U.S. Department of Energy
Technical Qualification Program

OAK RIDGE OPERATIONS OFFICE DEFENSE NUCLEAR FACILITIES

Study Guide

East Tennessee Technology Park

Developed by the
OAK RIDGE OPERATIONS OFFICE
TRAINING AND DEVELOPMENT DIVISION

AUGUST 1997
REVISION 0

II. East Tennessee Technology Park

The East Tennessee Technology Park (formerly known as the K-25 Site or the Oak Ridge Gaseous Diffusion Plant) was built during the World War II Manhattan Project to produce highly enriched uranium for use in nuclear weapons. The gaseous diffusion plant later produced low assay uranium for use as commercial nuclear power reactor fuel. Production ceased in 1985 and the plant was permanently shutdown in 1987.

The East Tennessee Technology Park (ETTP) mission is to reindustrialize and reuse site assets, i.e., facilities, equipment, materials, utilities, and trained workforce, through leasing of vacated facilities and incorporation of commercial industrial organizations as partners in the ongoing environmental restoration, decontamination and decommissioning, waste treatment and disposal, and diffusion technology development activities.

The ETTP defense nuclear facilities are:

- HEU process buildings K-25, K-27
- LEU process buildings K-29, K-31, K-33
- Decontamination Facility K-1420
- UF_6 cylinder storage yards

In this study guide, the UF_6 cylinder storage yards are treated as one facility but, more accurately, include K1066B, K1066E, K1066F, K1066J, K1066K, and K1066L.

HEU Process Buildings K-25, K-27

HEU K-25 and K-27 process buildings were originally designed and built to house a full-gradient cascade to yield uranium fully-enriched in ^{235}U to the weapon-grade level. The cascade enriched the ^{235}U isotope of uranium by the gaseous diffusion process that used uranium hexaflouride (UF_6) as the process gas.

Current activities in the HEU process buildings are limited. The ETTP Site Operations Division is responsible for maintaining the buildings and equipment to ensure continued safe confinement of residual uranium deposits in the process equipment and process lines. The Operations Division is also responsible for some of the vault areas, such as those that contain reactive lithium compounds, most of which are lithium hydroxide. The Deposit Removal Project (DRP) is an on-going demonstration project for removing uranium deposits from process equipment. The ETTP Waste Management Division (WMD) uses Buildings K-25 and K-27 to store hazardous, radioactive, and mixed wastes in containers pending shipment off-site for disposal.

K-25 and K-27 activities are managed by the Surveillance and Maintenance Operations (S&M) Department under the ETTP Operations Division. Monitoring and inspection of facilities is the major responsibility of the S&M Department. These responsibilities include asbestos inspection and mitigation, identification of leak sources, fire protection equipment inspections, and monitoring equipment removal or inspection.

Shutdown HEU facilities still contain large quantities of chemicals, tools, and equipment that supported uranium enrichment activities. Since the shutdown of the cascade operations, materials and equipment have been defined as surplus. Most coolant materials, lube oils, and some equipment have been removed from the site as surplus materials and shipped to other DOE facilities for use. Removal of surplus materials will continue for many years. Activities such as short-term storage of various materials removed from HEU buildings prior to shipping are typical surplus materials activities.

Waste Management Division (WMD) has responsibility for waste management activities at ETTP. Included is the responsibility for providing storage for waste (containerized RCRA, TSCA, fissile, PCB, and other LLW, as well as some fissile material not classified as waste) pending treatment and/or disposal. WMD activities include:

- Recombination (Bulking) of Waste — Drums of RCRA, TSCA, LLW, fissile, and mixed waste are stored throughout the basement vault areas. Periodically, some of these materials can be transferred into tanker trucks and transported off-site. These operations may require Unresolved Safety Question Determinations (USQDs) if not already covered by other safety basis documentation. If the materials are radiologically contaminated, Nuclear Criticality Safety Approvals (NCSAs) may also be required.

