities are generally limited to such activities as simple troubleshooting, basic parts replacement or repairs that can be performed without additional written work instructions (task leader direction may be required). Examples of work included in this work package include:</p> <p>MILLWRIGHT TASKS, (e.g. pump maintenance, mechanical equipment repairs, filter replacements, assembling equipment, valve operator repairs, fabricate customized parts, performing preventive maintenance work, etc.)</p> <p>PIPEFITTER AND WELDING TASKS, (e.g. piping/fitting repairs and replacements, valve/valve operator repairs and replacements, installation of pressure relief valves, minor piping modifications, valve lubrication, gasket repairs, steam trap maintenance and repairs, gauge replacements, pressure regulating equipment troubleshooting and repairs, preparing metal surfaces by grinding utilizing hand tools and power equipment, cutting/beveling piping, join piping/fittings using arc/tig/etc. welding techniques, prepare and operate fixed and portable welding equipment, performing preventive maintenance work, etc.) All code compliance for steam piping fabrication, repairs, and inspections will follow ORNL Engineering Standard ES-MECH-G-01.</p> <p>ELECTRICIAN TASKS, (e.g. taking voltage readings, operating breakers, troubleshooting input power issues to equipment, performing lighting repairs and replacements, performing electrical LTV activities, performing minor electrical wiring installations, installing electrical panels and sub-panels, air-gapping circuits, performing preventive maintenance work, etc.)</p> <p>I&C TASKS, (e.g., repairing and maintaining instruments and controllers, performing systems and device diagnostics, performing calibration activities, installing control wiring/equipment/panels for system improvements, troubleshooting control-related equipment malfunctions, performing preventive maintenance work, etc.)</p> <p>UTILITY MECHANIC TASKS, (e.g. concrete forming, concrete repairs, floor leveling, installation of flooring materials, caulking of joints, wall patching, utility trench repairs and replacements, masonry work, sidewalk repairs, performing preventive maintenance work, etc.)</p> <p>LABORER TASKS, (e.g. moving materials, clearing brush, organizing/warehousing parts, floor cleanup, supporting concrete and other similar repairs, operating hand and power tools, operating pressure washers, assisting in the erection of temporary structures, equipment moving, waste collection, cleaning pits and utility trenches, performing preventive maintenance work, etc.)</p> <p>BOILERMAKER TASKS, (e.g. open pressure vessels, install man-way gaskets, clean tubes, perform preventive maintenance work, perform preventive maintenance work, etc.)</p> <p>CARPENTER TASKS, (e.g. construct scaffolding, erect containment structures, build elevated wooden/metal work platforms, concrete form construction and removal, perform preventive maintenance work, etc.)</p>	

INSULATOR TASKS, (e.g. replacement/abatement of piping and duct insulation, routine prefabrication, shop work, field installations on hot and cold systems, disposal of insulating materials, encapsulation of damaged piping and duct insulation with wettable cloth/tape/metal jacket/CP-11 mastic, repairing and cleaning of water sprays/vacuums/abatement tools)

Activities also include the encapsulation, removal and/or disposal of installed insulation materials to include the following:

Fiberglass

Armaflex

Foam Glass

Perlite

Calcium Silicate

Asbestos

Maintenance activities not included in the scope of work for this work package include: Any maintenance activity that is non-routine.

Work start authorization must be obtained from the Task Leader

Charge Number, if required:	3126OTSD		
Work Plan Grade/Worktype:	2 / 0		
Author (Name/Badge):	Jinks, Michael / 03113830		
File Attachments:			
Badge	Name	Attachment Desc	File Name
03113830	Jinks, Michael	Glove Selection Chart	ANSI glove cut levels.pdf
03113830	Jinks, Michael	Armaflex Exposure Assessment - May 2021	Armaflex520QEA2021.pdf
03113830	Jinks, Michael	CP11 Exposure Assessment - 2021	CP11QEA2021.pdf
03113830	Jinks, Michael	I-Chem Spray Adhesive Exposure Assessment - 2021	IChemWebSprayAdhesiveQEA2021.pdf
03113830	Jinks, Michael	Silica control measures and exemptions	Silica Exposure Control Methods Exhibits.pdf
03113830	Jinks, Michael	Silica QEA for dust producing activities	silica QEA for silica activities 2022 brummitt.pdf
03113830	Jinks, Michael	dust generated by cleanup of site	2022 QEA for Nuisance Dust.pdf
03113830	Jinks, Michael	Noise from equipment	Noise generic tools 6-14-22.pdf
03113830	Jinks, Michael	welding, grinding stainless steel 2022	Welding, grinding, stainless steel feb 2022.pdf
03113830	Jinks, Michael	1-1550 lbs 45 degree Lift Plan	1-1550 lbs 45 degree Lift Plan.pdf
03113830	Jinks, Michael	1-1550 lbs 90 degree Lift Plan	1-1550 lbs 90 degree Lift Plan.pdf
03113830	Jinks, Michael	1-1750 lbs 45 degree Lift Plan	1-1750 lbs 45 degree Lift Plan.pdf
03113830	Jinks, Michael	1-1750 lbs 90 degree Lift Plan	1-1750 lbs 90 degree Lift Plan.pdf
03113830	Jinks, Michael	Welding, Grinding, Pipefitting Carbon Steel July 2022	Welding, grinding, pipefitting July 2022.pdf
03113830	Jinks, Michael	2023 Lifting Guidance	2023 Lifting Guidance.pdf

INSTRUCTIONS

Prerequisites/Precautions:

PREREQUISITES:

Assure applicable/appropriate access and training requirements are identified and adhered to.

Notify affect R&D personnel of work activity when applicable

PRECAUTIONS:

Not all hazards and controls from the Job Hazard Evaluation (JHE) will apply for each job scope. The applicable hazards and controls for each job scope will be communicated in the pre-job brief.

PRESTART CHECKLIST:

- * Review Scope of Work in the accompanying Work Order to ensure that its request is within the Description of Service for this Work Plan.
- * Establish jobsite boundary.
- * Prior to beginning work, establish a staging area and path for the disposal of waste in accordance with ORNL procedures.
- * Check that appropriate PPE is identified and utilized to help ensure worker safety while performing job duties.
- * Ensure that workers have appropriate training for the tools and equipment to be utilized for the project.
- * Assess work area and implement/perform preventive measures as necessary to enhance worker safety.
- * Perform a "Pre-Job Safety Review Briefing".
- * Identify to the project personnel the project's scope and sequence of work is specified in the accompanying work order, noting potential hazards and work controls.
- * Ensure that Task Leader and workers share a common understanding of work scope, hazards and associated controls.

* Verify that all personnel performing work tasks associated with this project have participated in the Pre-Job Safety Briefing, reviewed the Pre-Job Safety Review Guide, reviewed all applicable permits, and have participated in discussions pertaining to the project's work tasks, activities, hazards (included in the Work Plan JHE), hazard controls, and required PPE as needed to thoroughly understand the tasks, steps and controls required to safely complete this work.

* After the completion of this briefing, confirm that each person in attendance has had the opportunity to ask questions about the project's tasks/activities/hazards/permits/PPE/etc. Once all questions have been addressed, ensure that each attendee signs the Pre-Job Safety Review Guide indicating he has had the opportunity to ask questions regarding the project's tasks/activities/hazards/permits/PPE/etc., and that all questions have been answered to each person's satisfaction.

SAFETY:

Refer to the JHE attached to this Work Plan.

All personnel shall work in a manner to protect against injury by following safe work practices as well as job-related hazard controls.

Properly secure unused tools, equipment, etc. during work and at the end of each work day.

Maintain a clean work area. Remove any unnecessary items before starting work as applicable.

Ensure that no personnel hazards are introduced in the work area by the work in progress. This can be done by posting the area as work in progress OR performing housekeeping to return the area to original condition.

Ensure that all hazardous energy sources that may be encountered during the performance of this work order have been placed in a LO/TO configuration.

Personnel shall wear all appropriate PPE as required to perform work tasks associated with the completion of the work order. See the JHE attached.

Personnel shall comply with all posted signage relative to PPE requirements specific to a work area (e.g., hearing protection when equipment is operating).

Task Leader shall ensure all personnel meet training requirements necessary to complete the work tasks associated with the work order.

FIRE PROTECTION ENGINEERING

Fire Protection Engineering shall be contacted on all items associated with Fire Protection. Below are some examples, but not all inclusive:

- * Fire barriers
- * Blocking exits (stairwells, hallways, corridors, doors, etc.)
- * Non-flame producing soldering machines
- * Smoke or dust producing operations
- * Suppression systems
- * Detection/Alarm systems
- * Electrical power outages

MISCELLANEOUS:

Tasks may be worked out of sequence and/or simultaneously at the direction of the Task Leader.

Workers shall stop work and notify the Task Leader if any of the following situations are encountered during the project: a) changes to the scope of work, b) unusual/unexpected circumstances arise and/or c) uncertainty arises concerning how to perform a work task.

NOTE: Link will have to be copied and pasted into file search and access to T: drive is required. This is a running list and may not be all inclusive. Speak with Utilities Division Health and Safety Representative with any questions.

Directions:

Perform work as directed in the associated work order.

Post Work Testing:

Ensure system/equipment is functioning properly.

Closeout:

Verify that worksite is left in a clean and safe condition.

Report any abnormal conditions, concerns, and/or process improvements to the Task Leader.

JOB HAZARD EVALUATION

HAZARDS	PERMITS / CONTROLS
Asbestos/Man-Made Mineral Fibers: Gaskets, Roofing Material, Insulation	<ul style="list-style-type: none"> Asbestos hazard controls applied: <ul style="list-style-type: none"> Wet methods HEPA Vacuum Prompt Cleanup Medical Monitoring Authorization by the Asbestos Program Manager (APM) Follow applicable sections of the F&O-ADM F&O Asbestos Work Procedure. Training - Asbestos Competent Supervisor Training - Asbestos O&M Training Training - Asbestos Accreditation <u>Asbestos Management and Tracking System (AMTS)</u> (formerly UCN-13385, Asbestos Work Authorization (AWA)): Permit required for all Asbestos Work PPE & Access - Signs or Markings: Regulated Area PPE & Access - Respiratory protection: Specify. Minimum Cartridge P100 and a minimum half face RESPIRATOR. Contact Health and Safety Filed representative for specific respiratory protection requirements. Follow requirements in the SBMS subject area Respiratory Protection. All personnel that use respiroars shall be trained on that specific respirator and have a medical clearance. PPE & Access - Gloves: Specify. PPE & Access - Safety glasses Approved HEPA Vacuum Cleaner
Confined Space: Pits	<ul style="list-style-type: none"> <u>Confined Space Entry Permit</u>: Follow all permit requirements.
Deenergized Hazardous Energy Sources (LTV)	<ul style="list-style-type: none"> <u>ORNL-213, ORNL Lock/Tag/Verify Permit form</u> OR <u>ORNL-214, ORNL Lock/Tag/Verify Permit Continuation form</u> OR <u>ORNL-215, ORNL Lock/Tag/Verify Permit Temporary Suspension form</u> Single source LO/TO may be utilized as required(PPE is required for zero energy verification, and operation of disconnects and breakers. Reference SBMS Electrical Work for PPE requirements.)
Energized Electrical (>50v)	<ul style="list-style-type: none"> <u>ORNL-646, Energized Electrical Work Permit (EEWP)</u> (Formerly used <u>UT-T-ELEC-002, Power Distribution Work Permit (PDWP)</u>) All energized work must be performed in accordance with

the SBMS subject area Electrical Work.

Excavation/penetration (includes trenching and shoring)	<ul style="list-style-type: none"> ORNL-211, Excavation Permit Form Excavation Permit (PERX) ORNL-648, Penetration Permit Form Penetration Permit (PERX) For excavation/penetration activities that are exempt from permit requirements, document the exemption criteria on the work order.
Hoisting and Rigging: Ordinary lifts only	<ul style="list-style-type: none"> Lift Plans: Use Lift Classification exhibit Instructions for Completion of Ordinary Lift Form (ORNL-544, Ordinary Lift Plan) Hard hats: required when performing any hoisting and rigging activities Safety shoes Qualified personnel: Personnel performing hoisting and rigging are to be trained and qualified.) Traffic control: As Required Ensure hoisting and rigging equipment is in good condition and inspections are current.
Lead: Paint and Pipe Coating	<ul style="list-style-type: none"> Approved HEPA Vacuum Cleaner: Use wet method or HEPA vacuum 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): EA will be completed per task due to variability in work performed under this work plan Lead Exposure Control: Paint or coatings containing lead will be required to be stripped back from cut site or taped over. No hot work shall be performed on painted or coated surfaces.
Radiological Work: For specific tasks located within radiological areas including posted steam pits.	<ul style="list-style-type: none"> Radiological Work Permit (Enter RWP no.): RWPs will be developed for specified work in radiological areas. Follow radiological posting, entry control & egress requirements
Welding/burning/hot work	<ul style="list-style-type: none"> Welding/Burning/Hot Work Permit 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): Ensure an exposure assessment is completed and documented noting applicable controls prior to hot work activities Exposure Controls: The use of exhaust is required. Dilution ventilation is allowed if exhaust ventilation is not possible as long as it's effective with blowing the contaminants completely out of the breathing zones of all effective employees.
Atmospheric Issues - Oxygen enriched/Oxygen deficient: Pits	<ul style="list-style-type: none"> Atmospheric monitoring
Boiler, Pressure Vessels, Relief Valves	<ul style="list-style-type: none"> Inspection of vessels
Compressed Gas: must be secured at all times and capped when not in use.	<ul style="list-style-type: none"> Securing of cylinders Transportation of cylinders controls Prominently posted hazard class(es): bottles shall be segregated and stored pertaining to hazard class.

