

**LESSONS LEARNED FOLLOWING THE SUCCESSFUL DECOMMISSIONING
OF A REACTION VESSEL CONTAINING LIME SLUDGE AND
TECHNETIUM-99**

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ABSTRACT

This paper documents how WESKEM, LLC utilized available source term information, integrated safety management, and associated project controls to safely decommission a reaction vessel and repackage sludge containing various Resource Conservation and Recovery Act constituents and technetium-99 (Tc-99). The decommissioning activities were segmented into five separate stages, allowing the project team to control work-related decisions based on their knowledge, experience, expertise, and field observations. The information and experience gained from each previous stage and rehearsals contributed to modifying subsequent entries, further emphasizing the importance of developing hold points and incorporating lessons learned. The hold points and lessons learned, such as performing detailed personal protective equipment (PPE) inspections during sizing and repackaging operations, and using foam-type piping insulation to prevent workers from cutting or puncturing their PPE on sharp edges or small shards generated during sizing operations, minimized direct contact with the Tc-99. To prevent the spread of contamination, the decommissioning activities were performed inside a containment enclosure connected to negative air machines. After performing over 235 individual entries totaling over 285 project hours, only one first aid was recorded during this five-stage project.

INTRODUCTION

A Resource Conservation and Recovery Act (RCRA) storage facility at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, housed a 15,141-liter (4000-gallon) stainless-steel reaction vessel. The vessel was approximately 3.7 meters (12 feet) in diameter and 2.1 meters (7 feet) high at its extremities, with 0.64-centimeter (0.25-inch) thick walls (Figure 1).



Fig. 1. Reaction Vessel

Between 1953 and 1975, recycled uranium (RU) was used to manufacture uranium hexafluoride (UF_6) as part of the gaseous diffusion process. After draining all liquid materials, a 5.1-centimeter (2-inch) to 7.6-centimeter (3-inch) layer of sludge remained in the vessel. Considering the vessel dimensions, the amount of sludge was equivalent to approximately 568 liters (150 gallons); less than 4% of the container volume. The sludge mass was estimated to be 900 kilograms (1,985 pounds). Since the vessel was no longer in service, WESKEM, LLC was tasked with decommissioning the vessel and its contents.

This paper documents how WESKEM, LLC used available information in conjunction with U.S. Department of Energy (DOE) guidelines and project controls, as follows:

- ◆ Source term
- ◆ Applying integrated safety management
- ◆ Engineering and administrative controls
- ◆ Personal protective equipment
- ◆ Hold points and emergency notifications
- ◆ Collection, storage and disposal of waste stream materials
- ◆ Containment enclosure demobilization
- ◆ Lessons learned
- ◆ Metrics

to complete a very complex and hazardous decommissioning project successfully.

SOURCE TERM

Sludge characterization identified a pH between 9 and 10, RCRA hazardous constituents (e.g., arsenic [D004], chromium [D007], and mercury [D009]), and large amounts of calcium and potassium, likely from lime and potassium hydroxide used to adjust the pH during the RU process. Polychlorinated biphenyls (PCBs) were not detected.

In addition, the sludge contained a maximum concentration of 1.74E6 Becquerels per gram (Bq/g) (47 microcuries per gram) of technetium-99 (Tc-99), that remained in the sludge as a trace impurity. Technetium-99 has a half-life of 2.13E5 years, and decays by beta-particle emission (β^- , $E_{avg} = 84.6$ keV, $E_{max} = 293.6$ keV) to stable ruthenium-99 (1). The sludge uranium assay (U-235 mass percent) was <1%, exempting it from nuclear criticality concerns. Although Tc-99 has a low-specific activity, i.e., it decays very slowly, the concentration in the sludge warranted external radiation protection and contamination control measures. The external radiation hazard resulted from the emitted beta particles interacting with the vessel's stainless-steel walls producing Bremsstrahlung X rays. The X rays contributed to worker exposure, particularly to the extremities.

Furthermore, the air immediately surrounding the sludge can become ionized, which is typical of highly concentrated, pure beta-emitting radionuclides. The resulting negative and positive ions create an electrostatic attraction and repulsion of the Tc-99. If there is no medium present to either absorb the beta particles or neutralize the electrostatic charges in the air, this ionization field results in a migration, or "creep" of Tc-99 with the aid of air currents. The gross manifestation of this phenomenon can result in the spread of contamination.

