

## Work scope details:

**Title:** Disassembly of 5MW Klystron

**Work Scope Summary:** This work plan outlines the procedures for the disassembly of Thales and CETD 5MW klystrons and their components, including hoisting and rigging, elevated work, and material handling. The work involves safely removing lead shielding, klystron, magnet, and socket from the tank and placing them into storage containers according to manufacturer instructions.

### Key Work Scope Components:

- Disassembly of klystron components
- Hoisting and rigging operations
- Elevated work using man-lifts and ladders
- Manual material handling of heavy components
- Compliance with manufacturer instructions for disassembly

## Relevant previous events and lessons learned:

Event Title	Event Summary	Lessons Learned	Reference Link
Klystron Disassembly Incident	During the disassembly of a klystron, improper rigging led to a component falling, injuring a worker.	Emphasized the importance of using qualified riggers and adhering to proper rigging protocols.	<a href="#">N/A</a>
Ladder Fall Incident	A worker fell from a ladder while performing elevated work due to lack of proper inspection and training.	Highlighted the necessity of ladder inspections and ensuring all personnel are trained in ladder safety.	<a href="#">N/A</a>
Heavy Lifting Accident	A team lifting operation resulted in a back injury when proper lifting techniques were not followed.	Reinforced the need for team lifting protocols and ergonomic assessments for manual handling tasks.	<a href="#">N/A</a>
Electrical Shock Incident	An electrical shock occurred during the disassembly of equipment due to inadequate lockout/tagout procedures.	Stressed the importance of strict adherence to lockout/tagout procedures to prevent electrical hazards.	<a href="#">N/A</a>
Equipment Failure During Maintenance	A hoisting system failed during operation, leading to a near-miss incident.	Underlined the necessity for regular equipment inspections and maintenance checks prior to use.	<a href="#">N/A</a>

## Missing Hazards:

Hazard	Missing or Inadequate Mitigation in Current Work Control Document	Recommended Mitigation for Revision	Reference Link	SBMS Link
Falling Objects	Not addressed	Implement a drop zone and use toe boards on scaffolding.	<a href="#">N/A</a>	<a href="#">N/A</a>
Inadequate PPE	Not addressed	Specify required PPE for each task, including gloves and eye protection.	<a href="#">N/A</a>	<a href="#">N/A</a>
Lack of Emergency Procedures	Not addressed	Develop and communicate emergency response plans specific to disassembly operations.	<a href="#">N/A</a>	<a href="#">N/A</a>
Inadequate Communication	Not addressed	Establish clear communication protocols for rigging and lifting operations.	<a href="#">N/A</a>	<a href="#">N/A</a>
Improper Use of Tools	Not addressed	Provide training on the correct use of tools and equipment for all personnel involved.	<a href="#">N/A</a>	<a href="#">N/A</a>
Overexertion	Not addressed	Implement a buddy system for heavy lifting and provide mechanical aids.	<a href="#">N/A</a>	<a href="#">N/A</a>
Environmental Hazards	Not addressed	Assess and control environmental conditions such as noise and temperature extremes.	<a href="#">N/A</a>	<a href="#">N/A</a>
Lack of Training	Not addressed	Ensure all personnel are trained on specific hazards associated with klystron disassembly.	<a href="#">N/A</a>	<a href="#">N/A</a>
Electrical Hazards	Inadequate mitigation	Implement lockout/tagout procedures and ensure all electrical equipment is de-energized before work.	<a href="#">N/A</a>	<a href="#">N/A</a>
Confined Space Risks	Not addressed	Evaluate the work area for confined space hazards and implement appropriate controls.	<a href="#">N/A</a>	<a href="#">N/A</a>

**Failure mode analysis:**

Current Control	Failure Mode of the Control	Effect of Failure	Cause of Failure	Recommended Action
Hoisting and Rigging Procedures	Permit not obtained or expired	Potential for equipment failure or accidents during lifting	Lack of oversight in permit management	Implement a tracking system for permits and ensure regular audits.
PPE Requirements	PPE not used or inadequate	Increased risk of injury from falling objects or exposure	Lack of enforcement of PPE policies	Conduct regular PPE audits and training refreshers.
Work Instructions	Instructions not followed or unclear	Increased likelihood of accidents or improper disassembly	Vague or incomplete instructions	Revise work instructions to include detailed steps and visual aids.
Communication Protocols	Poor communication during lifting	Increased risk of accidents and injuries	Lack of established communication methods	Implement a standardized communication protocol for all lifting operations.
Emergency Response Procedures	Emergency procedures not practiced	Delayed response in case of an incident	Lack of drills or training	Schedule regular emergency response drills specific to disassembly operations.
Tool Availability	Tools not available or inadequate	Increased time to complete tasks and potential for unsafe improvisation	Poor inventory management	Conduct regular inventory checks and ensure all necessary tools are available before work begins.
Training and Competency Verification	Inadequate training for personnel	Increased risk of accidents due to lack of knowledge	Insufficient training programs	Develop and implement a comprehensive training program for all personnel involved in disassembly.

Current Control	Failure Mode of the Control	Effect of Failure	Cause of Failure	Recommended Action
Equipment Inspection	Equipment not inspected prior to use	Increased risk of equipment failure during operation	Inconsistent inspection schedules	Establish a mandatory inspection checklist and schedule for all equipment.
Manual Handling Procedures	Improper lifting techniques used	Increased risk of musculoskeletal injuries	Lack of ergonomic training	Provide ergonomic training and resources for manual handling tasks.
Elevated Work Safety	Lack of fall protection measures	Increased risk of falls from heights	Non-compliance with safety standards	Ensure compliance with OSHA regulations for fall protection and conduct regular inspections.