AIIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

Inches

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

WHC-SA-1609-FP

Mobile Inspection and Repackaging Unit

G. A. Whitney
R. J. Roberts

Date Published
December 1992

To Be Presented at
1993 International Conference on
Nuclear Waste Management and
Environmental Remediation
Prague, Czechoslovakia
September 5-11, 1993

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

MOBILE INSPECTION AND REPACKAGING UNIT

Gerald A. Whitney
Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Randal J. Roberts
Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

ABSTRACT

Storage of large volumes of radioactive mixed waste (RMW) and transuranic waste generated over the past 20 years at the Hanford Site has resulted in various waste management challenges. Presently disposal capacity for this waste type does not exist. The waste will be stored until processing facilities can be completed to provide treatment and final disposal. Because of the complexity of these wastes, special projects have been initiated to properly manage them. This paper addresses one such project. The goal of this project is to develop a mobile solid waste inspection and repackaging facility for solid RMW and transuranic waste.

KEYWORDS

Drum, box, inspecting, sampling, repackaging, overpacking, operating area.

INTRODUCTION

The Hanford Site is 1 of 14 U.S. Department of Energy (DOE) sites located throughout the United States that generate and/or store RMW and transuranic radioactive wastes from national defense programs. Regulatory changes have provided the emphasis for better management of these wastes. Interpretations of the *Atomic Energy Act of 1954* and the *Resource Conservation and Recovery Act of 1976* (RCRA) have led to the definition of a group of wastes called RMW and transuranic wastes. The RMWs are stored in the Solid Waste Operations Complex. Current disposal capacity for these wastes will not exist for several more years. In some cases, wastes have been stored for more than 20 years. Because of the indefinite storage, container degradation can occur from internal waste-related causes and external environmental effects. Periodically these containers must be repackaged or overpacked to ensure the waste is contained safely. Containers also must be opened and inspected to meet current verification requirements according to state of Washington regulations.

DISCUSSION

The various waste handling operations required to properly manage RMW and transuranic wastes presents several problems. Opening containers of these kinds of wastes can be a potentially dangerous operation in the wrong environment. The inspection repackaging unit (IRU) design will allow opening and other waste handling operations to take place in two confined areas, a glovebox and box drum inspection room. These two areas will contain both radiological and hazardous constituents from the environment and operations personnel. Because of a large waste storage area, i.e., several hundred acres, a mobile facility was needed to accommodate movement of the facility to the waste instead of moving the waste long distances to the facility. The IRU also will be capable of supporting waste retrieval projects at various locations, which will require several waste handling activities. Therefore, a mobile system was selected.

DESIGN CODES AND STANDARDS

The IRU project was conducted under several provisions, including ASME NQA-1-1989. A hazard classification completed by the Westinghouse Hanford Company was used as the basis for evaluating the level of quality assurance required. Project design was based on DOE Order 6430.1A, *General Design Criteria* (DOE 1989) requirements for nonreactor nuclear facilities. The design incorporates good engineering design standards consistent with worker-related health and safety requirements including

Occupational Health and Safety Administration, American Conference of Governmental Industrial Hygienists, National Institute for Occupational Safety and Health, and National Fire Protection Association. All applicable state and national standards were applied to the IRU design process.

FUNCTIONS

Design functions were based on past, present, and future RMW and transuranic waste storage requirements at the Hanford Site. Several design functions were identified, and as result, the design was developed to accommodate those needs. Activities include inspecting, sampling, repackaging, and overpacking waste stored in boxes and steel drums. Drums and boxes are required to be opened to accommodate visual and physical inspection of waste contents. This operation will provide information for contents verification and internal container integrity verification. Drums that have internal damage may require repackaging, overpacking, sampling, or both depending on the evidence found during the inspection process. Drums or boxes that show evidence of integrity loss caused by corrosion or other damage may require sampling of contents to determine the cause and identify potential unknown waste properties. Drums of waste materials that show signs of corrosive degradation or other serious damage will be repackaged into new containers with the appropriate internal packaging designed to meet storage requirements of the waste material. Drums that show evidence of slight degradation or damage may be overpacked into 85-gal drums to ensure integrity during storage. This is not an option for drums that show evidence of material leakage through the drum. Storage space must also be considered when making a decision to overpack instead of repackaging.

