WCH-33
Rev. 0

River Corridor
Closure Contract

105-H Reactor Interim Safe Storage Project Final Report

October 2005

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

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ACRONYMS

CVP	cleanup verification package
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
Ecology	Washington State Department of Ecology
FSB	fuel storage basin
FY	fiscal year
ISS	interim safe storage
PCB	polychlorinated biphenyl
RESRAD	RESidual RADioactivity
RL	U.S. Department of Energy, Richland Operations Office
ROD	record of decision
S&M	surveillance and maintenance
SAP	sampling and analysis plan
SSE	safe storage enclosure
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 SCOPE

The following information documents the decontamination and decommissioning (D&D) of the 105-H Reactor facility and placement of the reactor core into interim safe storage (ISS). The D&D of the facility included characterization, engineering, removal of hazardous and radiologically contaminated materials, equipment removal, decontamination, demolition of the structure, and restoration of the site. The ISS work also included construction of the safe storage enclosure (SSE), which required the installation of a new roofing system, power and lighting, a remote monitoring system, and ventilation components.

2.0 FACILITY DESCRIPTION AND CONDITIONS

2.1 HISTORY

In 1942, the United States government commissioned the Hanford Site for the production of plutonium for use in weapons production. Between 1942 and 1955, eight water-cooled, graphite-moderated production reactors were constructed along the Columbia River in the 100 Areas of the Hanford Site. The 105-H Reactor facility is located in the 100-H Area of the Hanford Site, as shown in Figure 2-1. Construction of the 105-H Reactor was initiated in 1948. Initial startup of the reactor was achieved on October 29, 1949. The H Reactor was placed in final shutdown mode in April 1965. Until the start of the ISS Project, the 105-H Reactor had been in a condition of minimum surveillance and maintenance (S&M).

In the years following deactivation, several significant cleanup efforts were completed at the 105-H Reactor complex. More information on these activities can be found in a Hanford Site D&D summary report (WHC 1990):

- The 105-F and 105-H fuel storage basin (FSB) sediment was stabilized in place in 1970 with approximately 6 m (20 ft) of soil backfill and was left in place (UNI 1986b).
- In fiscal year 1983, the 116-H reactor exhaust stack and associated above-grade exhaust ducting was demolished (UNI 1986a).
- In 1984, the 117-H exhaust air filter building was demolished (WHC 1990).
- In 1986, the outside walls of the 107-H effluent water retention basin were demolished and buried within the basin (WHC 1990).

2.2 FACILITY DESCRIPTION

The 105-H Building was 111 by 91 by 37 m (363 by 298 by 120 ft) in height. An aerial photograph looking north is shown in Figure 2-2. The lower levels of the building and the central portions surrounding the reactor are constructed of reinforced concrete. A floor plan layout at ground level is shown in Figures 2-3 and 2-4. The massive reinforced-concrete walls surrounding the reactor are 0.9 to 1.5 m (3 to 5 ft) thick. The upper portion of the building and many of the at-grade ancillary rooms were steel framed, enclosed with either sheet metal or concrete masonry unit blocks. The existing roof panels were removed from the FSB, transfer bay, process area, C machine room, and D machine room in 1994 and replaced with steel decking, which was secured to the existing roof framing and concrete walls. The new steel roof decking was covered with sheetrock, polyurethane foam, and two applications of silicon rubber. A truss frame and sheet metal over roof was placed over top of the existing front-face roof during the same time period.

Figure 2-1. Hanford Site Map.