Electrical Equipment and Tools	<ul style="list-style-type: none"> Listed by a nationally recognized testing laboratory (NRTL) Not NRTL listed <ul style="list-style-type: none"> i Has Equipment Labels or i Have made provision for Electrical Equipment Inspector (EEI) review and Electrical Safety Officer (ESO) approval or i Equipment poses no or little hazard (see Exhibit)
Electrical Work	<ul style="list-style-type: none"> Minimum level of electrical worker qualification for the task (i.e. EW, QEW 1, 2, 3, 4, or 5): Specify. Verify and establish limited approach boundary and restricted approach boundary. See Table 1 for AC or Table 2 for DC: Specify. Two-person rule Complete and document electrical work hazard analysis
Elevated Work: Fall protection is required when working exposed to an unprotected edge of 4 feet or greater.	<ul style="list-style-type: none"> Inspecting Ladders Guide [Step & Fixed] Fall Protection Competent Person: Specify. When a fall protection plan is needed Fall Protection Training Requirements: Specify. Scaffolding - Scaffold Competent Person Evaluates Work Scope Aerial Lifts (Boom, Articulating, Telescoping, Scissor, Bucket, etc.): Personell must be trained/qualified to operate Safety Harness/Fall Protection Equipment: Specify. Ensure fall protection equipment is in good condition and inspected before use Several fixed ladders do not meet current OSHA standards. Discuss in pre-job brief.
Ergonomic Conditions (Contact Stress, Vibration, Posture, Force, Repetitive Motion)	<ul style="list-style-type: none"> 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) Special Tools (Lifts, etc.) Stretch breaks/exercises Worker rotation
Heat/Cold Stress: May be encountered due to environmental conditions and/or PPE	<ul style="list-style-type: none"> 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) Follow SBMS Management System: Worker Safety and Health, Directive: Heat and Cold Stress Program for guidance related to heat and cold stress safety when the activities expose workers to an extreme temperature environment or expose workers to conditions that prevent the body from maintaining proper body temperature (e.g. hot weather, outside work in the winter, wearing of PPE).
Low Clearance	<ul style="list-style-type: none"> Maintain awareness of potential overhead hazards.: In situations where hard hats will not create additional hazards, hard hats should be worn to provide protection from overhead obstructions.
Manual Material Handling	<ul style="list-style-type: none"> Establish Controls (Guideline) [apply 30-50-30 criteria for a non-repetitive lifting task] <ul style="list-style-type: none"> i Reduce weight i Decrease load i Design work area

	<ul style="list-style-type: none"> Facilitate access to material Optimum environment Reduce distance /Provide proper storage facilities Load storage Eliminate manual lifting/lowering Eliminate pushing/pulling – Use lifting aids Other instructions to staff Team Lifting (Guideline) 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) Consider forklifts or powered industrial trucks: See Power Equipment hazard (formerly Lifting Aides) Use 30-50-30 F&O Lifting Guidance
Noise	<ul style="list-style-type: none"> 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) Ensure hearing protection is used for maintenance activities in posted high noise areas and when work activities produce high noise levels.
Obstructed Access/Egress	<ul style="list-style-type: none"> Ensure that at least one path to egress is available during work activity
Power Equipment	<ul style="list-style-type: none"> Qualified operator Seat belts: Shall be worn when provided and when operating heavy equipment and Hearing protection: Required if using equipment 85db or greater
Thermal Sources: Steam Piping/Systems	<ul style="list-style-type: none"> Allow time for equipment to cool down: If equipment has to be maintenance while warm/hot then don appropriate PPE (Gloves, Long Sleeves, Long Pants) before working on hot equipment.
Chemical/Rec ID 1: Silica	<ul style="list-style-type: none"> Approved HEPA Vacuum Cleaner Workplace monitoring: Periodically 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): Follow the attached silica guidance. If guidance cannot be followed or work goes longer than 4 hours, sampling and respiratory protection may be required. Administrative controls: See attached silica work control guidance Gloves: Specify. Ventilation: Use cross ventilation to fugitive particles from work area. Respirator: Will depend upon task, effectiveness of engineering controls, and length of time task is performed. Safety glasses Engineering controls: See attachmented guidance detailing silica exposure controls. Wet methods, ventilation Required Training: General Hazard Communication - Web Course Medical Monitoring: Mandatory Program Enrollment Request form: Only if it's anticipated that action level will be exceeded for 30 days

	<ul style="list-style-type: none"> Job Specific Haz Com Training Wet Methods: Always use water connections designed to reduce airborne exposure. When not possible, use copious amounts of water directly on point source of dust generation. 	
Chemical/Rec ID 2: Reference QEA for evaluated chemicals	<ul style="list-style-type: none"> <u>Exposure Assessment:</u> Enter or attach justification to classify exposure scenario as low risk, qualitative exposure assessment (QEA), or requirement to conduct quantitative exposure monitoring (QEM) Consult SDS and contact IS/IH for QEA prior to chemical use Ensure chemical/material has been approved for use and is in CREAS 	
Respirable Crystalline Silica	<ul style="list-style-type: none"> <u>Exposure Assessment:</u> Enter or attach justification to classify exposure scenario as low risk, qualitative exposure assessment (QEA), or requirement to conduct quantitative exposure monitoring (QEM). Example: QEA required for respirable silica generating construction activities and where Respirable Silica is above action level. Specify. See attached exposure assessment Wet methods: Specify. use water to control dust according to silica control methods. PPE & Access - Air monitoring req.: Specify. contact safety and health for determination of air monitoring needs. 	
Insects/animals/wildlife/parasites: Be alert for insects and wildlife while performing maint. activities	<ul style="list-style-type: none"> PPE: Specify. Insect spray 	
hand injuries: Wear appropriate glove for work being performed. See attached glove selection chart as a reference or SDS for chemical applications.	<ul style="list-style-type: none"> PPE: Wear appropriate glove for work being performed. See attached glove selection chart as a reference or SDS for chemical applications. 	
Potential eye injury	<ul style="list-style-type: none"> Safety glasses w/side shields shall be worn while working and in posted areas. 	
DOCUMENTATION REVIEW AUTHORIZATION (Approvals are certification of hazards assessment)		
Reviewer/Approver Roles	Signature	Date
Accountable Management (Service Provider, Line, Equipment Owner, or Facility Management)	Parkison, Michael Lee	
Fire Protection Engineer	Migun, Peter	
IS/IH	Joyce, David R	
IS/IH	Massaro, Bekkah	
Operations Manager	McLemore, Jason	
Radiation Protection	O'Dell, Roger	
System Engineer, Accountable Equipment Owner, or Facility Engineer	Jinks, Michael	
Task Leader	Brummitt, Jeff	
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:			
FOR INFORMATION ONLY. WORK RELEASE AND SYSTEM HOLD POINTS			
TASK DESCRIPTION	RESOURCES	DUR	
[Hold Point] - Ensure the job scope is routine, is applicable under the work plan scope and all hazards are addressed in the JHE and/or the JHA	Supervisor	0	
[Hold Point] - Ensure that tasks performed using this pre-approved work plan have an associated "Ready to Work" work order assigned.	Supervisor	0	
[Hold Point] - Obtain work start authorization from the supervisor	Supervisor	0	
WORK DETAILS - Prerequisites/Precautions			
Hazards	Permits/Controls	Resources	Dur
[Hold Point] - 1) - Ensure the job scope is routine, is applicable under the work plan scope and all hazards are addressed in the JHE and/or the JHA			
Signature:		Supervisor	0
[Hold Point] - 2) - Ensure that tasks performed using this pre-approved work plan have an associated "Ready to Work" work order assigned.			
Signature:		Supervisor	0
WORK DETAILS - Directions			
Hazards	Permits/Controls	Resources	Dur
1) - Conduct pre-job brief using the work order, JHE and/or the JHA to identify scope of work, hazards, controls, etc. Include input from all personnel involved in performance of task.			
A pre-job briefing will be performed on each job and each task will be discussed with the craft that will be performing the task.			
		Supervisor	1
2) - Perform work per service request/work order			1
[Hold Point] - 3) - Obtain work start authorization from the supervisor			
Signature:		Supervisor	0

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PRE-JOB SAFETY REVIEW GUIDE

ID: 61212

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).

- ε 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:

- ε Written permits for the work activity.
- ε Precautions, step warnings, Hold Points ...
- ε Personal Protective Equipment (PPE)

- ε Work instructions for information - e.g., steps where hazards are introduced.
- ε ORNL subject area requirements - e.g., non-permit hazard controls.

Performing Work:

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

→ **Potential Error Traps:**

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

Old ANSI Cut-Resistant Levels (Grams)	New ANSI Cut-Resistant Levels (Grams)	Applications By Cut Level	
		Cut-Resistant Levels (Grams)	ASTM ANSI CUT LEVEL
1 (200)	A1 Light cut hazards (200)	Material handling, small parts assembly (sharp edges), packaging, warehouse, general purpose, forestry, construction	A1
2 (500)	A2 Light/medium cut hazards (500)	Material handling, small parts assembly (sharp edges), packaging, warehouse, general purpose, forestry, construction, pulp ad paper, automotive assembly	A2
3 (1000)	A3 Light/medium cut hazards (1000)	Material handling, small parts assembly (sharp edges), packaging, warehouse, general purpose, forestry, construction, pulp ad paper, automotive assembly	A3
4 (1500)	A4 Medium cut hazards (1500)	Appliance manufacturing, bottle and light glass handling, canning, drywall work, electrical, carpet installation, HVAC, pulp ad paper, automotive assembly, metal fabrication and handling, packaging, warehouse, aerospace industry, food prep/processing	A4
5 (3500)	A5 Medium/heavy cut hazards (2200)	Appliance manufacturing, bottle and light glass handling, canning, drywall work, electrical, carpet installation, HVAC, pulp ad paper, automotive assembly, metal fabrication and handling, packaging, warehouse, aerospace industry, food prep/processing	A5
	A6 High cut hazards (3000)	Metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry	A6
	A7 High cut hazards (4000)	Metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry	A7
	A8 High cut hazards (5000)	Metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry	A8
	A9 High cut hazards (6000)	Metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry	A9

Single Hazard Qualitative Exposure Assessment Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task <input type="checkbox"/> QEA could not be conducted at the time the RSS/Work Plan was reviewed/approved due to inadequate information on the agent(s)/hazards provided by the PI, Work Planner/Package author. Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future: _____					
Process/Job/Task: (SEG/SET Name)	GENERIC WORK PLAN FOR INSULATORS GRADE 2 SHOP FABRICATION & FIELD INSTALLATION				
Work Description:	THE FOLLOWING TASKS HAVE BEEN IDENTIFIED TO MEET THAT CRITERIA FOR: PREFABRICATE SHOP WORK AND FIELD INSTALLATION HOT & COLD APPLICATIONS, FOR THE INSTALLATION OF FIBERGLASS, ARMAFLEX AND FOAM GLASS ON PIPING SYSTEMS, PERLITE, CALCIUM SILICATE, CHILLED WATER HVAC PIPING AND DUCT WORK. PREFABRICATE SHOP WORK AND FIELD INSTALLATION. THIS WORK PLAN ALSO COVER THE REMOVAL OF THESE PRODUCTS: COMPACT ASBESTOS, FIBERGLASS, CALCIUM SILICATE AND FOAMGLASS. PLANT WIDE PICK UP OF ASBESTOS, AND FIBEROUS MATERIAL WASTE FOR DISPOSAL. ENCLAPSULATION OF DAMAGED PIPING AND DUCT INSULATION WITH WETTABLE CLOTH, TAPE, METAL JACKET OR CP-11 MASTIC. REPAIRING AND CLEANING OF WATER SPRAYS, VACUUMS AND ABATEMENT TOOLS. NOTE: THE BUILDING AND LOCATION SHALL BE HAND WRITTEN FOR EACH PROJECT. THIS WORK PACKAGE SHALL ALSO CONTAIN THE FOLLOW IF REQUIRED. INSULATION SPECIFICATION, BUILDING CONTACTS, FLOOR PLAN, PICTURES.				
Facility #: Various	<input type="checkbox"/>	Room/Lab/Shop #:	Various		
Organization:	<input type="checkbox"/>	RSS/Work Plan #:	MU-PA-XXXX		

Hazard Information

Agent/Hazard (for chemical products, list multiple components)	Quantity	*OEL	Unit	Percent (if applicable)
ACETONE	VARIOUS	250	PPM	
HEXANES	VARIOUS	50	PPM	
TOLUENE	VARIOUS	20	PPM	

* Optional field

Source of OEL: ACGIH OSHA DOE NIOSH None Other:

CHEMICAL HAZARD

Chemical Product Name: ARMAFLEX 520 ADHESIVE, RECID 86146

Potential Routes of Entry

Inhalation Penetration Ingestion Splash Absorption Other

Primary Exposure Forms

Solid Liquid Gas Fume Particulate Vapor Mist Nano Other

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

PHYSICAL HAZARD

Type of Hazard

Thermal Stress: Heat Cold

Single Hazard Qualitative Exposure Assessment Form

Ergonomic (Specify): |

Acoustic: Infrasound and low-frequency sound

Noise

Ultrasound

Electromagnetic Radiation & Fields (Specify):

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

Single Hazard Qualitative Exposure Assessment Form

Control Strategy

No controls in-place or specified in RSS or Work Plan/Package

¹Engineering: GV

²Administrative: P

1. 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; **2. 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

Controls Effective:

Yes No Uncertain Comments:

Exposure Assessment Rating

$$\begin{array}{c}
 \text{(Health Severity} \\ \text{Rating (1-4)} \\
 3
 \end{array}
 +
 \begin{array}{c}
 \text{Exposure Rating} \\ \text{Rating (1-4)} \\
 2
 \end{array}
 \times
 \begin{array}{c}
 \text{Certainty} \\ \text{Rating (1-3)} \\
 1
 \end{array}
 =
 \begin{array}{c}
 \text{QEA Rating} \\ \text{(2-24)} \\
 5
 \end{array}$$

Exposure Decision

Acceptable (2-7) <input checked="" type="checkbox"/> document and schedule follow-up assessment	Uncertain (8-15) <input type="checkbox"/> prioritize for further information gathering	Unacceptable (16-24) Implement control measures and prioritize for Follow-up assessment
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Was hazard considered Low Risk (Acceptable)?

