**HIGH-LEVEL WASTE CANISTER STORAGE
FINAL DESIGN, INSTALLATION, AND TESTING**

Topical Report

By
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April, 1998

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U. S. Department of Energy
Assistant Secretary for Nuclear Energy

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ABSTRACT

This report is a description of the West Valley Demonstration Project's radioactive waste storage facility, the Chemical Process Cell (CPC). This facility is currently being used to temporarily store vitrified waste in stainless steel canisters. These canisters are stacked two-high in a seismically designed rack system within the cell. Approximately 300 canisters will be produced during the Project's vitrification campaign which began in June 1996. Following the completion of waste vitrification and solidification, these canisters will be transferred via rail or truck to a federal repository (when available) for permanent storage.

All operations in the CPC are conducted remotely using various handling systems and equipment. Areas adjacent to or surrounding the cell provide capabilities for viewing, ventilation, and equipment/component access.

1.0 INTRODUCTION

The Western New York Nuclear Service Center (WNYNSC) is located about 56 kilometers (35 miles) south-east of Buffalo near West Valley, New York and is owned by the New York State Energy Research and Development Authority (NYSERDA). It was the site of the only commercial nuclear fuel reprocessing facility ever to have operated in the United States. Nuclear Fuel Services Company, Inc. (NFS) was the original facility owner. The plant reprocessed spent nuclear fuel assemblies from various nuclear power plants from 1966 to 1972. Reprocessing operations generated approximately two million liters (560,000 gal.) of highly radioactive liquid waste.

When the plant was built in the early 1960s, the management of high-level radioactive liquid waste at federal installations employed underground storage in carbon steel tanks. Following this precedent, the WNYNSC was licensed to operate with the expectation that the high-level radioactive liquid wastes generated during fuel reprocessing would be stored underground in steel tanks for an indefinite period.

In 1972 NFS shut down operations in order to increase the plant throughput. However, rising costs and uncertain regulatory requirements prompted their decision to withdraw from the nuclear fuel reprocessing business. NFS turned over the facility to New York State on November 30, 1976.

In 1980, Congress passed Public Law 96-368, the West Valley Demonstration Project (WVDP) Act. The Project was established to demonstrate that liquid waste generated from reprocessing spent commercial nuclear fuel can be managed safely in the United States. As a primary objective, the Act authorized the U.S. Department of Energy (DOE) in cooperation with the NYSERDA to convert the high-level waste (HLW) stored at the WNYNSC into a safe, more stable form. This objective is being met through the process of vitrification. Vitrified HLW solidifies into a solid glass product that is currently being stored in stainless steel canisters on the site. These canisters will be transported to a federal repository for final disposal.

Supporting the interim storage of the canistered HLW is a large shielded cell of the former reprocessing plant. This location, the Chemical Process Cell (CPC), was selected as the primary storage location to minimize construction costs and maximize the reuse of existing contaminated facilities.

This report discusses the redesign of the CPC for HLW interim storage including decontamination and decommissioning efforts, and the current Facility configuration and testing relative to canister storage.

2.0 CHEMICAL PROCESS CELL HISTORY

The DOE/NYSERDA management objective for the site specified the reuse of existing buildings where practicable to minimize the design and construction of new facilities. In 1984, a comparative analysis was performed to determine which facilities could be reused and for what purposes.¹ The CPC, Equipment Decontamination Room (EDR)/Chemical Crane Room (CCR), and various extraction cells were evaluated as alternative viable locations for canister storage. These facilities were reviewed for: radiation level, general condition, location, size, wall thickness and type of shielding, size of openings for personnel and equipment access, cranes and manipulator availability and capacity, viewing windows condition, potential for decontamination and decommissioning for reuse, and utility service availability for continued use. Several of these factors rendered most locations unsuitable for HLW storage with the exception of the CPC. The CPC and additionally the EDR/CCR would be reused for the transfer, handling, and management of the HLW in interim storage (see figures 1, 2, and 3). Although the thick reinforced concrete walls and roof of the CPC were originally designed for fuel dissolution, they were determined to be radiologically and structurally adequate to serve as a shield around the solidified HLW.

2.1 Original CPC Configuration

The CPC was designed by Bechtel for NFS to be a remotely operated hot-cell of the canyon-type design. Its dimensions are 6.70 m (22 ft) wide by 28.3 m (93 ft) long by 13.1 m (43 ft) high with 1.75 m (5.75 ft) thick reinforced concrete walls. This cell housed the tanks, dissolvers, and piping necessary for the dissolution of spent nuclear fuel (see figure 4). Overhead bridge cranes delivered cut-up fuel rods in baskets to a dissolver tank, and assisted in maintenance and other remote handling operations. The cell additionally contained two separate bridge cranes on two sets of crane rails: a 14.5-Mg (16-ton) and a 1.8-Mg (2-ton) trolley on an upper bridge that would pass over the top of the trolley and an electromechanical manipulator combination on a lower bridge. Because of the radiation levels in the CPC during reprocessing operations, the CPC was designed with plutonium uranium extraction (PUREX)-type connectors for remote disassembly and change-out of components. Four leaded glass, oil-filled shield windows permitted viewing into the cell.

Additionally, the cell was equipped with three 79 kW (270,000 Btu/hr) coolers along the west wall to provide the cell with cooling capacity above that provided by the flowthrough ventilation system. The cell was also equipped with two sumps that were operated by steam jets to provide cell pump-out capability.

An internal rail system existed for transport of equipment to and from the cell by transfer cart. The rails extended 23 m (74 ft) into the cell. The internal rail system crossed the door slot between the adjacent EDR and the CPC using a hinged rail system that lifted the rails to allow the door to close.

2.2 Equipment Decontamination Room

The EDR is located at the northwest corner of the Main Process Building at grade elevation. This room supported CPC operations, was a transfer station for equipment entering into the CPC, and a decontamination and transfer area for equipment exiting from the CPC. The EDR's concrete interior is approximately 9.75 m (32 ft) wide by 13.34 m (44 ft) long by 7.62 m (25 ft) high. The walls vary in thickness from 0.91 to 1.22 m (3 to 4 ft) and the floor is 0.30 m (1 ft) thick. There are rolling concrete doors on the northwest side and southeast end of the room. A ceiling hatch opens to the above CCR for maintenance of the electromechanical manipulator. A soaking pit and sump located in the floor provided for the decontamination of any CPC vessels. The two EDR cranes were used for transferring vessels into and out of the soaking pit.