APPLYING INTEGRATED SAFETY MANAGEMENT

By emphasizing employee health and safety, and drawing from previous high-hazard experiences and training activities performed by WESKEM, LLC (2), a project team was assembled representing the following organizations and PGDP support groups:

- ◆ Project Manager
- ◆ Environment, Safety & Health (ES&H) Representative
- ◆ Site Safety and Health Officer (SSHO)
- ◆ Front Line Manager (FLM)
- ◆ Maintenance Mechanics
- ◆ Sampling, Waste Handling and Chemical Operator Work Teams
- ◆ Radiological Control (RADCON) Technician/Health Physicist
- ◆ Waste Stream Manager
- ◆ Regulatory Compliance Specialist
- ◆ Quality Assurance Representative
- ◆ Data Management Group
- ◆ Emergency Response Personnel

The principles of the DOE's Integrated Safety Management System (ISMS) and WESKEM, LLC's ISMS program were applied from the beginning through the end of the project. The ISMS process is defined by a cycle of steps that relies on thorough planning and worker feedback to continuously improve the safe performance of work. This cycle consists of five elements:

- ◆ Define the scope of work to be performed
- ◆ Analyze hazards associated with work conditions
- ◆ Develop and implement hazard mitigation controls
- ◆ Perform the work
- ◆ Assimilate worker feedback and field measurements to modify future work stages

In order to utilize resources efficiently in defining the scope of work, the project was segmented into five separate stages:

- ◆ Stage 1 - Work area mobilization and preparation
- ◆ Stage 2 – Reaction vessel preparation and dismantling
- ◆ Stage 3 - Sludge removal and containerization
- ◆ Stage 4 – Reaction vessel sizing, containerization and characterization
- ◆ Stage 5 - Work area cleanup and demobilization

The integrated safety management principles, listed below, were applicable to all five stages and addressed to the maximum extent possible in the project documents:

- ◆ Thoroughly assessing planned activities to recognize potential hazards.
- ◆ Designing mitigating actions and controls for each potential hazard.
- ◆ Providing personnel performing the work with the authority to control work-related decisions based on their knowledge, experience, expertise, and field observations.
- ◆ Incorporating hold points that require work interruption to evaluate both the nature and extent of the hazards and the adequacy of the entry team's preparedness before proceeding to address unexpected conditions.

- ◆ Ensuring that personnel involved are adequately trained and equipped to safely accomplish the objectives of each stage of work.
- ◆ Fully communicating the shared-site resource requirements, action plans, and contingencies to affected PGDP managers.
- ◆ Reviewing each planned activity through pre-job briefings and rehearsals with all affected project personnel, including the Entry Team, Support Team, and PGDP Fire Department and Emergency Squad representatives.
- ◆ Documenting and reviewing information gained from previous stages of the project and modifying project documents and related plans, as needed, prior to performing work in subsequent stages.
- ◆ Explicit authority and direction for *any worker* associated with the project to *stop work* if an unsafe condition was observed.

Project documents, such as the Work Plan and Health and Safety Plan (WP/HASP), were developed in accordance with Title 29 of the Code of Federal Regulations, Part 1910.120 - Hazardous Waste Operations and Emergency Response (HAZWOPER) (29 CFR 1910.120) (3) and incorporated the following sections:

- (1) Safety and health program
- (2) Hazard communication program
- (3) Medical surveillance program
- (4) Decontamination program
- (5) Material handling program; e.g., drum and container handling
- (6) Training program
- (7) Emergency response program

Project- and stage-specific attachments included:

- ◆ Field Work Requests
- ◆ Activity Hazard Analyses (AHAs, for example, see Table 1)
- ◆ Quality Assurance Plan
- ◆ RADCON Plan, developed in accordance with Title 10 of the Code of Federal Regulations, Part 835 - Occupational Radiation Protection (10 CFR 835) (4)
- ◆ Sampling and Analysis Plan
- ◆ Waste Generation Plan
- ◆ Critical Lift Plan

These attachments detailed the regulatory requirements, specific project objectives, and suspected hazards, including engineering and administrative controls required to mitigate the suspected hazards. If feedback (e.g., experience, lessons learned) was collected following completion of the previous stage, the program documents were revised accordingly.