- Overpacking — As part of the normal inspection and surveillance program, WMD identifies any leaking or corroded storage containers. Corrective action includes overpacking and putting containers inside a larger container (e.g., putting a 55-gallon drum into a 85-gallon drum).

- Sampling — Sampling is required to determine the proper storage and/or disposal of waste. Containers are opened and samples taken for analytical processing.

- Storage Area Monitoring, Inspection, and Housekeeping — WMD performs weekly and monthly inspections of all containers and areas under their control. Inspections include but are not limited to inspection of container integrity, container labeling, and facility conditions.

- Container Staging — Containers (drums and ST-5 boxes) are staged for sampling, bulking, and segregation. Forklifts are used to unstack, stack, and transport the containers within the waste storage unit.

- Waste Tracking — WMD tracks waste containers using bar codes which are tracked by the ETTP Waste Tracking and Report System (TARS). The bar codes are added to the waste containers by operators as new containers are received from generators.

Environmental Restoration Division (ERD) is responsible for the DRP in the HEU facilities. The DRP involves removing target items such as pieces of pipe or equipment from existing locations; transporting the items to the DR room; confirming the uranium deposit mass by NDA measurements; removing deposits inside a glovebox; and packaging and storing deposits, wastes,

and target items. Following interim storage in Building K-25, the removed deposits will be relocated to safe storage at the Y-12 Plant. Some items have deposits that will be removed using gaseous removal process. The gaseous removal process refluorinates the deposits to a gaseous state for removal via a trap.

HEU facilities present several safety risks to workers and/or the public. The risks stem from:

- Radioactive material
- Toxic material
- Reactive material

Radioactive material

The hazards associated with radioactive materials stem from three groups of material: radioactive deposits and material in fissile material storage areas, radioactive wastes, and radioactive contamination.

Large quantities of uranium deposits consisting primarily of uranyl fluoride remain in the process equipment inside buildings K-25 and K-27. The largest single deposits found in the process piping have deposit masses in excess of minimum critical masses for the deposit ^{235}U enrichments. Single deposits in excess of minimum critical masses were measured only in Building K-25.

In addition to uranium deposits, residual deposits from UF_6 feed materials produced from reactor returns were identified. The three isotopes of concern are ^{239}Pu, ^{237}Np, and ^{99}Tc. The ^{239}Pu and ^{237}Np fluoride compounds are not very volatile. Most of the materials would have remained in the feed cylinders or would have been deposited in the process equipment near the feed points. The quantities remaining in the cascade equipment are judged insignificant with respect to the uranium deposits.

The other radioactive material locations are in the Building K-25 fissile material storage areas. Though these inventories may vary, they are significant compared to the uranium deposits in the process equipment in the HEU buildings.

In addition to the radiotoxicity hazard of the uranium in the HEU buildings, the masses of many deposits substantially exceed the critical safe mass for the ^{235}U enrichments identified. Nuclear criticality is prevented by avoiding the introduction of a moderator to these large deposits. However, the possibility of accidental introduction of moderator and resulting nuclear criticality exists.

The storage vaults in the basements of buildings K-25 and K-27 are permitted for the storage of radioactive LLW. The vault storage configurations generally limit storage capacities to less than the permitted levels of waste. However, if the vaults are filled to permitted storage capacities, then significant quantities of uranium are present.

The HEU buildings and building penetrations are generally contaminated with uranium and most

are designated as Contamination Areas (except some small clean or High Contamination Areas). Most of the uranium contamination in these buildings is fixed with very little removable in routinely accessible areas.

Toxic material

The health effects caused by the chemical toxicity of soluble uranium and technetium compounds found in these buildings are often greater than the radiological effects. Adverse health effects may result from acute exposure to inhaled or ingested soluble material. Insoluble uranium compounds are not present in significant quantities in these facilities.