Figure 1. NFS Process Plant - 110'-0" Level

Figure 4. Equipment Layout in the CPC

2.3 First Phase of CPC Decontamination and Decommissioning

Decontamination and decommissioning of the CPC began in January 1985. The major cell decommissioning operations involved: (1) establishing transfer paths for waste being transfer to the Waste Tank Farm (WTF) by means of flexible jumpers (2) replacing both 1.8-Mg (2-ton) hoists and the 14.4-Mg (16-ton) hoist (3) decontaminating the crane bridges (4) vacuuming the cell floor (5) applying foamed cleaning chemicals to the cell interior (6) high-pressure rinsing (7) disconnecting vessels (8) cutting cell piping (9) cutting and removing three concrete dissolver pedestals (10) loading waste into boxes and transferring the boxes out for storage, and (11) wall/ceiling scarification (see figure 5).

This effort spanned a two-year period and included the removal of all jumpered piping and 11 vessels; vacuuming the cell floor; and decontamination of the ceiling, walls, and floor with foamed chemicals followed later by high-pressure washing of all surfaces. In addition, two 20-Mg (22.5-ton) concrete neutron absorbers and one 4.5-Mg (5-ton) neutron absorber base required removal. These concrete cores were located at the annulus of the two spent fuel dissolvers. Of particular interest was the method of remote cutting and removal of the reinforced concrete pedestals. The overhead cranes were used to place an ultra high-pressure, water-abrasive cutting nozzle and its tracking device over a pedestal. The pedestal was then cut, cracked, and tipped onto a transfer cart using a tipping fixture and the 14.4-Mg (16-ton) crane.

The cell dose rate was reduced from an average typical whole body dose rate of 12 to 56 r/hr to a rate of 0.2 to 1.2 r/hr at the completion of the decontamination activity. Vessel removal and clean-up was completed March 1987.

All decontamination operations were performed remotely utilizing the cell overhead cranes and an electromechanical manipulator. Refer to DOE/NE/44139-41, "Decontamination and Decommissioning of the CPC,"² for further details and to DOE/NE/44139-30, "Decontamination and Decommissioning of the West Valley Reprocessing Plant,"³ for cost summary information.

Figure 5. View Into the CPC from a Shield Window

2.4 EDR/CCR Decontamination and Decommissioning

The EDR was decontaminated to provide a waste packaging and transfer area for decontaminating the CPC. Decontamination was accomplished by: (1) packaging and removal of wastes (2) grinding concrete floor surfaces (3) emptying and cleaning the soaking pit (4) washing/painting the walls, and (5) refurbishing the utilities. Decontamination operations also included repairing the transfer cart, load testing the cranes, and cutting through the concrete walls of the EDR to provide outside and vitrification tunnel access (see figure 6). EDR decontamination activities are further discussed in DOE/NE/44139-2, "Initial Decontamination of the EDR at the West Valley Demonstration Project."⁴ Cutting of EDR walls is discussed in detail in DOE/NE/44139-58, "The Use of the Deep Kerfer for Thick, Steel-reinforced Concrete Cutting."⁵

The CCR, located above the EDR, was used for the storage and servicing of bridge cranes and an electromechanical manipulator used in the CPC. Decontamination operations involved: (1) removing air lock surface contamination (2) establishing containment (3) vacuum cleaning (4) damp wipe down (5) floor and wall surface grinding (6) grinding and acid descaling of crane rail surfaces (unsuccessful in significantly reducing embedded contamination), and (7) painting. The CCR was also used as a service area for the CPC cranes.

Figure 6. General Layout of EDR Showing Shield Door Placement

2.5 Second Phase of CPC Decontamination and Decommissioning

The second phase of CPC refurbishment activities began in 1994 and spanned two years. These activities included: (1) remotely painting the inside surface of the cell (2) installing permanent jumpers for the sump steam jets and level detection instrumentation (3) replacing cell lighting, and (4) refurbishing the cranes with new control equipment and emergency retrieval components. Additionally, the electromechanical manipulator required replacement due to cable failure; the shield door 3M-3 was modified; and the cell coolers, jumpers, and a heating, ventilation and air conditioning (HVAC) vent duct were remotely installed. The remote painting of the CPC and shield door 3M-3 modifications are described below.

2.5.1 CPC Painting Summary

The CPC required painting to provide better lighting, improve the appearance of the cell, and fix radiological contamination. Several preparations were required prior to the start of painting. A set of window covers was designed and installed over each of the hot-side cell windows to keep them free of paint. A specially designed filter was installed at the in-cell ventilation duct to avoid plugging the ventilation filters. Additionally, a set of bellows was installed over the electromechanical manipulator tubes to keep them free of paint.

The CPC upper and lower walls and ceiling were painted during September 1994, with approximately 568 l (150 gal.) of white Amerlock 400tm paint, using an airless sprayer for paint delivery and a specially designed remote-operated spray nozzle.

Since manned entry into the CPC was not possible due to the high radiation field, the paint spraying equipment was designed to be used with the in-cell power manipulator system. The nozzle was a commercially available electrically actuated nozzle. The nozzle was capable of being rotated 180 degrees inside an electrically actuated nozzle body to allow periodic plugs to be blown out. Movement and direction of the nozzle was accomplished by mounting it to a commercially available video camera pan/tilt unit, which in turn was connected to an attachment arm mounted to the bottom of the in-cell manipulator tubes. The nozzle was then moved around the cell using the manipulator tubes, attachment arm, and pan/tilt as required. The upper walls and ceiling were painted using the pan/tilt unit attached to a special extension arm designed to reach above the manipulator bridge.

The paint delivery system was set up in the west Mechanical Operating Aisle (MOA), an area adjacent to the CPC east wall. The paint was mixed in the MOA and delivered to the nozzle using an airless sprayer. The paint hose, nozzle control cable, and pan/tilt control cable were fed through a penetration between the west MOA and the CPC. The other end of the control cables were run from the west MOA to the Chemical Viewing Aisle (CVA). All manipulator motions and paint nozzle operations were controlled from the CVA. The painting operations were monitored through the cell's four shield windows and two in-cell video cameras.

2.5.2 Door 3M-3 Modifications

Shield door 3M-3 is a horizontally moving door located between the CPC and EDR. The door is 1.22 m (4 ft) thick and weighs approximately 99.8-Mg (110-tons), and is driven by an electric motor in the EDR Viewing Aisle (EDRVA) coupled to a 38.1 mm (1-½ in.) diameter ball screw through a penetration in the wall between the viewing aisle and the door cavity. The door is hung from two hangers that rest on top of two independent trolley trucks. Each truck has four wheels that ride on a set of rails located on each side of the door. Access to the door is provided by a roof hatch.

