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7. Abstract APPROVED FOR PUBLIC RELEASE This document describes the deactivated UO ₃ facility at the time of turnover for decontamination and decommissioning.		

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UO₃ Turnover - Facility Description Document

1.0 Summary

This document was developed to provide a facility description for those portions of the UO₃ Facility being transferred to Bechtel Hanford Company, Inc. (BHI) following completion of facility deactivation. The facility and deactivated state condition description is intended only to serve as an overview of the plant as it is being transferred to BHI.

Section 3.0 of this document includes the results of a Hazards Assessment of the final UO₃ Facility deactivated state. Hazards identified were negligible. The identified hazards constitute those that remain in the UO₃ deactivated state.

The facility description and hazards assessment are consistent with an industrial facility. Per WHC-SD-CP-HC-004, UO₃ Building Hazards Classification - Deactivated State the UO₃ Facility constitutes an industrial facility. This determination was made per the provisions of DOE-STD-1027-92, DOE-EM-STD-5502-94 and WHC-CM-4-46, Safety Analysis Manual.

2.0 Facility Description

The UO₃ plant is located on the DOE Hanford Site in the 200 West Area approximately a half mile southwest of the East access gate. The plant was an important link in the Department of Energy's (DOE) nuclear fuel cycle. This facility converted uranyl nitrate hexahydrate (UNH), a product of Hanford's PUREX Plant, into uranium trioxide (UO₃). The UO₃ powder was shipped offsite for conversion to uranium metal for nuclear reactors.

The UO₃ Plant consists of two major buildings: the 224-U building (built in 1943 as part of the plutonium processing construction, but converted to uranyl nitrate concentration, conversion processing); and the 224-UA building built in 1956 to house new continuous calciners. The 224-U building houses the concentrating and nitric acid recovery equipment. In addition to the calciners, the 224-UA building houses the powder handling tower and the UO₃ powder packaging machinery (loads T-hoppers).

The UO₃ Plant consists of the 224-U building, the 224-UA building, and storage areas for uranyl nitrate, UO₃ product, and recovered nitric acid.

The 224-U building was part of the original U Plant Complex (221-U, 222-U and 224-U buildings). U Plant was one of the three original fuels separations facilities (T, B, and U Plants) constructed during 1943-44 within the Manhattan Project; these facilities were designed to use the bismuth phosphate process for recovery of plutonium from irradiated fuel. However, U Plant was never used for that purpose.

In conjunction with the conversion of the 221-U building (to recover uranium from bismuth phosphate waste) and construction of the Redox Plant (for solvent extraction recovery of both plutonium and uranium from irradiated fuel) the 224-U building was modified to house uranyl nitrate concentration equipment: 20 batch-type pot calciners to convert uranyl nitrate hexahydrate to UO_3 , and equipment for by-product nitric acid recovery.

The following is an in-depth description of each of these plant buildings and their supporting facilities and their current process condition.

Physical Plant Description

The following facility description information was excerpted from the UO_3 Plant Specifics Study Guide of the UO_3 Operations Training Manual (Ostboe, 1991).

2.1 UO_3 PLANT DESIGN

The 224-U building, comprising 11,982 square feet, resides at a grade elevation of 702 feet above mean sea level and is 197 feet long, 60 feet 1-inch wide, and 60 feet 5-inches tall. The building is divided along its length by a 12-inch thick concrete shield wall into a gallery side and a canyon side. The gallery side is a three-story reinforced concrete frame structure with concrete floor and roof slabs. Exterior and interior walls are non-reinforced, 8-inch concrete blocks. The roof, supported by concrete beams, is a flat reinforced concrete slab between 5 and 12-inches thick.

The canyon side, constructed of 12-inch thick reinforced concrete walls, is also three stories high. The canyon is divided into six cells and lucky pot room. Each cell is separated by a concrete wall that extends part way (15 feet) toward the ceiling. A portion of C-cell is the only part of the 224-U building that extends below grade.

In 1956, the 224-UA building (housing six electrically heated agitated-trough calciners designed for continuous operation) was constructed to process the uranyl nitrate product from the PUREX Plant. Additional concentrators and nitric acid recovery equipment were installed in the 224-U building. This is the equipment that was used in the present plant configuration to convert the PUREX uranium product to UO_3 .

2.2 224-U BUILDING

As described previously, this building is a canyon style structure, three stories high that is divided into two longitudinal divisions: the gallery side and the canyon side. 224-U is referred to as the "wet side" process building due to the fact that the majority of the concentrator equipment for pre-treatment prior to conversion to UO_3 is located within the

cell divisions on the canyon side. The gallery section is divided into three floors containing, offices, lunch rooms, change rooms, control room, maintenance and instrument shops, etc.