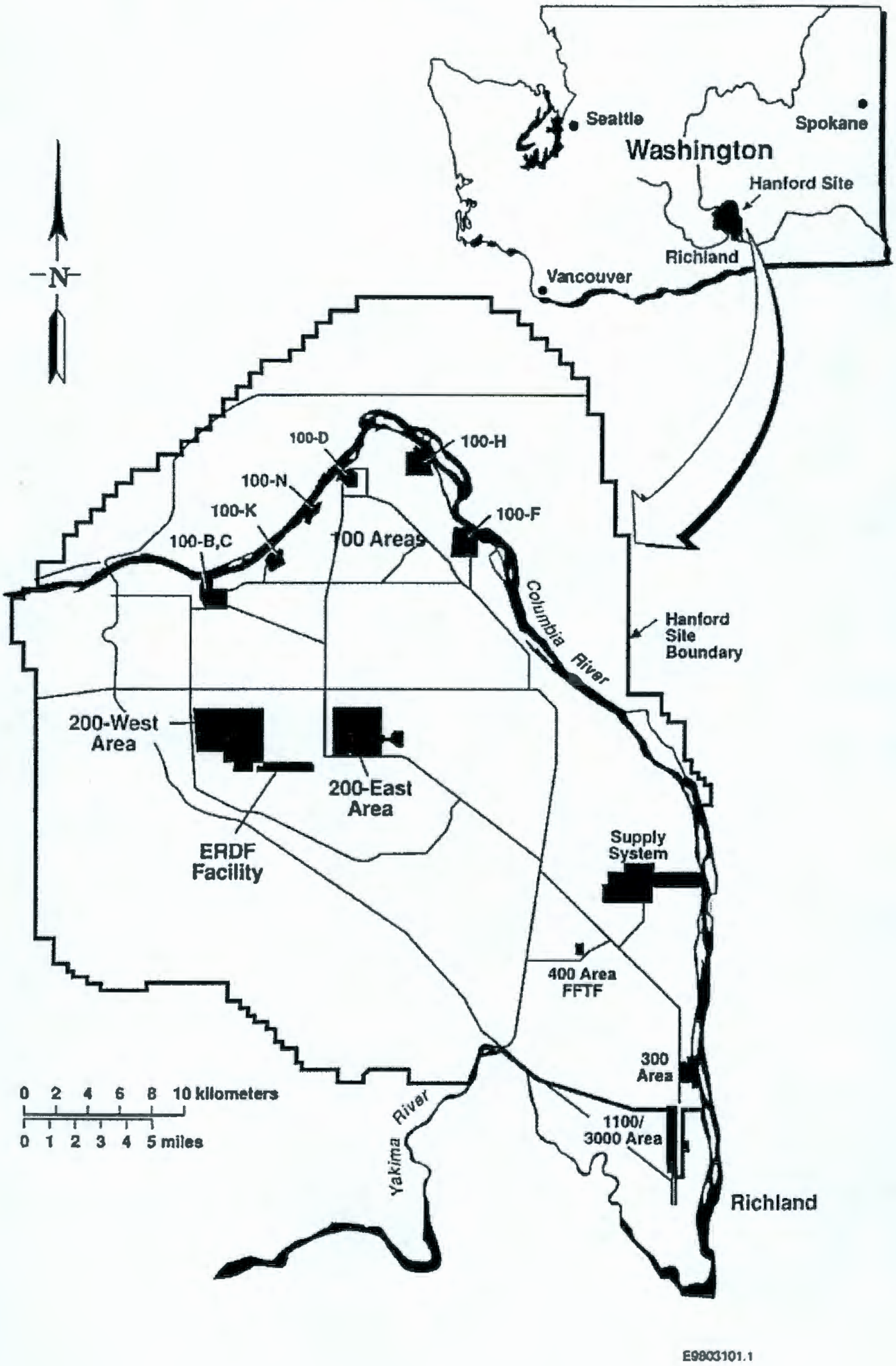


Figure 2-2. Pre-Decontamination and Decommissioning Aerial Photograph (Looking North).

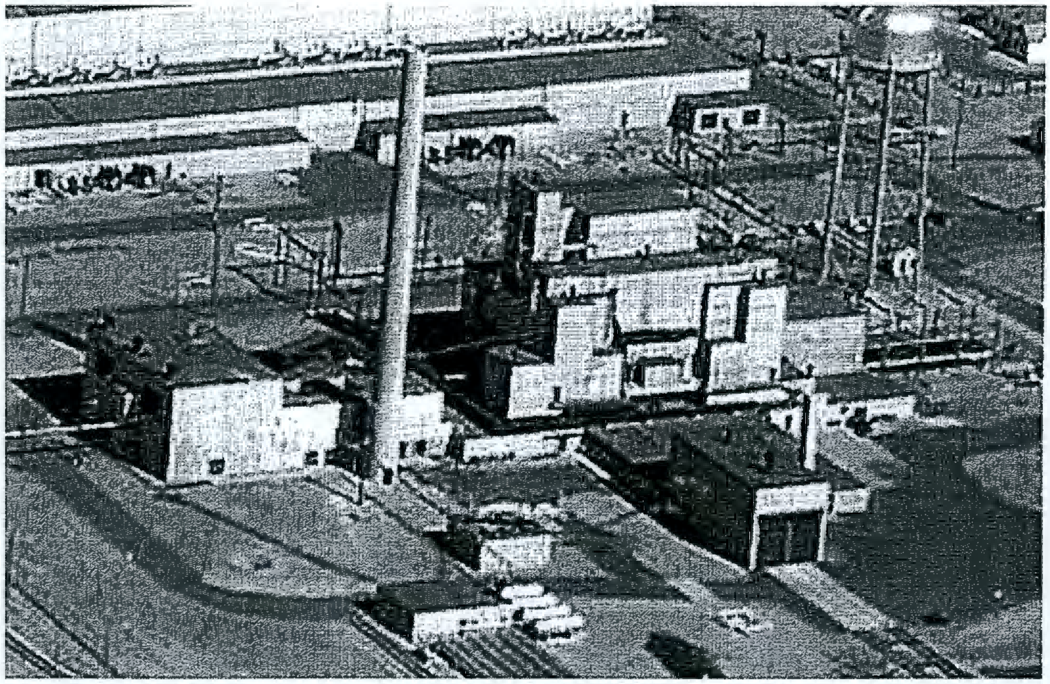


Figure 2-3. Pre-Demolition Floor Plan Layout at Ground Level.