No, proceed with Follow-up section **Yes**, describe justification for classification as acceptable or "Low Risk"

Acceptable Exposure Justification: PRODUCT IS APPLIED OUTDOORS OR IN AREAS WITH SUFFICIENT VENTILATION TO MINIMIZE VAPOR BUILD-UP.

Follow-up

Follow-up Assessment Priority: Low Schedule: Month 6 months 1 year 3 years Other: See Recommendations/Comments

Is Quantitative Exposure Monitoring recommended? Yes No

Recommendations/Comments: IF PRODUCT WILL BE APPLIED IN TIGHT SPACES OR IN ANY AREA(S) WITH LIMITED VENTILATION, THE USE OF FANS TO REDUCE VAPOR BUILD-UP IS REQUIRED. CONTACT HEALTH AND SAFETY WHEN WORK WILL BE PERFORMED IN CONFINED SPACES OR IN AREAS WITH LIMITED VENTILATION.

Qualified H&S Professional: Chastity Guinn, 3012149

Date: 7/19/2021

QEA Rating Tables

Table 1: Health Severity Rating

Rating		Criteria
HSR		Effects from Over Exposure
1	Negligible	Negligible or reversible effects of little concern
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.

**See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible/Remote	<ul style="list-style-type: none"> • 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 routine exposure
2	Low/Occasional	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating.

Table 3: Certainty Rating

Rating		Criteria
1	Certain	The environmental agent's exposure profile and/or 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.

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Qualitative Exposure Assessment – Multiple Hazard Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task <input type="checkbox"/> 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: <input type="checkbox"/> All Agents (see below) or Specific Agent(s) that could not be assessed: . Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future:		
Process/Job/Task: (SEG/SET Name)	GENERIC WORK PLAN FOR INSULATORS GRADE 2 SHOP FABRICATION & FIELD INSTALLATION	
Work Description:	THE FOLLOWING TASKS HAVE BEEN IDENTIFIED TO MEET THAT CRITERIA FOR: PREFABRICATE SHOP WORK AND FIELD INSTALLATION HOT & COLD APPLICATIONS, FOR THE INSTALLATION OF FIBERGLASS, ARMAFLEX AND FOAM GLASS ON PIPING SYSTEMS, PERLITE, CALCIUM SILICATE, CHILLED WATER HVAC PIPING AND DUCT WORK. PREFABRICATE SHOP WORK AND FIELD INSTALLATION. THIS WORK PLAN ALSO COVER THE REMOVAL OF THESE PRODUCTS: COMPACT ASBESTOS, FIBERGLASS, CALCIUM SILICATE AND FOAMGLASS. PLANT WIDE PICK UP OF ASBESTOS, AND FIBEROUS MATERAIL WASTE FOR DISPOSAL. ENCLAPSULATION OF DAMAGED PIPING AND DUCT INSULATION WITH WETTABLE CLOTH, TAPE, METAL JACKET OR CP-11 MASTIC. REPAIRING AND CLEANING OF WATER SPRAYS, VACUUMS AND ABATEMENT TOOLS. NOTE: THE BUILDING AND LOCATION SHALL BE HAND WRITTEN FOR EACH PROJECT. THIS WORK PACKAGE SHALL ALSO CONTAIN THE FOLLOWING IF REQUIRED: INSULATION SPECIFICATION, BUILDING CONTACTS, FLOOR PLAN, PICTURES	
Facility #: VARIOUS		Room/Lab/Shop #: VARIOUS
Organization: MECHANICAL UTILITIES		RSS/Work Plan #: MU-PA_XXXX

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 Engineering/ Administrative Controls	*OEL	Health Severity Rating 1 – 4	Exposure Rating 1 – 4	Certainty Rating 1 – 3	³ QEA Rating 1 - 24	⁴ Exposure Decision
1	APPYLING/REMOVING CHILDERS CP-11	CRYSTALLINE SILICA	UNKNOWN	INH	Particulate	Variable	1/2 - 2 hours	GV, W, P, T	0.025 mg/m3	4	1	1	4	Acceptable (2)
2	APPYLING/REMOVING CHILDERS CP-11	ATTAPULGITE	UNKNOWN	INH	Particulate	Variable	1/2 - 2 hours	GV, W, P, T	Not Listed	4	1	1	4	Acceptable (2)
3	APPYLING/REMOVING CHILDERS CP-11	TITANIUM DIOXIDE	UNKNOWN	INH	Particulate	Variable	1/2 - 2 hours	GV, W, P, T	10 mg/m3	4	1	1	4	Acceptable (2)
4	APPYLING CHILDERS CP-11	VINYL ACETATE	UNKNOWN	INH	Vapor	Variable	1/2 - 2 hours	GV, P	10 PPM	4	1	1	4	Acceptable (2)
5				-----	-----	-----	-----	-----	---	---	---	---	-----	
6				-----	-----	-----	-----	-----	---	---	---	---	-----	

1. **Routes of entry codes:** Inh – Inhalation, P – Penetration, Ing – Ingestion, S – Splash; A – Absorption; 2. **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;

3. **QEA Rating** = (Health Severity Rating + Exposure Rating) X Certainty Rating; 4. **Exposure Decision:** Acceptable (2-7), Uncertain (8-15), Unacceptable (16-24)

* Optional field

Exposure Decision and Follow-up

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	Being applied wet therefore particles are bound in liquid; removal is performed with wet methods to minimize dust		Low	3 years	NO	
2 YES	Being applied wet therefore particles are bound in liquid; removal is performed with wet methods to minimize dust		Low	3 years	NO	
3 YES	Being applied wet therefore particles are bound in liquid; removal is performed with wet methods to minimize dust		Low	3 years	NO	
4 YES	Being applied wet therefore particles are bound in liquid; removal is performed with wet methods to minimize dust		Low	3 years	NO	
5 -----			-----	-----	----	

Qualitative Exposure Assessment – Multiple Hazard Form

6	-----	-----	-----	-----	-----
Additional Comments					

Qualified H&S Professional: Chastity Guinn, 3012149

Date: 07/19/2021

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,

*See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible /Remote	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating

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

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Qualitative Exposure Assessment – Multiple Hazard Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task		
<input type="checkbox"/> 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 or some or all agent(s)/hazard(s). List the agent(s) for which a QEA could not be conducted: <input type="checkbox"/> All Agents (see below) or Specific Agent(s) that could not be assessed: . Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future:		
Process/Job/Task: (SEG/SET Name) GENERIC WORK PLAN FOR INSULATORS GRADE 2 SHOP FABRICATION & FIELD INSTALLATION		
Work Description: THE FOLLOWING TASKS HAVE BEEN IDENTIFIED TO MEET THAT CRITERIA FOR: PREFABRICATE SHOP WORK AND FIELD INSTALLATION HOT & COLD APPLICATIONS, FOR THE INSTALLATION OF FIBERGLASS, ARMAFLEX AND FOAM GLASS ON PIPING SYSTEMS, PERLITE, CALCIUM SILICATE, CHILLED WATER HVAC PIPING AND DUCT WORK. PREFABRICATE SHOP WORK AND FIELD INSTALLATION. THIS WORK PLAN ALSO COVER THE REMOVAL OF THESE PRODUCTS: COMPACT ASBESTOS, FIBERGLASS, CALCIUM SILICATE AND FOAMGLASS. PLANT WIDE PICK UP OF ASBESTOS, AND FIBEROUS MATERAIL WASTE FOR DISPOSAL. ENCLAPSULATION OF DAMAGED PIPING AND DUCT INSULATION WITH WETTABLE CLOTH, TAPE, METAL JACKET OR CP-11 MASTIC. REPAIRING AND CLEANING OF WATER SPRAYS, VACUUMS AND ABATEMENT TOOLS. NOTE: THE BUILDING AND LOCATION SHALL BE HAND WRITTEN FOR EACH PROJECT. THIS WORK PACKAGE SHALL ALSO CONTAIN THE FOLLOW IF REQUIRED. INSULATION SPECIFICATION, BUILDING CONTACTS, FLOOR PLAN, PICTURES.		
Facility #:	VARIOUS	
Organization:	MECHANICAL UTILITIES	
	Room/Lab/Shop #:	VARIOUS
	RSS/Work Plan #:	MU-PA_XXXX

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 Engineering/ Administrative Controls	*OEL	Health Severity Rating 1 – 4	Exposure Rating 1 – 4	Certainty Rating 1 – 3	³ QEA Rating 1 - 24	⁴ Exposure Decision
1	APPLYING I-CHEM WEB SPRAY ADHESIVE - RECID E0499	PROPANE	UNKNOWN	INH	Vapor	Variable	1/2 - 2 hours	GV, P	1000 PPM	3	2	1	6	Acceptable (2)
2	APPLYING I-CHEM WEB SPRAY ADHESIVE - RECID E0499	ACETONE	UNKNOWN	INH, A	Vapor	Variable	1/2 - 2 hours	GV, P	250 PPM	3	2	1	6	Acceptable (2)
3	APPLYING I-CHEM WEB SPRAY ADHESIVE - RECID E0499	BUTANE	UNKNOWN	INH	Vapor	Variable	1/2 - 2 hours	GV, P	1000 PPM	3	2	1	6	Acceptable (2)
4	APPLYING I-CHEM WEB SPRAY ADHESIVE - RECID E0499	METHYL ACETATE	UNKNOWN	INH	Vapor	Variable	1/2 - 2 hours	GV, P	200 PPM	3	2	1	6	Acceptable (2)
5				-----	-----	-----	-----	-----	-----	-----
6				-----	-----	-----	-----	-----	-----	-----

1. **Routes of entry codes:** Inh – Inhalation, P – Penetration, Ing – Ingestion, S – Splash; A – Absorption; 2. **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;

3. **QEA Rating** = (Health Severity Rating + Exposure Rating) X Certainty Rating; 4. **Exposure Decision:** Acceptable (2-7), Uncertain (8-15), Unacceptable (16-24)

* Optional field

Exposure Decision and Follow-up

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	PRODUCT IS APPLIED OUTDOORS OR IN AREAS WITH SUFFICIENT VENTILATION TO MINIMIZE VAPOR BUILD-UP.		Low	3 years	NO	IF PRODUCT WILL BE APPLIED IN TIGHT SPACES OR IN ANY AREA(S) WITH LIMITED VENTILATION, THE USE OF FANS TO REDUCE VAPOR BUILD-UP IS REQUIRED.
2 YES	PRODUCT IS APPLIED OUTDOORS OR IN AREAS WITH SUFFICIENT VENTILATION TO MINIMIZE VAPOR BUILD-UP.		Low	3 years	NO	IF PRODUCT WILL BE APPLIED IN TIGHT SPACES OR IN ANY AREA(S) WITH LIMITED VENTILATION, THE USE OF FANS TO REDUCE VAPOR BUILD-UP IS REQUIRED.
3 YES	PRODUCT IS APPLIED OUTDOORS OR IN AREAS WITH SUFFICIENT VENTILATION TO MINIMIZE VAPOR BUILD-UP.		Low	3 years	NO	IF PRODUCT WILL BE APPLIED IN TIGHT SPACES OR IN ANY AREA(S) WITH LIMITED

Qualitative Exposure Assessment – Multiple Hazard Form

						VENTILATION, THE USE OF FANS TO REDUCE VAPOR BUILD-UP IS REQUIRED.
4	YES	PRODUCT IS APPLIED OUTDOORS OR IN AREAS WITH SUFFICIENT VENTILATION TO MINIMIZE VAPOR BUILD-UP.	Low	3 years	NO	IF PRODUCT WILL BE APPLIED IN TIGHT SPACES OR IN ANY AREA(S) WITH LIMITED VENTILATION, THE USE OF FANS TO REDUCE VAPOR BUILD-UP IS REQUIRED.
5	-----		-----	-----	---	
6	-----		-----	-----	---	

Additional Comments

Qualified H&S Professional: Chastity Guinn, 3012149

Date: 07/19/2021

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,

*See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible /Remote	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating

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

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Exhibit: Respirable Crystalline Silica Exclusions

Respirable Crystalline Silica (RCS) dust producing activities listed in this exhibit, with requisite controls as indicated below, have been evaluated for their potential to cause exposure to staff in excess of RCS **occupational exposure limit (OEL)**. Exposure assessment for these tasks has taken into account amount of material to be disturbed, potential for activity to produce respirable size particles, duration of activity, and effectiveness of controls listed. Based upon assessment of these variables, it has been determined that there is very low risk/potential for staff exposure to exceed the OEL. Where specified, activities described below must be conducted using manufacturer approved tools/equipment in accordance with manufacturer operation and maintenance instructions. If activity cannot be conducted according to controls listed below then the activity does not meet the exclusion in this exhibit and additional work control and planning procedures must be implemented (see [Work Control](#)).