2.2.1 224-U Building--Process Cells

The east side of 224-U referred to as the "Canyon" area is open vertically, three stories high, but divided horizontally into six cells. Five of the cells are basically the same size: 28'x 25'x 48'. F-cell is 50'x 25'x 24' and starts on the second floor level. A seventh cell area is the Luckey Pot Room, which is actually an appendage area constructed in 1953 adjacent to F-cell. It measures 37'x 28'x 24'.

The cells are labeled cell A through F, although only cells A-D were in use in the last processing campaign. Cells E and F contain the old pot calciners which are obsolete, and the Luckey Pot Room contains equipment for the Central CAM Vacuum Sampling System (CCVS).

- o A-Cell contains acid recovery equipment, mainly the T-A3 acid absorber and E-A4 cooler. Other equipment in the cell is not in use.

Deactivated State: The acid absorber tower was flushed to a non hazardous state during the deactivation.

- o B-Cell contains the E-B-3 condenser, four UNH transfer pumps, and a decon sink.

Deactivated State: The deactivation of the plant left the following conditions: The transfer pumps were flushed to a non hazardous state and the power has been isolated. The Decon sink was cleaned out and is also non hazardous. The cooling water to the plant has been isolated.

- o C-Cell contains eight tanks: Tk-C-1 (60% UNH from PUREX); Tk-C-2 (Recycle UNH Concentrator); Tk-C-3 (alternate acid receiver); Tk-C-4 (Acid receiver); Tk-C-5 (Process condensate); Tk-C-6 (Acid cooler); Tk-C-7 (waste collection); TK-C-9 (condensate catch tank).

Deactivated State: All of the tanks in C cell have been flushed to a non hazardous state during the deactivation.

- o D-Cell contains concentrators (E-D-2, 6, 7), condenser E-D-3, Catch tanks (D-13, D-8), seal pots (D-4 and D-5), and D-D-1 Demister.

Deactivated State: The deactivation flushed all of the process equipment in D cell to a non hazardous condition except for E-D-6 concentrator. The outlet from E-D-6 is

plugged with solidified UNH which prevented the cleaning of that concentrator.

- o E-F Cell contains old, out of service pot calciners.

Deactivated State: The condition of the pot calciners was checked during the deactivation and they were found to have been left in a cleaned out state following their last use. It appears that they were acid flushed to remove the uranium contamination. The agitator gear boxes were drained during the deactivation after the inspection found some oil had leaked into several of the pot calciners. All of the leaked oil was cleaned out.

- o The Luckey Pot Room contains the C CVS air sampling unit and miscellaneous storage supplies.

Deactivated State: During the deactivation the C CVS system was isolated and the oil drained from the pump. The storage cabinets were removed and discarded. All supplies were removed and discarded.

2.2.2 224-U Building--First Floor

This side of 224-U, the Gallery, is considered the non-contaminated or "clean" side. The first floor of the Gallery contains various offices, change-rooms, and the MCC panels with the HVAC Buffalo unit in the motor control room.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The connections to the sanitary sewer were all plugged and all toilets were removed from the building. The HVAC portals were all covered to prevent intrusion by animals or insects. The power to all MCCs has been isolated.

- o Operators' Supply Room - Situated on the corner next to the supervisor's office, this room holds all basic supplies for operational duties: duct tape, radiation waste stickers(waste collection), zone tape, operational tags, etc.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Shift Supervisor Office - Located at the north end of the gallery first floor area, this is the office of the

assignment supervisor. It contains some files, a few procedural manuals, and chemical and waste handling information.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Women's Change Room - The women's change and locker room is located across from the supervisor's office. The locker room contains locker storage and showering facilities.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Motor Control Room #3 (Buffalo Room) - The motor control room, located between the men's and women's change rooms, contains the Buffalo unit for filtering and washing incoming air and motor control center. The Buffalo Unit provides ventilation for the majority of the 224-U building. The motor control panel handles various pumps, fans, blowers, air conditioners, agitators and vacuum cleaners throughout the building.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The HVAC portals were all covered to prevent intrusion by animals and insects. The power to the MCCs was isolated.

- o Men's Change Room - The blue coverall storage room and men's change room are located south of the Buffalo Room. Showers and a bathroom are situated between the two rooms.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The toilets were removed and all connections to the sanitary sewer were plugged to prevent intrusion of sewer gases.