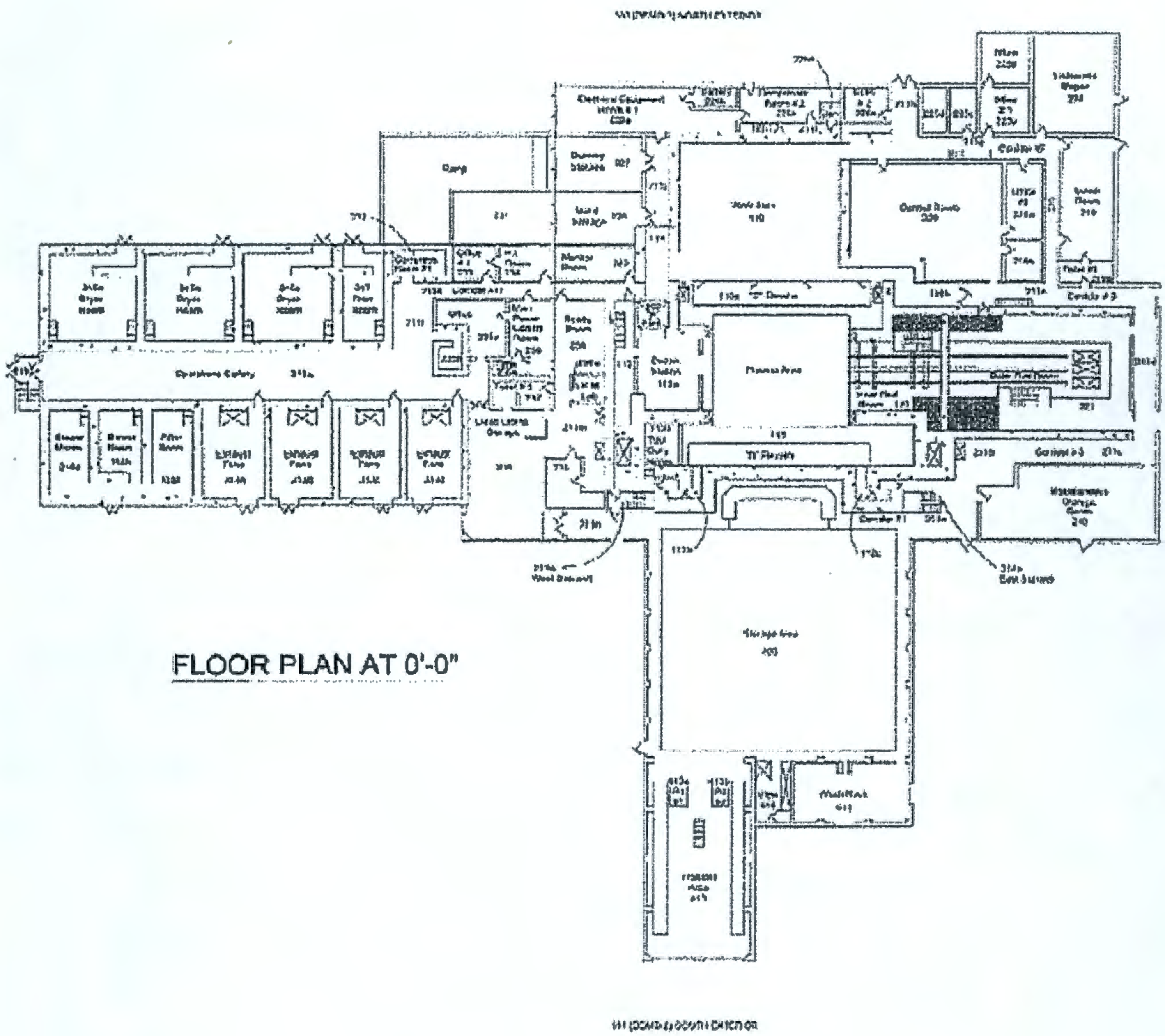
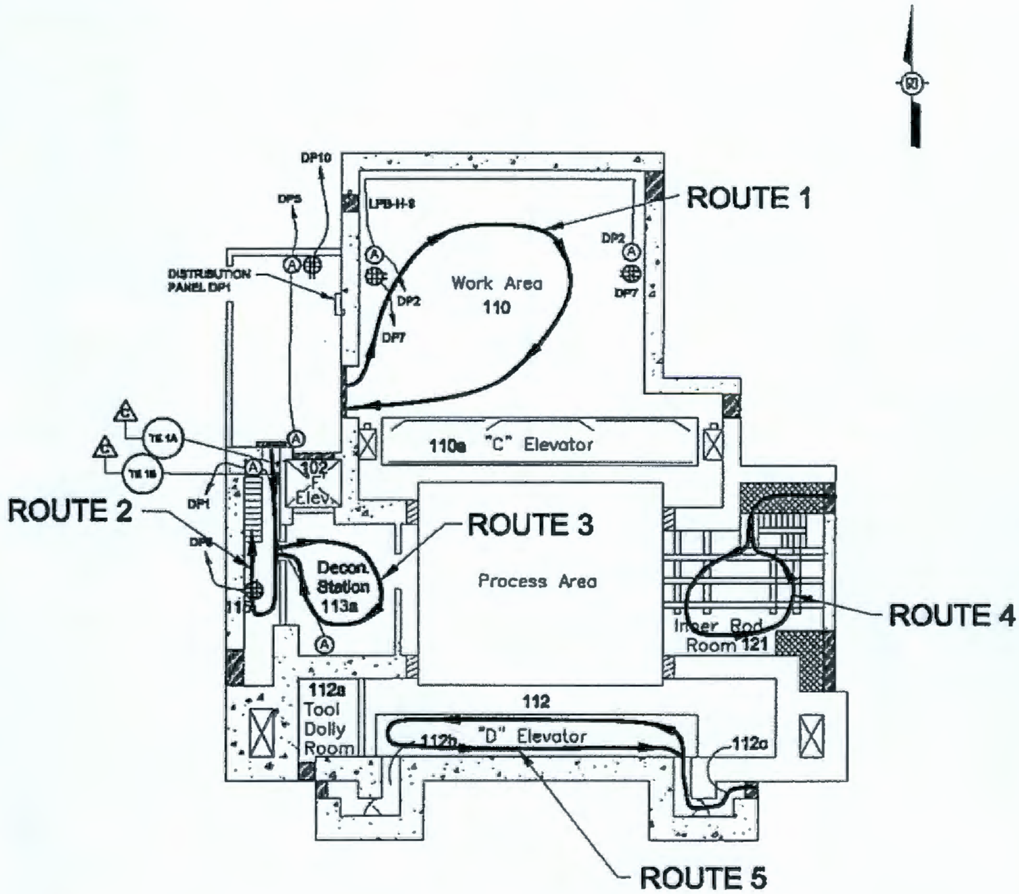


