THE DESIGN, CONSTRUCTION, AND OPERATION OF THE
INTEGRATED RADWASTE TREATMENT SYSTEM (IRTS)
DRUM CELL

Topical Report

By
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December 1989

Work Performed Under Contract No. AC07-81NE44139

West Valley Nuclear Services Co., Inc.
West Valley, New York

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DOE/NE/44139--52

DE90 013480

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U.S. Department of Energy
Office of Scientific and Technical Information

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ABSTRACT

This report describes the design, construction, and the operation of the Integrated Radwaste Treatment System (IRTS) Drum Cell at the West Valley Demonstration Project (WVDP), West Valley, N.Y. The IRTS Drum Cell was designed to provide a shielded, secure storage area for the remote handling and placement of low-level Class C radioactive waste produced in the IRTS. The Drum Cell was designed to contain up to approximately 8,804 drums (plus 100% overload capacity) from decontaminated supernatant processing. This waste is to be poured into 0.27m³ (71 gallon) square drums and allowed to cure (harden) in a temperature controlled environment to ensure the cement will not be subjected to freezing and thawing cycles.

A Temporary Weather Structure (TWS), a pre-engineered building, now encloses the Drum Cell and associated equipment so that remote waste-handling and placement operations can continue without regard to weather conditions. The Drum Cell was designed so that this TWS could be removed and the low-level waste entombed in place. Final disposition of this low-level waste is currently being evaluated in an Environmental Impact Statement (EIS).

ACKNOWLEDGMENTS

Special thanks to DeAnne Adams for the initial word processing preparation of many drafts of this report, to D. L. Wiltse, B. W. Liskow, J. E. Crumlish, W. G. Secen, M. N. Baker, D. A. Dooley, D. K. Ploetz, D. R. Leap, D. A. Lipka, C. J. Pruitt, L. E. Webster, E. Maestas and T. L. Sonntag for all of their helpful input which was greatly appreciated.

A very special thank you is extended to R. A. Grant for photos obtained.

EXECUTIVE SUMMARY

The primary objective of the West Valley Demonstration Project (WVDP) is the solidification in a glass form of the liquid high-level wastes presently stored in two underground steel tanks at the West Valley site.

In order to accomplish this primary objective, the supernatant layer of the high-level wastes presently stored in one of the underground tanks is being processed and decontaminated to low-level radioactive Class C wastes through the Integrated Radwaste Treatment System (IRTS).

The IRTS is composed of four (4) subsystems.

- 1) Supernatant Treatment System (STS)
- 2) Liquid Waste Treatment System (LWTS)
- 3) Cement Solidification System (CSS)
- 4) Drum Cell (DC)

These subsystems combine to produce cement solidified low-level Class C wastes which are encapsulated in 0.27m^3 (71 gallon) square drums.

A discussion of the design, construction, and operation of the Drum Cell (DC) at the WVDP site is the objective of this report. The DC is a specially designed facility which provides for the remote handling and placement of the IRTS resultant product.

The DC began radioactive operations on June 1, 1988. As of December 1989, fourteen placement campaigns have been completed. These campaigns resulted in 6,788 drums in storage, approximately 38% of the facility capacity.

1.0 INTRODUCTION

The West Valley Nuclear Services Co., Inc. (WVNS), subsidiary of the Westinghouse Electric Corporation, has been contracted by the United States Department of Energy (DOE) to perform a high-level radioactive waste management demonstration project at West Valley, New York, the site of a former nuclear fuel reprocessing facility.

Approximately 2120m^3 (560,000 gallons) of liquid high-level waste (HLW) was generated by the reprocessing facility between 1966 and 1972. This HLW is currently stored in an underground steel tank surrounded by a concrete vault. The HLW will be vitrified into a borosilicate glass matrix and poured into stainless steel canisters. This waste will ultimately be shipped to a federal HLW repository for permanent disposal.