- o SWP Change Room - The SWP change room is at the south end of the building. It contains SWP clothing, rain gear and respiratory equipment(masks) specifically for zone entry.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o SWP Lobby - The SWP lobby is the zone entry and exit point for the canyon cell area. Contaminated laundry and waste collection receptacles are located to the side of the step-off-pad (SOP) which is designated as the undress area when exiting the cell zones. Personnel leaving a zone will be individually monitored by the HPT on duty and must use the hand and foot counter situated in the Lobby.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o HPT Office - The Health Physics Technologists (HPT) work area and office include a cubicle space sharing the SWP lobby and a room next to the SWP change room. Any questions concerning RWP's, zone entry or work limitations involving possible contamination will be handled by the HPTs. Monitoring equipment maintained here includes a stationary monitor(alpha), GM counters, CPs (Cutie Pie) for dose rate(beta-gamma) and a stationary GM counter for beta-gamma. All personnel exiting the zone must be checked by an HPT after undressing and before donning street clothing or blues. Each must use the hand and foot counter to check for contamination, also.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Laundry Room - The laundry room is connected to the SWP lobby and change room and has a door to the outside. This door serves as both a delivery point for clean blues, SWPs, towels and masks and as a pick-up station for soiled and contaminated laundry and used masks.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

2.2.3 224-U Building--Second Floor

This floor is referred to as the Pipe Gallery because of its configuration of piping for the deluge system.

- o Switch Gear Room - The switch-gear room on the south end of the floor can be entered from the stairwell or the corridor. The central breathing air system is located here. This room houses the main switch gear for 224-U and two MCC panels.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The breathing air bottles were removed and excessed. The power to the MCCs was isolated.

- o Lunch Room - The lunch room is situated about midway between the stairs and elevator on the west side of the gallery.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The cooking appliances were removed and excessed.

- o Materials Storage Room - Materials for plant operations are stored on the second floor in the materials storage room. The room is actually a fenced in space between the lunch room and elevator. The elevator is located adjacent to this room.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Pipe Gallery - Located along the east wall of the gallery, the pipe gallery houses steam, water, and sulfuric piping and valving, plus all necessary piping penetrations into the individual storage rooms and cells. The D-12 sulfuric tank and pump for the X-30 sulfuric addition are located along the gallery wall aligned with E-Cell and across from the lunchroom. North of the sulfuric tank (aligned with C-Cell) is the storage room that holds the 150 gallon phosphoric acid tank (C-8).

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The sulfuric acid tank was flushed to a non hazardous state. The phosphoric acid tank was flushed to a non hazardous state.

- o Instrument Air Dryer and Compressor Area - At the far north end of the second floor, the instrument air dryer and 224-U compressor #1 and receiver take up the majority of space. This compressor alternates with the third floor compressor in providing instrument air for the building. Off-shift surveillance is required of this system in order to provide uninterrupted instrumentation monitoring.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed.

All supplies were removed and excessed. The air dryer and receiver tanks are still in place.

2.2.4 224-U Building--Gallery--Third Floor

The third floor area is called the Operating Gallery with its array of panel boards and the control console. The majority of plant functions are monitored and administered on this floor. The open area in cells A-D can be viewed from portals (with HPT concurrence) in the galley wall behind the panel board along the east wall. The portal openings are covered with heavy, lead-reinforced doors approximately one foot by two feet in size, hinged from the top and placed at eye-level on the wall and are normally locked.

- o Panel Boards and Control Console - The remote control panels for all plant functions are situated in the central area of the third floor with the nitric acid recovery and calciner panel functions located on the west side of the gallery and the concentrator and off-gas panels located on the east side. The panels are free-standing (not flush-up against the walls). Recorders, computers and calculators are situated on the console in the center between the panels. The TA-3, vacuum systems, effluent monitoring, sulfuric addition, PAX communication system and tank capacity measuring systems are also located on the panels.

Deactivated State: The deactivation removed all furniture and storage fixtures and supplies. The computers and consoles were removed. All of the instrumentation was deactivated and the faces of the instruments covered with black paper.

- o Conference Room.- In the far south east corner of the third floor is a conference room.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Instrument Shop - The instrument shop is located along the west wall of the gallery behind the calciner panels.

Deactivated State: During the deactivation all removable furniture, work benches, and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o Operational Shift Office - Adjacent to the south side of the electrical shop is the office generally used when the plant is in a production mode. When the plant is down, this office is used only intermittently and for storage.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

- o 224-U Compressor #2 - Located in the far northwest corner, this compressor alternates with the second floor compressor in providing instrument and process air for the plant systems.

Deactivated State: The #2 compressor has been depowered.

- o Miscellaneous - Additional space for storage is provided in the rooms adjacent to the instrument shop on the north side. The concentrator water deluge valving rack with pipe penetrations into the cell walls is situated in the mid-floor section to the south of the panel boards.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. All water to the plant was isolated.

2.2.5 224-U Roof

The 224-U roof holds the critical systems for vacuum control of the wet processing systems, fans for building and cell exhausts, along with ducts and piping. On the northwest corner are the two jets, JA-1 and JA-3. South of the jets are the 296-U-4 stack with a sampler, analyzer and the X-14 blower. On the east roof border are the cell exhauster fans. Below on the lower roof are the washer motors, roof exhausters and roof fans for the Luckey Pot Room, E, and F cells.

Deactivated State: During the deactivation the steam to the plant was isolated which disabled the vacuum jets. Power to the HVAC exhaust fans was isolated. The HVAC portals were covered. The 296-U-4 stack was capped and all sampling equipment was isolated. The X-14 blower power was isolated.