Respirable Crystalline Silica Task Exclusions

- Drilling holes less than or equal to $\frac{1}{2}$ " diameter to maximum allowed by Excavation/Penetration Exclusions exhibit, that meet the following requirements:
 - Holes drilled are associated with installation of fasteners into shield blocks, floors, ceilings, and walls for anchoring or mounting wall features such as dry boards, whiteboards, monitors/displays, conduit/mechanical system supports, surface mounted raceways, shelving/shelving supports, storage lockers, HVAC thermostats/control panels, or filter housings
 - Number of holes drilled per day does not exceed 30 holes drilled with an approved dust control system such as an integrated dust extraction system with HEPA filtration attached to a hammer drill, or dust collection shroud or hollow core drill bit attached via hose to HEPA vacuum used to collect dust during drilling
- Cutting sheet rock using approved knife to score sheet rock and snapping sheet rock along score line or using large-toothed dry wall hand saw to cut holes in sheet rock
- Mixing small amounts of mortar (less than 2 bags); small amounts of concrete (less than 2 bags); bagged, silica-free drywall compound; bagged exterior insulation finishing system (EIFS) base and finish coat; removing concrete formwork; using block or tile splitters; and using manual (i.e., non-powered) chisels, shears, and utility knives
- Tasks where employees are working with silica-containing products that are, and are intended to be, handled while wet (examples include finishing and hand wiping block walls to remove excess wet mortar, pouring concrete, and grouting floor and wall tiles).
- Removing, replacing and handling less than 25 four by two feet ceiling tiles (< 200 square feet of other size tiles) that are shown to contain silica per safety data sheet - Non-silica tiles are excluded from this exhibit.

RCS dust producing activities not on this exempt list and are not in the Silica Exposure Control Methods for Construction Activities exhibit are required to be performed using work control documentation and controls that are evaluated by a QHSP.

Exhibit: Silica Exposure Control Methods for Construction Activities

This exhibit has been developed to meet the Respirable Crystalline Silica threshold limit value (TLV) published by the American Conference of Governmental Industrial Hygienist (ACGIH), in the "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," as referenced in the latest edition of 10 CFR 851 Worker Safety and Health Program. For staff engaged in a task identified in the table below, the engineering controls, work practices, and respiratory protection specified for the task must be fully and properly implemented to mitigate potential for staff to be exposed in excess of the occupational exposure limit (OEL). All tools and equipment listed in this table must be operated and maintained per manufacturer's instructions to minimize dust emissions. See [Respiratory Protection](#) subject area regarding assignment of type of respiratory protection needed to meet specified assigned protection factor (APF).

Note: For each equipment/task description in the table there is a link to an OSHA Fact Sheet for that equipment/task which describes dust controls to be used to minimize the amount of airborne dust when engaged in referenced equipment/task.

Equipment/Task	Engineering and Work Practice Control Methods	ORNL Required Respiratory Protection and Minimum APF		
		≤ 1 hr/shift	≤ 4 hr/shift	> 4 hr/shift
Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to blade. ² Note: See OSHA Fact Sheet 3631	None	None	APF 10
Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to blade. ² <ul style="list-style-type: none">• When used outdoors• When used indoors or enclosed area³ Note: See OSHA Fact Sheet 3627	None APF 10	APF 10 APF 10	APF 10 APF 25
Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: Use saw equipped with commercially available dust collection system. Dust collector must provide air flow recommended by tool manufacturer, or greater, and have a filter with 99% or greater efficiency. Note: See OSHA Fact Sheet 3927	None	None	APF 10

Walk-behind saws	<p>Use saw equipped with integrated water delivery system that continuously feeds water to blade.²</p> <ul style="list-style-type: none"> • When used outdoors • When used indoors or enclosed area³ <p>Note: See OSHA Fact Sheet 3633</p>	None APF 10	None APF 10	APF 10 APF 25
Drivable saws	<p>For tasks performed outdoors only: Use saw equipped with integrated water delivery system that continuously feeds water to blade.²</p> <p>Note: See OSHA Fact Sheet 3928</p>	None	None	APF 10
Rig-mounted core saws or drills	<p>Use tool equipped with integrated water delivery system that supplies water to cutting surface.²</p> <p>Note: See OSHA Fact Sheet 3929</p>	None	None	APF 10
Handheld and stand-mounted drills (including impact and rotary hammer drills)	<p>Use drill equipped with commercially available shroud or cowling with dust collection system.</p> <p>Dust collector must provide air flow recommended by tool manufacturer, or greater, and have HEPA filter and filter-cleaning mechanism⁴. Use HEPA-filtered vacuum when cleaning holes.</p> <p>Note: See OSHA Fact Sheet 3630</p>	None	None	APF 10
Dowel drilling rigs for concrete	<p>For tasks performed outdoors only: Use shroud around drill bit with dust collection system. Dust collector must have a HEPA filter and filter cleaning mechanism. Use HEPA-filtered vacuum when cleaning holes.</p> <p>Note: See OSHA Fact Sheet 3930</p>	APF 10	APF 10	APF 25
Vehicle-mounted drilling rigs for rock and concrete	<p>Use dust collection system with close capture hood or shroud around drill bit with low-flow water spray to wet dust at dust collector discharge point.²</p> <p>or</p> <p>Operate from within an enclosed cab and use water for dust suppression on drill bit.^{2,5}</p> <p>Note: See OSHA Fact Sheet 3931</p>	None	None	APF 10

Jackhammers and handheld powered chipping tools	<p>Use tool with water delivery system that supplies continuous stream or spray of water at point of impact:²</p> <ul style="list-style-type: none"> • When used outdoors • When used indoors or enclosed area³ <p>or</p> <p>Use tool equipped with commercially available shroud and dust collection system. Dust collector must provide air flow recommended by tool manufacturer, or greater, and have HEPA filter and filter-cleaning mechanism.⁴</p> <ul style="list-style-type: none"> • When used outdoors • When used indoors or enclosed area³ 	None APF 10	APF 10 APF 10	APF 10 APF 25
Note: See OSHA Fact Sheet 3629				
Handheld grinders for mortar removal (i.e., tuckpointing)	<p>Use grinder equipped with commercially available shroud and dust collection system</p> <p>When used indoors or in enclosed area, use HEPA-filtered vacuum to remove loose dust between passes.³</p>	APF 10	APF 25	APF 50
Note: See OSHA Fact Sheet 3632				
Handheld grinders for uses other than mortar removal.		<p>For tasks performed outdoors only:</p> <p>Use grinder equipped with integrated water delivery system that continuously feeds water to grinding surface.</p> <p>or</p> <p>Use grinder equipped with commercially available shroud and dust collection system. Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have HEPA and cyclonic pre-separator or filter-cleaning mechanism.⁴</p> <ul style="list-style-type: none"> • When used outdoors • When used indoors or enclosed area³ 	None None	None APF 10 APF 10
Note: See OSHA Fact Sheet 3628				

Walk-behind milling machines and floor grinders	<p>Use machine equipped with integrated water delivery system that continuously feeds water to cutting surface.</p> <p>or</p> <p>Use machine equipped with dust collection system recommended by manufacturer. Dust collector must provide air flow recommended by manufacturer, or greater, and have HEPA filter and filter-cleaning mechanism.⁴ When used indoors or enclosed area use HEPA-filtered vacuum to remove loose dust between passes.</p> <p>Note: See OSHA Fact Sheet 3932</p>	None	None	APF 10
Small drivable milling machines (less than half-lane)	<p>Use machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with surfactant.²</p> <p>Note: See OSHA Fact Sheet 3933</p>	None	None	APF 10
Large drivable milling machines (half-lane and larger)	<p>For cuts of any depth on asphalt only: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.²</p>	None	None	APF 10
	<p>For cuts of four inches in depth or less on any substrate: Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.²</p> <p>or</p> <p>Use machine equipped with supplemental water spray designed to suppress dust. Water must be combined with surfactant.²</p> <p>Note: See OSHA Fact Sheet 3934</p>	None	None	APF 10
Crushing machines	<p>Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (hoppers, conveyors, sieves/sizing or vibrating components, and discharge points). Use ventilated booth that provides fresh, climate-controlled air to operator, or a remote-control station.^{2, 5}</p> <p>Note: See OSHA Fact Sheet 3935</p>	None	None	APF 10

Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	<p>Operate equipment from within an enclosed cab.⁵</p> <p>When staff outside of cab are engaged in task, apply water and/or dust suppressants as necessary to minimize dust emission.² Note: See OSHA Fact Sheet 3936</p>	None	None	APF 10
Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	<p>Apply water and/or dust suppressants as necessary to minimize dust emissions.²</p> <p>or</p> <p>When equipment operator is only staff engaged in task, operate equipment from within enclosed cab.⁵ Note: See OSHA Fact Sheet 3937</p>	None	None	APF 10

Table Footnotes:

¹ Where staff perform more than one task on table during shift, and total duration of all tasks combined is more than four hours, required respiratory protection for each task is respiratory protection specified for more than four hours per shift. If total duration of all tasks on table combined is less than four hours, required respiratory protection for each task is respiratory protection specified for less than four hours per shift. If total duration of all tasks on table combined is less than one hour, required respiratory protection for each task is the highest respiratory protection listed for any of less than 1-hour tasks. .

² For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust.

³ For tasks performed indoors or enclosed areas, provide means of exhaust as needed to minimize accumulation of visible airborne dust.

⁴ Full and proper implementation of dust collection systems requires employer to ensure the following:

- Shroud or cowling is intact and installed in accordance with manufacturer's instructions
- Hose connecting tool to vacuum is intact and without kinks or tight bends
- Filter on vacuum is cleaned or changed in accordance with manufacturer's instructions
- Dust collection bags are emptied to avoid overfilling

⁵ For measures implemented that include enclosed cab or booth, ensure enclosed cab or booth meets the following criteria:

- Cab or booth maintained as free as practicable from settled dust
- Door seals and closing mechanisms work properly
- Gaskets and seals are in good condition and work properly
- Cab or booth is under positive pressure maintained through continuous delivery of fresh air
- Intake air is filtered through filter that is 95% efficient in 0.3-10.0 µm range (e.g., MERV-16 or better)
- Cab or booth has heating and cooling capabilities

<https://sbms.ornl.gov/sbms/SBMSearch/SubjArea/Silica/ExhibitMethods.cfm>

Single Hazard Qualitative Exposure Assessment Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task	
<input checked="" type="checkbox"/> QEA could not be conducted at the time the RSS/Work Plan was reviewed/approved due to inadequate information on the agent(s)/hazards provided by the PI, Work Planner/Package author. Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future: _____	
Process/Job/Task: (SEG/SET Name)	Activities that produce silica dust.
Work Description:	Activities that produce silica dust, such as concrete demolition, chipping, jackhammering, mixing concrete, etc
Facility #: multiple locations	Room/Lab/Shop #: N/A
Organization: Utilities	RSS/Work Plan #: various

Hazard Information

Agent/Hazard (for chemical products, list multiple components)	Quantity	*OEL	Unit	Percent (if applicable)
Crystalline Silica		.025	mg/m3	

* Optional field

Source of OEL: ACGIH OSHA DOE NIOSH None Other:

CHEMICAL HAZARD

Chemical Product Name: silica

Potential Routes of Entry

Inhalation Penetration Ingestion Splash Absorption Other

Primary Exposure Forms

Solid Liquid Gas Fume Particulate Vapor Mist Nano Other

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

PHYSICAL HAZARD

Type of Hazard

Thermal Stress: Heat Cold

Ergonomic (Specify): |

Acoustic: Infrasound and low-frequency sound Noise Ultrasound

Electromagnetic Radiation & Fields (Specify):

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

Single Hazard Qualitative Exposure Assessment Form

Control Strategy

No controls in-place or specified in RSS or Work Plan/Package

¹Engineering: W, GV, T, P

²Administrative: T

1. 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; **2. 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

Controls Effective:

Yes No Uncertain Comments:

Exposure Assessment Rating

$$\begin{array}{c} \text{(Health Severity} \\ \text{Rating (1-4)} \\ \text{3} \end{array} + \begin{array}{c} \text{Exposure Rating} \\ \text{Rating (1-4)} \\ \text{1} \end{array} \times \begin{array}{c} \text{Certainty} \\ \text{Rating (1-3)} \\ \text{2} \end{array} = \begin{array}{c} \text{QEA Rating} \\ \text{(2-24)} \\ \text{8} \end{array}$$

Exposure Decision

Acceptable (2-7) <input type="checkbox"/> document and schedule follow-up assessment	Uncertain (8-15) <input checked="" type="checkbox"/> prioritize for further information gathering	Unacceptable (16-24) Implement control measures and prioritize for Follow-up assessment <input type="checkbox"/>
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Was hazard considered Low Risk (Acceptable)?

No, proceed with Follow-up section Yes, describe justification for classification as acceptable or "Low Risk"

Acceptable Exposure Justification:

Follow-up

Follow-up Assessment Priority: mediu Schedule: Month 6 months 1 year 3 years Other:

Is Quantitative Exposure Monitoring recommended? Yes No

Recommendations/Comments: Sampling will be conducted to demonstrate negative exposures if work is outside of the silica controls SBMS guidance document.

Qualified H&S Professional: David Joyce

Date: 07/15/22

QEA Rating Tables

Table 1: Health Severity Rating

Rating		Criteria
HSR		Effects from Over Exposure
1	Negligible	Negligible or reversible effects of little concern
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.

**See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible/Remote	<ul style="list-style-type: none"> • 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 routine exposure
2	Low/Occasional	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating.

Table 3: Certainty Rating

Rating		Criteria
1	Certain	The environmental agent's exposure profile and/or 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.