In support of this work, the IRTS first processes the liquid HLW. The IRTS consists of the Supernatant Treatment System (STS), the Liquid Waste Treatment System (LWTS), the Cement Solidification System (CSS), and the Drum Cell (DC). The end product of the IRTS process is Class C low-level cemented waste that is contained in 0.27m^3 (71 gallon) square drums. These low-level waste drums are transported approximately 800 m (2624 ft) from the CSS to the DC, where they are stored. These drums may be disposed on site. Selection of the final disposal alternative will be decided as part of an EIS for total site closure activities.

2.0 SYSTEM DESCRIPTION

The DC consists of a base pad, shield walls, remote waste-handling equipment, waste unloading area, waste storage area, control room, and TWS.

The DC performs these functions:

- 1) **Shield Enclosure** - Provides sufficient shielding of the drum storage area, control room, and loadout area to maintain radiation levels as low as reasonably achievable (ALARA) and within federal and WVNS guidelines. Also prevents personnel from inadvertently entering the storage area where the waste is located.
- 2) **Placement and Retrieval** - Provides an area to accept drums from the drum transporter. Provides for the retrieval of drums in the cell and provides a remote viewing system for the drum load-in and placement operation for the facility.
- 3) **Curing and Storage** - Provides for controlled curing of the drums. Also provides sufficient space to accommodate up to 8084 (plus a 100% overload capacity) of 0.27m^3 (71 gallon) square drums of cement solidified Class C waste.

The DC storage area is 105.2m x 14.9m (345 ft x 49 ft). The TWS surrounding the storage area is 114.3m x 18.3m (375 ft x 60 ft). The TWS was built to protect waste and DC equipment from the elements and to provide a means to prevent unauthorized entry to the areas adjacent to the shield enclosure (Figure 1).

2.1 Drum Cell Equipment

The DC equipment (Figure 2) consists of a bridge, crane, and trolley. The bridge is approximately 17 meters in length (55 ft), and moves east and west inside of the DC. The trolley travels north and south along the bridge. A 1818 kg (4000 lb) capacity crane is attached to the hoist and trolley. A 909 kg (2000 lb) grabber, a crane attachment and a power rotating lifting device, is used to pick up and hold the drums along their axis angle, as it moves the drums parallel to the drum stack. Drums are then placed at their respective coordinates in the drum stack.

2.2 Control Room

The equipment for the DC is operated from control panels located in the Control Room. Operations are initiated from the control room. All waste handling is done remotely so that personnel exposure levels to radiation are ALARA and within federal and WVNS guidelines. The control room (Figure 3), adjacent to the east side of the DC, is the control center for the crane and conveyors.

1. Remote Conveyor Control Panel

Drums are transferred from the transporter to the stationary conveyor unit. The conveyor control panel consists of selector switches and buttons used to advance drums across the conveyor units to allow crane pick up within the storage area. Visual contact is maintained through Closed Circuit Television (CCTV) monitors connected to two cameras in the load-out area.

FIGURE 1
IRTS Drum Cell

FIGURE 2
Drum Cell Equipment

FIGURE 3
Control Room

2. Remote Crane Control Panel

This panel consists of bridge, trolley, and hoist controls, a computer screen (which displays operational instructions), and a printer. Once a drum is placed in the cell and data has been stored on a hard disk, a print-out of the drum ID number, bridge, trolley, and hoist coordinates, along with the time and date of placement is produced.

3. Remote CCTV Panel

This panel consists of four CCTV monitors connected to two cameras on the crane trolley (one on the north side and one on the south), the remaining two monitors are connected to four cameras mounted on the shield walls. Viewing from any camera throughout the cell can be accomplished by pushing the button dedicated to the desired monitor.

2.3 Crane Maintenance Area

The crane maintenance area is located between the storage area shield wall and the operator control room (Figure 4). This area will be used for crane and bridge maintenance needed during DC operation. The maintenance area is separated from the DC storage area by a 508 mm (20 inch) thick concrete shield wall.

2.4 Waste Unloading Area

The waste unloading area (Figure 5) is a shielded area at the north side of the DC. The remote unloading of drums by conveyors from the transporter takes place in this area. There are 3 sets of conveyors:

The first set is the truck unloading conveyor.