STRUCTURAL DESIGN

The IRU is 16 m (53 ft) in length, 4.3 m (4 ft) wide, and 4.3 m (14 ft) high with an approximate weight of 13,500 kg (30,000 lb) (see Figure 1). The suspension consists of a triple tandem system allowing the floor to be within 1.5 ft from the ground. Three, single 210-mm- (8.25-in.-) wide wheels on each side, fitted with 572-mm (22.5-in.) low profile tires are mounted independently on air suspension wheel plates. The body consists of materials designed to withstand winds up to 129 km/h (80 mph) and temperature variances between -28 to 54 °C (-20 to 130 °C). Inside the unit are five separate areas: Area 1, Loading Dock; Area 2, Box Processing Room; Area 3, Drum Processing Room; Area 4, Glovebox Chamber; Area 5, Utilitiy Room; and Area 6, Personnel Entry/Exit (see Figure 2). Located in the drum processing area is a glovebox where drum opening, inspecting, sampling, repackaging, and compaction operations are conducted.

Connected to the end of the IRU loading area is an according foldout weather enclosure to keep the loading area protected from the elements. Connected to the IRU is a Personnel Support Facility (PSF) equipped with changerooms and other personnel accommodations. The PSF and the IRU are designed to be moved by a standard fifth wheel attached to a tractor.

There are two large rollup doors and one small rollup door designed to form a tight seal when closed (see Figure 3). The first door is located at the extreme rear of the IRU, the second is located 2.85 m (9.4 ft) inside of the first, and the third is located in the operating area wall for drum entry into the glovebox. All doors are opened and closed electrically by controls located in the drum processing area. Drum and box operations are conducted separately. The left side conveyor moves drums through the box processing room and into the glovebox. Left and right conveyors are required to move boxes into and out of the IRU (see Figure 4).

Located inside the drum processing area is a stainless steel glovebox (see Figure 4). The glovebox is approximately 4.6 m long by 1.8 m wide by 3.4 m high (15 ft by 6 ft by 11 ft). The glovebox will allow safe handling of all waste materials by confining all hazardous and radioactive emissions from the operator. All drum operations, except overpacking, are performed within the glovebox including opening, sampling, and repackaging. A drum compactor is located within the glovebox chamber. The compactor will smash used empty drums into small pucks, thereby greatly reducing their volume before disposal.

VENTILATION SYSTEM

The IRU is equipped with heating, ventilation, and air conditioning (HVAC) and high-efficiency particulate air (HEPA) systems designed to control radioactive contamination and releases to the environment. An in-line air monitor system will alarm before discharges exceed required limits.

INSTRUMENT AND ELECTRICAL

Electrical power is supplied by an outside source but there is also an onboard generator for backup emergency power. Each room is illuminated by overhead fluorescent lighting and has wall-mounted electrical outlets. Exterior-mounted lighting provides for around-the-clock operations. The conveyors, compressor, manipulator, and drum hoists require 110 V Ac power supply. The HVAC, HEPA, and compactor require 240 V Ac. An instrument control panel for operation of conveyors and automatic overhead doors is located Area 3. A second control panel is located at the glovebox for control of monorail hoist, compactor, and remote video cameras. Drums are positioned into the drum ports by an automated tracking system and then raised into the drum port by operator controls.

An interlocked automatic door system will allow operations personnel inside the IRU to control entry and exit of containers. This system will be integrated with the motorized conveyor system for ease of operation when moving drums into and out of the IRU. The doors are overhead rollup design made of light-weight materials. The rollup doors will form a seal with the floor walls and ceiling to provide an airtight operating area within the IRU.

FIGURE 1. ELEVATIONS.