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Single Hazard Qualitative Exposure Assessment Form

Project Information					
<p><input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task</p> <p><input checked="" type="checkbox"/> QEA could not be conducted at the time the RSS/Work Plan was reviewed/approved due to inadequate information on the agent(s)/hazards provided by the PI, Work Planner/Package author. Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future: <u>Contact Health and Safety before cutting/drilling/grinding silica containing materials</u></p>					
Process/Job/Task: (SEG/SET Name) Cutting/drilling/grinding non-silica containing materials					
Work Description: See specific work plan					
Facility #: Various		Room/Lab/Shop #:			
Organization: Utilities		RSS/Work Plan #: Various			
Hazard Information					
Agent/Hazard (for chemical products, list multiple components)		Quantity	*OEL	Unit	Percent (if applicable)
Nuisance Dust		15	mg/m3		
* Optional field					
Source of OEL: <input type="checkbox"/> ACGIH <input checked="" type="checkbox"/> OSHA <input type="checkbox"/> DOE <input type="checkbox"/> NIOSH <input type="checkbox"/> None <input type="checkbox"/> Other:					
CHEMICAL HAZARD					
Chemical Product Name:					
Potential Routes of Entry					
<input checked="" type="checkbox"/> Inhalation <input type="checkbox"/> Penetration <input type="checkbox"/> Ingestion <input type="checkbox"/> Splash <input type="checkbox"/> Absorption <input type="checkbox"/> Other					
Primary Exposure Forms					
<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input type="checkbox"/> Gas <input type="checkbox"/> Fume <input checked="" type="checkbox"/> Particulate <input type="checkbox"/> Vapor <input type="checkbox"/> Mist <input type="checkbox"/> Nano <input type="checkbox"/> Other					
Frequency of Exposure					
<input type="checkbox"/> One Time <input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually <input checked="" type="checkbox"/> Variable					
Duration of Exposure (per exposure event)					
<input checked="" type="checkbox"/> <1/2 hour <input type="checkbox"/> 1/2 - 2 hours <input type="checkbox"/> 2 - 6 hours <input type="checkbox"/> 6 - 8 hours <input type="checkbox"/> > 8 hours <input type="checkbox"/> Variable					
PHYSICAL HAZARD					
Type of Hazard					
Thermal Stress: <input type="checkbox"/> Heat <input type="checkbox"/> Cold <input type="checkbox"/> Ergonomic (Specify):					
Acoustic: <input type="checkbox"/> Infrasound and low-frequency sound <input type="checkbox"/> Noise <input type="checkbox"/> Ultrasound <input type="checkbox"/> Electromagnetic Radiation & Fields (Specify):					
Frequency of Exposure					
<input type="checkbox"/> One Time <input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually <input type="checkbox"/> Variable					
Duration of Exposure (per exposure event)					
<input type="checkbox"/> <1/2 hour <input type="checkbox"/> 1/2 - 2 hours <input type="checkbox"/> 2 - 6 hours <input type="checkbox"/> 6 - 8 hours <input type="checkbox"/> > 8 hours <input type="checkbox"/> Variable					

Single Hazard Qualitative Exposure Assessment Form

Control Strategy

No controls in-place or specified in RSS or Work Plan/Package

¹Engineering: GV, W

²Administrative: T, P

1. 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; **2. 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

Controls Effective:

Yes No Uncertain Comments:

Exposure Assessment Rating

$$\begin{array}{c} \text{(Health Severity} \\ \text{Rating (1-4)} \\ \text{4} \end{array} + \begin{array}{c} \text{Exposure Rating} \\ \text{Rating (1-4)} \\ \text{2} \end{array} \times \begin{array}{c} \text{Certainty} \\ \text{Rating (1-3)} \\ \text{1} \end{array} = \begin{array}{c} \text{QEA Rating} \\ \text{(2-24)} \\ \text{6} \end{array}$$

Exposure Decision

Acceptable (2-7) <input checked="" type="checkbox"/> document and schedule follow-up assessment	Uncertain (8-15) <input type="checkbox"/> prioritize for further information gathering	Unacceptable (16-24) Implement control measures and prioritize for Follow-up assessment
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Was hazard considered Low Risk (Acceptable)?

No, proceed with Follow-up section **Yes**, describe justification for classification as acceptable or "Low Risk"

Acceptable Exposure Justification: Short duration task using wet methods and ventilation as controls. If lead based paint is to be encountered, taping area prior to cutting is a sufficient control to keep dust hazard at a minimum.

Follow-up

Follow-up Assessment Priority: Low Schedule: Month 6 months 1 year 3 years Other:

Is Quantitative Exposure Monitoring recommended? Yes No

Recommendations/Comments: Contact Health and Safety before cutting/drilling/grinding silica containing materials. Silica work is not to be included with this QEA.

Qualified H&S Professional: David Joyce 612878

Date: 7/15/22

QEA Rating Tables

Table 1: Health Severity Rating

Rating		Criteria
HSR		Effects from Over Exposure
1	Negligible	Negligible or reversible effects of little concern
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.

**See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible/Remote	<ul style="list-style-type: none"> • 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 routine exposure
2	Low/Occasional	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating.

Table 3: Certainty Rating

Rating		Criteria
1	Certain	The environmental agent's exposure profile and/or 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.

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Single Hazard Qualitative Exposure Assessment Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task	
<input type="checkbox"/> QEA could not be conducted at the time the RSS/Work Plan was reviewed/approved due to inadequate information on the agent(s)/hazards provided by the PI, Work Planner/Package author. Discuss controls incorporated into <i>Work Control</i> to assure EA is conducted in the future: _____	
Process/Job/Task: (SEG/SET Name)	General site specific task
Work Description:	See specific work plan - use of power tools, cut off saws, generators, pumps and other small equipment
Facility #: Various	Room/Lab/Shop #:
Organization: Utilities	RSS/Work Plan #: Various

Hazard Information

Agent/Hazard (for chemical products, list multiple components)	Quantity	*OEL	Unit	Percent (if applicable)
Noise	>85	85	db	

* Optional field

Source of OEL: ACGIH OSHA DOE NIOSH None Other:

CHEMICAL HAZARD

Chemical Product Name:

Potential Routes of Entry

Inhalation Penetration Ingestion Splash Absorption Other

Primary Exposure Forms

Solid Liquid Gas Fume Particulate Vapor Mist Nano Other

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

PHYSICAL HAZARD

Type of Hazard

Thermal Stress: Heat Cold

Ergonomic (Specify): |

Acoustic: Infrasound and low-frequency sound Noise Ultrasound

Electromagnetic Radiation & Fields (Specify):

Frequency of Exposure

One Time Daily Weekly Monthly Quarterly Annually Variable

Duration of Exposure (per exposure event)

<1/2 hour 1/2 - 2 hours 2 - 6 hours 6 - 8 hours > 8 hours Variable

Single Hazard Qualitative Exposure Assessment Form

Control Strategy

- No controls in-place or specified in RSS or Work Plan/Package

1Engineering:

2Administrative: T, P, LT

1. 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; **2. 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

Controls Effective:

- Yes No Uncertain Comments:

Exposure Assessment Rating

(Health Severity <u>Rating (1-4)</u>	+	Exposure Rating) <u>Rating (1-4)</u>	x	Certainty <u>Rating (1-3)</u>	=	QEA Rating <u>(2-24)</u>
4		2		1		6

Exposure Decision

Acceptable (2-7) <input checked="" type="checkbox"/> document and schedule follow-up assessment	Uncertain (8-15) <input type="checkbox"/> prioritize for further information gathering	Unacceptable (16-24) Implement control measures and prioritize for Follow-up assessment <input type="checkbox"/>
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Was hazard considered Low Risk (Acceptable)?

- No**, proceed with Follow-up section

- Uncertain (8-15)**
prioritize for further gathering

- Unacceptable (16-24)** Implement control measures and prioritize for Follow-up assessment

Acceptable Exposure Justification:

Follow-up

Follow-up Assessment Priority:

Schedule: Month 6 months 1 year 3 years Other:

Is Quantitative Exposure Monitoring recommended? Yes No

Recommendations/Comments: Staff shall wear HPD with a minimum NRR 25 when using small handtools or equipment is running, use of the cut off saw will require double hearing protection with a minimum of 25 NRR for ear plugs and then muffs over top of the plugs.

Qualified H&S Professional: David Joyce

Date: 6/14/22

QEA Rating Tables

Table 1: Health Severity Rating

Rating		Criteria
HSR		Effects from Over Exposure
1	Negligible	Negligible or reversible effects of little concern
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.

**See the [Hodge and Sterner toxicity classification scale](#)

Table 2: Exposure Rating**

Rating		Criteria
1	Negligible/Remote	<ul style="list-style-type: none"> • 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 routine exposure
2	Low/Occasional	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating.

Table 3: Certainty Rating

Rating		Criteria
1	Certain	The environmental agent's exposure profile and/or 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.

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

Qualitative Exposure Assessment – Multiple Hazard Form

Project Information

<input type="checkbox"/>	No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task and the following Low Risk Justification:
<input checked="" type="checkbox"/>	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 or some or all agent(s)/hazard(s). List the agent(s) for which a QEA could not be conducted: <input type="checkbox"/> All Agents (see below) <u>or</u> Specific Agent(s) that could not be assessed (list): hexavalent chromium. Discuss controls incorporated into Work Control to assure EA is conducted in the future (list):
Process/Job/Task: Facilities Maintenance / Welder-Pipefitter / welding and grinding stainless steel. <small>(SEG/SET Name)</small>	

Work Description: All pressure piping repairs shall be fabricated and installed to the following UT-Battelle engineering standards, pipe specifications and welding specifications.

Facility #:	Plant wide	Organization:	Utilities	Room/Lab/Shop #:	N/A	RSS/Work Plan #:	Various
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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 Engineering/ Administrative Controls	*OEL	Health Severity Rating 1 – 4	Exposure Rating 1 – 4	Certainty Rating 1 – 3	³ QEA Rating 1 - 24	⁴ Exposure Decision
1	Fabrication / Welder / SMAW and GTAW stainless steel	hexavalent chromium		inh	Particulate	Quarterly	1/2 - 2 hours	GV, Hood	5 ug/m3	4	2	1	10	Uncertain (8-15)
2				-----	-----	-----	-----		---	---	---	---	---	-----
3				-----	-----	-----	-----		---	---	---	---	---	-----
4				-----	-----	-----	-----		---	---	---	---	---	-----
5				-----	-----	-----	-----		---	---	---	---	---	-----
6				-----	-----	-----	-----		---	---	---	---	---	-----

1. **Routes of entry codes:** Inh – Inhalation, P – Penetration, Ing – Ingestion, S – Splash; A – Absorption; 2. **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;
 3. **QEA Rating** = (Health Severity Rating + Exposure Rating) X Certainty Rating; 4. **Exposure Decision:** Acceptable (2-7), Uncertain (8-15), Unacceptable (16-24)

* Optional field

Exposure Decision and Follow-up

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	NO	Use of point source ventilation required for all welding activities in shops and outdoors. Personal air sampling should be conducted for welding activities	Medium	3 years	YES	Conduct air sampling to assess exposure as applicable	
2	-----		-----	-----	---		
3	-----		-----	-----	---		
4	-----		-----	-----	---		
5	-----		-----	-----	---		
6	-----		-----	-----	---		

Additional Comments

Qualified H&S Professional: _David Joyce 612878

Date: 02/11/2022

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,

*See the [Hodge and Sterner toxicity classification scale](#)

Rating		Criteria
1	Negligible /Remote	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating

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

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$

ORNL Ordinary Lift Plan

Section 1		
Work Package, Work Order, or RSS Number: Various work packages	Plan Prepared by: Andrew Bush	Badge Number: 70748

Section 2

Lift Description

Lift includes various size valves, PRV, piping, motors, pumps, and associated pieces. Pipe sizes range from 1 inch to 24 inches in diameter to 1 ft to 15 ft long. Max total weight to be lifted for this lift plan is 1 lb. to 1,550 lbs. including rigging and load block. An assigned trained designated leader will review hoisting and rigging activity to determine crane set-up and the specific equipment to be used based on weight of objects and service truck set-up location. Lifts will be performed using a service auto crane with the hitch types being vertical, choker or basket. Shackles may be used. For this lift plan, A minimum of 2 legs of rigging will be used for each lift. Rigging will utilize a 45-degree angle or greater below the crane load hook Calculations must be based on 2-legs. See Special requirements for lifting in a basket hitch and sling angles. **THIS PLAN DOES NOT ALLOW A WIRE ROPE BASKET HITCH THRU RIGGING HARDWARE (E.G. SHACKLE, SWIVEL HOIST RING) OR THE USE OF EYEBOLTS.**

Lift Information

Center of Gravity determined by:

- Manufacturer Trial and Error Calculations
 Other (Describe) If object is uniform, it is assumed the COG is centrally located. Trial and Error will be used on all lifts.

Sling angle: min 45 deg.

Load angle factor/multiplier: 1.414 min

Weight of item: max 1,550 lbs.

D/d ratio reduction in efficiency for wire rope slings: 50 %

No. of Legs: 2 – 4 legs

Sling Tension/Loading: max 1,095 lbs.

Size: See Section 3

Limited capacity of rigging as configured:

Hitch Type: Vertical Choker Basket

Sling Type/Bridle Information:

EE2-902 sling – 6,789 lbs.

Nylon Wire Metal Other:

EE2-902 sling – 3,395 lbs.

3/8" Wire rope – 2,630 lbs.

3/8" Shackle – 2,828 lbs.

7/16" Shackle – 4,243 lbs.

1/2" Shackle – 5,657 lbs.

5/8" Shackle – 9,193 lbs.

3/4" Shackle -13,437 lbs.

Section 3

Hoisting Equipment/Below the Hook/Lifting Equipment	Capacity
Autocrane 17-8149	3,200 lbs.
Autocrane 17-8229	2,000 lbs.

Section 4

Rigging Equipment	Capacity	Rigging Hardware	Capacity
Nylon sling EE2-902	V: 6,400 lbs. CH: 4,800 lbs.	3/8" Shackle	2,000 lbs.