2.3 224-UA BUILDING

The 224-UA building houses the 'dry side' processes pertaining to the calcination and powder handling operations. Part of this building contains a five story tower which holds the entire powder processing and packaging mechanisms, a two-story section housing the ventilation equipment and a one story section over the accountability equipment. The calciners, their motors, electrical equipment, and pick-up bins and wet scrubbers are located in the two level section in the north half of the building. Each calciner occupies a two story cell that has a 0 feet level (pickup bins) and a 10 feet level (calciners).

2.3.1 224-UA Building--First Floor

- o Switch Gear Room - The switch gear room contains the electrical distribution equipment required to run the calciner furnace beds, motor units and other electrical equipment throughout the building. This room extends down the middle of the floor beneath the motor room adjacent to the wall separating the cells from the powder handling side.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The power to 224-UA was isolated after installation of a new surveillance lighting system.

- o 0' Level Calciner Cells - There are six calciner cells(G,H,J,K,L,M) with an open access between the cells. Each cell on the first floor contains a pick-up bin, with associated piping for powder transfer and a wet scrubber with associated piping.

Deactivated State: During the deactivation all of the powder handling equipment was vacuumed to remove all loose powder, the wet scrubber systems were acid flushed to remove the powder residues.

- o Loadout Room - The loadout room contains a hood, prefilters, scales, vacuum cleaner, monitoring equipment and a washdown station. The loading unit at the bottom of the storage bin projects down into the hood and is connected to a 'T' hopper shipping container which sets on the scale. This part of the room is the bottom level of the five level tower section of 224-UA.

The southeast corner of this room containing the accountability equipment is on the ground floor and has no second floor.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The power was isolated.

2.3.2 224-UA Building--Second Floor

- o Storage Bin Room - The X-26 storage hopper occupies the second floor of the five level tower section. This hopper is the collection point for UO_3 powder and the final leg of

the entire process. Sharing the west side of the floor are the duct work and supply fan that send air to the other sections of the 224-UA building. The ventilation or vent room, as it is referred to, contains routing for the building heating and cooling coils, the 15# steam line for the building and routing valves for the process water.

Deactivated State: During deactivation the storage bin X-26 was drained of all available powder. The HVAC portals were covered to prevent animal and insect intrusion. The water and steam was isolated.

- o 10' Level - Calciner Cells - The second floor of the two level section houses the upper part of the calciner cells. The calciner bed, hot boxes, acid pots, and two chain hoists for moving heavy equipment and for charging the calciner all share this level. The floor separating the upper and lower cell is of a heavy type of grating.

Deactivated State: During deactivation the calciners were disassembled and all loose powder was vacuumed and then the covers were reinstalled and sealed. The hot boxes were steamed and cleaned to remove the gross contamination.

- o Motor Room - The motor room extends the length of the building along the wall separating the cell area from the powder handling area and contains six 125 horse power electric motors and six reduction units geared so that calciner agitator shaft will revolve at 60 rpm. The UO_3 powder requires a powerful unit to rotate the agitator. There is also a spare motor near one end of the motor room. A bridge crane chain hoist is set up to traverse the entire length of the room when needed.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. The oil was drained from the agitator gear boxes.

2.3.3 224-UA Building Roof--28' and 12' level

- o Roof Exhausters - There are three X-21 exhausters that provide the motive force for the powder handling system. Also situated on these roofs are the individual cell exhausters.

Deactivated State: During deactivation the X-21 exhausters power was isolated and the vacuum breakers were capped. The

individual cell HVAC portals were covered to prevent animal and insect intrusion.

- o HEPA Filters and Process Stacks - A large bank of HEPA filters is situated upstream of the 296-U-13 stack (twenty-seven feet tall on the 12' roof section) for filtering exhausts of all contaminated dust particulates from the powder handling system before exiting the stack. Another bank of HEPA filters sit next to the 296-U-2 stack (thirteen feet tall on the 28' roof) to filter the exhausted air from the primary bag filters and the vacuum routing air.

Deactivated State: During deactivation the bag filters were air blown to remove as much powder as possible, the bag filters were sealed, the HEPA filters were sealed and left in place, and the 296-U-2 and 296-U-13 stacks were capped.

2.3.4 224-UA Tower Section

The tower section extends approximately 25 feet above the main roof of the building. Each of the top three levels is separated by aluminum diamond plated grating.

- o 22' level - The top of the X-26 storage bin extends into this level with the hammermills sitting above that.

Deactivated State: The hammermills had been isolated and gutted before the final operating campaign.

- o 33' level - The two X-28 primary bag filters occupy the majority of the space on this level with the two X-22 cyclone separators situated between them.

Deactivated State: During deactivation the bag filters were air blown as one of the final steps in vacuuming the powder from all powder handling equipment.