ENGINEERING AND ADMINISTRATIVE CONTROLS

Observations and photographic evidence indicated the remaining material contained inside the reaction vessel was in a semi-liquid state containing suspended solids (i.e., a slurry), and a semi-solid layer of concentrated sludge in the bottom of the container. Since the vessel had remained sealed (i.e., not vented to atmosphere), the void space inside the vessel was assumed to be saturated with water vapor resulting from an equilibrium having been established between the wet slurry and the inside air. Once the container was breached, it was expected that this equilibrium condition would change, resulting in Tc-99 migration. Therefore, it was extremely important to implement a combination of effective engineering and administrative controls to prevent any contamination of personnel, the RCRA facility, and the environment.

Since the decommissioning activities could potentially expose personnel to Tc-99, all work activities were conducted under strict Occupational Safety and Health Administration (OSHA) and radiological controls, including As Low As reasonably Achievable (ALARA) principles. The engineering and administrative controls mitigating the hazards to a manageable level included:

- ◆ RCRA storage facility access/egress requirements were posted at the pedestrian entrance, limiting access to project personnel during sizing and sludge repackaging activities.
- ◆ A containment enclosure consisting of a steel frame supporting a flame-resistant plastic membrane was erected around the vessel. Access/egress to the containment enclosure was through a series of radiological control chambers with doors; three sections for support and donning/doffing PPE, and one large section for decommissioning operations (Figure 2).



Fig. 2. Containment Enclosure

- ◆ Emergency exits were provided through two breakout doors. The exits were posted with luminescent signs in the event of power failure.
- ◆ High efficiency particulate air- (HEPA-) filtered negative air machines (NAMs) were used to draw potential airborne radioactivity and removable contamination away from workers during vessel sizing and sludge repackaging activities, as well as away from workers during their anti-contamination doffing sequence. Although primary and backup NAMs were installed, only the primary NAM was used during the course of the project. In addition, the NAM was used to maintain the containment enclosure under negative pressure.
- ◆ Equipment was de-energized during periods of non-operation, with the exception of the NAM to maintain negative pressure on the containment enclosure.
- ◆ Windows were located strategically throughout the containment enclosure to position external, portable lighting as needed.
- ◆ When working inside the containment enclosure, the "buddy system" was used to ensure that rapid assistance could be provided in the event of an emergency. The "buddy system" organized work groups so that each worker inside the containment enclosure was observed by at least one other worker (i.e., line-of-sight) at all times.

Should an emergency situation arise (e.g., chemical exposure, heat stress, breach in work partner's PPE), workers could communicate using prearranged hand signals.

- ◆ Rehearsals were conducted prior to breaching the reaction vessel to reveal any issues or problems with the project objectives, so corrective actions could be implemented. Specific roles and responsibilities for all project personnel were outlined in the WP/HASP.
- ◆ In the summer months, elevated temperatures were expected inside the RCRA storage building. To reduce heat stress conditions, work-rest periods, and alternative schedules (e.g., late night/early morning start times) were established at the discretion of the SSHO. The exhaust fans were used to pull cool air through the building, and an air-conditioned break room provided a cool-down area for the workers.
- ◆ Work areas, both inside and outside of the containment enclosure, were routinely surveyed (e.g., smears and direct readings) by the radiological control technicians (RCTs). A fixative agent was sprayed on highly contaminated surfaces to prevent contamination migration. The removable Tc-99 contamination in the primary containment enclosure section ranged from $1.7E3$ Bq per 100 cm^2 (100,000 disintegrations per minute per 100 cm^2) up to $1.7E6$ Bq per 100 cm^2 (100 million disintegrations per minute per 100 cm^2). By using the fixative agent, for example, contamination levels in the airlock were being maintained at approximately 7 Bq per 100 cm^2 (400 disintegrations per minute per 100 cm^2).
- ◆ Non-airborne-generating cutting tools were used to cut the vessel into top-and-bottom sections, and segment the sides (i.e., "sizing") into manageable sections; approximately 0.84 square meters (9 square feet), weighing approximately 32 kilograms (70 pounds).
- ◆ Hand and power tools were inspected and tested periodically to verify they were safe for use.
- ◆ According to the Critical Lift Plan, a gantry crane was used to suspend the top section of the vessel during cutting and sizing activities. In order to access and repack the sludge contained in the bottom vessel section, the crane was used to relocate the top section to another staging area within the containment enclosure. The hoist chain and hook passed through a zippered slot located on the top of the containment enclosure and was secured to the vessel. At the connection point, the vessel welds were inspected for cracks and rust that could lead to failure.
- ◆ The sludge was removed from the vessel using hand tools, and collected in 11.3-liter (3-gallon) plastic buckets lined with plastic bags. The buckets were used for transferring the sludge through a portal to the repackaging drum located outside the enclosure. The plastic bags would contain the sludge, with the bucket acting as a support system to prevent spills and collect any drips. Either pouring the sludge down the sides of the inner plastic bag in the repackaging drum, or transferring a closed, sludge-filled plastic bag to the repackaging drum directly reduced splashing. Additional plastic was placed around the portal and repackaging drum to catch any spills or drips.
- ◆ Sized sections of the vessel were bagged and taped closed before being removed from the containment enclosure.