As part of the door modifications, the truck wheels were replaced with a new set. Past failure of one of the old bearings and additional calculations revealed that the bearings were undersized. New wheels, bearings, mount pins, and guide rollers were designed and installed using hydraulic jacks to raise the door and remove each of the old wheels.

Between the EDR and CPC was a door slot that the door fit into to eliminate shine between the cells. A transfer cart that rode on a set of rails was used to move equipment between the cells. To move the cart between the cells, a set of hinged rails was lowered in place across the door slot when the door was open and raised before the door was closed. This hinged rails system was inadequate, and it was decided to install permanent rails across the door slot. To install the permanent rails, the door needed to be raised approximately 203 mm (8 in.). This was accomplished using hydraulic jacks and specially designed lifting equipment. The door hangers were lifted from the top of the door trucks and permanent shim blocks were installed between the door hanger mount blocks and the top of the door trucks.

The end of the ball screw opposite the door motor was attached to a 305 mm (12 in.) I-beam that spanned the width of the upper door area. Because the height of the door hangers would interfere with the I-beam after the door was raised, the beam was cut in place and a horizontal knee brace added.

3.0 THE CPC AS USED FOR CANISTER STORAGE

3.1 Structural

The CPC structure was constructed in the early 1960s and was designed to the 1961 Uniform Building Code (UBC) utilizing UBC earthquake loads and other loads from the American National Standards Institute (ANSI)⁶ codes. The structural function of this building is to provide HLW radiation shielding and environmental control for the canisters.

Several times since its construction, the structural integrity of the CPC has been investigated by different organizations under various loading conditions, with particular emphasis on the structure's seismic limitation. More recently, studies have been conducted to address the CPC's structural integrity with representative canister mass and temperature gradient loads. Also, a physical examination of the interior surfaces of the CPC walls was conducted and indicated no evidence of any prior service damage.

The floor capacity of the CPC was determined using two independent analyses. Both studies determined an allowable floor loading capability of 680 kg (1,500 lb.) to 771 kg (1,700 lb.) per square foot, while assuming that the cell is solely supported by the building pilings with no benefit from soil support. This average load level permits the HLW canisters to be stacked in a two-high arrangement. The floor limit was established using standard shear consideration with respect to allowable stresses.

3.2 CPC Shielding Analysis

The proposed use of the CPC differs significantly from its prior use, in that all of the HLW from all prior operations will be contained in the cell at the same time. The combined radiation fields outside the CPC will not be proportionately increased, however, since all of the HLW will be homogeneously distributed in excess of 180-Mg (200-tons) of vitrified glass. This is expected to result in a significant amount of self-shielding such that the exterior radiation field will be acceptable.

The acceptable radiation field outside the CPC is based upon the West Valley Nuclear Services, Co. (WVNS) administrative control level of 500 mrem/year effective dose equivalent based upon continuous worker occupancy. This translates into a free-air exposure rate of 0.25 mr/hr as a design limit. Shielding analysis results indicate that the exposure rate outside the CPC is at least two orders of magnitude below the free-air exposure limit of 0.25 mr/hr for even the most limiting interim storage conditions.

The storage facility must have sufficient shielding capability in the cell walls to limit the dose rates received by personnel operating the storage facility. Unlimited operator occupancy of the west CVA requires that the dose rate be below 0.25 mrem/hr. An analysis of the CPC shield wall indicated that no modifications to the facility shielding were required for canister storage operations.

Shielding and materials used in all components of the storage system accommodate the radiation field produced by the vitrified HLW canisters which emit a maximum of 7,500 rads/hr at contact.

3.3 CPC Remote Handling, Maintenance, and Viewing

CPC remote handling, maintenance, and viewing is performed by the use of a transfer cart, cranes, manipulators, cameras, lighting, windows, shield door controls, and in-cell remote handling tools. The primary function is to provide remotely operated crane and cart handling of empty, filled, and completed (welded and decontaminated) vitrified HLW canisters within the VF including the CPC and EDR.

Several components work in conjunction to lift and transfer empty, filled, or partially filled canisters from one location to another, and securely hold the canisters for cooling or temporary storage. Moving equipment within the Vitrification Cell (VC) to the CPC is accomplished by cranes, transfer cart, various fixtures, tooling and hooks, a tipping assembly, and manipulators. The viewing of equipment movement is accomplished by a closed-circuit television (CCTV) system, shield windows, and cell lighting. Equipment transfers between HVAC zones is accomplished using door interlocks to control opening and closing the shield doors.

3.3.1 Material Handling/Lifting

The CPC is equipped with two 1.8-Mg (2-ton) cranes, one 14.5-Mg (16-ton) crane, and one electromechanical manipulator. The 14.5-Mg (16-ton) crane is required to do all canister lifting operations and is equipped with a canister grapple. The 1.8-Mg (2-ton) cranes are inadequate to lift an individual canister although they can be used to aid in the control and positioning of equipment in general; the same can be said of the electromechanical manipulator to a limit of 453.60 Kg (1,000 lb).

3.3.2 Transfer Cart

The primary activity of the transfer cart is the transfer of filled or empty canisters between the VC, EDR, and CPC. A secondary activity is to provide the base platform and locomotion to transfer materials to and from the areas served by the existing rail system within the VF (see figure 7).

Figure 7. Transfer Cart Path

The transfer cart design calls for the cart having the capacity to transport four full canisters of glass or operational equipment from the VC to the CPC and to move empty canisters from the EDR to the VC. The cart is battery powered, remote-controlled with individual wheel drives, and structurally able to accommodate the weight of four filled canisters (see figure 8). A trailer may be attached to the cart for hauling larger components. Once the canisters are unloaded from the cart in the CPC, it returns to a standby position at the battery charging station in the EDR. The charging station is located in a low radiation area to maintain a low total integrated dose to the cart control system.

Figure 8. Remote Transfer Cart

The cart can be controlled from either the north viewing window of the VC or the north window of the CPC. Four antennas are located in the VF to assure line-of-site control transmission at all times. The cart has two antennas with a diversity detection system that will continually check signal strength and use the antenna with the highest signal strength. The dual antennas assure continuous control even if signal nulls should occur due to multi-path reception from signals bouncing off the stainless steel liner within the VF.

The transfer cart has four completely independent drive trains, any one of which is sufficient to drive the cart. The cart travels at approximately 4.57 m (15 ft) per minute. The control/battery enclosure can be replaced with a spare from the EDR using an overhead crane. In the event of a total cart failure, a previously existing tethered cart is available in the EDR for pushing or retrieving the failed cart. A removable canister rack holds four canisters in the center of the cart approximately 101.6 mm (4 in.) above the transfer cart rails.