- o 42' level - The top sections of the X-28 primary bag filters occupy this level, completing the powder handling mechanism.

Deactivated State: See above state.

- o 51' roof - The RV-7 tower exhauster is situated on this roof.

Deactivated State: During deactivation the tower exhauster was capped to prevent animal and insect intrusion.

2.4 UO₃ STORAGE FACILITIES

2.4.1 203-U

A diked, concrete enclosure on the east side of the main facility building (224-U) that contains: the 100,000 gallons each, 60 percent UNH storage tanks Tk-X-1 and TK-X-2; the 8,000 gallon recovered filtered uranium (for shipment back to PUREX) tank Tk-X-38; a 14,000 gallon condensate storage tank TK-X-37; and a caustic storage tank TK-X-36.

Deactivated State: During deactivation all storage tanks in the 203-U enclosure were flushed until the last flush was non hazardous. Tanks X-1, X-2, X-37, and X-38 have less than a 1 inch heel and tank X-36 was damp with no standing water. The outside surfaces of the tanks were cleaned to remove yellow uranium stains. The enclosure floor was cleaned, the pipe trenches were cleaned and vacuumed. The area is still considered as a surface contaminated zone.

2.4.2 203-UX Canopy

This facility is outside of the west side of the 224-U building about mid-way. It is a large concrete enclosure partially covered with a canopy that serves as a tank storage area. There are three tanks and two filters in 203 UX: the 4,000 gallon, 100 percent UNH storage tank TK-X-30; one 415 gallon, filter flush receiving tank (from TK-X-30) TK-X-20; and a spare 4000 gallon 100 per cent UNH tank Tk-X-19; and two filtering units, F-1 and F-2.

Deactivated State: During the deactivation tanks X-20 and X-30 were flushed to a non hazardous state. The legacy tank X-19 was not cleaned or flushed beyond that done when the legacy equipment was abandoned in the late 50s. The tank was visually verified as being empty. Contaminated insulation was removed from the piping around the tanks and filters. The two filters, F-1 and F-2 were flushed to a non hazardous state. The surfaces of the pipes, tanks, and filters were decontaminated to further reduce contamination levels and the enclosures were cleaned.

2.4.3 207-U Diversion Basin

This concrete basin is divided into two equal parts (550,000 gallon capacity each side) and is situated approximately a quarter mile west of the UO₃ plant. It receives cooling water and steam condensate prior to discharge into the 216-U-14 trench.

Deactivated State: The basin was discovered to be leaking before the final processing campaign and was lined with rubber. Deactivation left any storm water on the concrete pads of the UO₃ plant routed to 207-U

for solar evaporation after the outlet valves from the basin were closed and isolated from the 216-U-14 ditch.

2.4.4 211-U Tank Farm

The 211-U tank farm sits on the west side of the old 221-U building on the north side of the railroad tracks and loading dock. Several 100,000 gallon tanks are maintained, but only three are need to hold recovered nitric acid for shipment back to PUREX: Tk-306, Tk-307, and Tk-308 with Tk-301 reserved as a spare.

Deactivated State: During deactivation tanks 301, 302, 303, 306, 307, and 308 were emptied and flushed to a non hazardous state. Later examination of the tanks found that the tanks were all dry with no heel.

2.4.5 2714-U Building

On the south side of the railroad tracks with its own loading spur and dock, is the metal storage building that houses depleted UO_3 powder barrels (55 gallon drums) in indefinite storage. A large concrete storage pad is provided for shipping and storage of T-hoppers.

Deactivated State: The 2714-U Building is not part of the UO_3 Facility Turnover activity and the building custody remains with Westinghouse Hanford Company.

2.4.6 2715-U Building

Maintenance storage of drums of oil and grease used throughout the plant is the prime function of building 2715-U. Its location just off the south exit of the Lucky Pot Room makes it easily accessed by deliveries.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

2.5 UO_3 SUPPORT FACILITIES

2.5.1 MO-321 Change Trailer

The change trailer sits on the south side of the loading tracks next to the 211-U tank farm. SWP clothing, plastics and acid gear, and respiratory equipment(masks) are stored in the change trailer for possible contaminated or chemical exposure work.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. This will be given to BHI as part of the turnover.

2.5.2 UNH Truck Loading Spot

Located on the northwest corner of the 224-U building, this loading pad serves a dual purpose. UNH tank trailer shipments from PUREX are parked on this pad which is constructed of sloped, reinforced concrete. Overhead transfer lines are attached at the truck tanker cupola and the contents pumped into the accountability tank, TK-C-1. The reverse operation occurs when loading the recovered uranium waste from Tk-X-38 into the tank trailer for recycle shipment back to PUREX.

Deactivated State: During the deactivation all supplies were removed and excessed. The sump was filled with grout and the area decontaminated as much as possible.