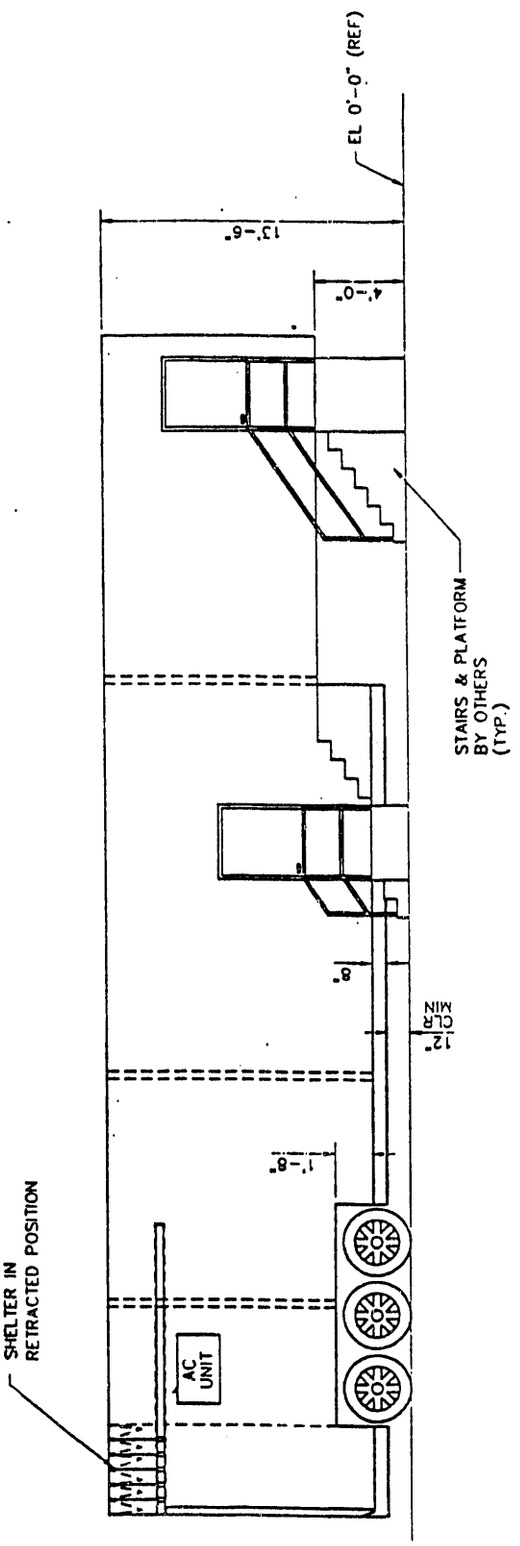


FIGURE 2. FLOOR PLAN.