Figure 2-4. General Plan of 105-H Safe Storage Enclosure at Ground Level.



105 H
GRADE LEVEL
(ELEVATION 0'-0")

LIGHTING FIXTURE SCHEDULE			
TYPE	DESCRIPTION	REMARKS	SYMBOLS
A	METAL HALIDE FIXTURE, 120V, [illegible]W WALL MOUNT	APPLETON # [illegible] OR APPROVED EQUAL	Ⓐ
	RECEPTACLE, QUADRUPLEX, 120V, 20A		⊕

2.3 DECOMMISSIONING DECISIONS

After deactivation, the 105-H Reactor was in a condition of minimum S&M. Significant deterioration occurred, particularly in the roof sections over the front face, fan room and work area. Permanent decommissioning alternatives for the Hanford Site production reactors were assessed in the *Final Environmental Impact Statement, Decommissioning of the Eight Surplus Production Reactors at the Hanford Site* (DOE 1992). The "Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington" (ROD) was issued by the U.S. Department of Energy (DOE) (58 *Federal Register* 48509). The ROD alternative selected is to place the reactors into an ISS condition for up to 75 years. After ISS, the reactors would be transported in one piece to a specially prepared burial facility in the 200 West Area of the Hanford Site.

The 105-C Reactor was the first reactor to complete ISS in September 1998 (BHI 1998). The 105-D, 105-DR, 105-F, and 105-H Reactors were selected to be the next follow-on reactors to be placed in ISS, in order to reduce the costly burden of maintaining and cleaning up inventory of the aging reactors. The 105-DR, 105-F, and 105-D Reactors were placed in ISS in September 2002 (BHI 2003a), September 2003 (BHI 2003b), and September 2004 (BHI 2005), respectively.

The plan for ISS of the 105-H Reactor included removing all portions of the reactor facility outside of the reactor block shield walls. The areas removed include the FSB, outer rod room, control room, electrical room, switchgear room, lunch room, office space, fan supply and exhaust rooms, sample rooms, ready room, upper reactor framing and roofing, and other miscellaneous rooms and tunnels. The remaining portion of the reactor facility (the areas inside the concrete shield walls) is called the SSE, and the design and construction is discussed in detail in Section 8.0.

The planning process for the 105-H ISS Project was conducted jointly between the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the DOE, Richland Operations Office (RL). The up-front planning for the project allowed waste disposal to the Environmental Restoration Disposal Facility (ERDF) and streamlined the process for releasing DOE real property. The working relationships between DOE, EPA, and Ecology were greatly strengthened through open communication and cooperation in developing solutions to streamline the D&D planning process. The 105-H ISS Project was the fifth Hanford production reactor decommissioned under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* at the Hanford Site (which is a joint strategy between EPA and DOE). The *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989) was revised to include a section (Section 8) for the facility decommissioning process employed by the 105-H ISS Project, including milestones for the follow-on reactors.

3.0 ENGINEERING EVALUATION/COST ANALYSIS

The *Engineering Evaluation/Cost Analysis for the 105-H Reactor Facility and Ancillary Facilities* (DOE-RL 2000a) resulted in the recommendation to decontaminate and demolish the contaminated reactor buildings (except for the reactor blocks and shield walls) and the ancillary facilities, and to construct a SSE over the reactor. The recommendation was approved in the *Action Memorandum for the 105-D and 105-H Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, Washington* (Ecology et al. 2001), signed by Ecology, EPA, and DOE. The DOE is the agency responsible for implementing the removal actions in the 105-H Area. Ecology is the lead regulatory agency for facilities in the 100-H Area.