The vault areas in buildings K-25 and K-27 are permitted to store hazardous wastes and RCRA-regulated materials in quantities up to the full permitted storage capacity of the facilities even though vault storage configurations limit the amounts actually stored. These materials are potentially toxic and/or corrosive, and may react with other stored waste.

Other toxic materials are PCB oils. PCBs are in:

- Capacitors
- Transformers
- Contaminated lube oil
- Contaminated waste

Additionally, PCB-contaminated oils have been found in process building ductwork. Low levels of PCB contamination in ductwork are expected in both HEU process buildings. Miscellaneous PCB-contaminated equipment is stored on the K-25 cell-floors.

Liquid fluorocarbon coolants also present a toxic threat to personnel in the HEU buildings. Liquid fluorocarbon coolants are stored in the basement vaults and could potentially be released to the area atmosphere. This release presents an asphyxiation hazard to building personnel because the HEU building ventilation systems are shutdown.

Reactive material

Building K-25 vaults contain drums of lithium compounds, primarily lithium hydroxide (LiOH). LiOH is soluble in water and produces a strongly alkaline solution. This material is toxic and corrosive.

LEU Process Buildings K-29, K-31, K-33

LEU process buildings K-29, K-31, and K-33 were originally designed and built to house the low enrichment part of the Oak Ridge Gaseous Diffusion Plant (ORGDP) cascade.

Current activities in the LEU buildings are limited and the facilities are scheduled to be turned over for D&D. The ETTP Operations Division occasionally removes process equipment and ships it to the operating gaseous diffusion plants (PGDP or PORTS) for reuse. Operations Division is also responsible for maintaining the buildings and equipment to ensure continued safe confinement of residual uranium deposits in the process equipment and process lines. The ETTP WMD uses buildings K-31 and K-33 to store mixed and low-level radioactive wastes in containers pending treatment or shipment off-site for disposal.

In the LEU facilities, buildings K-31 and K-33 are used by WMD to store drums containing soils contaminated with uranium or PCBs, LLW in ST-5 boxes, and removed PCB-contaminated electrical capacitors. Other WMD activities include recontainerization (bulking) of wastes, overpacking of waste containers, sampling of wastes and inspection of waste containers, and the staging (movement) of waste containers.

A fissile material storage area is located on the operating floor of Building K-31. The fissile storage containers hold UF_6. The stored fissile materials include relatively small quantities of uranium-contaminated materials and uranium compounds cleaned from piping and valves and larger quantities of UF_6 in partially filled containers.

S&M Operations responsibilities in LEU facilities include monitoring, inspecting, and correcting deficiencies that might otherwise affect the environment, jeopardize the public or site personnel's health and safety, or adversely affect national security due to the loss of classified technology or SNM.

Shutdown LEU facilities still contain large quantities of chemicals, tools, and equipment that supported uranium enrichment activities. Since the shutdown of the cascade operations, materials and equipment have been defined as surplus. Most coolant materials, lube oils, and some equipment have been removed from the site as surplus materials and shipped to other DOE facilities for use. Removal of surplus materials will continue for many years. Activities such as short-term storage of various materials removed from EU buildings prior to shipping are typical surplus materials activities.

LEU facilities also present several safety risks to workers and/or the public. These risks stem from:

- Radioactive material
- Toxic material
- Reactive material

<u>Radioactive material</u>

The hazards associated with radioactive materials stem from three groups of material: radioactive deposits and material in fissile material storage areas, radioactive wastes, and radioactive contamination.

Large quantities of uranium deposits consisting primarily of UO_2F_2 remain in the process equipment inside the three LEU buildings. The largest single deposits are located in process piping.

In addition to UO_2F_2 deposits, residual deposits from UF6 feed materials produced from reactor returns were identified. The three isotopes of concern are ^{239}Pu, ^{237}Np, and ^{99}Tc. The ^{239}Pu and ^{237}Np fluoride compounds are not very volatile. Most of the materials would have remained in the feed cylinders or would have been deposited in the Building K-33 process equipment near the feed points. The process equipment deposits were removed during facility upgrades for buildings K-31 and K-33.