The second set consists of 2 staging conveyors, a shuttle table, and an upender.

The third set consists of a transfer conveyor and a tilting unit. The tilting unit places the drum into a diamond pattern position (See Figures 6 and 11).

2.5 Shield Walls

The concrete shield walls were designed with the ALARA concept in mind to provide perimeter shielding of the DC storage area. These shield walls are 508 mm (20 inches) thick, sufficiently thick to ensure that radiation levels will be less than 2.5 mR/hr in potentially accessible areas. The shield walls protect workers from drums having a contact dose rate of 700 mR/hr (these radiation levels were based on original design criteria). As of December 1989, no drums > 100 mR/hr have been produced.

1. Control Room
2. Crane Maintenance Area
3. Waste Unloading Area
4. Storage Area

FIGURE 4
LAYOUT OF DRUM CELL

FIGURE 5
Waste Unloading Area

FIGURE 6
Drum Cell Storage Area

2.6 Storage Area

The DC will store a maximum of 8,084 (plus a 100% overload capacity) 0.27m³ square drums (Figure 6). The steel drums are 23 in. x 23 in. (584.2 mm x 584.2 x 882.7) and are high integrity containers. The drums are stacked horizontally in a diamond pattern to maximize storage volume. There are 127 storage rows that will have a maximum of 16 containers per row with each row stacked to a maximum height of nine layers of drums. Certified, stabilized cement, in the form of cement-filled drums will be placed on the top (ninth layer) of the waste mass to provide additional shielding.

2.7 Basepad

The basepad consists of compacted crushed stone (gravel) overlaying compacted clay providing a level surface upon which the DC foundation is placed. It also contains a system of instrumentation for monitoring ground water.

2.8 Transporter Description

The transporter is an exclusive-use truck with a shielded, enclosed unit used to transport radioactive cemented containers between the CSS and the DC. The transporter must travel 800 meters (2625 ft) on the road connecting the CSS and DC at a maximum speed of 24 km/hour (15 mph). The transporter is a 1987 GMC medium-duty truck with a gross vehicle weight of approximately 2270 kg (50,000 lb). It is equipped with a tailgate containing live roller conveyors which transport containers into and out of the shielded enclosure. The function of the tailgate is to interface with the conveyors at CSS and DC and the conveyor in the shielded enclosed unit.

The tailgate is a system operated by a hydraulic cylinder. The conveyor rollers are motor driven. All power and control cables terminate at a terminal block and junction box located on the transporter. A high (480 V) and low (120 V) voltage electrical power cable connects the control receptacle to the motor starters. All controls on the transporter are operated from the CSS and DC control rooms through a conveyor control panel.

The containers are restrained in the shielded enclosure and positioned on self-locking conveyors. The walls of the shielded enclosure and internal guides restrain the movement of the drums during transport. The interior clearance between the containers and shield walls is 76.2 mm (3 inch) around the entire periphery. The clearance between the containers and central guide rail is 44.5 mm (1.75 inch). There is a 127 mm (5 inch) clearance from the top of the drum container to the roof of the transporter. These clearances are required for ease of loading and unloading drums.

When the shielded enclosure is loaded with eight containers filled in the CSS, the tailgate is raised to an upright position. When the tailgate is in this position, the containers are shielded on all sides. The shielded enclosure is composed of 102 mm (4 inch) thick steel on the front, 51 mm (2 inch) thick steel on the bottom, sides, and tailgate, and 6.35 mm (0.25 inch) thick steel on top. Shielding thicknesses were selected on the basis of radiation exposure to the driver and external surroundings.

Radiation field data for the calculated dose rate inside the cab of the drum transporter assumed the truck to be loaded with eight 0.27m^3 (71 gal) square drums, each containing 1 Ci of Cs-137. This activity level was derived from the assumption that the drums were filled to 90 percent capacity and was based on average projected Cs-137 concentrations in the decontaminated supernatant and in the final cement form.