4.0 PROJECT ACTIVITIES

4.1 ENGINEERING AND PERMITS

The *Removal Action Work Plan for 105-D and 105-H Building Interim Safe Storage Projects and Ancillary Buildings* (DOE-RL 2000b) was prepared to satisfy the requirements in the action memorandum (Ecology et al. 2001), outlining how compliance with and enforcement of applicable regulations will be achieved for cleanup and ISS of the reactor building. Additionally, DOE-RL (2000b) serves as the decommissioning plan and project management plan for the 105-H ISS Project. The removal action work plan was prepared in accordance with Section 7.2.4 of the Tri-Party Agreement (Ecology et al. 1989) and approved by RL and the regulators.

The removal action work plan established the methods and activities to perform the following removal action functions:

- Modify the structure, as necessary, and construct an ISS enclosure for the 105-H Reactor building
- Remediate waste sites within the reactor footprint or provide for deferral to the remedial action waste disposal program (with approval from the lead regulatory agency)
- Manage and dispose of all waste generated during these actions.

The action memorandum (Ecology et al. 2001) specifies other deliverables that must be submitted by DOE to the lead regulatory agencies for review and approval. The removal action work plan (DOE-RL 2000b) describes the deliverables and provides a schedule for meeting the deliverables. The deliverables specified in the action memorandum and discussed in the removal action work plan include the following:

- Sampling and analysis plan (SAP) for waste and soil characterization and disposal (DOE-RL 2001)
- Treatment plans if treatment is necessary prior to waste disposal in the ERDF
- Verification SAPs for soil and below-grade structures (see Section 4.9)
- Cleanup verification package (CVP) (planned for completion in fiscal year [FY] 2006).

The intent of the removal action work plan (DOE-RL 2000b) is to identify the basis and provide guidance for preparation of work packages for the project tasks. Using the most recent information concerning facility conditions, field-level work packages were developed to direct work activities and instruct workers in the most applicable work methods.

The 105-H ISS and ancillary building project schedule, which encompasses the work scope through project completion, presents the logical progression of events and estimated durations for each activity.

The removal action objectives were as follows:

- To the extent practicable, reduce potential future releases of hazardous substances contained within facilities to acceptable protection levels established in applicable or relevant and appropriate requirements.
- Protect workers from the hazards posed by these facilities.
- Prevent adverse impact to cultural resources and threatened or endangered species.
- Safely manage (e.g., treat or dispose) waste streams generated by the removal action.
- Reduce or eliminate the need for future S&M activities.
- Place the 105-H Reactor Building into ISS.
- Coordinate with the Bechtel Hanford, Inc. (BHI) remedial action waste disposal program to address waste sites or activities that may interfere with the disposition of the 105-H Reactor building or ancillary facilities.

Prior to the ISS Project, the 105-H Reactor was under the control of the Surveillance/ Maintenance and Transition Projects group. The control of the building was temporarily assigned to D&D Projects to perform the ISS work. The *Memorandum of Understanding for Buildings 105-D and 105-H* (BHI 2000a) accomplished this change of control.

The *Ecological and Cultural Review of 105-D and 105-H Reactors (00-ER-017)* (BHI 2000b) was performed prior to mobilization at the 105-H Reactor site. The findings of the ecological review for the 105-H Reactor Building revealed five different individual bats roosting. Three were small-footed Myotis, one Yuma Myotis, one western pipistrelle, and one pallid bat. One dead little brown bat was found on the floor. The small-footed Myotis and Yuma Myotis are former federal candidate species. These two Myotis and the pallid bat are considered priority species by the Washington Department of Fish and Wildlife where they aggregate and form maternity colonies. No maternity colonies were found and workers within the building have not reported seeing any aggregation of bats. Artificial roost sites (e.g., bat houses) have been installed to provide suitable alternative roost sites. No other species of concern or impact to ecological resources were anticipated. Mitigation strategies were evaluated and implemented, as appropriate, throughout the duration of the project. No species of concern were identified either inside or in areas surrounding the 105-H Reactor Building.

Plant Forces work reviews were performed on the entire scope of work required to bring the 105-H Reactor into its final state of ISS. The Plant Forces work reviews are documented in BHI (2000c, 2003c).

The *Final Hazard Classification and Auditable Safety Analysis for the 105-H Facility Interim Safe Storage Project* (BHI 2004) summarizes the inventories of radioactive and hazardous materials present within the 105-H Reactor. BHI (2004) also documents the operations associated with the ISS Project, which include decontamination, demolition, and construction of the SSE. This document also identifies accident scenarios, performs a bounding evaluation of the potentially significant accident scenario consequences, and establishes a hazard classification based on the bounding consequence evaluation. The result of the evaluation is that the final hazard classification for the 105-H ISS Project is "radiological."