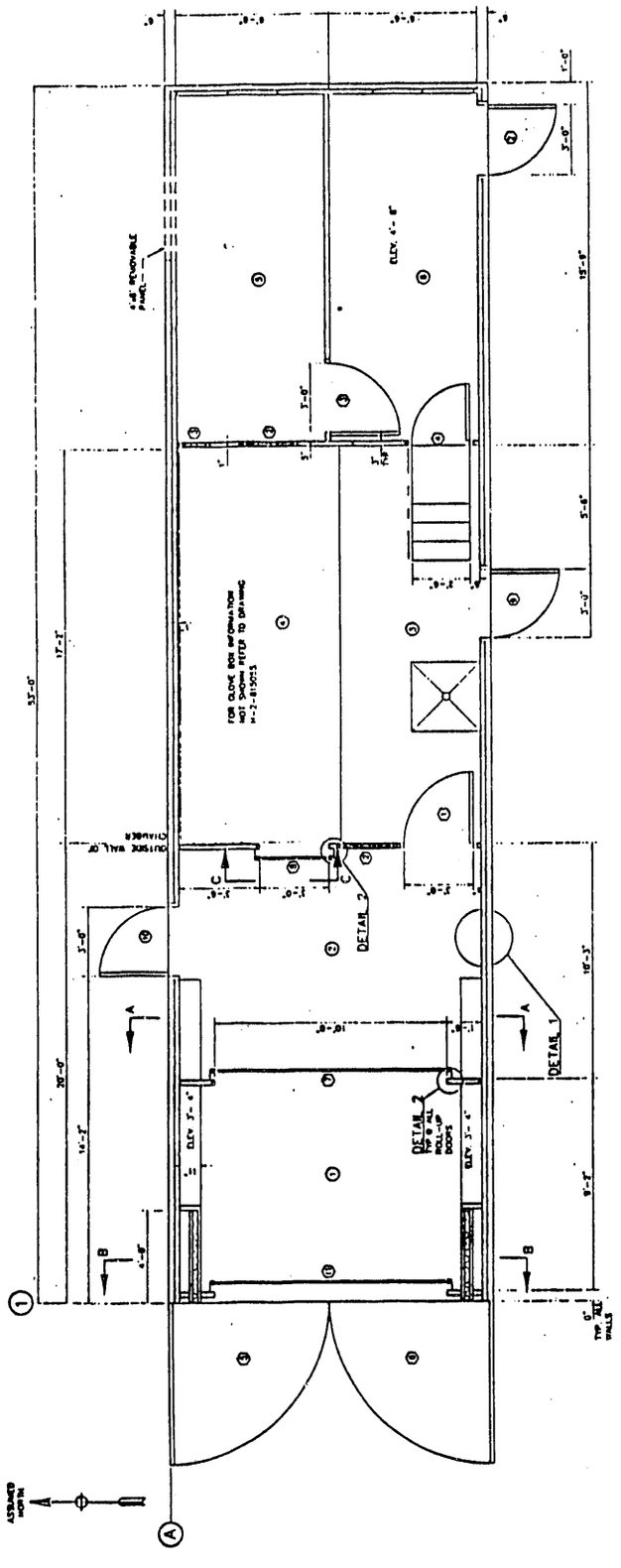
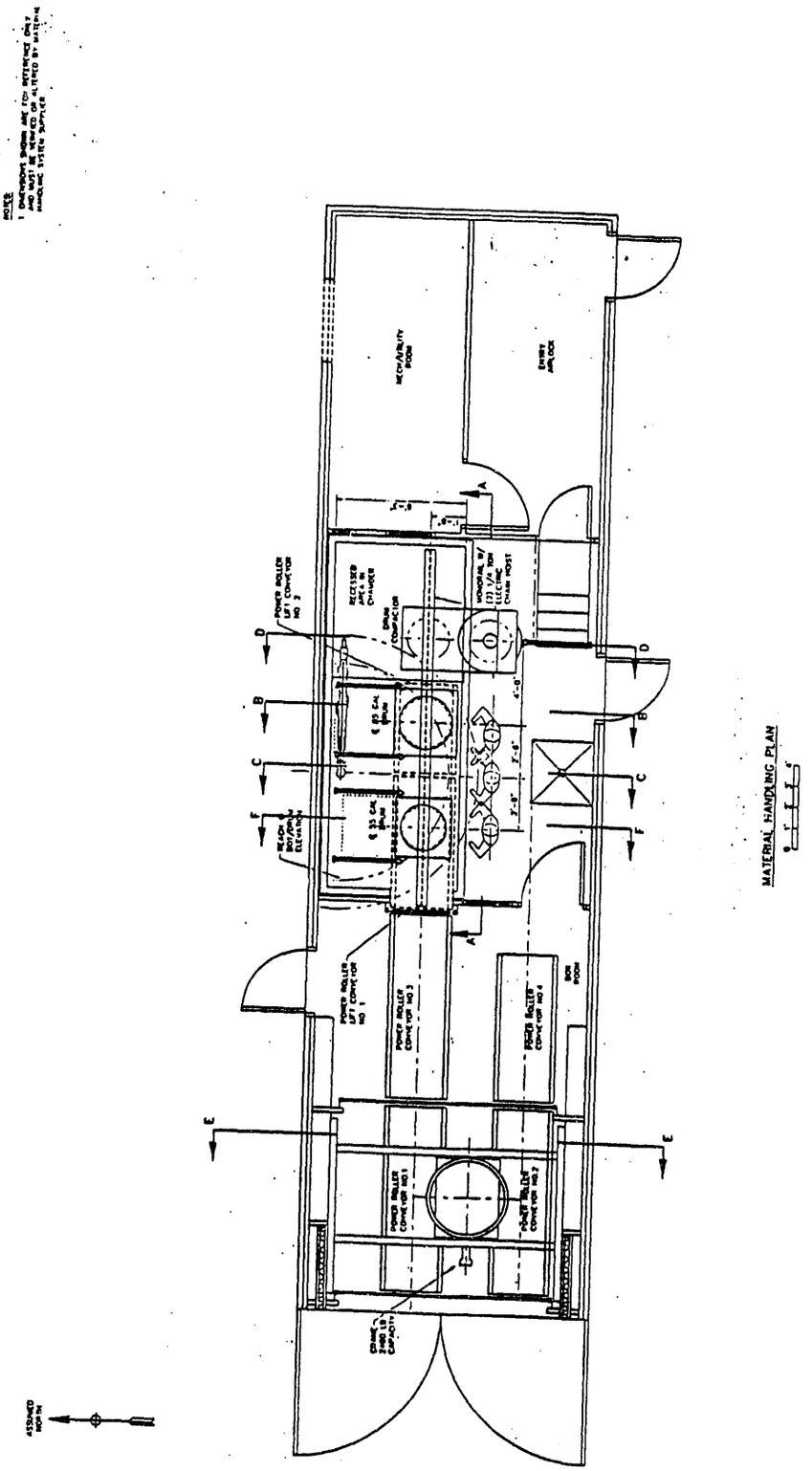