The dose rate at the point of highest exposure (center of back of cab) was calculated to be 0.90 mRem/hr while the dose rate on the driver and passenger sides of the cab was calculated to be 0.83 mRem/hr. The time spent by the driver inside the loaded truck was estimated to be approximately 15 min/trip. An additional minute was added to allow for engine warm-up. At four trips per day for 260 days per year, the maximum annual dose to the driver while inside the cab was estimated to be 220 mR/yr. The maximum driver dose rate actually received for a year was < 1.0 mR. This is based on ten minutes per trip and three trips per day for a 167-day operating year. The actual dose rates at the point of highest exposure (center back of cab) are an average of < 0.01 mR/hr.

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3.0 CONSTRUCTION

The construction of the DC began October 1, 1986, and was completed December 23, 1987. The DC was built approximately 800 meters (2624 ft) to the southeast of the former nuclear fuel reprocessing plant. The DC for Class C waste is located in an area of the WVDP site removed from erosional areas (Figure 7).

The DC basepad has a depth of 914.4 mm to 1828.8 mm (3 ft to 6 ft) and is constructed of a native impermeable clay called silty till. This clay was placed in the basepad excavation and compacted. Instrumentation (i.e., piezometers, tensiometers, and settlement gauges) was then set at various levels within the clay to measure any moisture content and settlement. A double layer geotextile mat was installed to prevent the stones from migrating into the clay. The basepad was completed with the backfilling and compaction of number 1 crushed stone, on top of the geotextile mat, raised slightly above grade. Concrete curbs, which provide the support for the stacking of the drums, were placed on top of the basepad. The shield walls composed of 508 mm (20 in) thick concrete are cast-in-place construction (ACI 318, Building Code Requirements for Reinforced Concrete) surrounding the basepad storage area.

An existing road approximately 800 meters (2624 ft) from the CSS was improved during construction of the IRTS DC to provide a safe route of transport for the cement-filled drums.

3.1 Design Requirements

The design life of the DC will be ten years, minimum. The physical arrangement will be such that radiation exposure to operating and maintenance personnel and the general public will be ALARA.

3.1.1 Structural Requirements

The DC was designed to accommodate meteorological design loads of snow at 195.3 kg/m² (40 lb/ft²), peak wind gust of 140 km/h (87 mph) and 100 year wind of 123.9 km/h (77 mph).

Provisions were made for mounting cranes, conveyors, and other equipment for remote handling and moving of drums. This also includes vehicular access to the DC.

Supports and anchors for the equipment were designed in accordance with the requirements for each component/structure safety class.

3.1.2 Radiation and Safety Requirements

The shielding design of the DC was based on a source strength of 1 curie/drum of Cs-137; a density of 1.75 kg/liter (14.6 lb/gal) for the waste/cement mixture; and a drum capacity of 8084, 0.27m³ (71 gallon) square drums in the DC plus a 100% overload capacity.

3.1.3 Dose to Personnel

Equipment within the controlled area of the DC was designed so that routine maintenance would result in a collective annual dose less than 1.0 person rem. In the operating areas, such as the control room, the maximum radiation dose rate for a full time occupancy area, one in which an individual may be expected to spend all or most his/her workday, was designed to be no more than 0.1 mR/hour. The actual radiation levels in the control room are approximately 60 microR/hour. (See Table 3.1).

In full time access areas, such as the crane maintenance area or the loadout area, the maximum radiation dose rate was designed to be $1.0/t$ mR/hour where "t" is the maximum range in hours per day that the area is expected to be occupied by any one individual. A full-time access area is one in which no physical or administrative control of entry exists and individuals are expected to work some of the time.

The actual radiation levels are approximately 80-100 microrem/hr in the crane maintenance area and approximately 200-280 microR/hr in the load-out area.

Outside of the DC building, the dose rate was designed to be less than 1.0 mR/hour to avoid that area being declared a controlled area. The actual radiation levels on the outside of the DC building (readings microR/hr 1 ft from building) range from 35 microR/hr at the west end of the building to 190 microR/hr towards the east end of the building.