2.5.3 Caustic Truck Pad

The unloading area for potassium hydroxide (KOH) is located just outside the 203-U tank storage area. KOH is off-loaded directly into TK-X-36 which is inside the diked 203-U storage area. It is constructed similar to the UNH pad of reinforced concrete.

Deactivated State: During the deactivation the sump was cleaned and routed to the 207-U basin for storm water evaporation.

2.5.4 Recovered Nitric acid Loading Station

Railroad tank cars are positioned (spotted) next to the transfer lines by the 211-U tank farm which is across the tracks from the 321 change trailer. Recovered nitric acid is loaded into the tank cars for shipment to PUREX.

Deactivated State: For the final processing campaign the rail cars were not used for transferring the remaining acid back to PUREX. The UNH tank trailer was used. The rail car transfer line was drained and each end blanked.

2.6 EXTENDED AREA SUPPORT SYSTEMS

2.6.1 The 216-U-17 Crib

The newest disposal site for neutralized condensate streams from the plant processes opened in January 1988 replacing the 216-U-12 crib. Situated approximately 200 feet south of 16th street and 200 feet west of Beloit Avenue

and southeast of the UO_3 plant, the 216-U-17 crib can handle 15,000 gallons of condensate per day. A pipeline about 1,200 feet long transports the condensate to settle in a 150 foot long bed of gravel covered with a polyethylene barrier which has been backfilled and stabilized. Redundant pH probes, transmitters, alarm switches, and strip chart recorders monitor the pH of the process condensate at a location just prior to exiting the 224-U building.

Deactivated State: During deactivation the connection from the UO_3 Plant to the 216-U-17 crib was cut and a section of pipe removed with both ends of the line having caps welded in place.

2.6.2 The 216-U-14 Trench

The 216-U-14 trench is a large deep ditch connected to the 207-U Retention Basin with a pipeline. Discharge water from the sumps and drain and chemical sewers collects in the 207-U basin and is deployed slowly out into the trench. The maintenance of the trench comes under the tank farm jurisdiction.

Deactivated State: During deactivation the outlet from the 207-U basin was blanked and grouted in to prevent storm water from entering the 216-U-14 ditch.

2.7 MISCELLANEOUS SUPPORT BUILDINGS

2.7.1 MO-419 and 107 Trailers

These facilities are located outside the barrier fence on the south end of the UO_3 plant. MO-419 houses the maintenance engineers, material coordinator, planner/scheduler and JCS facility administrator. MO-107 houses the plant manager, process and environmental engineers, and clerk.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

Tank 270-W located underneath 2715-UA is owned by West Tank Farms.

2.7.2 272-U Maintenance Shop

The 272-U shop houses the service and repair maintenance for all plant equipment. The building is divided into a "hot shop" for potentially contaminated repairs with a restricted access and SWP clothing requirement and a "cold shop" for regular maintenance repairs.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed. All shop equipment was excessed as well.

2.7.3 2715-UA Lagger Shop

The 2715-UA building actually houses both the insulator shop and the painter shop. The building is located to the northeast of the 203-U enclosure across from the caustic truck loading pad.

Deactivated State: During the deactivation all removable furniture and storage fixtures were removed and excessed. All supplies were removed and excessed.

2.8 UO₃ SUPPORT SYSTEMS-SERVICE AND UTILITIES

2.8.1 Ventilation

The UO₃ plant ventilation and air balance is designed to provide air flow from areas of low contamination potential to areas of higher contamination potential. Building and process ventilation is used to control possible radioactive contamination, chemical exposures to operating personnel and ambient temperatures affecting processes and personnel.

2.8.1.1 224-U Ventilation

Ventilation is supplied by the Buffalo Blower Unit on the first floor (gallery side). The unit contains heating coils and water sprays for air washing and to maintain temperature and humidity control. Clean air is routed from the cold side (non-contaminated) of the building through to the hot side (potentially contaminated) of the building.

Air is initially routed to all floors starting with the offices, control room, change rooms, etc., on the gallery side. On the second floor, air is exhausted through the concrete barrier wall separating the gallery and canyon areas into the process areas.

The lunchroom on the second floor has a separate ventilation system that pressurizes that air in relation to the pipe gallery. This unit has an evaporative cooler system and a steam-heating system on the air intake.

Air from the hot side of the 224-U building is exhausted to the atmosphere via several roof exhausters-some explained already. Five exhausters, one located above each cell (cell A through E) handle the majority of the building exhaust. There are two exhausters situated on the F-Cell roof and two on the Lucky Pot Room roof. An additional powerful exhaust fan sits on the C-Cell roof and draws air out of the canyon side of the building. That air is drawn up through and exhausted out the eighty-foot 296-U-4 stack.

Deactivated State: During deactivation all HVAC equipment was isolated from power and all portals covered to prevent intrusion by animals or insects. The 296-U-4 stack was also capped.