- ◆ Personnel monitoring consisted of collecting bioassay samples and wearing whole body and extremity thermoluminescent dosimeters. At the end of the project, all employee dosimeter results were less than the pre-determined administrative limit.
- ◆ Non-radiological airborne contamination monitoring was performed for heavy metals, including flammable and explosive vapors caused by radiolytic decomposition of wet and/or organic waste. During the entire project, all monitoring results were less than their respective action limits.
- ◆ Combustibles or flammables were not allowed to be stored within 3 meters (10 feet) of the exterior containment enclosure walls. PPE collection bags were kept a minimum of 0.9 meters (3 feet) from the inside walls. To minimize the buildup of combustible materials inside the enclosure, the collection bags were removed from the enclosure at the end of each shift, and placed in an appropriate waste container.

PERSONAL PROTECTIVE EQUIPMENT

The typical PPE regiment consisted of:

- ◆ Company-issued clothing under coveralls
- ◆ Company-issued steel-toe work boots
- ◆ Inner coveralls w/ optional hood (worn outside containment enclosure)
- ◆ Fully encapsulated, impermeable outer coveralls w/ attached supplied-air bubble hoods (worn inside containment enclosure)
- ◆ Certified Grade-D breathing air for supplied air hoods
- ◆ Powered air-purifying respirators (PAPRs) and cartridges (when demobilizing the containment enclosure)
- ◆ Outer disposable, tear-away booties
- ◆ Rubber totes
- ◆ Inner rubber/surgical gloves
- ◆ Rubber/chemical resistant outer gloves
- ◆ Outer gloves taped at wrists to the outer coverall
- ◆ Covered zippers
- ◆ Cut-resistant (e.g., leather, rubber) aprons (when handling or sizing steel)
- ◆ Hearing protection (as needed)

This multi-layer PPE approach was designed to mitigate the “creep” or invasive, mobile nature of the Tc-99 contamination, as well as provide shielding. Health physics surveys measured 7.4 milligrays (740 millirads) at the start of the project. During the course of the project, additional surveys yielded 0.02 Grays per hour (2 rads per hour) smearable, and 0.07 Grays per hour (7 rads per hour) direct reading. Whereas unshielded, direct contact with Tc-99 could have caused significant shallow doses due to the emitted beta radiation, the dose rate through 2 layers of 10-mil impermeable anti-contamination coveralls worn by the workers was essentially zero (5).

HOLD POINTS AND EMERGENCY NOTIFICATIONS

The WP/HASP included various hold points and emergency actions that would require the entry team to momentarily stop, evaluate and mitigate unexpected hazardous conditions or situations during each work stage. Depending on the complexity of the condition or emergency situation, the project team would decide on a course of action before proceeding with decommissioning activities.

For example, "PPE Failure or Alteration" was identified as a hold point. Therefore, if an employee experienced a PPE failure or alteration (e.g., torn or ripped garment), the affected employee was to immediately leave the containment enclosure, and proceed through the decontamination line. Reentry was not permitted until the PPE had been replaced, and the source of the failure or alteration (e.g., loose metal shards from sizing operations) had been corrected (e.g., vacuum up shards, and cover cut edges to eliminate direct contact with sharp edges).

In the event of a minor leak, spill or puddle accumulation of Tc-99-contaminated sludge, absorbents and berms were staged in the work area and containment enclosure to prevent migration. The minor spill would have been cleaned up and resultant wastes handled similar to project-generated wastes (e.g., PPE). However, if a large quantity of material was spilled or migrated outside of the containment enclosure, the workers would have stopped work, exited the containment enclosure, and assisted with recovery operations to prevent further contamination migration.