4.2 MOBILIZATION

Site mobilization activities in support of pre-demolition housecleaning, asbestos and hazardous material removal, and liquid pipe checks were initiated in April 2000 (FY 2000). Initial activities consisted of setting up the field support and radiological control technician lunch trailers and the associated electrical and telephone systems. Parking areas were graded and graveled for the workers, which completed mobilization activities outside the reactor fence.

Inside the fence, MODEC trailers and water trailers were set up for the asbestos workers, and numerous trailers were set up for D&D equipment and supplies. The final step in mobilization was to utilize the temporary power and lighting system marked as "In Service," which was previously installed by the Bechtel Hanford, Inc. Surveillance/Maintenance and Transition Projects.

Electrical isolation was ensured by visual inspection of the temporary power and lighting system to ensure that no old feeds to the original AC power distribution system backfeeds remained.

4.3 HAZARDOUS MATERIAL REMOVAL

The scope of the demolition project included removing and properly disposing flammable and hazardous materials (e.g., oils, grease, asbestos-containing material, mercury, lead, and polychlorinated biphenyls [PCBs]). All known flammable and hazardous material was removed inside and outside of the SSE, with the exception of nonremovable lead (as discussed below). All of the removed material was typically removed prior to heavy equipment demolition, with the exception of the lead joints in bell and spigot piping and a few heavy pieces of lead-encased equipment (which was carefully removed during demolition).

4.3.1 Asbestos (Excluding Transite)

Asbestos monitoring was performed in support of asbestos removal activities. Removal work activities included the use of glovebags, a cut-and-wrap technique, and negative-pressure enclosures. Applicable areas were sprayed with lock-down after the asbestos work. An asbestos clearance sampling and inspection program was implemented to release each area from asbestos concerns following the asbestos abatement in each area. Approximately 25 m^3 (882 ft^3) of asbestos insulation was removed.

The ISS Project identified three locations for asbestos insulation that are not practical to remove. The approximate locations are as follows:

- Piping insulation — Behind small plate located on the west wall at elevation 18', 6', north of the southwest corner
- Piping insulation — Behind small plate located on the west wall at elevation 13', 5' north of the southwest corner
- Piping insulation — Behind small plate located on the east wall at elevation 18', 6' north of the southeast corner.

4.3.2 Transite (Cement Asbestos Board)

There were double transite panels in most of the interior rooms. Many panels were radiologically released and disposed off site. Radiologically contaminated transite was shipped to the ERDF for disposal.

4.3.3 Lead

Lead-based paint was originally used throughout the facility, but resultant concentrations were determined to be below regulatory limits. The majority of lead encountered during D&D was in the form of bricks; however, lead was encountered in additional forms, as follows:

- Sheet material
- Small lead balls
- Lead poured around piping and p-traps
- Lead poured into interior cavities of equipment (e.g., turrets)
- Lead joints from bell and spigot drain piping
- Light bulbs.

Appendix G of the *Radionuclide Inventory and Source Terms for the Production Reactors at Hanford* (UNI 1987) provided a list of the lead inventory at the 105-H Reactor. The ISS Project could not remove lead from inside the reactor block (72,575 kg [160,000 lb]). In addition, the ISS Project identified two lead items as components that are not practical to remove. The locations and estimated weights are as follows:

- Horizontal control rod shielding — 42,638 kg (94,000 lb) (attached to the inner rod room east wall)

- Vertical rod tip shield block 11,340 kg (25,000 lb) (not practical to remove).

146 metric tons (161 tons) of lead was inventoried. During D&D, 19.5 metric tons (21.5 tons) of lead was removed from the reactor building. All lead was macroencapsulated at the ERDF.

4.3.4 Mercury

Mercury was found in numerous switches, manometers, and instruments. All mercury was sent to the ERDF for treatment and disposal.

4.3.5 Polychlorinated Biphenyls

No regulated quantities of PCBs were found in any of the grease or oil. The main transformer was the property of the Hanford Utility Group, who handled its disposal. Light ballasts and some applied dried paints were the only PCB waste stream requiring 105-H ISS Project disposal.

4.4 EQUIPMENT REMOVAL

Some of the major equipment removed during the ISS Project is listed in Table 4-1.

Table 4-1. Major Equipment Removed During the Interim Safe Storage Project. (2 Pages)

Description	Location
45 vertical safety rod drives	Upper reactor
Vertical safety rod drive crane	Upper reactor
D (rear-face) elevator drive equipment	Upper reactor
C (front-face) elevator drive equipment	Upper reactor
D elevator counterweights	East and west side exterior of SSE
Horizontal control rod drives and cooling equipment	Outer rod room
Control room equipment	Control room
Leak detection turrets	Sample rooms
Fan equipment	Fan supply and exhaust rooms
Fuel loading equipment	Metal storage room
Heat exchanger	Valve pit
Cask crane	Transfer bay
Compressor	Compressor room
Vacuum receiver	Vacuum system room

Table 4-1. Major Equipment Removed During the Interim Safe Storage Project. (2 Pages)

Description	Location
Gas piping	Gas tunnel 13
Water supply piping	North and south water tunnels
Electrical equipment	Upper electrical room
Switchgear equipment	Switchgear room

SSE = safe storage enclosure

The reactor block was disturbed as little as possible.