Table 3.1 Radiation Exposure Rates

The latest survey of radiation exposure rates is as follows:

Drum Cell Control Room Area:	0.060 mrem/hr
Outside of Drum Cell Building:	0.035 mrem/hr West End
	0.270 mrem/hr Edge of Array
	0.113 mrem/hr Average
Rock Springs Road:	No Increase Over Background

Note that approximately 1/3 of all planned drums had been placed at the time of this survey. Note also that a considerable number of shield drums have been processed through the Cement Solidification System. These are intended to be placed in the western most rows and ninth layer.

3.1.4 Instrumentation and Control Requirements

The equipment for the DC will be operated from control panels located in the Control Room.

3.1.5 Electrical Requirements

The DC will use an electrical system source of 480 volts $\pm 10\%$, 3 phase, 60 hertz, and 115 volt $\pm 5\%$, 1 phase.

3.1.6 Fire Protection, Industrial, and OSHA Requirements

Fire protection, industrial, and OSHA requirements will be in compliance with ID-12044, Reference 10-8 (e).

3.1.7 Maintenance and Inspection Requirements

Equipment shall be selected and designed to minimize and ease maintenance activities.

Equipment arrangement shall also provide space for maintenance, inspection, removal, and replacement of components and the equipment itself.

Equipment shall be selected for a minimum of maintenance and inspection. It will be designed for a minimum lifetime of ten years.

3.1.8 Interface Requirements

The DC shall interface with and be compatible with the following:

- a. The roads and access ways to the DC from the CSS
- b. The functions and operations of the plant and site.
- c. The low-level waste handling and storage operations.

3.1.9 Applicable Codes and Standards

- AISC - 1980, American Institute of Steel construction, "Specification for the Review, Fabrication, and Erection of Structural Steel for Buildings," Part 1, 8th Edition.
- ANSI - American National Standards Institute
 - A58.1 - 1982, Minimum Design Load for Building and Other Structures
 - ANSI/ASME-NQA-1 - 1983, Quality Assurance Program Requirements for Nuclear Facilities
- ASTM - American Society for Testing and Materials
 - ASTM A-36 - 1981, Specification for Structural Steel

- AWS - American Welding Society
 - A2.4 - 1979, Symbols for Welding and Nondestructive Testing
 - ANSI/AWS D1.1 - 1984, Structural Welding Code - Steel
- CEMA - Conveyor Equipment Manufacturers Association
 - CEMA 401 Roller Conveyor - Nonpowered
 - CEMA 404 /Chain Driven LIVE Roller Conveyors
- CFR - Code of Federal Regulations, Title 49, Parts 170-179, Transportation, Department of Transportation
- CMAA 70 - 1975, Crane Manufacturer's Association of American Specification No. 70 - Specification for Electric Overhead Traveling Cranes
- DOE - Department of Energy
 - "Radioactive Waste Management," DOE Order 5820.2, U.S. Department of Energy, Washington, DC, February 6, 1984.
 - "Environmental Protection, Safety, and Health Protection Program for DOE Operations, " DOE Order 5480.1A, U.S. Department of Energy, Washington, DC, August 13, 1981.
 - "INEL Architectural Engineering Standards, " U.S. Department of Energy, Idaho Operations Office, Idaho Falls, Idaho, Rev. 3, June 15, 1982.
 - "General Design Criteria Manual, " DOE Order 6430.1, U.S. DOE.
 - "Operational Safety Design Criteria Manual, " DOE ID, 12044.
- NEMA - National Electrical Manufacturers Association
 - ANSI/ASME MG-1 - 1978, Motor Standards
 - MG-13 - 1974, Frame Assignments for Alternating Current Integral Horsepower Induction Motors
- OSHA - Federal Occupational Safety and Health Administration Standards Parts 1910 and 1926
- SNT-TC-1A - 1980, Recommended Practice/Personnel Qualification and Certification in Nondestructive Testing
- SSPC - Steel Structures Painting Council
 - PA1 - Shop, Field, and Maintenance Painting
 - PA1 - Measurement of Dry Paint Thickness with Magnetic Gauges
 - SP1 - 1982, Solvent Cleaning
 - SP3 - 1982, Hand Tool Cleaning
 - SP3 - 1982, Power Tool Cleaning
 - SP6 - 1982, Commercial Blast Cleaning