Other hold points included, but were not just limited to:

- ◆ Detection of contamination outside containment enclosure
- ◆ Radiological and industrial hygiene meter readings exceeding pre-determined action limits
- ◆ Unfavorable atmosphere (e.g., detecting flammable/explosive vapors)
- ◆ HEPA-filtered NAM shutdown
- ◆ Instrument failure
- ◆ Radioactive or chemical contamination on PPE
- ◆ Unusual weather conditions (e.g., high temperatures)
- ◆ Under-performance of equipment
- ◆ Inadequate critical lift repositioning technique
- ◆ Vessel weld inspection failure

Any of the following events, for example, would have required prompt notification of the Project Manager, ES&H Manager, Subcontractor Technical Representative, and PGDP Plant Shift Superintendent by the FLM:

- ◆ Containment enclosure collapse
- ◆ Fire
- ◆ Worker losing consciousness

Project personnel would have been required to support or perform recovery operations following control of the emergency. Emergency contacts (e.g., phone numbers, radio call-out numbers, routes to medical facilities) were maintained in a visible location at the entrance to the building and work area.

COLLECTION, STORAGE AND DISPOSAL OF WASTE STREAM MATERIALS

The Waste Stream Manager classified the project-generated wastes as hazardous, radioactive, or mixed waste, as appropriate. The wastes were collected, treated, stored, and disposed according to the type of contamination and concentration in accordance with applicable regulations. Removing packing materials and using only pre-identified equipment during a particular work stage, and decontaminating tools and equipment used in the containment enclosure for unrestricted use contributed to project waste minimization efforts. The waste streams and volume generated during the project consisted of:

- ◆ Contaminated calcium and potassium hydroxide sludge - 0.57 m³ (20 ft³)
- ◆ Contaminated stainless steel - 1.1 m³ (40 ft³)
- ◆ Containment enclosure - 2.8 m³ (100 ft³)
- ◆ Project generated waste (e.g., PPE and soft solids) - 11.3 m³ (400 ft³)
- ◆ Contaminated tools and equipment - 0.57 m³ (20 ft³)
- ◆ Contaminated wood - 0.31 m³ (11 ft³)

CONTAINMENT ENCLOSURE DEMOBILIZATION

When all materials were removed from the containment enclosure, a series of coordinated steps were taken to seal all doors and inlet ports, systematically disconnect the containment enclosure membrane from its frame, and collapse the containment enclosure, while regulating air flow through the NAM. As the enclosure was collapsing, workers rolled and folded the membrane towards the NAM, where it was finally disconnected from the NAM under RCT supervision. The membrane was then placed into a suitable disposal container. Paint was applied to the floor area to secure any loose contamination, and allow for downposting of the area, such that a Radiation Work Permit (RWP) was no longer required for entry. This final demobilization returned the RCRA storage facility to its original operating condition.

LESSONS LEARNED

Numerous lessons learned were identified and implemented during the course of the project:

- ◆ Conduct crew briefings to emphasize “STOP Work” authority and attention to detail; e.g., donning/doffing techniques and performing detailed PPE inspections before each entry, and during cutting/repackaging operations to prevent cross contamination.
- ◆ Monitor floor and airlock contamination levels within the enclosure to verify the contamination is not spreading and apply fixative as needed.
- ◆ Install a portable frisker at the step-off pad to survey the employee’s shoes for contamination.
- ◆ Frequently change or replace temporary “sticky pads” on the floor in the work areas to minimize buildup of radioactive contamination.
- ◆ To prevent workers from cutting or puncturing their PPE on sharp edges or small shards generated from sizing operations, cushioning (e.g., foam piping insulation) was placed on the vessel edges to act as a buffer, and rubber floor mats were added to the work area.
- ◆ Utilize stronger and more tear-resistant PPE, including tear-resistant gloves when handling metal pieces.
- ◆ Utilize kneepads, kneeling pads, or rubber mats to cover sharp edges of the vessel.
- ◆ Install a camera to critique work practices within the containment enclosure.
- ◆ Stand down the work immediately when personnel identified work practices that could tear or puncture PPE.
- ◆ Use a vacuum cleaner to remove metal pieces and sharps generated from cutting and shearing operations.
- ◆ Install foam insulation on the vessel to prevent tears in PPE from the jagged edges created during vessel sizing activities.
- ◆ Cut vessel to sizable pieces for easier handling by workers.
- ◆ To eliminate potential back injuries and minimize direct handling of the heavy panels, tables with rollers were installed to roll the sized pieces from inside the containment enclosure to the waste containers.
- ◆ Have backup equipment (e.g., air distribution box) available in the event of a malfunction.
- ◆ Depending on weather, determine if equipment can operate under extreme hot or cold environments.