- During initial deactivation in 1965, the 15 horizontal control rods and the 45 vertical safety rods were placed in the "full-in" position into the reactor (GE 1965). The ISS Project did not touch the rods, but their drive shafts and cables were disconnected and removed.
- Also during deactivation, all 2,004 process tubes were emptied and a "plastic noodle" was placed through the tube to verify that the tube was empty (GE 1965). The ISS Project did not remove any process tube caps on the front or rear face.
- The ball-hoppers in the Ball 3X system are full of boron-steel balls. The Ball 3X system was left intact, and each of the 45 hoppers contains about 420 kg (925 lb) of balls.
- Concrete pourbacks (61 cm [24 in.] thick) were placed in the gas tunnel, in line with the remainder of the SSE shield wall. Thus, the gas tunnel piping was severed inside of this pourback.

4.5 DEMOLITION OF ABOVE-GRADE STRUCTURES

After the hazardous materials and isolations were performed (as discussed in Sections 4.2 and 4.3), the above-grade structures were ready for demolition (Figure 4-1). Demolition was performed based on whether the areas were relatively radiologically "clean" or contaminated.

Many areas of the reactor (e.g., fan supply room, office spaces, control room, and electrical room) had very little radiological contamination.

For the areas of the building to be demolished, it was not cost effective or safe to decontaminate entirely. The major portion of the loose contamination was removed, and a fixative was applied as required.

The building structure was demolished using excavator-mounted hydraulic shears and a hoe-ram. The debris was segregated for disposal or salvage.

Figure 4-1. Photographs Showing Exhaust Fan Room and Exhaust Tunnels Demolition in Progress.

The original footprint area of the reactor building was approximately 6,934 m^2 (74,640 ft^2). The final footprint area of the SSE is 1,387 m^2 (14,928 ft^2) (see Figures 2-3 and 2-4). Thus, the footprint area of the reactor was reduced by 80%. To avoid confusion, the footprint area is strictly the at-grade area and does not include the square footage of any above-grade rooms (e.g., sample rooms, ready room, upper electrical room, or exhaust plenums) or below-grade rooms/tunnels.

The front- and rear-face elevators were secured in place by shimming and/or blocking so the elevator floor could serve as a working platform to access the front and rear faces of the reactor block. The rear-face elevator is part of the path for performing surveillance.

4.6 UTILITY AND DRAIN ISOLATION

4.6.1 Electrical System

The power supply to the entire reactor complex utilized the in-service system during the ISS Project.

4.6.2 Water Systems

All Hanford Site water supply lines have been isolated to the 105-H Reactor SSE. The two fire hydrants east and west of the 105-D Reactor fenced in site remain active.

4.6.3 Equipment and Floor Drains

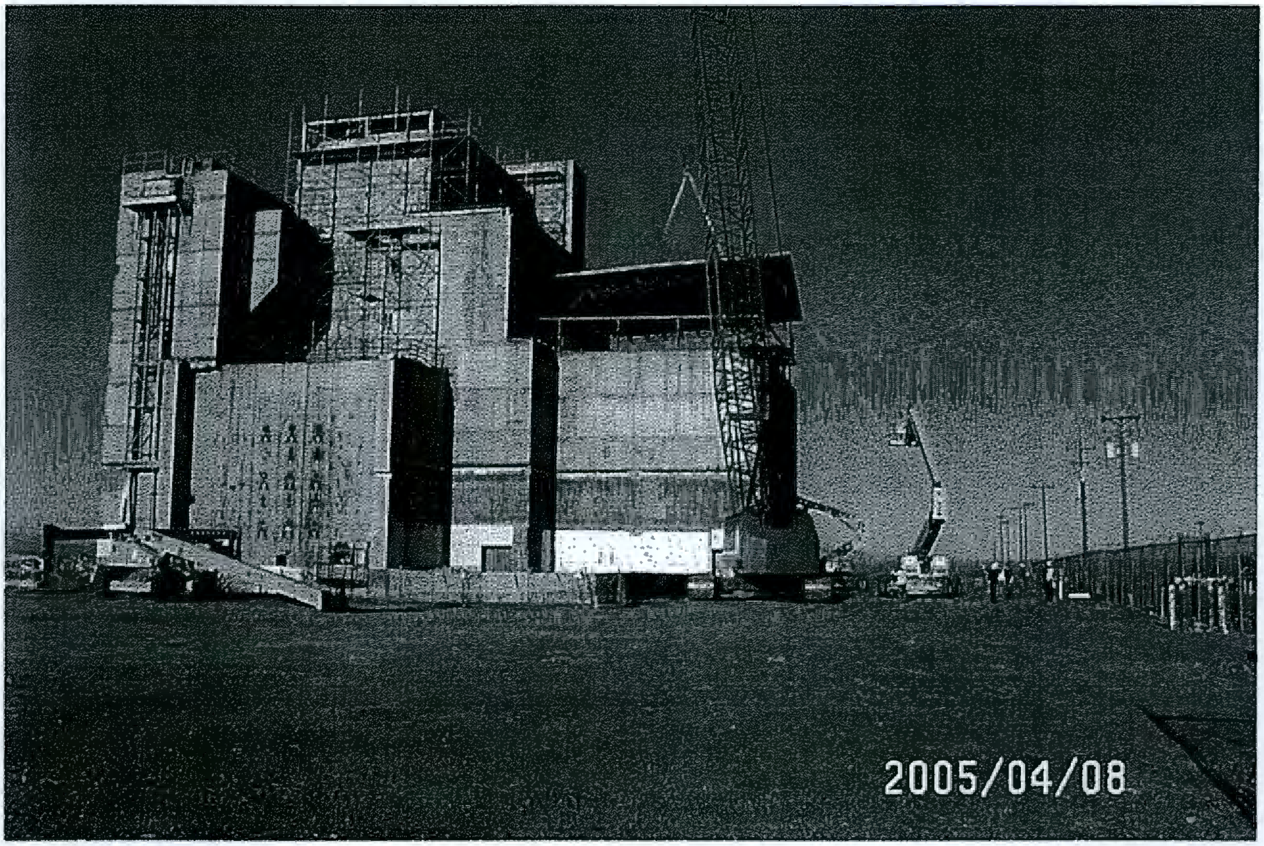
All operations at the 105-H Reactor have been shut down since April 1965, and the liquids have been flushed and drained to the extent possible as part of the shutdown and deactivation process. Liquid pipe checks have been performed at low points of the piping systems to ensure that no liquids remain. Contaminated piping systems (e.g., the gas piping and process effluent piping) remaining in the facility have been sealed as part of the SSE modifications.