- UBC - Uniform Building Code of International Council of Building officials
- In addition to the above codes and orders, the following also apply:
 - WVNS Low-Level Waste Form Criteria for the Disposal of Low-Level Waste at the WVDP (R&D Report 84-8B3-EASTV-R6 dated July 30, 1984.
 - WVNS Radiological Controls Manual, WVDP-010.
 - WVNS Industrial Hygiene and Safety Manual, WVDP-011.
 - WVNS Quality Management Manual.
 - DOE/EA 0295, Environmental Assessment for Disposal of Project Low-Level Waste, April 1986.

3.1.10 Startup Test Phase

A test procedure, Standard Instruction Procedure (SIP) 87-60, was developed which identified the DC components/equipment which required testing to verify compliance with the specified design and performance requirements. SIP 87-60 provided a description of the scope and acceptance criteria for components/equipment.

The testing was performed while the DC system was in a NON-RADIOACTIVE MODE. The objective was to transport eight (non-radioactive) drums to the DC and remotely place them in the storage area.

All testing was performed by trained operators using applicable Standard Operating Procedures (SOP's) and SIP's. Startup crews included Shift Supervisors and engineers to direct testing.

Operating deficiencies encountered and resolved were: proper alignment of the transporter tailgate conveyor to the stationary DC and CSS conveyors, tire failure in the transporter, and power blips which caused equipment shutdowns. Poor visual contact during drum placement was due to the initial camera installation. The transporter balance on the front end caused poor control of the vehicle during inclement weather. Prior to startup, remote testing was performed on the crane. The testing performed was to ensure that a drum could be freed remotely from the drum grabber to allow crane movement to the crane maintenance area.

4.0 OPERATION

4.1 Transporter Loading at CSS

At the CSS, 0.27m³ (71 gallon) square drums are filled remotely, one at a time, with approximately 454 kg (1000 lbs) of an approved cement recipe. The drums are remotely sealed and removed by a conveyor to a loadout room where they remain for approximately one hour. This allows the drums to begin to cure before transport to the DC.

A barcode identification label is placed on each drum before it is filled with cement. The barcode label is read by a scanner in the CSS. At the CSS this identification number is programmed into a computer and is used to trace the production history of the drum, which includes waste content, cement recipe, and date of pour.

The transporter enters the load-in area at the CSS. The transporter operator plugs high and low voltage connectors into wall receptacles and transporter receptacles to connect the conveyor control system in the CSS control room. The transport operator then enters the CSS control room. The CSS operator remotely raises the loadout area shield door and the transporter tailgate shield door from the control room. The transporter support is raised and the transporter tailgate conveyor is lowered. The drums are transferred by a series of conveyors from the loadout room into the transporter. After the drums are in the transporter, the transporter tailgate shield door is closed. The transporter is then surveyed by Radiation and Safety (R&S) technicians for contamination control purposes and the cable connectors are disconnected. Upon R&S release, the transporter is driven to the drum cell for unloading.

4.2 Transporter Unloading

The shielded transporter carrying up to eight square drums, or six square waste drums and two overpacks, is backed into the DC unloading area (Figure 8) where the transporter guides align it with the conveyor system. The operator plugs high and low voltage connectors into wall receptacles and transporter receptacles to connect the conveyor control system in the drum cell control room. The transporter operator then enters the DC control room. A stationary hydraulic system lifts and aligns the transporter conveyor with the stationary conveyors, opens the drum cell shield door and lowers the transporter tailgate, to interface the transport conveyor and the drum load-out conveyor. The drums are then transferred from the truck to the stationary drum loadout conveyor. All drums are advanced, placing one drum each on the north and south staging conveyors. The drum from the south staging conveyor advances onto the shuttle conveyor which transfers it to the "south" position.