2.8.1.2 224-UA Ventilation

Building ventilation is supplied by an American Blower Unit on the second floor. Air from the blower is distributed along five major pathways.

- o Air enters the motor room and passes through filters before reaching the second level calciner cells and the loadout room. This air stream is controlled by dampers, so that when the loadout room bay doors are open, the dampers shut automatically and cause all the air flow to be routed to the calciner cells.
- o A second airstream routed to the tower enters at the second floor level. A roof ventilator exhaust fan moves the air up through the floor gratings of the tower.
- o The third pathway is routed directly to the loadout room.
- o A direct duct from the blower to the calciner cells provides the fourth ventilation pathway.
- o The last pathway directs air to the electrical and switchgear room. It also passes through filters before reaching the calciner cells.

As mentioned before there are several roof exhausters, HEPA filters and exhaust stacks on the 224-UA building: six calciner cell exhausters, one load out room exhaust, primary bag filter room exhausts and one large roof exhauster on the tower; two banks of HEPA filters-one bank filtering for the 296-U-13 stack on the 12' roof and one bank filtering for the 296-U-2 stack on the 28' roof.

Deactivated State: During deactivation all HVAC portals were covered to prevent animal and insect intrusion. The 296-U-2 and 296-U-13 stacks were capped, and the HEPA filters sealed. The vacuum breakers were also capped.

2.8.2 Electrical

Electrical power sufficient to operate all the equipment in the 224-U building is supplied from the 13.8' kV line through a 750 kVA transformer in the 252-U substation approximately 250 feet west of the building. There is also an alternate emergency power line for selected equipment coming into the building through a 300 kVA transformer.

The electrical power for the 224-UA building is supplied through two 1,500 kVA transformers immediately south of the 224-UA building. If current is lost from one line, an automatic bus tie switches power so that the other line can continue to supply the UA building. However, one line is not sufficient to operate all six calciners.

There are two main switchgear rooms in the 224-U building, and one switchgear room in the 224-UA building. The 224-UA switchgear room is the largest and most complex as its transformers are needed for the calciner furnaces. There are 54 transformers serving the heating elements in the calciners plus regulators for these circuits. The regulators are needed for precise control of the electrical current to obtain the required calciner heating patterns. Emergency batteries are in place to maintain emergency switching in both switch gear rooms.

Deactivated State: During Deactivation all incoming power to the plant was isolated with a section of wiring removed so that reinstallation of the line fuses could not repower the equipment. The oil from the transformers was also removed and disposed of as PCB contaminated waste.

2.8.3 Compressed and Instrument air

Both process and instrument air are provided by the same Joy air compressor with interchangeable routing capabilities. The compressor is located at the north end of the pipe gallery. The instrument air passes through a Zurn desiccant refrigerant dryer and an oil air filter before being used. The process air, discharged through a trap and oil filter, is routed to storage in a 240 gallon receiver at 90 psi. Instrument air pressure is independently controlled, and is reduced to 60 psi. Regulators control the air Pressure for both the process air(90 psi) and the instrument air(60 psi) supply.

Deactivated State: The Joy air compressor is electric motor driven and the electric power to the facility has been disconnected.

2.8.3.1 Process Air

Process air in the UO_3 plant is used for air spargers, jet air blow to purge transfer lines, blowing out calciner feed points and other miscellaneous uses. Process air is supplied by two alternating compressors--one on the second floor and one on the third floor of the 224-U building.

Deactivated State: Process air compressor is electric motor driven and electric power to the facility has been disconnected.

2.8.3.2 Instrument Air

Instrument air originates from the same compressor and is used for pneumatic instrumentation, air purge metering for vessel weight factor and specific gravity dip tubes, and as an actuating force for air operated valves, flow meters, and ventilation dampers.

Deactivated State: Instrument air compressor is electric motor driven and electric power to the facility has been disconnected. The air dryer system is still in place, however, and could also be removed and excessed if needed elsewhere.

2.8.3.3 Backup Compressor

A backup air supply is available from a compressor located on the third floor of 224-U which is presently not in use.

Deactivated State: The backup air supply is electric motor driven and electric power to the facility has been disconnected.

2.8.4 Water

2.8.4.1 Raw Water

Raw water is supplied to the 224-U and 224-UA buildings from the 3-million gallon water reservoir(282-W) that is adjacent to the 284-W powerhouse. Raw water is used as cooling water in the process condensers(E-B-3 and E-D-3), acid absorber tower (TA-3), gas cooler (A-4), and the C-6 acid cooler. The deluge system on the three UNH concentrators, the fire control sprinkler systems, and one fire hydrant are also tied into the raw water system as well as several other miscellaneous services.

Deactivated State: The raw water to the facility has been terminated. The line is cut and filled with grout where it enters the 224-U building and a blank flange installed over the grout.