Other radioactive material locations are in the Building K-31 fissile material storage areas. Though these inventories may increase, the inventory in the fissile material storage area will remain small compared to the uranyl fluoride deposits in the process equipment of each of the LEU buildings. As areas go through D&D, these areas will become fewer and fewer.

In addition to the radiotoxicity hazard of the UO_2F_2 in the LEU buildings, the masses of many deposits substantially exceed the critical safe mass for the ^{235}U enrichments identified. Nuclear criticality is prevented by avoiding the introduction of a moderator to these large deposits. However, the possibility of accidental introduction of moderator and resulting nuclear criticality exists.

The storage vaults in the basements of buildings K-31 and K-33 are permitted for the storage of radioactive LLW. The vaults contain drummed wastes from the decontamination of waste settling and holding ponds.

The LEU buildings contain large areas of radioactive contamination. Areas without significant contamination are designated nonradiological. Other areas are designated as Contamination Areas or High Contamination Areas. Most of the areas for the three LEU buildings are designated as Contamination Areas due to uranium contamination. The majority of contamination in these areas is fixed. Selected areas of the three buildings are designated as High Contamination Areas due to ^{99}Tc contamination. These areas are the north side of the Building K-33 operating floor, the west end of the K-31 operating floor, and the entire cell floor of K-29.

<u>Toxic material</u>

The principal identified toxic materials in the LEU Process Buildings are the radioactive materials identified above, and PCB oils. Significant quantities of PCBs are present only in K-33.

PCBs are in:

- Capacitors
- Transformers
- Contaminated lube oil
- Contaminated waste

Additionally, PCB-contaminated oils have been found in process building ductwork. Low levels of PCB contamination in ductwork is expected in both LEU process buildings.

Decontamination Facility K-1420

Decontamination Facility K-1420 was originally built to provide radiological decontamination, uranium recovery, and metal-plating process capabilities. Today, the building has a limited mission of some operations which include plating and compressor and valve rebuilding. The majority of the work in the facility is D&D. The K-25 Site Operations Division is responsible for maintaining the building and equipment to ensure continued safe confinement of residual uranium and neptunium deposits in the process equipment and process lines.

Building K-1420 is shutdown with minimal ongoing activities. The former decontamination process areas have been cleaned and are scheduled for private industrialization. One area of the facility, the Fluorination Tower Reactor Room and related process equipment, is retained by ORO for D&D. Current operations in the facility involve storage of containers of radioactive and contaminated liquid, sludge, and solid wastes; surveillance and maintenance; 90-day RCRA storage area management; periodic audits and inspections; and occasional decontamination work.

The K-1420 Decontamination and Uranium Recovery Facility presents hazards in addition to the routine hazards found in an industrial facility. These additional hazards include:

- Radioactive material
- Toxic material
- Reactive material

<u>Radioactive material</u>

The decontamination of gaseous diffusion process equipment resulted in uranium and neptunium contamination in equipment used for the decontamination and uranium recovery operations. Most of the building equipment is permanently shutdown but still in place with the exception of equipment used in current limited decontamination operations. The deposits of contamination are distributed among the process equipment, floor pans, and uranium recovery and oxide fluorination systems.

The tunnel area decontamination solution storage columns contain the largest mass of radioactive materials. The contents of the columns were removed and are planned for shipment to Y-12.

Other radioactive materials, including uranium deposits in pipe sections from Building K-1423 and miscellaneous drums and boxes are stored in the high bay area. The piping, fittings, and other

mounted equipment storage is controlled by Nuclear Criticality Safety Approvals (NCSAs).

K-1420 was used for decontamination of equipment, hence, it contains radioactive materials. The major areas of the facility are posted as Contamination Areas, with the process/mezzanine, tunnel, roof, and calciner room posted as High Contamination Areas.

