Work scope details:

Title:** PREAPPROVED WORK PLAN FOR THE STEAM PRODUCTION SYSTEM

Work Scope Summary:
The objective of this work package is to conduct routine maintenance activities on the Steam Production Systems and related equipment. These activities include troubleshooting, basic parts replacement, and repairs that do not require additional written instructions, though task leader direction may be necessary. The work encompasses various tasks performed by millwrights, pipefitters, welders, electricians, instrumentation and control technicians, utility mechanics, laborers, boilermakers, carpenters, and insulators.

Key Work Scope Components:
- Millwright tasks: pump maintenance, mechanical repairs, filter replacements, preventive maintenance. - Pipefitter and welding tasks: piping repairs, valve replacements, pressure relief valve installations, welding. - Electrician tasks: voltage readings, breaker operations, electrical repairs, panel installations. - I&C tasks: instrument maintenance, diagnostics, calibration, control wiring installations. - Utility mechanic tasks: concrete repairs, floor leveling, masonry work, preventive maintenance. - Laborer tasks: material moving, site cleanup, equipment support, waste collection. - Boilermaker tasks: pressure vessel maintenance, tube cleaning, gasket installations. - Carpenter tasks: scaffolding construction, containment structures, platform building. - Insulator tasks: insulation replacement, abatement, disposal, encapsulation.

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Relevant previous events and lessons learned:

Event Title	Event Summary	Lessons Learned	Reference link
Inadequate Work Controls during Refrigeration Repair	On March 14, 2014, a technician from ACME Refrigeration arrived at Brookhaven National Laboratory to perform preventive maintenance on an ice machine. The CulinArts Food Vendor Manager notified him that a walk-in cooler in Building 30 was not operating correctly and asked him to troubleshoot that equipment instead. The technician did not follow the required lockout/tagout process, did not use required fall protection, operated a breaker without required personal protective equipment and training; and improperly secured a junction box leaving wires exposed and energized. Upon discovery of the unsafe electrical condition, the equipment was made electrically safe, and an investigation was initiated.	The importance of having clear and concise instructions documented in work packages. The hoist installation work package and the PM procedure did not have an appropriate level of detail to ensure adjustments to the oiler were being effectively monitored. Effective communication between engineering, maintenance, and manufacturers is crucial.	Link

Hoist Repairs in Building 12-60	After a hoist in Building 12-60 developed an air leak, maintenance personnel evaluated the hoist and determined that the control valve was malfunctioning. Four days later, a second hoist in the building, similar to the first, also developed an air leak. Maintenance personnel performed troubleshooting activities and identified a common cause of the failures associated with the control valve oilers. Operations were suspended during the repair of both hoists. Subsequently, a preventive maintenance procedure was revised to ensure that maintenance personnel checked the control valve oilers on a quarterly frequency. A critique was held.	The importance of having clear and concise instructions documented in work packages. The hoist installation work package and the PM procedure did not have an appropriate level of detail to ensure adjustments to the oiler were being effectively monitored. Effective communication between engineering, maintenance, and manufacturers is crucial.	Link
Working outside the package scope	Not following written work instructions results in a procedural non-compliance with the Waste Treatment Project work control process. It was discovered during the close-out review that electricians working a Heating, Ventilation, and Air Conditioning (HVAC) Preventive Maintenance (PM) Work Package had performed work beyond the specific work scope. While some PM package instructions do allow for troubleshoot and repair activities, this PM package did not. It is important for the workers to work within the scope of the package.	Not following written work instructions results in a procedural non-compliance with the Waste Treatment Project work control process. It is important for the workers to work within the scope of the package.	Link
Failure to follow Lockout/Tagout procedures	In 2019, an employee servicing a baler failed to follow Lockout/Tagout (LOTO) procedures during routine maintenance. A shift turnover occurred and the next crew also did not lock out the machine. The baler was inadvertently powered on during troubleshooting, resulting in a worker losing their hand.	Periodically review original preventative maintenance (PM) bases to ensure PMs are still valid and that the proper level of maintenance is being performed to maintain equipment reliability.	Link