2.8.4.2 Sanitary Water

Sanitary or potable water is supplied from the 283-W water treatment facility. Sanitary water services both change-rooms, the lunch room, safety showers, drinking fountains, toilets, personal usage and consumption and some fire hydrants.

Deactivated State: The sanitary water to the facility has been terminated. The valve was removed where the line enters the 224-U building and the line filled with grout and blind flanges installed.

2.8.5 Steam

Steam at a pressure of 225 psi is delivered from the 284-W powerhouse. Service is routed through an eight inch take-off line at a point where the main is reduced from fourteen to ten inch diameter. The eight inch steam line enters the plant at the northeast corner of the 224-U building and is reduced down for process usage.

Steam is used at various pressures throughout the plant:

140 psi for vacuum jets
125 psi for the UNH concentrators and tank steam coils and jackets

55 psi for the calciner hot box
30 psi for the calciner feed points
25 psi in the pipe gallery
15 psi for heating and miscellaneous services

Deactivated State: During deactivation the steam to the facility was terminated. The main steam valve, MVS-224U-MAIN, was removed and blind flanges installed on both pipes where the valve had been.

3.0 Hazards Assessment

The deactivated UO₃ Plant state was analyzed for hazards by an expert team. The team used the "What If Analysis" technique to identify the hazards, the cause of the hazard or the accident initiating condition, the major effects of the hazard, and preventive/mitigating features if any. The tabular results of that analysis are shown below.

The "What If Analysis" technique is a creative, brainstorming examination of a process, an operation or an activity. The technique relies on an experienced team with expert knowledge of the process or activity under consideration. Such a team was used to for the hazard assessment of the deactivated state of the UO₃ Plant. The team members and meeting date are found in the hazard assessment table below.

The team identified first the hazardous material that was in such a form and quantity to pose a hazard to workers if left uncontrolled. The team then determined the cause, and major effects of such a loss of control. Finally, the team made a recommendation for prevention or mitigation where they felt loss of control posed a credible threat to worker health or safety if additional control were not established. Those recommendations are found in the last column of the hazards assessment table below. The most significant hazard and the only one that the team considered to warrant a recommendation, was the potentially significant buildup of radon in the sealed U and UA buildings. The only recommendation to come out of the hazards assessment was to install radon detectors to provide a baseline measurement of radon buildup levels in that time period between plant surveillances when the plant is closed up and not ventilated. The recommendation was accepted and radon specific detection has been installed in both the U and UA buildings.

UO₃ Deactivated State Hazards Assessment

Plant Area Considered :UO₃ Plant (Portion for Turnover)

Meeting Date: 10/05/94

Hazards Assessment Team Members: Judy Siemer, Ron Walser, Rees Risenmay, Dennis Clapp and Brian Oldfield

Hazard	Cause	Major Effects	Preventive Measures/Recommendation
Residual Uranium in the form of UO ₃	UO ₃ is in processing equipment that is not accessible/cannot be cleaned out.	Uranium poses both a radiological and heavy metal toxicity hazard	The material's location is well known and identified as a radiological zone. The materials have no dispersing energies associated with them. Adherence to surveillance procedures will preclude unnecessary exposure.
Radon	Radon is one of the decay daughters of Uranium.	Potentially elevated concentrations of Radon may be possible with time and without ventilation dilution.	Radon detection and quantification (such as TRACK ETCH) are recommended to establish maximum concentrations expected in surveillance intervals. SCBA or supplied air is recommended until historical concentrations are established.
Slightly acid/basic tank heels left in some tanks	Some storage tanks that held acid or caustic do not have bottom emptying capability so that a small quantity (heel) remains in the tank. Although flushed and diluted, the pH in acid storage tanks can be as low as 2 and as high as 12 for caustic tanks	Although there is no dispersing energy known, the acid or caustic in contact with unprotected human flesh would be damaging.	The tanks will not be opened or otherwise breached in the future except as part of a decontamination and decommissioning activity. That activity will presumably have as part of the activity, procedures to safely inspect or empty the contents. No surveillance activity that is currently under WHC control includes opening or emptying tanks without first reviewing safety implications and revising work instructions. Therefore, the likelihood of contact with acid or caustic tank heel material in the plant surveillance mode is so low as to be practically incredible. No recommendation is made regarding this potential hazard.

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Hazard	Cause	Major Effects	Preventive Measures/Recommendation
Hydrogen in flushed acid storage tank heels	Because of the low (milligram per liter range) of uranium in some tanks, radiolytic hydrogen generation is possible.	It is considered highly unlikely that flammable limits of hydrogen could be reached for two reasons; uranium concentrations are very low and the tanks are vented	The likelihood of hydrogen concentrations greater than trace are considered practically nonexistent. No recommendation is made regarding this potential hazard.

4.0 Reference

Ostboe, S., 1991, Study Guide, UO, Plant Specifics, UO, Operations Training Manual, Westinghouse Hanford Company, Richland, Washington