3.3.3 Storage Racks

The canister storage rack assembly is located on the southern portion of the CPC (see figure 9). To optimize the available storage space, the canisters are stacked two-high and nine-wide (east to west) to fill the maximum width of the CPC. A 1.40 m (4 ft-6 in.) separation has been provided between the south wall and the first canister rack to accommodate crane access.

Figure 9. CPC Rack Assembly Plan

For remote installation of the canister storage rack, the entire rack assembly was subdivided into prefabricated modular units. The modular rack units were partitioned into lower and upper modules that were assembled progressively in the cell to form a complete rack assembly (see figure 10). In this installation process, the modular rack units are stacked side by side and aligned using alignment/shear pins. The rack modules are tied together structurally using remotely installed threaded pins. There are 11 modular rack units - each having the capacity to hold 36 canister (stacked two-high, two-wide, and nine-across) for a total rack capacity of 396 canisters. An additional rack module, modified to support two coolers rather than the canisters, is attached to the north end of the rack. The entire rack was remotely assembled and installed in the CPC before vitrification operations began.

The welded rack modules have been designed with diagonal bracing to function as vertical trusses in supporting the canister loads by spanning the width of the CPC from the east and west walls (see figures 11 and 12). The floor support locations for the truss footings (foot pads) are located on the floor slab directly above the pile foundations that are located under the heavy walls of the CPC. There are no supporting piles under the interior floor slab of the CPC, away from the walls. The foot pads on the rack modules are articulated to accommodate any unevenness of the CPC floor.

Figure 10. Assembly of Lower and Upper Rack Modules

Figure 11. Lower Rack Module and Bracing

Figure 12. Upper Rack Module and Bracing

The adjacent rack modules are supported on a common foot pad. When the first rack unit (bottom and top modules) was installed, the lower module of the second rack unit was placed over the shear pins on the foot pads for alignment and seismic constraint. The foot pad also has a horizontal shear pin that provides for rotational alignment between the pad and the slope of the CPC floor (see figures 13 and 14). The pad is fabricated of stainless steel to obtain the optimum coefficient of friction with the stainless steel liner on the cell floor. No anchor bolts were provided to constrain the foot pad from sliding under conditions of thermal expansion or earthquake loading. Instead, the foot pad has been oversized to act as a bumper should the rack slide against the east or west walls in the event of a greater than Design Basis Earthquake. A seismic bumper has also been provided to fill the 1.40 m (4 ft-6 in.) space between the rack assembly and the south wall (see figure 15).

Figure 13. Foot Pad and Connection

Figure 14. CPC Floor Contours

Figure 15. Rack Position Relative to Seismic Bumper/CPC Wall

The second upper rack module was placed on the lower rack module and aligned with locating bars at each of the vertical columns. The upper and lower modules were then tied together with a horizontal threaded pin anchored in a threaded connection plate. Adjacent rack units are tied together with the connection plate located at the top of the lower module by a second threaded pin (see figures 16 and 17). This connection plate is welded to one of the rack columns and connected with the threaded pin to the other rack column to act as a structural restraint and to transfer vertical shear between the racks. The connection also holds the two lower racks on the common foot pad.

The top modules are aligned with an alignment/shear pin. This connection prevents the racks from separating and pounding together during an earthquake. The connection is designed only to provide horizontal shear restraint. Thus, by tying the adjacent rack units together at their tops and bottoms with shear pins or threaded pins, the rack units form a continuous structural assembly capable of remaining stable against seismic overturning forces and they act as an integral unit (see figure 18).

The canister racks installed in the cell are seismically designed to the UBC and the American Institute of Steel Construction (AISC) Manual for the condition of the racks being loaded with 100 percent filled canisters.⁷ A dynamic seismic analysis was also conducted.

Additional analysis was performed to demonstrate that natural convection within the storage rack system in the CPC provides sufficient cooling to maintain the canister centerline temperature below 400° C (752° F).⁸

The location of each canister in the rack is documented as a WVNS Operational Record.

Figure 16. Lower to Upper Rack Connecting Pins

Figure 17. Upper Rack Locating Pin Connection

Figure 18. Completed Rack Assembly

3.4 CPC Ventilation

CPC ventilation is currently sized at 156 cmm (5,500 cfm) which is supplied through the EDR/CPC doorway, CCR, and duct work from the Scrap Removal Room. All air flows to the General Purpose Cell (GPC) hatch located in the northeast corner on the floor of the CPC and is delivered to the head-end ventilation system through the GPC.

An alternative ventilation path is available through one 152 mm (6 in.) line located on the east wall of the CPC that exhausts into the main vent system through the Vent Wash Room. This system automatically opens and provides additional air flow in the event the vacuum in the CPC drops too low.

3.5 CPC Cooling

The CPC ambient temperature must be maintained so that the canister centerline temperature does not increase above 400° C (752° F) and the cell concrete temperature does not increase above 60° C (140° F).

The heat dissipation from a heat-producing canister shows that a 2.8° C (5° F) drop across the air film of the canister is sufficient to cool a canister that is producing 390 watts (1,331 Btu/hr). This analysis shows that a total temperature change of 11° C (19.8° F) between the ambient temperature and the canister centerline temperature is sufficient to dissipate 390 watts (1,331 Btu/hr) at steady state. Increasing the ambient temperature to 60° C (140° F) will produce a maximum centerline temperature of 71° C (160° F) and, therefore, allow a sufficient margin to maintain the canisters at a centerline temperature well below 400° C (752° F).

Cell coolers are mounted on a cooler rack located at the north end of the canister racks. They consist of two coolers and two motors, and force cool air under the racks. The fan coolers provide a means of dissipating the decay heat transmitted to the storage area air by the HLW. These coolers additionally provide a backup to the cooling provided by the 156 cmm (5,500 cfm) of ventilation air that flows through the CPC.

3.5.1 Chilled Water System

The chilled water system is designed to provide a source of cooling water for the fan coolers. The system is a classic primary and secondary loop configuration. Water removes heat from the canister storage area fan coolers by pumping warmed water from the fan coolers to a heat exchanger located outside the CPC. Heat is transferred to a water/glycol solution that is pumped outdoors to a refrigerant-type chiller which dissipates the heat to ambient outdoor air. The system is comprised of isolation valves, relief valves, flow and temperature indicators, pumps, air separators, compression tanks, intermediate heat exchanger, and chillers.

The chilled water system, pumps, and heat exchangers are currently not installed and will only be installed as required by the air temperature in the CPC.