BP Texas City Refinery Explosion	On March 23, 2005, workers at BP's Texas City refinery were conducting routine maintenance when deferred upkeep of warning systems and neglected level indicators caused a massive explosion due to an overfilled processing unit. The accident killed 15 and injured 180.	Periodically review original preventative maintenance (PM) bases to ensure PMs are still valid and that the proper level of maintenance is being performed to maintain equipment reliability.	Link
Evergreen Packaging Paper Mill Fire	In 2020 at Evergreen Packaging Paper Mill (USA), maintenance contractors died in a fire inside a pulp bleaching tank. During periodic preventive maintenance, workers attempted insulation abatement and resin application. Using a heat gun to cure fiberglass inside a confined tank with residual flammable resin caused ignition—two contractors died due to inadequate training and poor monitoring during parts replacement and troubleshooting.	Periodically review original preventative maintenance (PM) bases to ensure PMs are still valid and that the proper level of maintenance is being performed to maintain equipment reliability.	Link

Missing Hazards:

Hazard	Missing or Inadequate Mitigation in Current Work Control Document	Recommended Mitigation for Revision	Reference link	SBMS Link
Ergonomic hazards (e.g., repetitive motion, posture)	No mention of ergonomic assessments or controls	Conduct ergonomic assessments, diversify activities, provide PPE and special tools, implement stretch breaks/exercises, and worker rotation	N/A	Link
Inadequate Lockout/Tagout (LOTO) procedures	Current controls mention LTV but not comprehensive LOTO procedures	Implement comprehensive LOTO procedures, including digital systems and human factor considerations	Link 1, Link 2, Link 3	Link
Working outside the defined work package scope	No controls for scope management risks	Implement scope management controls, including risk identification and mitigation strategies	Link 1, Link 2, Link 3	Link

Inadequate work controls and communication	No specific mention of communication protocols or work control systems	Establish robust communication protocols and work control systems to prevent hazards	Link 1, Link 2, Link 3	Link
Deferred maintenance and inadequate preventive maintenance	No mention of maintenance protocols	Implement preventive maintenance schedules and deferred maintenance risk assessments	Link 1, Link 2, Link 3	Link
Fire hazards during insulation abatement	No mention of fire hazards specific to insulation	Implement fire hazard controls specific to insulation materials	Link 1, Link 2, Link 3	Link
Chemical exposure	Chemical hazards are mentioned but not comprehensively covered	Enhance chemical hazard controls, including exposure limits and hierarchy of controls	Link 1, Link 2, Link 3	Link
Use of flammable materials	Flammables are mentioned but not comprehensively covered	Implement comprehensive controls for flammable materials, including prevention strategies and training	Link 1, Link 2, Link 3	Link
High workload and time pressures	No mention of workload management or time pressure controls	Implement workload management strategies and controls for high-pressure environments	Link 1, Link 2, Link 3	Link

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 issued or incorrect	Unauthorized work leading to safety hazards	Miscommunication or oversight	Implement a digital permit system with automatic checks
Personal Protective Equipment (PPE)	Inadequate or incorrect PPE	Increased risk of injury	Lack of training or awareness	Conduct regular PPE training and audits
Work instructions & safety procedures	Non-compliance or outdated procedures	Increased risk of accidents	Lack of updates or enforcement	Regularly review and update procedures; enforce compliance

General Ventilation (GV)	Ventilation failure	Exposure to hazardous fumes	Equipment malfunction or blockage	Regular maintenance and monitoring of ventilation systems
Training (T)	Insufficient training	Improper handling of equipment	Inadequate training programs	Develop comprehensive training programs with regular refreshers
Housekeeping	Poor housekeeping	Increased risk of slips, trips, and falls	Neglect or lack of responsibility	Implement a housekeeping checklist and assign responsibilities
Labeling or Postings (L/P)	Missing or unclear labels	Misidentification of hazards	Poor labeling practices	Standardize labeling and conduct regular inspections
Safety glasses w/side shields	Not worn or inadequate protection	Eye injuries	Lack of enforcement or awareness	Enforce wearing of safety glasses and provide quality equipment
Engineering Controls (e.g., Glovebox, Lab Hood)	Equipment failure	Exposure to hazardous materials	Lack of maintenance or improper use	Schedule regular maintenance and provide user training