In addition to the radiotoxicity hazards, some enriched uranium deposits exceed minimum critical mass limits and potentially can achieve nuclear criticality. In general, nuclear criticality is prevented by combinations of several factors including Nuclear Criticality Safety Program requirements, critically safe geometry equipment, limited quantities of fissile materials in isolated equipment, and prevention of the introduction of a moderator to the deposits.

Toxic material

The toxic material in K-1420 includes uranium-bearing nitric acid solution that was drained from the storage columns and contained in 55-gallon drums in the fissile storage area in the high bay.

In addition to the nitric acid in the facility, nickel sulfate residuals may remain in piping and containers that were formerly used in the nickel plating process. These chemicals have been drained and the piping and containers are vented to the atmosphere.

A 600-gallon tank contained hydrochloric acid and a 200-gallon tank contained sodium hydroxide. Both tanks are drained and vented to the atmosphere. The other toxic materials in K-1420 are residual mercury in the mercury recovery equipment and solid wastes stored in the RCRA 90-day accumulation area.

Reactive materials

The nickel plating processes used various chemicals including acetone, hydrochloric acid, isopropyl alcohol, nickel chloride, nickel nitrate, nitric acid, perchloroethylene, potassium hydroxide, and sulfuric acid. Nickel chloride, nickel nitrate, and nickel sulfate are known carcinogens. Since the suspension of operations, the chemicals have been drained from the system, and the system vented to the atmosphere. Nickel sulfate was the primary chemical used in the process, and the most hazardous of the chemicals used.

UF_6 Cylinder Storage Yards

The UF_6 cylinder storage yards serve as long-term storage areas for steel cylinders containing depleted, normal, or enriched UF_6. The mission of the cylinder storage yards includes storage of cylinders containing normal or enriched UF_6 until they are eventually relocated to an operating gaseous diffusion plant for disposition and long-term storage of other UF_6 cylinders.

The cylinder storage yards were built to support gaseous diffusion plant operations. The yards stored UF_6 cylinders filled with depleted assay UF_6, normal assay UF_6 Feed material, and enriched assay UF_6 product material. Since enrichment operations were terminated in 1985, the filled UF_6

product cylinders and most of the UF_6 feed cylinders have been shipped off-site to the operating gaseous diffusion plants. Current operations consist of shipping the remaining feed cylinders to the operating diffusion plants and storing depleted assay UF_6 cylinders and empty and nearly empty cylinders containing residual quantities of UF_6 until plans for ultimate disposition of these cylinders are finalized and implemented.

Cylinder yard operations include confinement of UF_6 in cylinders during storage, handling, and transfer. Other operations include performing routine inspections and performing maintenance and repair operations on stored cylinders and yards.

For the East Tennessee Technology Park Site cylinder yards, there are two reasonably potential accidents that present a real hazard to workers (but not the public) from operation of the yards: a release of solid/gaseous UF_6 to the atmosphere and a cylinder yard fire. Since the yards do contain fissionable material, nuclear criticality is possible but is not likely due to the amounts of material and the operations involved.

The potential for a release of solid/gaseous UF_6 to the atmosphere can begin through any of several plausible scenarios, e.g., cylinder corrosion, pressurized/nonpressurized cylinder valve leak or shear, pressurized/nonpressurized cylinder impact/drop, or a cylinder welding accident. Whatever the initiating accident catalyst, the hazards involved are due to the possible inhalation of radiological and toxic materials.

The principal hazard in the cylinder yard operations is UF_6 , which is a radiological and toxic material. The ^{235}U component is also a potential nuclear criticality hazard. The nature of storage process in the cylinder storage yard operations precludes a criticality from occurring. The amount of UF_6 in the cylinder storage yards is limited and is expected to lower as more and more cylinders are relocated to other gaseous diffusion plant sites. When UF_6 reacts with water, uranyl fluoride and HF are produced. Uranyl fluoride is also a radioactive and toxic hazard. The concerns for uranyl fluoride are the same as for UF_6 , except for the capability of generating HF, and the hazards associated with uranyl fluoride are not as limited by the controlled amount of UF_6 . HF is extremely irritating, corrosive to the skin and mucous membranes, and may cause death for prolonged exposures.