3.6 Vent Duct

The vent duct is a free-standing, stainless-steel seismically designed structure located near the northeast end of the CPC storage area. It is 7.92 m (26 ft) high and 0.97 m (38 in.) in diameter with an elbow at the top facing toward the south end of the CPC storage area (see figures 19 and 20). The function of the duct is to remove warm air from the top of the canister storage area. Air is drawn through the vent duct from the CPC to the GPC by the existing ventilation system. The base of the duct is anchored to the CPC/GPC hatch opening with a toggle bolt-style mechanism. Installation of the duct was accomplished using remote handling methods.

The vent duct contains an air flow measurement system to measure the air flow through the duct. The use of this instrument is not required for operation of the ventilation system. The flow measurement system is a multiple pitot tube arrangement that transverses the flow area. The system averages the duct air flow total and static pressure values. The pressure signals are transmitted by hoses to the measuring instrument located outside the storage area on the northeast face of the CPC wall. The measuring instrument indicates air flow values in units of cubic feet per minute.

3.7 Electric and Cooling Water Flexible Jumpers

The flexible jumpers transmit electrical power and chilled water (when the chilled water system is installed) to the fan coolers. The jumpers are flexible stainless-steel with a 50.8 mm (2 in.) inside diameter and have a 50.8 mm (2 in.) PUREX connector on each end. Four jumpers, an inlet and outlet for each cooler, have lengths varying from 4.27 to 7.32 m (14 to 24 ft) to accommodate the distance from the bulkhead near the east wall inside of the CPC to each cooler location. The jumpers are connected to the PUREX male connectors on the bulkhead and cooler chassis using remote handling techniques. Rigid piping traverses from the bulkhead through the containment wall penetration to the chilled water supply system.

The flexible jumpers are designed per American Society of Mechanical Engineers and American National Standards Institute codes⁹ for 200 psig hydrostatic pressure and having a 50.8 mm (2 in.) PUREX connector on each end.

The fan cooler's 460 Vac/60 Hz/3-Phase 20 amp electrical power flexible jumpers have a LEMO four-pin electrical plug connector on each end and are jacketed with a 19.05 mm (3/4 in.) inside diameter corrugated stainless-steel metal hose.

Figure 19. Upper Vent Duct Assembly

3.7.1 Waste Transfer Flexible Jumpers

The waste transfer flexible jumpers transfer plant waste solutions from decontamination operations to underground HLW storage tanks. The waste transfer jumpers have the same 50.8 mm (2 in.) inside diameter as the electrical power flexible jumpers. These jumpers also vary in length.

To maintain the existing plant waste solution transfer paths, the four flexible jumpers installed during decommissioning operations were removed from service, redesigned, and replaced. The four new jumpers use the same type of 50.8 mm (2 in.) PUREX connectors welded to flexible steel hose, but were designed to accommodate the HLW storage rack configuration within the CPC.

Figure 20. Lower Vent Duct Assembly

3.8 Storage Temperature Indicators

The storage temperature indicators provide a means of monitoring the storage area air temperature to determine when to energize the fan coolers and for archiving of the temperatures. The storage temperature indicators are a rugged, radiation-resistant, nonelectrical-type, such as a dial temperature indicator, to facilitate 20-year operation with a minimum amount of preventive maintenance. They indicate temperature in at least the 10 to 93° C (50 to 200° F) temperature range. Standard instrument accuracy of nominally two percent of the full scale reading or range span is acceptable. The temperature data obtained is acceptable as a Production Record.

Two methods of controlling the temperature by removing heat produced by radioactive decay of the HLW canisters are available. Heat removal capability is provided by the existing plant ventilation air flow that is constantly present. The approximate 156 cmm (5,500 cfm) of head-end ventilation air flow removing heat from the top of the canister storage area through the vent duct is anticipated to be the primary heat removal method.

The fan cooler heat removal system will be installed and activated if the ventilation air flow does not adequately cool the CPC storage area. This system consists of in-containment fan coolers (presently installed) and an outside the confinement chilled water supply system (to be installed). The air temperature will be monitored and the cooling system will be manually activated before the storage area air temperature near the ceiling exceeds 37° C (100° F). The chilled water system, pumps, and heat exchangers will only be installed if actual storage temperatures approach 37° C (100° F).

The CPC concrete containment and shielding structure has sufficient thermal capacitance so that the air temperature will change very slowly, allowing the necessary time to react to an impending over-temperature condition and to repair/replace any failed equipment.

3.9 CPC 16-Ton Crane (3V-1)

The CPC 14.4-Mg (16-ton) crane is used to remove filled canisters from the transfer cart and place them into the interim storage racks. Full canister handling is a HLW activity in accordance with Engineering Procedure, EP-2-001, "Determination of Required High-level Waste Designation."¹⁰ The bridge drive is a CMAA70 type A4, with two totally independent drives and no cross shaft between them. The crane has a 14.4-Mg (16-ton) trolley/hoist on the south girders and a 1.8-Mg (2-ton) auxiliary hoist on the north girders. The north-south bridge travel is 0.97 or 2.89 m (3.2 or 9.5 ft) per minute. The bridge span is 7.08 m (25 ft-7 in.). Total travel is approximately 36.58 m (120 ft). There is no bridge brake.

The 14.4-Mg (16-ton) hoist lifts at 0.61 or 1.82 m (2 or 6 ft) per minute. The hoist lift is 11.89 m (39 ft). The hook is free swiveling with a geared-up, geared-down limit switch. The hoist has eight-part reeving and provides straight-lift capability.

The 14.4-Mg (16-ton) trolley travels east-west at 0.91 or 2.74 m (3 or 9 ft) per minute. Total travel is approximately 5.80 m (19 ft). The trolley span is 1.46 m (4 ft-8 in.). The trolley has an automatic brake.

The 1.8-Mg (2-ton) hoist lifts at 2.13 or 6.4 m (7 or 21 ft) per minute. The hoist has a geared-up and geared-down limit switch. The limit switch has been adjusted to limit the hoist travel from 19.81 m (65 ft) to approximately 12.2 m (40 ft), since lifts into the GPC (below the CPC) are no longer required. The hook is free swiveling. The hoist has two-part reeving and provides straight-lift capability.

The 1.8-Mg (2-ton) trolley travels east-west at 2.74 or 5.49 m (9 or 18 ft) per minute. Total travel is approximately 6.58 m (21 ft-6 in.). The trolley span is 0.81 m (32 in.). There is no trolley brake.