ORNL Ordinary Lift Plan

	B: 12,800 lbs. Reduction for 45 deg angle 9,051 lbs.	7/16" Shackle	3000 lbs.
Nylon Sling EE2-901	V: 3,200 lbs. CH: 2,400 lbs. B: 6,400 lbs. Reduction for 45 deg angle 4,525 lbs.	1/2" Shackle	4,000 lbs.
3/8" Wire Rope (12 ft)	V: 2,400 lbs. CH: 1,860 lbs. B: 4,800 lbs. Reduction for 45 deg angle 3,394 lbs. D/d @ 50 % efficiency: 2,400 lbs. for a load with a 1-inch diameter.	5/8" Shackle	6.500 lbs.
		3/4" Shackle	9,500 lbs.
3/8" Wire Rope (4-ft)	V: 2,800 lbs. CH: 2,200 lbs. B: 5,800 lbs. Reduction for 45 deg angle 4,000 lbs. D/d @ 50 % efficiency: 2,900 lbs. for a load with a 1-inch diameter.		

Section 5

Special requirements (facility requirements, communication methods, etc.):

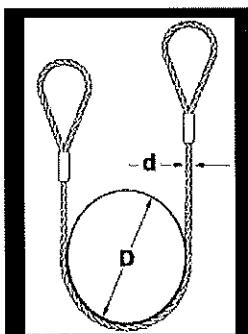
Supervision will assign a trained designated leader to review crane set-up (crane boom reach & angle), load chart, sling angles, and rigging equipment. In addition, sling angles need to be reviewed for items in a basket configuration prior to lift for D/d ration efficiency.

Lifts must not exceed 85% of crane capacity.

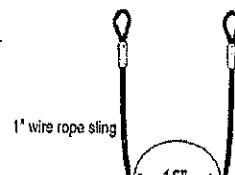
Basket hitches are not allowed to go below a 45-degree load which equals a 0.7071 loss factor in the working load.

Wire Rope D/d ratio example and info for designated leader. When a wire rope is used in a basket configuration, the designated leader must review the D/d ratio and the wire rope sling capacity adjusted (as needed) based on the given chart's efficiency rating. The wire load capacity must not be exceeded.

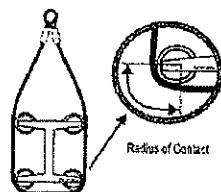
Example and information



D/d	Efficiency	D/d	Efficiency
25	100%	3.5	73%
20	92%	3.25	72%
15	88%	3	71%
10	85%	2.75	70%
8	84%	2.5	68%
6	80%	2.25	67%
5	78%	2	65%
4.75	77%	1.75	62%
4.5	76%	1.5	59%
4	75%	1.25	55%
3.75	74%	1	50%



D/d ratio = 15: 15" ÷ 1" = 15
15:1 ratio = approx. 88% efficiency



Softeners can be used to improve the radius of contact when using a wire rope sling around a 90° corner. The softener's purpose is to create a contact radius of at least 6 times the wire rope diameter.

Lift must comply with the following:

- Load attachment points must be above the center of gravity
- Inspect all H&R equipment prior to lift.
- Ensure all H&R equipment has a current annual inspection.
- Softeners must be used on sharp edges.

ORNL Ordinary Lift Plan

Pre-Lift Checklist (To be performed prior to lift):

- | | | | |
|---|---|--|---|
| <ul style="list-style-type: none"> Pre-Job Brief Designated Signal Person Annual Inspections currents on H&R equipment | <ul style="list-style-type: none"> Equipment Inspected prior to lift Center of gravity identified capacities reduced | <ul style="list-style-type: none"> Edge protectors used as needed Attachment points identified Load path and landing area clear | <ul style="list-style-type: none"> Evacuation paths identified Load drop zone controlled Load will lift freely |
|---|---|--|---|

Section 6

Approvals – Valid for up to two (2) years

	Print Name	Signature	Badge #	Date
Hoisting and Rigging Designated Leader or Hoisting and Rigging Competent Person		Andrew Bush <small>Digital signature by Andrew Bush Date: 2022-05-12 11:55:15 -04'00'</small>	70748	

Section 7

Pre-Lift Briefing

The following hoisting and lifting personnel have attended the pre-lift meeting, reviewed the approved lift plan, and understand the procedure and equipment to be used (sign on back as necessary)

Name/Signature	Badge #	Date
Jeff Brummitt - <i>Jeff Brummitt</i>	39091	5/12/2022
Matt Fields - <i>Matt Fields</i>	73202	5/12/2022
Jared Sexton - <i>Jared Sexton</i>	3008021	5-12-22
Cory Weber - <i>Cory Weber</i>	975760	5-12-22
Dylan Purkey - <i>Dylan Purkey</i>	3007799	5-12-22
Jim Mullins - <i>Jim Mullins</i>	947302	5-12-2022
Donnie Phillips - <i>Donnie Phillips</i>	29708	5/12/2022

Section 8: Additional Information (I.e., Applicable Load Travel Path/ Load Schematic and Rigging Method) (May also be attached to back of plan)

N/A

ORNL-544 (4/18/2019)

ORNL Ordinary Lift Plan

Section 1		
Work Package, Work Order, or RSS Number: Various work packages	Plan Prepared by: Andrew Bush	Badge Number: 70748

Section 2

Lift Description

Lift includes various size valves, fire hydrant, piping, motors, fittings, tapping sleeves, pumps, and similar items. Pipe sizes range from 1 inch to 24 inches in diameter to 1 ft to 15 ft long. Max total weight to be lifted for this lift plan is 1 lb. to 1,550 lbs. including rigging and load block. An assigned trained designated leader will review hoisting and rigging activity to determine crane set-up and the specific equipment to be used based on weight of objects and service truck set-up location. Lifts will be performed using a service auto crane with the hitch types being vertical, choker or basket. Shackles may be used. For this lift plan, one leg of rigging will be used for each lift or crane load will attach directly to rigging hardware. Rigging will utilize a 90-degree angle below the crane load hook. See Special requirements for lifting in a basket hitch and sling angles. **THIS PLAN DOES NOT ALLOW A WIRE ROPE BASKET HITCH THRU RIGGING HARDWARE (E.G. SHACKLE, SWIVEL HOIST RING) OR THE USE OF EYEBOLTS.**

Lift Information

Center of Gravity determined by:

- Manufacturer Trial and Error Calculations
 Other (Describe) If object is uniform, it is assumed the COG is centrally located. Trial and Error will be used on all lifts.

Sling angle: 90 deg.

Load angle factor/multiplier: 1

Weight of item: max 1,550 lbs. (includes rigging & load block)

D/d ratio reduction in efficiency for wire rope slings: 50 %

No. of Legs: 1 leg

Sling Tension/Loading: max 1,550 lbs. (Weight of load will be the tension on sling)

Size: See Section 3

Limited capacity of rigging as configured: 2,000 lbs.

Hitch Type: Vertical Choker Basket

Sling Type/Bridle Information:

- Nylon Wire Metal Other:

Section 3

Hoisting Equipment/Below the Hook/Lifting Equipment	Capacity
Autocrane 17-8149	3,200 lbs.
Autocrane 17-8229	2,000 lbs.

Section 4

Rigging Equipment	Capacity	Rigging Hardware	Capacity
Nylon sling EE2-902	V: 6,400 lbs. CH: 4,800 lbs. B: 12,800 lbs. Reduction for 45 deg angle 9,051 lbs.	3/8" Shackle	2,000 lbs.
		7/16" Shackle	3000 lbs.
Nylon Sling EE2-901	V: 3,200 lbs. CH: 2,400 lbs. B: 6,400 lbs. Reduction for 45 deg angle 4,525 lbs.	1/2" Shackle	4,000 lbs.

ORNL Ordinary Lift Plan

3/8" Wire Rope (12 ft)	V: 2,400 lbs. CH: 1,860 lbs. B: 4,800 lbs. Reduction for 45 deg angle 3,394 lbs. D/d @ 50 % efficiency: 2,400 lbs. for a load with a 1-inch diameter.	5/8" Shackle	6,500 lbs.
		3/4" Shackle	9,500 lbs.
3/8" Wire Rope (4-ft.)	V: 2,800 lbs. CH: 2,200 lbs. B: 5,800 lbs. Reduction for 45 deg angle 4,000 lbs. D/d @ 50 % efficiency: 2,900 lbs. for a load with a 1-inch diameter.		

Section 5

Special requirements (facility requirements, communication methods, etc.):

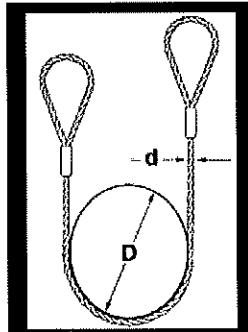
Supervision will assign a trained designated leader to review crane set-up (crane boom reach & angle), load chart, and rigging equipment. In addition, sling angles need to be reviewed for items in a one leg basket configuration prior to lift for D/d ration efficiency.

Lifts must not exceed 85% of crane capacity.

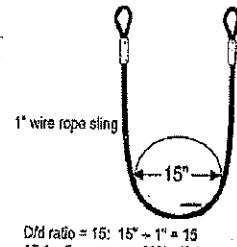
Basket hitches are not allowed to go below a 45-degree load which equals a 0.7071 loss factor in the working load.

Wire Rope D/d ratio example and info for designated leader. When a wire rope is used in a basket configuration, the designated leader must review the D/d ratio and the wire rope sling capacity adjusted (as needed) based on the given chart's efficiency rating. The wire load capacity must not be exceeded.

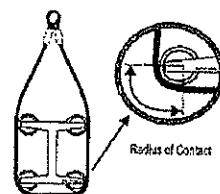
Example and information



D/d	Efficiency	D/d	Efficiency
25	100%	3.5	73%
20	92%	3.25	72%
15	88%	3	71%
10	86%	2.75	70%
8	84%	2.5	68%
6	80%	2.25	67%
5	78%	2	65%
4.75	77%	1.75	62%
4.5	76%	1.5	59%
4	75%	1.25	55%
3.75	74%	1	50%



D/d ratio = 15: 15° ÷ 1" = 15
15:1 ratio = approx. 88% efficiency



Softeners can be used to improve the radius of contact when using a wire rope sling around a 90° corner. The softener's purpose is to create a contact radius of at least 6 times the wire rope diameter.

Lift must comply with the following:

- Load attachment points must be above the center of gravity
- Inspect all H&R equipment prior to lift.
- Ensure all H&R equipment has a current annual inspection.
- Softeners must be used on sharp edges.

Pre-Lift Checklist (To be performed prior to lift):

• Pre-Job Brief	• Equipment Inspected prior to lift	• Edge protectors used as needed	• Evacuation paths identified
• Designated Signal Person	• Center of gravity identified	• Attachment points identified	• Load drop zone controlled
• Annual Inspections currents on H&R equipment	• capacities reduced	• Load path and landing area clear	• Load will lift freely

Section 6

Approvals – Valid for up to two (2) years

Print Name	Signature	Badge #	Date
Hoisting and Rigging Designated Leader or Hoisting and Rigging Competent Person	Andrew Bush <small>Deposited by Andrew Bush Date: 2022-05-12 01:53:01 S4-00</small>	70748	

ORNL Ordinary Lift Plan

Section 7

Pre-Lift Briefing

The following hoisting and lifting personnel have attended the pre-lift meeting, reviewed the approved lift plan, and understand the procedure and equipment to be used (sign on back as necessary)

Name/Signature	Badge #	Date
Jeff Brummitt - Jeff Brummitt	39097	5/12/2022
Matt Fields - Matt Fields	73702	5/12/2022
Jared Sexton - Jared Sexton	3008021	5-12-22
Gary Weber - Gary Weber	975750	5-12-2022
Dylan Autrey - Dylan Autrey	2097749	5-12-22
Jim Mullins - Jim Mullins	947302	5-12-2022
Donna Phillips - Donna Phillips	29708	5-12-2022

Section 8: Additional Information (I.e., Applicable Load Travel Path/ Load Schematic and Rigging Method) (May also be attached to back of plan)

N/A

ORNL-544 (4/18/2019)

ORNL Ordinary Lift Plan

Section 1		
Work Package, Work Order, or RSS Number: Various work packages	Plan Prepared by: Andrew Bush	Badge Number: 70748

Section 2

Lift Description

Lift includes various size valves, PRV, piping, motors, pumps, and associated pieces. Pipe sizes range from 1 inch to 24 inches in diameter to 1 ft to 15 ft long. Weight to be lifted for this lift plan is 1 lb. to 1,750 lbs. Total max with rigging is 1,800 lbs. An assigned trained designated leader will review hoisting and rigging activity to determine the specific equipment to be used based on weight of objects and lifting point availability (e.g., structure, A-frame). Lifts will be performed using a manual chain fall or lever hoist with the hitch types being vertical, choker or basket. A minimum of 2 legs will be used for each lift. Shackles may be used. All rigging will utilize a 45-degree angle or greater. Calculations must be based on 2-legs. See Special requirements for lifting in a basket hitch and sling angles. **THIS PLAN DOES NOT ALLOW A WIRE ROPE BASKET HITCH THRU RIGGING HARDWARE (E.G. SHACKLE, SWIVEL HOIST RING) OR THE USE OF EYEBOLTS.**

Lift Information

Center of Gravity determined by:

- Manufacturer Trial and Error Calculations
 Other (Describe) If object is uniform, it is assumed the COG is centrally located. Trial and Error will be used on all lifts.

Sling angle: min 45 deg.

Load angle factor/multiplier: 1.414 min

Weight of item: max 1,750 lbs.

D/d ratio reduction in efficiency for wire rope slings: 50 %

No. of Legs: 2 – 4 legs

Size: various

Sling Tension/Loading: max 1,238 lbs.

Length: various

Limited capacity of rigging as configured:

Hitch Type: Vertical Choker Basket

EE2-902 sling – 6,789 lbs.

Sling Type/Bridle Information:

Nylon Wire Metal Other:

3/8" Wire rope – 2,630 lbs.

3/8" Shackle – 2,828 lbs.

7/16" Shackle – 4,243 lbs.