Technetium-99, plutonium, and neptunium are present in the yards in trace amounts and do not contribute significantly to the chemical or radiological effects of a UF_6 release. These elements are contaminants that infiltrated the cascades and migrated through the diffusion process with the UF_6 . Additional amounts will not be added to the cylinder yard inventories.

A cylinder yard fire, though extremely unlikely to occur, presents hazards to workers not just due to the nature of fire itself but because of the threat of leading to a fire-induced rupture of a UF_6 cylinder. The most likely initiating sequence for this accident begins with a vehicle accident.

During operations associated with cylinder handling/storage, the potential exists for fires to occur. Cylinder storage yards are exposed to combustible materials from handling equipment that could cause significant fires if no mitigation were provided. The only mitigation source for these

facilities is the on-site fire department. Small fires can be caused by welding operations, electrical failures, and vehicle accidents. The significant fire hazards are diesel fuel, gasoline, and lubricants used in vehicles in the vicinity of the UF_6 cylinders.

The UF_6 cylinders have been tested in various fire conditions and failure due to fire occurs in just over 10 minutes, usually due to hydraulic failure or valve leakage. The time of failure and mode of failure vary with the size of cylinder tested. It is important to note, however, that fire fighting actions may successfully extinguish a fire prior to cylinder rupture, but not always. The fire department must decide whether to fight the fire or not based on the potential risks to the fire fighting personnel. Once the cylinder has failed, the hazards of concern are the same as those identified in the above release of solid/gaseous UF_6 to the atmosphere.

Because of the significant amount of time that must elapse before a fire becomes fully established to rupture a cylinder, facility workers should have sufficient time to evacuate the immediate area and avoid significant exposure. Due to the location of the cylinder yards and the distance to site boundaries, in neither case is there a reasonable threat to the public.

Safety

As with other DOE defense nuclear facilities, East Tennessee Technology Park relies upon established conduct of operations (as well as other administrative controls) for maintaining control of facility evolutions and to enhance the safety margin for facility personnel, site properties, the general public, and the environment. Additionally, and again like other DOE facilities, there are engineered safety features built into the facilities themselves.

<u>HEU, LEU, K-1420</u>

The ETTP Radiation/Criticality Accident Alarm System (RCAAS) alerts personnel in the vicinity of a nuclear criticality accident to evacuate the area of excessive radiation, thus limiting the potential exposure of on-site personnel. RCAAS monitors all ETTP buildings and storage areas that normally contain enriched materials in forms and quantities of potential nuclear criticality concern. These areas include:

- HEU facilities K-25 and K-27
- LEU facilities K-29, K-31, and K-33
- RDF K-1420

The RCAAS consists of gamma-detection cluster units at specified locations and their associated controls, annunciation, power, and monitoring systems. The central control and monitoring panel at the Site Central Control Facility in Building K-1650 is continually monitored by the Plant Shift Superintendent (PSS) or shift operations personnel.

The accident analysis for the ETTP cylinder storage yards shows the potential for significant consequences if a large UF_6 release occurred. Although several physical features and administrative programs for the ETTP cylinder storage yards contribute to defense-in-depth

against a large UF_6 release, there are no active preventive or mitigative systems, structures, or components that meet the definition of safety class SSCs. The cylinder storage yards do use design features and components that can be identified as safety significant because they are considered significant to worker safety and to defense-in-depth. These items are:

- UF_6 cylinders
- UF_6 cylinder lifting equipment
- UF_6 cylinder chocks

<u>UF_6 Cylinders</u>

The UF_6 cylinders are designed as safety-significant for the ORO cylinder handling/storage process. Various sizes of UF_6 cylinders are used at the cylinder yards. The cylinders are typically stacked no more than three high and are routinely inspected to detect potential corrosion and damage. The system consists of the cylinders, cylinder valves, and cylinder plugs.