The crane is controlled by a portable control station from any of the CPC windows or from the CCR window. Main power and control are provided by a cable reel mounted on the northwest corner of the bridge. The cable lays behind the runway track. Power and control to the trollies are provided by festoons on a messenger wire. The control system is a multiplexed system with motor contactors mounted on the bridge. Redundant programmable logic controller input/output racks are mounted above shielding blocks to increase reliability. The 14.4-Mg (16-ton) hoist has redundant wiring that by-passes the entire control system and allows the lowering of loads in the event of a control system failure. Lighting power is from a lighting panel, independent of the crane power to increase lamp life.

To overcome the event of total crane cable reel failure or hoist motor/mechanical failure, a secondary load lowering device is mounted between the 14.4-Mg (16-ton) hoist and the grapple. This allows the power manipulator bridge to be used to lower a canister and allow bridge retrieval. A towing mechanism is installed on the manipulator bridge so that a towing cable from a winch mounted on the CCR platform can be connected to the 14.4-Mg (16-ton) bridge. Thus, the bridge can be pulled back to the CCR for repair behind the CCR/CPC shield door.

New/replacement parts are moved into the CCR via the CCR air-lock, EDR to CCR through the hatch, EDR to CPC to CCR using the transfer cart, or through the hatch covers in the CCR roof.

The 1.8-Mg (2-ton) hook can be lowered into the EDR through a 0.60 m (24 in.) by 1.42 m (56 in.) hatch to transfer small loads between the EDR and CCR.

Thermal overloads are provided in the motor control center for all speeds on all motions. These overloads affect only one speed (but both directions) and can be manually reset in the motor control center. Since the motor control center is located on the bridge crane, a manned entry will be required to reset a tripped unit. The decision to use non-self-resetting overloads was a conscious one to assure control over nuisance tripping and to maintain reliable two-speed redundancy. The crane will not be used for canister handling if one speed is not available for redundancy.

3.10 CPC Lighting

The original CPC crane lighting consisted of eight self-ballasted, 450 watt mercury vapor high-bay type lights which have been replaced with high-pressure sodium (HPS) fixtures. The CPC in-cell lighting was originally 14 remotely changeable 1,000-watt mercury lamps with ballasts outside the CPC. Seven of these light fixtures have been replaced with new 1,000-watt HPS lamps and new HPS ballasts located outside the CPC. Since no remote operations are possible in the CPC without one of the cranes in the cell, most of the lighting is from a single row of eight HPS fixtures on the 14.4-Mg (16-ton) bridge crane and from a single row of six HPS fixtures on the 1.8-Mg (2-ton)/power manipulator bridge. The in-cell 1,000-watt HPS lights will be sufficient for CCTV monitoring and general viewing without the cranes in the CPC. Power for these lights comes from a separate lighting panel.

The CPC cell light fixtures can be remotely removed and replaced. The fixtures have a latch on the left side that must be opened by the electromechanical manipulator before removing the fixture with the manipulator or a crane hook. The light fixture can be moved to a work surface in the VC for lamp changes using manipulators.

3.11 CPC Closed-circuit Television System

The CPC has one moveable wall CCTV camera and one crane-mounted CCTV camera. One CCTV camera is also available in the CCR. The CPC camera can be remotely removed and carried to the CCR for repair. Enough cable is provided to reach the CCR.

All CCTV cameras are radiation resistant, black and white, high-resolution cameras. Each camera is equipped with pan/tilt capability and a zoom lens, except for the CPC 14.4-Mg (16-ton) trolley camera which is a fixed-position/fixed-focal length camera to assure a consistent view of canisters as they are lowered into the racks. An electronic cross-hair generator may be used on this camera as an additional targeting aid.

3.12 Shield Windows

Due to the significant transmission loss of light through lead glass shielding in the shield windows, actual in-cell lighting levels must be over-designed to assure an effective illumination of 50 foot candles through the windows. The lead glass in shielded viewing windows is a relatively poor transmission media for purple, blue, and green portions of the spectrum. Even at 589 nanometers (sodium peak from HPS lights), transmission is significantly reduced depending on the quantity of glass in the window. Color rendition through lead glass windows is thus imperfect, and a strong yellow cast is imparted to the view. In addition, the selection of HPS lighting does not allow good color rendition. In the CPC, little dependence has been placed on color coding. Where identification is needed, or status, location, or position determinations need to be made, high-contrast markings are used rather than color.

Since the refractive indices of all window glasses is relatively high compared to air, there is a significant bending of light rays as they pass through the glass/air interface. This is used to advantage in shield windows to provide a better viewing angle than would be expected by viewing through air alone, as though through an opening in a thick wall. At the extreme viewing angle, significant distortion (such as with a fish-eye lens) will be encountered.

All CPC shield window oil is sampled on a yearly basis. The oil is analyzed for a neutralization number in accordance with American Society for Testing and Materials (ASTM).¹¹

Additionally, analysis of window shielding capability indicated that the windows provided adequate radiation shielding for viewing and conducting remote operations.

3.12.1 CPC North Window, 3M-1-D

The CPC north window is vertically placed with a clear view of 0.53 m (21 in.) wide by 0.79 m (31 in.) high. The normal viewing angle is 13° horizontal by 17° vertical and the extreme viewing angle is 43° horizontal by 60° vertical. No separate hot-side protective barrier is required.

The CPC north window was disassembled, cleaned, reassembled, and reinstalled in the late 1995 - early 1996 time frame.

3.12.2 CPC West Windows: 3M-1-A, 3M-1-B, and 3M-1-C

The CPC west windows 3M-1-A, 3M-1-B, and 3M-1-C: have a clear view of 0.76 m (30 in.) wide by 0.93 m (37 in.) high. The normal viewing angle is 17° horizontal by 20° vertical and the extreme viewing angle is 70° horizontal by 70° vertical. No separate hot-side protective barrier is required.

Shield window 3M-1-A was disassembled, cleaned, reassembled, and reinstalled in the late 1995 - early 1996 time frame.

3.12.3 CCR Window

The CCR window was originally a zinc-bromide window that has been converted to an oil-filled window to provide observation of contact maintenance operations. This window is mounted horizontally with a clear view of 0.91 m (36 in.) wide by 0.61 m (24 in.) high. Internal glass shielding in this window is not required, nor is a hot-side protective barrier needed. This window was added to the CCR after original plant reprocessing operations began.

3.12.4 EDR Window, 15-M-3

The EDR window was originally zinc-bromide that had been converted to oil-filled in late 1995 - early 1996 to provide observation of contact maintenance operations and canister load-in. This window is approximately square with a clear view of 0.61 m (24 in.) wide by 0.61 m (24 in.) high. Internal glass shielding in this window is not required, nor is a separate hot-side protective barrier needed.