1/2" Shackle – 5,657 lbs.

5/8" Shackle – 9,193 lbs.

3/4" Shackle – 13,437 lbs.

Section 3

Hoisting Equipment/Below the Hook/Lifting Equipment	Capacity
Manual Chain Hoist/Fall	2,000 lbs.
Lever Hoist	3,000 lbs.
A-Frame	2,000 lbs.
Trolley	2,000 lbs.
Beam Clamp (BTH)	4,000 lbs.
Beam Clamp (BTH)	2,000 lbs.

ORNL Ordinary Lift Plan

Section 4

Rigging Equipment	Capacity	Rigging Hardware	Capacity
Nylon sling EE2-902	V: 6,400 lbs. CH: 4,800 lbs. B: 12,800 lbs. Reduction for 45 deg angle 9,051 lbs.	3/8" Shackle	2,000 lbs.
		7/16" Shackle	3000 lbs.
Nylon Sling EE2-901	V: 3,200 lbs. CH: 2,400 lbs. B: 6,400 lbs. Reduction for 45 deg angle 4,525 lbs.	1/2" Shackle	4,000 lbs.
3/8" Wire Rope (12 ft)	V: 2,400 lbs. CH: 1,860 lbs. B: 4,800 lbs. Reduction for 45 deg angle 3,394 lbs. D/d @ 50 % efficiency: 2,400 lbs. for a load with a 1-inch diameter.	5/8" Shackle	6,500 lbs.
		3/4" Shackle	9,500 lbs.
3/8" Wire Rope (4-ft)	V: 2,800 lbs. CH: 2,200 lbs. B: 5,800 lbs. Reduction for 45 deg angle 4,000 lbs. D/d @ 50 % efficiency: 2,900 lbs. for a load with a 1-inch diameter.		

Section 5

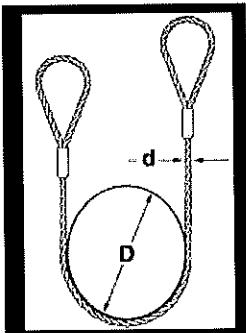
Special requirements (facility requirements, communication methods, etc.):

Supervision will assign a trained designated leader to review sling angles and rigging prior to lift.

Basket hitches are not allowed to go below a 45-degree load which equals a 0.7071 loss factor in the working load.

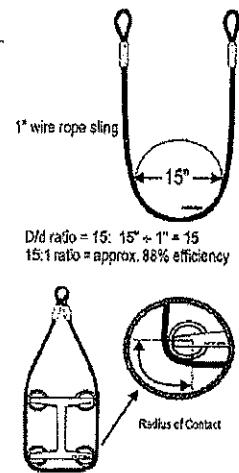
Wire Rope D/d ratio example and info for designated leader. When a wire rope is used in a basket configuration, the designated leader must review the D/d ratio and the wire rope sling capacity adjusted (as needed) based on the given chart's efficiency rating. The wire load capacity must not be exceeded.

Example and information



D/d	Efficiency	D/d	Efficiency
25	100%	3.5	73%
20	92%	3.25	72%
15	88%	3	71%
10	86%	2.75	70%
8	84%	2.5	68%
6	80%	2.25	67%
5	78%	2	65%
4.75	77%	1.75	62%
4.5	76%	1.5	59%
4	75%	1.25	55%
3.75	74%	1	50%

Softeners can be used to improve the radius of contact when using a wire rope sling around a 90° corner. The softener's purpose is to create a contact radius of at least 6 times the wire rope diameter.



Lift must comply with the following:

- Load attachment points must be above the center of gravity
- Inspect all H&R equipment prior to lift.
- Ensure all H&R equipment has a current annual inspection.
- Softeners must be used on sharp edges.

ORNL Ordinary Lift Plan

Pre-Lift Checklist (To be performed prior to lift):				
<ul style="list-style-type: none"> Pre-Job Brief Designated Signal Person Annual Inspections currents on H&R equipment 	<ul style="list-style-type: none"> Equipment Inspected prior to lift Center of gravity identified capacities reduced 	<ul style="list-style-type: none"> Edge protectors used as needed Attachment points identified Load path and landing area clear 	<ul style="list-style-type: none"> Evacuation paths identified Load drop zone controlled Load will lift freely 	
Section 6				
Approvals – Valid for up to two (2) years				
Hoisting and Rigging Designated Leader or Hoisting and Rigging Competent Person	Print Name	Signature	Badge #	Date
Hoisting and Rigging Designated Leader or Hoisting and Rigging Competent Person	Andrew Bush	<small>Digital signature by Andrew Bush Date: 2022-05-12 01:51:06 -04:00</small>	70748	
Section 7				
Pre-Lift Briefing				
<p>The following hoisting and lifting personnel have attended the pre-lift meeting, reviewed the approved lift plan, and understand the procedure and equipment to be used (sign on back as necessary)</p>				
Name/Signature			Badge #	Date
<u>Jeff Brummitt</u>	- <u>Jeff Brummitt</u>		<u>39099</u>	<u>5/12/2022</u>
<u>Matt Fields</u>	- <u>Matt Fields</u>		<u>73202</u>	<u>5/12/2022</u>
<u>Jared Sexton</u>	- <u>Jared Sexton</u>		<u>300821</u>	<u>5-12-22</u>
<u>Gary Weder</u>	- <u>Gary Weder</u>		<u>925150</u>	<u>5-12-22</u>
<u>Dylan Putney</u>	- <u>Dylan Putney</u>		<u>3097799</u>	<u>5-12-22</u>
<u>Jim Mullins</u>	- <u>Jim Mullins</u>		<u>947362</u>	<u>5-12-2022</u>
<u>Donnie Phillips</u>	- <u>Donnie Phillips</u>		<u>22108</u>	<u>5/12/2022</u>

**Section 8: Additional Information (I.e., Applicable Load Travel Path/ Load Schematic and Rigging Method)
(May also be attached to back of plan)**

N/A

ORNL-544 (4/18/2019)

ORNL Ordinary Lift Plan

Section 1		
Work Package, Work Order, or RSS Number: Various work packages	Plan Prepared by: Andrew Bush	Badge Number: 70748

Section 2

Lift Description

Lift includes various size valves, PRV, piping, motors, pumps, and associated pieces. Pipe sizes range from 1 inch to 24 inches in diameter to 1 ft to 15 ft long. Weight to be lifted for this lift plan is 1 lb. to 1,750 lbs. Total max with rigging is 1,800 lbs. An assigned trained designated leader will review hoisting and rigging activity to determine the specific equipment to be used based on weight of objects and lifting point availability (e.g., structure, A-frame). Lifts will be performed using a manual chain fall or lever hoist with the hitch types being vertical, choker or basket. For this lift plan, one leg of rigging may be used for each lift or chain fall load hook will attach directly to rigging hardware. Shackles may be used. All rigging will utilize a 90-degree angle. See Special requirements for lifting in a basket hitch and sling angles. **THIS PLAN DOES NOT ALLOW A WIRE ROPE BASKET HITCH THRU RIGGING HARDWARE (E.G. SHACKLE, SWIVEL HOIST RING) OR THE USE OF EYEBOLTS.**

Lift Information

Center of Gravity determined by:

- Manufacturer Trial and Error Calculations
 Other (Describe) If object is uniform, it is assumed the COG is centrally located. Trial and Error will be used on all lifts.

Sling angle: 90 deg.

Load angle factor/multiplier: 1

Weight of item: max 1,750 lbs.

D/d ratio reduction in efficiency for wire rope slings: 50 %

No. of Legs: 1 leg

Sling Tension/Loading: max 1,750 lbs. (Weight of load will be the tension on sling)

Size: various

Limited capacity of rigging as configured: 2,000 lbs.

Hitch Type: Vertical Choker Basket

Sling Type/Bridle Information:

- Nylon Wire Metal Other:

Section 3

Hoisting Equipment/Below the Hook/Lifting Equipment	Capacity
Manual Chain Hoist/Fall	2,000 lbs.
Lever Hoist	3,000 lbs.
A-Frame	2,000 lbs.
Trolley	2,000 lbs.
Beam Clamp (BTH)	4,000 lbs.
Beam Clamp (BTH)	2,000 lbs.

Section 4

Rigging Equipment	Capacity	Rigging Hardware	Capacity
Nylon sling EE2-902	V: 6,400 lbs. CH: 4,800 lbs. B: 12,800 lbs. Reduction for 45 deg angle 9,051 lbs.	3/8" Shackle	2,000 lbs.
		7/16" Shackle	3000 lbs.
Nylon Sling EE2-901	V: 3,200 lbs. CH: 2,400 lbs. B: 6,400 lbs. Reduction for 45 deg angle 4,525 lbs.	1/2" Shackle	4,000 lbs.

ORNL Ordinary Lift Plan

3/8" Wire Rope (12 ft)	V: 2,400 lbs. CH: 1,860 lbs. B: 4,800 lbs. Reduction for 45 deg angle 3,394 lbs. D/d @ 50 % efficiency: 2,400 lbs. for a load with a 1-inch diameter.	5/8" Shackle 3/4" Shackle	6.500 lbs. 9,500 lbs.
3/8" Wire Rope (4-ft)	V: 2,800 lbs. CH: 2,200 lbs. B: 5,800 lbs. Reduction for 45 deg angle 4,000 lbs. D/d @ 50 % efficiency: 2,900 lbs. for a load with a 1-inch diameter.		

Section 5

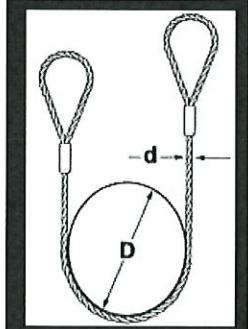
Special requirements (facility requirements, communication methods, etc.):

Supervision will assign a trained designated leader to review rigging equipment. In addition, sling angles for items in a one leg basket configuration prior to lift. for D/d ration efficiency.

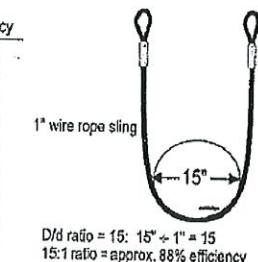
Basket hitches are not allowed to go below a 45-degree load which equals a 0.7071 loss factor in the working load.

Wire Rope D/d ratio example and info for designated leader. When a wire rope is used in a basket configuration, the designated leader must review the D/d ratio and the wire rope sling capacity adjusted (as needed) based on the given chart's efficiency rating. The wire load capacity must not be exceeded.

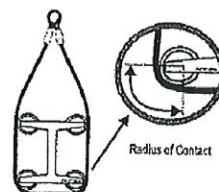
Example and information



D/d	Efficiency	D/d	Efficiency
25	100%	3.5	73%
20	92%	3.25	72%
15	88%	3	71%
10	86%	2.75	70%
8	84%	2.5	68%
6	80%	2.25	67%
5	78%	2	65%
4.75	77%	1.75	62%
4.5	76%	1.5	59%
4	75%	1.25	55%
3.75	74%	1	50%



Softeners can be used to improve the radius of contact when using a wire rope sling around a 90° corner. The softener's purpose is to create a contact radius of at least 6 times the wire rope diameter.



Lift must comply with the following:

- Load attachment points must be above the center of gravity
- Inspect all H&R equipment prior to lift.
- Ensure all H&R equipment has a current annual inspection.
- Softeners must be used on sharp edges.

Pre-Lift Checklist (To be performed prior to lift):

• Pre-Job Brief	• Equipment Inspected prior to lift	• Edge protectors used as needed	• Evacuation paths identified
• Designated Signal Person	• Center of gravity identified	• Attachment points identified	• Load drop zone controlled
• Annual Inspections currents on H&R equipment	• capacities reduced	• Load path and landing area clear	• Load will lift freely

Section 6

Approvals – Valid for up to two (2) years

	Print Name	Signature	Badge #	Date
Hoisting and Rigging Designated Leader or Hoisting and Rigging Competent Person		Andrew Bush <small>Digital signature by Andrew Bush Date: 2022-05-12 01:57:26 -04'00'</small>	70748	5/12/2022

ORNL Ordinary Lift Plan

Section 7

Pre-Lift Briefing

The following hoisting and lifting personnel have attended the pre-lift meeting, reviewed the approved lift plan, and understand the procedure and equipment to be used (sign on back as necessary)

Name/Signature	Badge #	Date
Jeff Brummitt - Jeff Brummitt	39097	5/12/2022
Matt Fields - Matt Fields	73702	5/12/2022
Jared Sexton - Jared Sexton	5008adj	5-12-22
Cary Weber - Cary Weber	925750	5-12-22
Dylan Purkey - Dylan Purkey	3097799	5-12-22
J.M. Mullins - Jim Mullins	947302	5-12-2022
Donnie Phillips - Donnie Phillips	209108	5/14/2022

Section 8: Additional Information (I.e., Applicable Load Travel Path/ Load Schematic and Rigging Method) (May also be attached to back of plan)

N/A

ORNL-544 (4/18/2019)

Qualitative Exposure Assessment – Multiple Hazard Form

Project Information

<input type="checkbox"/> No QEA is required based upon a review of the type(s) of hazard(s) associated with the activity/task and the following Low Risk Justification:
<input checked="" type="checkbox"/> 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 or some or all agent(s)/hazard(s). List the agent(s) for which a QEA could not be conducted: <input type="checkbox"/> All Agents (see below) <u>or</u> Specific Agent(s) that could not be assessed (list): Mg and iron oxide. Discuss controls incorporated into Work Control to assure EA is conducted in the future (list):
Process/Job/Task: Facilities Maintenance / Welder-Pipefitter / welding and grinding carbon steel. (SEG/SET Name)

Work Description: All pressure piping repairs shall be fabricated and installed to the following UT-Battelle engineering standards, pipe specifications and welding specifications.