<u>UF_6 Cylinder Handling Equipment</u>

The UF_6 cylinder handling equipment is designated safety-significant for the ORO UF_6 cylinder handling/storage process. The equipment includes various pieces for lifting and moving UF_6 cylinders containing UF_6. This system includes equipment, cylinder haulers, railcars, and forklifts. Cylinder haulers (e.g., stackers and straddle carriers) similar to those used in the lumber industry are modified for transporting UF_6 cylinders after they have cooled. Some of the cylinder haulers have a positive lifting device attached to the ears on the cylinders to provide a secondary catch to the carrier shoes should the cylinder lifting ear break contact with the carrier shoes. The positive lifting device helps prevent a cylinder drop.

<u>UF_6 Cylinders</u>

The cylinder chocks are designated as safety-significant for cylinders that are improperly stacked (i.e., subjected to an “upper tier stacking defect”). The chocks prevent loss of cylinder from rolling/falling due to an earthquake or any other jarring action.

Waste Streams

The ETTP WMD uses HEU Buildings K-25 and K-27 to store hazardous, radioactive, and mixed wastes in containers pending shipment off-site for disposal. Since the facility process systems are all shutdown, the wastes include legacy waste and those generated from DRP and decon and decommissioning activities inside the building. These wastes include uranium-contaminated wastes, PCB-contaminated wastes, RCRA hazardous materials, mixed wastes, and electrical equipment containing PCB oils.

As previously mentioned, shutdown HEU facilities contain large quantities of chemicals, tools, and equipment that supported uranium enrichment activities. Since the shutdown of the cascade operations, materials and equipment have been defined as surplus. Most coolant materials, lube

oils, and some equipment has been removed from the site as surplus materials and shipped to other DOE facilities for use. Removal of surplus materials will continue for many years.

The WMD uses LEU Buildings K-31 and K-33 to store mixed and low level radioactive wastes in containers pending treatment or shipment off-site for disposal. The LEU processes are also shutdown so the facility wastes include legacy waste and waste generated from decon and decommissioning work and waste generated from the removal of process equipment for reuse at the other operating gaseous diffusion plants. These wastes include uranium-contaminated, solidified pond sludge in drums, PCB-contaminated soils in drums, capacitors containing PCB oils stored in ST-5 boxes, and uranium-contaminated solids (LLW) in ST-5 boxes.

Like the HEU facilities, shutdown LEU facilities today contain large quantities of chemicals, tools, and equipment that supported former uranium enrichment activities. Since the shutdown of the cascade operations, materials and equipment have been defined as surplus. Most coolant materials, lube oils, and some equipment has been removed from the site as surplus materials and shipped to other DOE facilities for use.

Decontamination Facility K-1420 housed decontamination, uranium recovery, and metal plating processes, all of which generated radioactive wastes. These wastes, along with a small quantity of waste from ongoing decon activities, constitute the majority of K-1420 wastes. The facility stores uranium-contaminated nitric acid process solutions contained in storage drums. Current D&D activities in the building include the removal and disposition of large quantities of radiologically-contaminated process equipment and the decontamination of the building surfaces and surrounding soils. Radioactive contamination is removed or stabilized to reduce source terms and decrease the worker risks to lower hazards. D&D also includes abatement activities that facilitate compliance with environmental, health, and safety requirements.

Section Review

1. *Identify the current defense nuclear facilities at ETTP.*

2. *How has the mission changed for the ETTP facilities?*

3. *Summarize the process overviews for:*
   - *HEU buildings*
   - *LEU buildings*
   - *K-1420*
   - *Cylinder storage yards*

4. *What are the hazards associated with the work in these areas?*

5. *Characterize the ETTP defense nuclear facility waste stream in regards to the primary composition. How is this waste generated?*