

**Work scope details:**

Title: Mock up COG HEPA Filter Change Out

Work Scope Summary: - The work scope involves preparing for the change out of COG HEPA filters by creating a mock-up of the filter enclosure and work platforms, designing and fabricating necessary tools and equipment, and developing methods and techniques for the filter change out.

Key Work Scope Components: - Mock-up of COG HEPA filter enclosure and work platforms - Design and fabrication of tools and equipment for filter change out - Development of methods and techniques for changing out COG HEPA filters - Integration of mock-up, design, and development steps to prepare for the filter change

**Relevant previous events and lessons learned:**

Event Title	Event Summary	Lessons Learned	Reference link
Change out of Exhauster HEPA Filters	Implementation of worker feedback provides for improved operations. Beta Shields were changed to lighter plywood with rubber matting, allowing work activities to be performed faster while still providing adequate shielding in reducing the beta dose. Using a table with adjustable legs for filter removal reduced the worker exposure time. Work time was further reduced by larger, more substantial clear plastic filter bags rather than smaller yellow bags.	Implementation of worker feedback can improve operations. Using lighter materials and adjustable equipment can reduce worker exposure time and improve efficiency.	<a href="#">Link</a>
Two HEPA filters in Bldg. 236-Z found to not meet operability requirements (USQ)	The facility's Design Authority for ventilation systems determined that two HEPA filters were found to not meet current operability requirements. After calculations, the filters were found to be operable up to only 6" Water Gauge (WG), due to their age. Management determined this constituted a performance degradation of Safety Class components, and the filters were isolated pending replacement.	Contractors must institutionalize site-wide processes/programs that guide facility management in determination of operability of safety class equipment such as HEPA filters.	<a href="#">Link</a>
OSHA Investigation at Filtration Manufacturer	OSHA investigated an incident at a global filtration manufacturer after two employees suffered serious injuries. The manufacturer failed to protect workers from safety and health hazards associated with their filtration operations.	Ensure comprehensive safety and health hazard protections are in place for filtration operations to prevent worker injuries.	<a href="#">Link</a>

Fire Tests on ORNL Ventilation System Mock-ups	<p>Fire tests were conducted on full-scale mock-ups of the ORNL Building 7920 ventilation system to evaluate the potential fire threat and its effects on HEPA filter integrity. Thirteen fire experiments addressed questions arising from prior safety concerns, including HEPA filter ability to withstand fires and filter change scenarios.</p>	Evaluate HEPA filter integrity under fire conditions to ensure safety during filter change preparations.	<a href="#">Link</a>
Simulated Accident Conditions on HEPA Filters	<p>HEPA filters were subjected to simulated accident conditions, including fire and explosion, to determine filtration performance and structural limitations in both domestic and European filter models. Some catastrophic failures and loss of efficiency were observed under specific test scenarios.</p>	Understand filtration performance and structural limitations under accident conditions to improve filter design and change preparations.	<a href="#">Link</a>

#### Missing Hazards:

Hazard	Missing or Inadequate Mitigation in Current Work Control Document	Recommended Mitigation for Revision	Reference link	SBMS Link
Time pressures and high workload	Not addressed	Implement stress management programs, workload assessments, and time management training	<a href="#">Hazards.org</a>	<a href="#">Link</a>
Distractive environment and imprecise communications	Not addressed	Develop clear communication protocols and minimize distractions in work areas	<a href="#">Google Patents</a>	<a href="#">Link</a>
First-time evolution and vague guidance	Not addressed	Provide detailed guidance and training for new processes and ensure clear communication of procedures	<a href="#">Advanced HSE Solutions</a>	<a href="#">Link</a>

Overconfidence	Not addressed	Conduct regular training and assessments to ensure workers understand their limitations and the risks involved	<a href="#">Wikipedia</a>	<a href="#">Link</a>
Work stress	Not addressed	Implement workplace wellness programs and provide resources for stress management	<a href="#">OSHA</a>	<a href="#">Link</a>
Pinch points and sharp edges during filter handling	Not addressed	Install guards and provide training on safe handling techniques	<a href="#">Cornell EHS</a>	<a href="#">Link</a>
Fire and explosion scenarios	Not addressed	Develop and implement fire prevention and response plans, including regular drills	<a href="#">ISR Magazine</a>	<a href="#">Link</a>
Non-operable HEPA filters	Not addressed	Establish a regular maintenance and testing schedule for HEPA filters	<a href="#">HEPACART</a>	<a href="#">Link</a>
Inadequate safety and health hazard protections	Not addressed	Review and enhance current safety protocols to ensure comprehensive hazard protection	<a href="#">OSHA</a>	<a href="#">Link</a>

#### Failure mode analysis:

Current control	Failure mode of the control	Effect of Failure	Cause of Failure	Recommended action
Written permits for the work activity	Permit not obtained or invalid	Unauthorized work leading to safety hazards	Miscommunication or oversight in permit process	Implement a checklist to ensure all permits are obtained and valid before work begins
Precautions, step warnings, Hold Points	Steps not followed or ignored	Increased risk of accidents or errors	Lack of awareness or training	Conduct regular training sessions and audits to ensure compliance with safety steps
Personal Protective Equipment (PPE)	PPE not used or inadequate	Increased risk of injury	Lack of enforcement or availability	Ensure PPE availability and enforce strict PPE usage policies

Work instructions for information	Instructions not followed or misunderstood	Errors in task execution	Poor communication or unclear instructions	Simplify and clarify instructions; conduct briefings before work
ORNL subject area requirements	Non-compliance with requirements	Regulatory violations and safety risks	Lack of knowledge or oversight	Regularly review and update compliance requirements; provide training
Group/individual responsibilities	Responsibilities not understood or ignored	Task confusion and inefficiency	Poor communication or unclear roles	Clearly define roles and responsibilities; conduct team briefings
Availability/location of materials, tools	Materials/tools not available or misplaced	Delays and inefficiencies in work	Poor planning or organization	Implement inventory management and tool tracking systems
Response if work cannot be performed as planned	Inadequate response to unforeseen issues	Increased risk of accidents or delays	Lack of contingency planning	Develop and communicate contingency plans for unexpected situations
Potential error traps	Error traps not identified or mitigated	Increased likelihood of errors	Lack of hazard identification	Conduct thorough hazard assessments and implement error-proofing measures
Stop Work for unsafe conditions	Failure to stop work when necessary	Continuation of unsafe work conditions	Lack of empowerment or awareness	Empower workers to stop work and provide training on recognizing unsafe conditions
Emergency Response	Inadequate emergency response	Increased severity of incidents	Poor planning or communication	Develop and practice emergency response plans regularly
Use of GFCI for electrical tools	GFCI not used or malfunctioning	Risk of electrical shock	Equipment failure or oversight	Regularly test GFCI functionality and enforce its use
Safety glasses with side shields	Glasses not worn or inadequate	Eye injuries	Lack of enforcement or availability	Ensure availability and enforce strict usage policies for eye protection
Work platform for elevated work	Platform not used or improperly set up	Fall hazards	Lack of training or improper setup	Provide training on platform setup and enforce usage policies