Facility #:	Plant wide	Organization:	Utilities	Room/Lab/Shop #:	N/A	RSS/Work Plan #:	Various
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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 Engineering/ Administrative Controls	*OEL	Health Severity Rating 1 – 4	Exposure Rating 1 – 4	Certainty Rating 1 – 3	³ QEA Rating 1 - 24	⁴ Exposure Decision
1	Fabrication / Welder / SMAW and GTAW carbon steel	Manganese		inh	Particulate	Weekly	< 1/2 hour	GV, Hood	.02 mg/m3	4	2	1	10	Uncertain (8-15)
2	Fabrication / Welder / SMAW and GTAW carbon steel	iron oxide		inh	Particulate	Weekly	< 1/2 hour	GV, Hood	5 mg/m3	3	1	2	8	Uncertain (8-15)
3	Fabrication / Welder/pipefitter gringing	Noise	93 dBA	Other	Other	Weekly	1/2 - 2 hours	T, L/P, P, MS	85 dBA	3	3	1	6	Acceptable (2 - 7)
4				-----	-----	-----	-----	-----	-----	-----
5				-----	-----	-----	-----	-----	-----	-----
6				-----	-----	-----	-----	-----	-----	-----

1. **Routes of entry codes:** Inh – Inhalation, P – Penetration, Ing – Ingestion, S – Splash; A – Absorption; 2. **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;

3. **QEA Rating** = (Health Severity Rating + Exposure Rating) X Certainty Rating; 4. **Exposure Decision:** Acceptable (2-7), Uncertain (8-15), Unacceptable (16-24)

* Optional field

Exposure Decision and Follow-up

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	NO	Use of general or point source ventilation required for welding activities. Personal air sampling should be conducted for welding activities			Medium	3 years	YES	Conduct air sampling to assess exposure as applicable.
2	NO	Use of general or point source ventilation required for welding activities. Personal air sampling should be conducted for welding activities			Low	3 years	YES	Conduct air sampling to assess exposure as applicable
3	YES	Use of hearing protection with a minimum NRR of 25 required for grinding operations.			-----	-----	---	
4	-----				-----	-----	---	
5	-----				-----	-----	---	
6	-----				-----	-----	---	

Additional Comments

Qualified H&S Professional: David Joyce 612878

Date: 07/19/2022

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,

*See the [Hodge and Sterner toxicity classification scale](#)

Rating		Criteria
1	Negligible /Remote	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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

** Use of personal protective equipment (including respirators) shall not be taken into account when determining the exposure rating

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

$$\text{QEA Rating} = (\text{Health Severity Rating} + \text{Exposure Rating}) \times \text{Certainty Rating}$$



MANUAL LIFTING GUIDELINE: 30/50/30



How much can I safely lift?

While there is no single weight that everyone can lift, this guideline can help simplify your decision.

KEY POINTS:

30/50/30 is the weight, in pounds, that may be lifted with minimal risk of injury. This guidance does not establish lifting limits because the amount of weight that can be safely lifted varies from person-to-person. Before making a lift, consider your personal capability.

- 30 lbs can be lifted from floor to head level
- 50 lbs should only be lifted between knuckle and elbow height (e.g. lifting items off a shelf or cart and placing them at the same height)
- Lift with two hands, keep the load close to your body, and avoid twisting your torso
- Again, use judgement as to your individual physical capability, especially if you have any medical conditions that could be aggravated by manual lifting

Note: This 30/50/30 pound guideline is for casual/non-repetitive manual lifts. It has a sound scientific basis, following the NIOSH Lifting Equation, and meets regulatory requirements. Health and Safety professionals should be consulted to assist in conducting hazard assessments and development of controls for repetitive lifts or lifts outside the limits of the 30/50/30 guidelines.

GUIDANCE TIPS FOR LIFTING

- | | |
|---|--|
| <ul style="list-style-type: none">❖ Do not lift an object if you have physical limitations (i.e. on restrictions, pregnant, have lower back pain, pre-existing injuries, etc.)❖ Lift performed using proper lifting techniques (i.e. Keep your back straight, bend with your knees and lift with your legs)❖ No twisting at waist during lift or while carrying or lowering the object❖ Weight of object is stable and evenly distributed❖ Good hand grip on object❖ Use lifting aids❖ Walking surface is even, firm, and non-slippery❖ Look at environment stressors – Temperature, Humidity, Lighting, Obstacles❖ Don't overdo it – Don't try to lift something too heavy for you. If you must strain to carry the load, it is too heavy for you.❖ Make sure you have enough room to lift safely. Clear a space around the object before lifting it.❖ Reduce the weight of the load when possible❖ Rest your back – Take frequent, short breaks and stretch❖ Exercise | <ul style="list-style-type: none">❖ Assess the situation:<ul style="list-style-type: none">➢ Weight, Size, Shape of the load➢ Can you grip the load?➢ Can you reach the load?➢ Clear obstacles near the load and near/in the path you will travel with the load➢ Ensure you can see where you are walking➢ Know the distance you will be traveling with the load➢ How is the terrain on the path you plan to take? Slippery, Icy, Damaged, Uneven, etc.➢ Any pre-existing injuries? |
|---|--|

American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs) for cold stress and heat stress and heat Strain, 2016 edition

TLVs Work/Warm-up Schedule for a 4-hour Shift

Air Temperature – Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C Approx.)	°F (Approx.)	Max. Work Period	No. of Breaks								
-26 to -28	-15 to -19	(Norm. Breaks) 1		(Norm. Breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29 to -31	-20 to -24	(Norm. Breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32 to -34	-25 to -29	75 min.	2	55 min.	3	40 min.	4	30 min.	5		
-35 to -37	-30 to -34	55 min.	3	40 min.	4	30 min.	5				
-38 to -39	-35 to -39	40 min.	4	30 min.	5						
-40 to -42	-40 to -44	30 min.	5								
-43 & below	-45 & below	Non-emergency work should cease									

Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten minutes in a warm location and 30th extended break (e.g. lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical activity): apply the schedule one step blower. For example, at -35°C (-35°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum worker period of 40 minutes with 4 breaks in a 5-hour period (Step 5).

Screening Criteria for TLVs and Action Limit for Heat Stress Exposure

Allocation of Work in a Cycle of Work and Recovery	TLV (WBGT values in °C)*				Action Limit (WBGT values in °C)**			
	Metabolic Rate Category				Metabolic Rate Category			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75% to 100%	31.0	28.0			28.0	25.0		
50% to 75%	31.0	29.0	27.5		28.5	26.0	24.0	
25% to 50%	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0% to 25%	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27.0

* TLV applies to acclimatized, adequately hydrated, unmedicated, healthy workers.

** Action Limit applies to unacclimatized workers

Metabolic Rate Categories and the Representative Metabolic Rate with Example Activities

Category	Metabolic Rate (W)*	Examples
Rest	115	Sitting
Light	180	Sitting with light manual work with hands or hands and arms and, driving. Standing with some light arm work and occasional walking.
Moderate	300	Sustained moderate hand and arm work, moderate arm and leg work, moderate arm and trunk work, or light pushing and pulling. Normal walking.
Heavy	415	Intense arm and trunk work, carrying, shoveling, and manual sawing; pushing and pulling heavy loads; and walking at a fast pace.
Very Heavy	520	Very intense activity at fast to maximum pace.

* The effect of body weight on the estimated metabolic rate can be accounted for by multiplying the estimated rate by the ratio of actual body weight divided by 70 kg (154 lbs)

Clothing-Adjustment Factors (°C) for Some Clothing Ensembles*

Clothing Type	WBGT Addition* °C
Work Clothes (Long sleeve shirt and Pants)	0
Cloth (woven material) overalls	0
Double-layer woven clothing	3
SMS polypropylene coveralls	0.5
Polyolefin coveralls	1
Limited-Use Vapor-Barrier	11

* These values must not be used for encapsulating suits, often called Level A. Clothing Adjustment Factors cannot be added for multiple layers. The coveralls assume that only modesty clothing is worn underneath, not a second layer of clothing.

Heat Strain (Physiological TLV) - One or more of the following

- Sustained (several minutes) heart rate is $> [180 \text{ beats per minute (bpm)} - \text{individual's age}]$, for individuals with assessed normal cardiac performance; or
- Recovery heart rate at one minute after a peak work effort is $> 120 \text{ bpm}$; or
- Body core Temperature
 - 38.5°C (101.3°F) for medically selected and acclimatized individuals or,
 - 38°C (100.4°F) for unselected and unacclimatized individuals
- Appearance of symptoms of sudden and severe fatigue, nausea, dizziness or lightheadedness.

Note: Heart rate monitoring watches may be used for physiological monitoring.

Heat Stress Controls

Hazard	Controls
Thermal Stressor – Heat Stress including Heat Cramps, Heat Stroke, Heat Exhaustion	<ul style="list-style-type: none"> • Worker rotation • Acclimatization • Frequent breaks(Workers self-pace work activities and consume hydrating beverages (i.e. water, Gatorade or similar) during breaks in the field) • Follow the SBMS document “<i>Occupational Hazard Controls - Evaluating Temperature Extremes.</i>”
Hazard	Controls
Thermal Stressor – Heat Stress including Heat Cramps, Heat Stroke, Heat Exhaustion	<ul style="list-style-type: none"> • Worker rotation • See table below table for definitions for work categories. • Contact Health and Safety for work/rest regimen for work that is defined as very heavy or for temperatures that are not on the table. Physiological may be needed. • Personnel shall be trained in Heat Stress Training. • Avoid alcohol, coffee, tea, energy drinks, and carbonated drinks. Caffeine is a diuretic which causes your body to drive water out of your system • Check medications that may inhibit perspiration, increase metabolism, and beta blockers. • Keep yourself hydrated through drinking water! Drink at least as much liquid as you sweat out. Do not drink too much at one time but maintain your fluid intake. Thirst is not a good indicator of inadequate fluid intake. • Watch out for symptoms of heat-related illness: fatigue, nausea, headache, excessive thirst, muscle aches and cramps, weakness, confusion or anxiety. <p>What Happens to the Body: Heat Cramps Symptoms: Heavy sweating during intense exercise; muscle pain or spasms</p> <p>What Should Be Done:</p> <ul style="list-style-type: none"> • Stop physical activity and move to a cool shaded or indoor area. • Drink water or sports drink • Wait for cramps to go away before proceeding physical activity <p>What Happens to the Body: Heat Stroke Symptoms: High body temperature (103 °F or higher); Hot, red, dry, or damp skin; fast, strong pulse; headache; dizziness; nausea; confusion; losing consciousness</p> <p>What Should Be Done:</p> <ul style="list-style-type: none"> • Call for emergency help [i.e., <u>Call 574-6606 (LSS)</u> or 911 from landline].

	<ul style="list-style-type: none"> Move the person to a cool shaded or indoor area. Don't leave the person alone. Help lower person's body temperature with cool cloths or cool bath. <p>What Happens to the Body: Heat Exhaustion</p> <p>Symptoms:</p> <p>Heavy sweating; cold, pale, and clammy skin; fast, weak pulse; nausea or vomiting; muscle cramps; tiredness or weakness; dizziness; headache; losing consciousness</p> <p>What Should Be Done:</p> <ul style="list-style-type: none"> Call for emergency help [i.e., <u>Call 574-6606 (LSS)</u> or 911 from landline]. Move the person to a cool shaded or indoor area. Don't leave the person alone. Loosen clothes Place cool, wet cloths on body or take cool bath Sip water
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Temperature Conversion Guidance Chart

Centigrade (°C)	Fahrenheit (°F)
0	32
10	50
15	59
20	68
25	77
30	86
35	95
40	104

$$\text{Degrees Fahrenheit} = 1.8 \times \text{degrees C} + 32$$

Definitions and Examples of Work Tasks

Work Category	Example Motions	Example Tasks
Light	<ul style="list-style-type: none"> • Sitting with light manual work with hands and arms • Driving • Standing with some light arm work and occasional walking • Casual walking (2 miles per hour) • Lifting 10 pounds fewer than eight times per minute, or 25 pounds less than four times per minute 	<ul style="list-style-type: none"> • Using small bench tools or small power tools • Inspecting and sorting produce • Sorting light materials • Assembling small parts • Driving vehicle on roads • Nailing
Moderate	<ul style="list-style-type: none"> ▪ Sustained moderate hand and arm work ▪ Moderate arm and leg work ▪ Moderate arm and trunk work ▪ Moderate pushing and pulling ▪ Walking at a moderate speed ▪ Lifting 10 pounds 10 times per minute, or 25 pounds six times per minute 	<ul style="list-style-type: none"> ▪ Work activities requiring bending/ squatting ▪ Painting with a brush ▪ Pushing or pulling lightweight carts or wheelbarrows ▪ Off road operation of trucks, tractors, or construction equipment ▪ Operating an air hammer ▪ Weeding or hoeing
Heavy	<ul style="list-style-type: none"> ▪ Intense arm and trunk work ▪ Carrying, shoveling, manual sawing ▪ Pushing or pulling heavy loads ▪ Walking at a fast pace (4 miles per hour) ▪ Lifting 10 pounds 14 times per minute, or 25 pounds 10 times per minute 	<ul style="list-style-type: none"> ▪ Transferring heavy materials, shoveling ▪ Sledgehammer work ▪ Hand mowing, digging ▪ Concrete block laying ▪ Pushing or pulling loaded hand carts or wheelbarrow
Very Heavy	<ul style="list-style-type: none"> ▪ Very intense activity at fast to maximum pace ▪ Jogging, running or walking faster than 4 miles per hour ▪ Lifting 10 pounds more than 18 times per minute, or 25 pounds more than 13 times per minute 	<ul style="list-style-type: none"> ▪ Heavy shoveling or digging ▪ Ax work ▪ Climbing stairs, ramps or ladders