3.13 CPC 2-Ton/Electromechanical Manipulator Crane 3V-2

The CPC 1.8-Mg (2-ton) crane/electromechanical manipulator is an original crane provided by Bechtel from Programmed and Remote Systems (PaR), and has been extensively upgraded. The 1.8-Mg (2-ton) hoist and festoons were replaced in 1984. The shoulder/arm assembly was replaced in 1986. The power manipulator hoist, trolley, tubes, control system, and cable reel were replaced in 1993. Upgrades included replacing the original electromechanical manipulator's small cylindrical tubes with larger square tubes. The electromechanical manipulator was rebuilt in late 1994 - early 1995 after cable failure resulted in dropping it to the floor of the CPC. The bridge drive was replaced in 1995 as were the electromechanical manipulator trolley girders, both changes intended to prevent oscillation during manipulator operation.

The bridge drive is a CMAA70 type A4, with two totally independent drives and no cross shaft between them. The crane has a 1.8-Mg (2-ton) trolley/hoist on the north girders and a power manipulator on the south girders.

The north-south bridge travel is variable speed from 0.67 to 6.71 m (2.2 to 22 ft) per minute. The bridge span is 7.04 m (23 ft-11 in.). Total travel is approximately 36.58 m (120 ft). There is no mechanical brake, but dynamic braking is used.

The manipulator hoist lifts within the range of 0.46 to 4.18 m (1.5 to 13.7 ft) per minute. The hoist lift is 8.23 m (27 ft). The capacity of the hoist is 453.60 Kg (1,000 lb) with the shoulder/arm in place. The hoist uses a regenerative dc drive to control load lowering and has an electromechanical brake to hold the load when stopped. The tubes have a lever-driven up and down limit, a secondary lever-driven up limit, and a slack cable limit. The capacity of the arm is 68.03 Kg (150 lb). The manipulator trolley travels east-west at 0.46 to 4.58 m (1.5 to 15 ft) per minute. Total travel is approximately 4.88 m (16 ft). The manipulator trolley span is 0.71 m (28 in.). There is no trolley brake.

The 1.8-Mg (2-ton) hoist lifts at 2.13 or 6.4 m (7 or 21 ft) per minute. The hoist has a geared-up and down limit switch. The limit switch has been adjusted to limit the travel from 19.81 m (65 ft) to 10.06 m (33 ft), since lifts into the GPC (below the CPC) are no longer required. The hook is free swiveling. The hoist has two-part double reeving and provides straight-lift capability. The trolley travels east-west at 2.74 or 5.49 m (9 or 18 ft) per minute. Total travel is approximately 6.10 m (20 ft). The 1.8-Mg (2-ton) trolley span is 0.81 m (32 in.). There is no trolley brake.

The crane is controlled by a portable station from any of the CPC windows or from the CCR window. Main power and control are provided by a cable reel mounted on the northwest corner of the bridge. The cable lays behind the runway track. Power and control to the trollies are provided by festoons on a messenger wire. The control system has individual conductors for every motion with motor contactors and dc power supplies mounted in the ex-cell power center. A 1.8-Mg (2-ton) power and a tool power (impact wrench) are 480-volt, three-phase while all other motions are variable speed dc. Lighting power is from a lighting panel, independent of the crane power, to increase lamp life.

Either the 1.8-Mg (2-ton) hook or the electromechanical manipulator can be lowered into the EDR through a 0.61 m (24 in.) by 1.42 m (56 in.) hatch for repair or to transfer small loads between the EDR and CCR.

Thermal overloads are provided in the power center for all speeds on all motions. These overloads affect only one speed (but both directions) and are manually reset in the power center in the EDRVA.

A 1.8-Mg (2-ton) steel plate is used as a shield cover between the EDR and CCR in the electromechanical manipulator repair hatch. This cover is also used to load-test the CPC 1.8-Mg (2-ton) hoists.

3.14 Shield Door 3M-3

Door 3M-3 is a 1.22 m (4 ft) thick concrete-filled shield door that opens to the west between the EDR and CPC. The door is driven by a 38.1 mm (1.5 in.) diameter ball screw at 0.61 m (2 ft) per minute. Full travel time is 5.75 minutes. Seismic latches are not provided. There is no ventilation seal around this door.

The door is operated from a control station at the CPC north viewing window. Door control is relay logic, powered from the same source as the door drive power. Permissive contacts are included from the transfer cart system, and door status is provided back to the cart. Permissive contacts are also provided by the time delay/warning system.

A time delay/audible/visual warning system is included in the door controls to provide adequate warning that a door is about to open. Warnings are provided in the Load-in Facility, the Secondary Filter Room, the CMR, and the Crane Maintenance Operating Aisle (CMOA).

Repair access to the drive is in the EDRVA. Repair to the wheels and ball nut are via a hatch on the EDR roof.

3.15 Shield Door 3M-2

Door 3M-2 is the CCR shield door. It is a vertical lift, 0.91 m (3 ft) thick, concrete-filled door. The door is raised by twin 68.03-Mg (75-ton) hoist drums driven from a common motor/gearbox at 0.76 m (2.5 ft) per minute. Travel time is 6.4 minutes. The door is controlled from the CCR viewing window. Door control is relay logic, powered from the same source as the door drive power. There is no ventilation seal around this door.

A time delay/audible visual warning system is included in the door controls to provide adequate warning that a door is about to open. the time delay/warning is powered by the door circuit and gives local warning in the north analytical operating aisle only.

4.0 CANISTER STORAGE

The canister storage rack locations are identified with a coordinate system. The upper eleven racks are labeled with alphabetical characters "A" through "H", "J", "K", and "L", the use of the letter "I" was intentionally omitted to avoid confusion with the number "1". The upper eleven racks also have canister positions labeled with numerical characters "1" through "9". Each number can apply to four different rack positions in that alphabetically identified space frame - north, south, upper or lower locations (see figure 21). The exact position of each serialized canister, WV-100 through potentially WV-495, is identified with four characters (e.g., A1NU is located in rack "A", position number "1" on the north side at the upper level).

4.1 HLW Canister Maximum Temperature During Storage

A fundamental requirement for the production of high-level canistered waste at the WVDP is that the compliance criteria of the Waste Acceptance Product Specification (WAPS)¹² be met. Included in the latter is the requirement that the waste form not exceed 400° C (752° F) limit after initial cool-down. The purpose of this requirement is to ensure that changes do not occur in the glass-phase structure. The 400° C (752° F) limit corresponds to approximately 50 to 100° C (122 to 212° F) below the glass transition temperature and was selected to provide a conservative discrete control target for waste form compliance. This limit is also included in the WVNS Waste Form Compliance Plan.¹³

Based upon a maximum design temperature of 100° C (212° F) and assuming natural convection as the primary heat transfer mechanism from the canistered waste, the waste form temperature does not exceed 400° C (752° F) following initial cool-down.