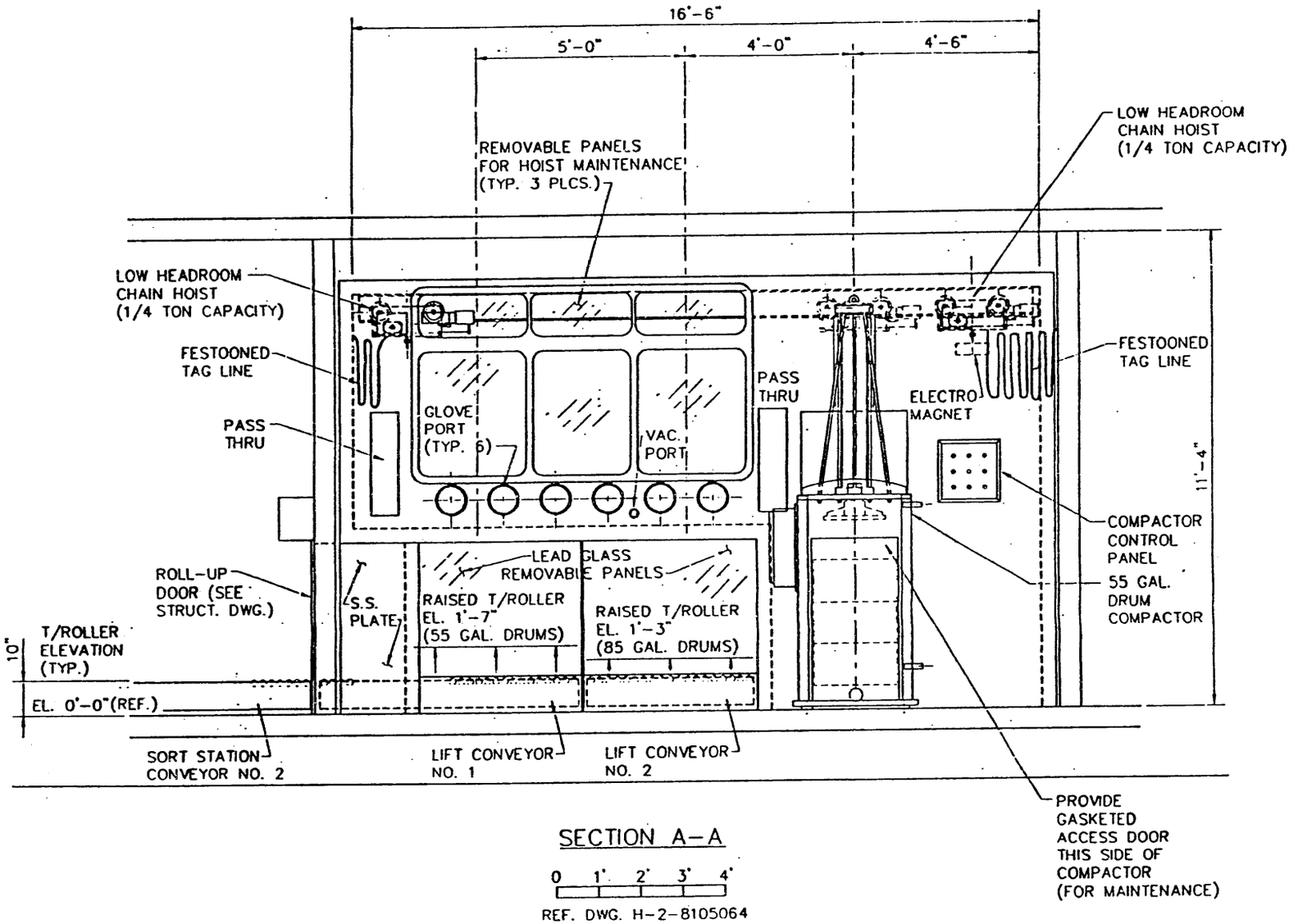