METRICS

Over 235 individual entries were performed, accruing over 285 total project hours. Regarding the actual effort spent on vessel cutting, sizing and removing sludge (Stages 2, 3 and 4), over 200 individual entries were performed, accruing approximately 250 hours; approximately 86% of the entire five-stage project effort.

Only one first aid was recorded on the project due to a bruised finger obtained while repackaging sized pieces. No broken bones resulted from the incident, and prescription medicine was not required. The employee returned to work without any restrictions. Afterwards, the project team held a crew briefing to discuss the event and corrective actions. Specifically, odd-shaped pieces of metal would be individually wrapped, and metal pieces of similar configurations would continue to be wrapped together. Regarding the roller table, two legs were reinforced to accommodate a wider and longer board used for rolling the sized tank pieces from the enclosure to the waste container located outside the containment enclosure.

CONCLUSION

The WESKEM, LLC project team completed the successful decommissioning of a former reaction vessel containing approximately 568 liters (150 gallons) of lime sludge and Tc-99. The planning process included a detailed review of all of the suspect hazardous constituents, radioactive materials and conditions. Consistent with the principles of ISMS, the multi-stage approach; i.e., segmenting the decommissioning activities into five separate stages, allowed the project team members the authority to control work-related decisions based on their knowledge, experience, expertise, and field observations. The information and experience gained from each previous stage, as well as rehearsals, contributed to modifying subsequent entries, as well as emphasizing the importance of developing hold points and incorporating lessons learned. Engineering and administrative controls, including PPE were used to minimize exposure to employees working inside the containment enclosure, and prevented radioactive contamination from migrating to the environment. Only one first aid was recorded (e.g., bruised thumb) over this five-stage project that consisted of performing over 235 individual entries, accruing over 285 project hours. Approximately 86% of this effort was spent on tank cutting, sizing and removing sludge. This decommissioning project exemplified how a detailed and thorough planning process that integrates safe work practices and commitment to teamwork can result in the safe and effective completion of a very complex and highly hazardous project.

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Table I - Stage 2 AHA (Example) - Preparation and Dismantling of Reaction Vessel

Activity (Tasks)	Potential Hazards	Administrative & Engineering Control Measures	Monitoring Required	Personal Protective Equipment	Training Requirements	Medical Monitoring & Surveillance	Decontamination, Disposal & Other Procedures
All activities in Stage 2	<p>Cutting or tearing of PPE</p> <p>Exposure to Tc-99 and RCRA constituents</p> <p>Heat stress</p> <p>Events requiring evacuation of building</p>	<p>Inspect PPE prior to use. Cover sharp edges of tank with foam insulation. Vacuum up small pieces resulting from tank cutting operations.</p> <p>PPE regiment to provide shielding and prevent exposure, maintain containment enclosure under negative pressure using NAMs.</p> <p>Monitor temperature, stay times</p> <p>Identify Assembly Area outside building and Assembly Point in the event of an alarm.</p>	<p>Attention to detail, review PPE integrity when inside containment enclosure</p> <p>External dosimetry, bioassay, IH monitoring</p> <p>Heat Stress</p>	<p>PPE Regiment</p> <p>Special PPE is required for firefighting and responding to other incidents requiring evacuation of building and is beyond the scope of this stage of work.</p>	<p>Applies to entire stage:</p> <p>GET</p> <p>RadWorker II</p> <p>HAZWOPER 40-hour</p> <p>HAZWOPER 8-hour refresher</p> <p>HAZWOPER Supervisor</p> <p>Work Plan, Health & Safety Plan (HASP), AHA, and RCRA permit review</p> <p>Back Safety/Lifting</p>	<p>Applies to entire stage:</p> <p>Baseline with annual physical.</p> <p>Pulmonary function test. Respirator fit test.</p> <p>Baseline bioassay.</p> <p>Baseline monitoring for metals for workers in the Containment Enclosure after reaction vessel has been breached.</p>	<p>Applies to entire stage:</p> <p>Refer to the RADCON Plan for decontamination and disposal of project-generated wastes.</p> <p>W-136 Handling & Storage of Low-Level Waste</p> <p>W-148 Powered Industrial Trucks</p> <p>W-212 General Safety Rules</p> <p>W-223 Stop Work</p> <p>W-240 Heat Stress</p> <p>W-255 Housekeeping</p> <p>W-256 Manual Lifting</p>