The storage area air temperature is maintained below 37° C (100° F) using the fan coolers as necessary for temperature control of the canisters and to protect the electronics used in the storage area.

4.2 Storage of Failed Equipment

In addition to HLW storage, the CPC is used to store failed or out-of-use equipment from vitrification operations along with some remaining CPC decommissioning wastes. Equipment is stored on the north end of the CPC in an area approximately 9.45 m (31 ft) by 3.35 m (11 ft). No active processing will be performed in the CPC and no operations are planned which would cause significant transient increases in the radiation levels in the cell.

Figure 21. Identification of Storage Rack Positions

5.0 TESTING

Testing components in the CPC began after the cell was in its final configuration. This testing was conducted in two stages: preoperational/operational and integrated operations that was part of overall readiness for HLW vitrification. Initial component testing was also conducted at vendor shops prior to shipment of the items to the WVDP. Vendor testing will not be described here. Preoperational/operational testing and integrated operations testing are described below.

5.1 Preoperational/Operational Testing

Cooler modules 68-E-2A and 68-E-2B, installed on the cooler support rack, were tested to demonstrate that there were no leaks in the flexible cooling water jumpers. The jumpers were pressurized with air to 10 psig for a period of 30 minutes. Acceptance criteria of the test was a pressure drop of less than 1 psig. Neither leaks nor a pressure drop were detected.

Fan motor modules 68-E-1A, 68-E-1B, and 68-E-1C required demonstration that they could be remotely replaced. These units would have to be unbolted from their guide pins and remotely removed without binding. This test was conducted after the fan/motor modules were installed on the cooler support rack and prior to connection of the flexible electrical jumpers. The four nuts at the base of each fan/motor module were removed using the crane with the impact wrench attachment. The crane hook was then engaged into the bail and the fan/motor module lifted off the guide pins. The fan/motor module was then repositioned and the bolts retorqued. Each fan/motor module was lifted and repositioned in this manner.

Prior to actual use, the fan/motor modules will be tested to demonstrate that the fan motors are electrically wired with the correct phase relationships. An air flow streamer will be installed on the crane and positioned above the fan to be tested. If the air flow direction is other than from the ceiling to the floor, the polarity of any two of the three phases will be switched.

Storage temperature indicators inside thermowells and temperature indicators not in thermowells will be tested to demonstrate peak daily offsets less than 15 degrees.

Ex-cell chillers, pumps, and heat exchangers will be installed only if temperatures in the CPC approach 37° C (100° F).

5.2 Integrated Operations Testing

As part of demonstrating readiness for processing and temporarily storing radioactive waste, a Line Management Self-Assessment (LMSA) was conducted. Several key operations in the CPC required performance and verification prior to the storage of any HLW canisters. Some of these operations were tested in accordance with requirements outlined in system descriptions. Test Instruction Procedures (TIPs) were developed for each test requirement outlined in the various system descriptions and all test requirements were combined into one detailed test program plan.¹⁴

5.2.1 CPC Crane Performance Test

Performance testing of the CPC crane demonstrated the ability of the CPC crane (3V-1) 14.4-Mg (16-ton) hoist to position a small fixture into the west-most canister position of each storage rack. This was done to assure that variations in the west cell wall concrete do not interfere with placement and removal of the canisters into the racks.

A WVDP test canister (hi-vac) was hoisted by the crane into position over each west-most storage location and the canister lowered into and raised out of the 22 positions along the west wall (see figure 22). No problems were encountered that would prohibit canister placement and storage.

5.3 Connection of the EDR to the VF

In April 1996, readiness for radioactive waste processing required demonstration through the LMSA process. As part of this process, several activities had to be completed to connect the former reprocessing plant radioactive areas to new facilities, piping, or noncontaminated areas. Connection or tie-in of the EDR to the VF transfer tunnel was necessary to permit canister transfers. An isolation barrier in front of door 63-M-008 and contamination barriers in the EDR were removed. Transfer cart track elevations were adjusted. The transfer cart charging shoes were also installed. Canister transfer hardware was functionally tested from the Load-in Facility into the EDR including the use of a conveyor and tipping fixture to upright a canister entering through the EDR load-in port. Air flows and pressure differentials in the CPC, transfer tunnel, and EDR were monitored to verify the correct flow path. Additional clean-up, decontamination, and disposal of contaminated material were also accomplished.

Vitrification readiness activities and all radioactive tie-ins were completed May 1996 in preparation for the transfer of radioactive waste for vitrification and solidification. Integrated operations testing of all vitrification facilities and systems were completed June 1996, by the remote filling, capping, decontamination, and transfer of four canisters into the CPC. DOE approval to initiate vitrification of HLW was granted June 19, 1996. The first radioactive canister was filled on July 5, 1996.

Figure 22. Canister being Positioned over Racks

6.0 CURRENT CPC STATUS

As of August 20, 1997, 126 filled HLW canisters have been transferred and lowered by crane into the two-tiered storage rack system in the CPC (see figures 23 and 24). The canisters have been placed into the storage racks starting at the south end of the CPC in rack position or row A1. Each row in both upper and lower positions has been filled moving south to row D9. The approximate 300 canisters produced during the vitrification campaign will be stored in the CPC until a federal repository is ready to accept the waste.

Contaminated vitrification equipment; including jumpers, thermocouples, and thermowells; are also currently being stored in the failed equipment storage area at the north end of the CPC.

The 126 canisters being stored in the CPC represent approximately half of the final heat load anticipated from all of the vitrified waste. The peak temperature in the CPC reached 30.6° C (87° F) on August 20. This is only 5 degrees higher than the peak temperature in the CPC prior to any waste being transferred into the cell. It is expected that the chilled water system will not be needed to maintain temperatures less than 37° C (100° F).

Additionally, 125 Canistered Waste Form (CWF) data packages; that include various data sheets, inspection instructions, material receiving, inspection, and release forms; have been developed per an approved integrated run plan¹⁵ and transferred to the site's Records Management Department for storage. These packages document the filling of each canister, its travel path, and all stops from the VC to the CPC. CWF data packages will be created for each canister, a portion of the package will be used as a Production Record to be shipped with the canister to the federal repository.

Figure 23. Canisters on Transfer Cart during Radioactive Operations

5472 PCX

Figure 24. Canisters Stored in the CPC

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**WEST VALLEY DEMONSTRATION PROJECT
High-Level Waste Canister Storage
Final Design, Installation, and Testing**

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