FIGURE 3. MATERIAL HANDLING PLAN.





SECTION A–A

0 1' 2' 3' 4'

REF. DWG. H-2-8105064

FIGURE 4. GLOVEBOX/CHAMBER.

VIDEO MONITORS AND RECORDERS

Closed-circuit television will be used to provide visual aids for operations personnel, including container entry/exit monitoring as well as recording of waste contents and container integrity. Video cameras are located in Areas 1, 2, and 4. Monitors are located at both control stations to aid in operations. Cameras can record activities in a designated area as required. The video disk will become a permanent record of the exact condition of each container processed in the IRU.

MATERIAL HANDLING

The IRU is designed to process 0.32 m^3 (85 gal) overpack drums (or any drum size smaller) and boxes including 1.2 m wide by 1.2 m high by 2.4 m long (4 ft by 4 ft by 8 ft) and smaller. The conveyors and hoists are capable of handling drums up to 2,000 lb and boxes up to 10,000 lb.

Two types of overhead cranes to assist with drum and box movement are located within the facility, one in the receiving area and the other in the glovebox chamber (see Figure 5). An overhead hoist, located in Area 1, will allow operations personnel to overpack drums or load drums directly onto the receiving area conveyor (see Figure 2). Two conveyor systems allow easy movement of containers into and out of the IRU by controls operated inside Area 3. The glovebox monorail and hoist has a 907-kg (2,000-lb) capacity and is located directly over the inspection and sorting table. A remote manipulator is also installed inside the chamber to allow hands-off sorting of waste materials. The manipulator has a lift capacity of 109 kg (240 lb) fully extended and 816 kg (1,800 lb) maximum.

WASTE PROCESSING

Boxes are placed onto the loading area conveyor by forklift. Operators inside the unit will use a control station and view the loading area on closed-circuit television. An airlock door is opened and the box conveyor moves the box into the operating area. Once inside the operating area the airlock door will close. The box can now be opened and all required sampling, inspecting, and repackaging activities can take place. When the inspection or sampling is complete, the lid will be replaced and the conveyor system will be reversed, allowing removal of the box.

Drums are loaded onto the drum conveyor system. An operator located at the control station in the operating area opens the airlock door and initiates entry into the operating area. The drum may be stopped when located in the operating area or moved directly into the glovebox loading area. Once the drum is located in this area it is raised into the drum port by a built-in conveyor lift system. After the drum is in the lift position an inflatable seal is energized, creating a seal. A drum port cover is removed from inside the glovebox and exposes the unopened drum. The drum ring and bolt is removed either by hand through glove ports or by using the manipulator. At this point, several actions may occur. Contents are moved out of the drum for close inspection. The interior of the steel drum can be examined for physical defects. Free liquids may be removed because they are prohibited in RMW packages. Samples, including core samples, may be taken using instruments located within the glovebox and removed through a sample port passthrough. Waste may be removed from a deteriorated or damaged drum and placed into a new drum by using the manipulator and/or glove ports. The damaged drum may be picked up and moved into position by the overhead monorail hoist and compacted in the drum compactor. The drum puck is removed by the manipulator and placed into an overpack located in the overpack drum port. Compacting the nonreusable empty drums will greatly reduce disposal volumes that may result from IRU operations.

Once drum operations are complete the drum lid is replaced, the drum port hatch is closed, and the seal is deflated. Then the operator initiates removal of the drum by lowering the conveyor and reversing the flow outward to the airlock. The door opens and closes to allow for quick movement out to the loading area. The drum is removed from the conveyor and placed onto a pallet then the next drum is loaded onto the conveyor and the process begins again.

SUMMARY

The IRU provides the capacity to properly manage RMW and transuranic waste containers as long as they are required to be stored at the Hanford Site. Content verification, sampling, liquid removal, repackaging, and overpacking operations can be conducted safely within the confines of the mobile IRU. Mobility will allow the facility to be placed at individual waste storage areas as required. Final design specifications are scheduled to be completed in February 1993. Fabrication is expected to take 6 to 8 months. The IRU is expected to undergo operational testing in November and December 1993 and will go into full operation in January 1994.