The control room operator activates a remote sensor which reads the bar code label affixed to the drum and transmits the number to the crane personal computer. Next, the drum is moved onto the upender which lays the drum horizontally. From here, the transfer conveyor moves the drum to the tilting unit. This unit tilts the drum 45° to a horizontal diamond position for crane pick up (Figure 9). This sequence repeats with the drum from the "north" staging conveyor while the other drums remain on the stationary drum un-loadout conveyor.

FIGURE 8
Transporter in Unloading Area

FIGURE 9
Drums on Loadout Conveyors

4.3 Stacking of Drums

The stacking plan for the DC provides the operator with the pre-determined location and sequence of each drum to be stored in the DC. It also indicates the pre-determined sequence and location of shield drums.

Drums are placed sequentially, east to west in the rows and south to north in the columns (Figure 10). The drums are placed within the layer to maintain a 45° horizontal angle (See Figure 11) and with the exposed face to the west.

- The X-coordinate is defined by the row (1 through 127) is entered as is the coordinate for the bridge destination.
- The Y-coordinate is defined by the column (A through R, with I and Q omitted) and is entered as is the coordinate for the trolley destination.
- The Z-coordinate is defined by the layer (1 through 9) and is entered as is the coordinate for the hoist destination.

A regular drum denoted by an "R" on the stacking plan is a production drum containing waste forms. A shield drum denoted by an "S" on the stacking plan is a "low dose" or "clean" drum designated and approved for placement as shielding for the "R" drums placed in the cell.

The drums are stacked remotely by a crane. The drum ID number is remotely read by a bar code scanner from the crane control panel. Bridge, trolley, and hoist coordinates for each drum are read from the control panel. Once the drum number is entered into the personal computer, the drum identification number is verified by the CCTV system. Once the bridge, trolley, and hoist reach the assigned drum destination, all coordinates are again verified upon drum placement. Placement of the drums is monitored by a CCTV system.

Approved shielding drums are stored temporarily in the cell to the west of the drum stack. When the stacking plan denotes the next drum to be placed is a shield drum ("S" on the plan), the operator retrieves one of the temporarily stored shield drums and places it at the coordinates stated on the stacking plan.

FIGURE 10
Stacked Drums

FIGURE 11
Drum and Stacking Configuration
(Diamond Pattern)

5.0 LESSONS LEARNED

1. Truck Guides - Modified truck guides eased transporter positioning, and resulted in decreased tire failure incidents.
2. Power Blips - Installation of an Uninterruptible Power Supply (UPS) eliminated brown outs/power blips which had interrupted the computer system.
3. Cameras - Relocation of two (2) cameras to near the center of the cell as the drum stack advanced to the west of the cell, restored visual contact from cell cameras on the N.E. and S.E. end of the cell that were blocked by the stacked drums. One additional camera was installed on the North side of the trolley to improve visual contact during drum placement in the stack.
4. Transporter - Installation of an additional 1362 kg (3000 lbs) of weight on the transporter front end allowed better control on icy roads.
5. Stacking - Stacking drums in the cell from east to west versus the initial plan to stack west to east, beginning the cold shield wall face at the east, resulted in less exposure to the control room operators.
6. Personnel Exposure - Radiation levels of the drums are much lower than anticipated. This directly resulted in lower exposure rates to all personnel involved in the transport and operation of the drum cell.

6.0 CONCLUSIONS

The DC has an inventory of 6,788 process and shield drums. The DC transporter has successfully delivered 6,520 process drums from the CSS to the DC, and non-radioactive shield drums. These drums were remotely stacked within the shielded enclosure through successful operation of the DC conveyor system and the bridge crane. Each drum location is easily traceable through the bridge crane interface with the DC computer system where drum stacking data is entered and stored.

Three hundred and twenty-one (321) process drums have qualified as shield drums because of the better-than-design performance by the IRTS processing sub-systems, thereby increasing the DC acceptance capacity for product drums. The estimated curie content for the 6,520 process drums in storage is approximately 175.25 Ci of Cs 137. The dose rate per shipment and to the DC personnel in the control room is much less than the design calculations.

7.0 REFERENCES

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DOE/NE/44139-52

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USDOE