REFERENCES

ASME, 1989, *Quality Assurance Program Requirements for Nuclear Facilities*, ASME NQA-1-1989, American Society for Mechanical Engineers, New York, New York.

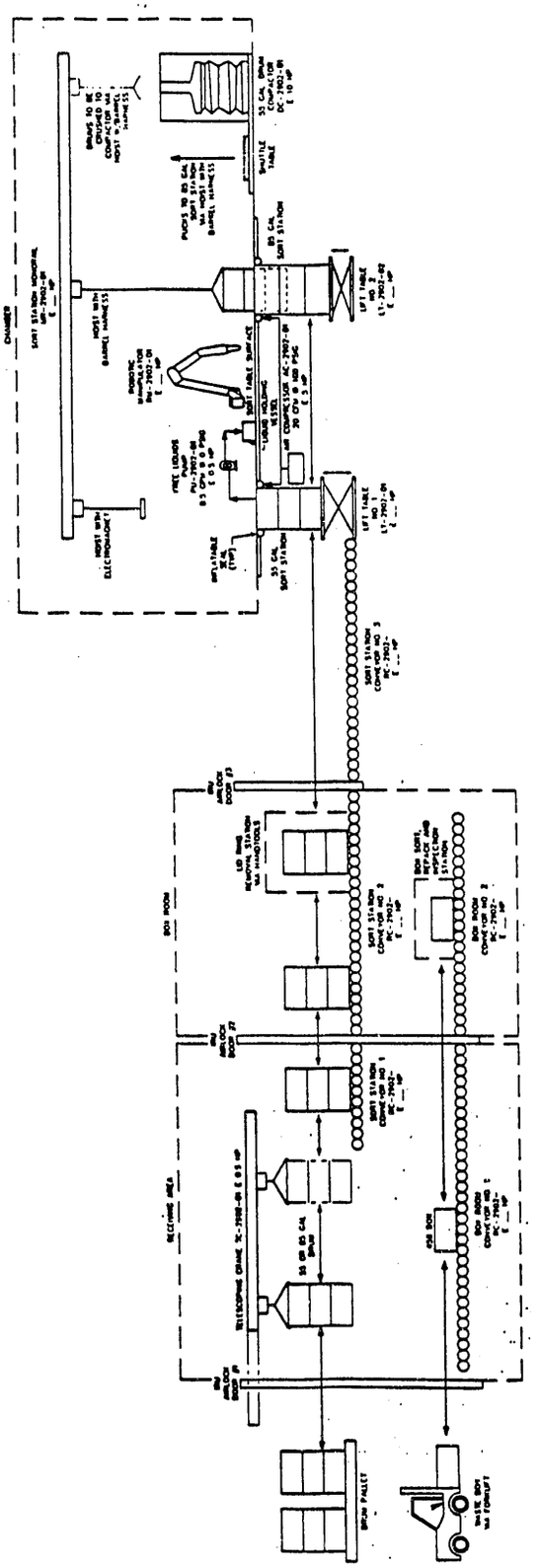
Atomic Energy Act of 1954, 42 USC 2011 et seq.

DOE, 1989, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

ERDA, 1975, *Final Environmental Impact Statement: Waste Management Operations, Hanford Reservation, Richland, Washington*, ERDA-1538, 2 vols, U.S. Energy Research and Development Administration, Washington, D.C.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

FIGURE 5. PROCESS FLOW DIAGRAM.



DISTRIBUTION

Number of copies		
ONSITE		
1	U.S. Department of Energy, Richland Field Office	
	R. F. Guercia	A5-21
24	Westinghouse Hanford Company	
	R. J. Giroir	N3-13
	W. H. Hamilton	N3-10
	W. G. Jasen (3)	N3-13
	M. M. McCarthy	N3-13
	J. G. Riddelle	H5-33
	R. J. Roberts	N3-13
	G. A. Whitney (13)	H5-33
	Information Release Administration	L8-07
	Document Processing and Distribution (2)	L8-15

DATE
FILMED
8/16/93
END