In the past, floors were drained to the 1608-H lift station. Floor drains were checked for liquid and mercury, and the floor drains have been sealed to provide isolation. There were no sanitary sewers inside the SSE.

4.7 SAFE STORAGE ENCLOSURE DEMOLITION

Demolition work on the reactor complex was divided between Plant Forces and the SSE subcontractor in accordance with the requirements of Plant Forces Work Reviews 8850-030-00 and 8850-001-04 (BHI 2000c, 2003c). The SSE subcontractor performed structural demolition on the portions of the reactor complex inside the SSE concrete shield walls. This structure was mainly composed of several levels of steel framing, with concrete masonry unit block walls (Figure 4-2). The SSE subcontractor also removed any large equipment required to place the reactor block into its final SSE configuration. Thus, the SSE subcontractor removed all of the upper reactor equipment listed in Section 4.5.

Figure 4-2. Photograph Showing Upper Reactor Roof Demolition in Progress.



After the elevators were shimmed into place by Plant Forces (see Section 4.6), upper drive units and synchronizing shafts were disconnected and removed. It was not safe to remove the front-face elevator (C elevator) counterweights; therefore, the weights, chains, and cables were lowered to the bottom of their shafts.

4.8 BELOW-GRADE VERIFICATION SURVEYING AND SAMPLING

The goal of the data quality objective (DQO) process was to establish the sampling and analysis design strategy to support decontamination and closeout decisions. The historical information for the 105-H Reactor explains the mechanism by which the below-grade structures and the underlying soils were contaminated, what contamination can be documented, which constituents are eliminated from further consideration, and which constituents are the subject of the sampling and analysis design. This process, along with the closeout criteria and procedures, is documented in the *Data Quality Objectives Summary Report for Interim Closure of D and H Reactor Below-Grade Structures and Soils* (BHI 2001a).

Using the DQO summary report as the basis, DOE-RL (2001) was developed to present the rationale and strategies for the sampling, field measurements, and analyses of the below-grade concrete and soil. The regulators (i.e., EPA and Ecology) were instrumental in helping RL and the Environmental Restoration Contractor team develop the SAP. The significant aspects of the SAP include the following:

- Shallow- and deep-zone distinctions for both structures and soil
- The applicable or relevant and appropriate requirements are consistent with the 100 Area ROD (EPA 1999) (15 mrem/yr above background, and the "Model Toxics Control Act—Cleanup" [*Washington Administrative Code* 173-340] for residual contamination levels in structures and soils).

For the actual implementation of the SAP, the *Instruction Guide for Verification Sampling of the 105-D and 105-H Reactor Below-Grade Structures* (BHI 2001b) was developed to provide a clear, concise set of instructions to radiological survey personnel and samplers in the field.

The survey results and sample analysis results are subjected to a data quality assessment to verify that the objectives of the DQO have been satisfied. The data will then be used in the RESidual RADioactivity (RESRAD) dose model and RESRAD-BUILD computer model to verify that cleanup criteria are satisfied. A brief summary of the data and the analysis results will be included in a CVP that is planned for FY 2006. The CVP is a brief report that summarizes and compares the results against the cleanup criteria.

4.9 BELOW-GRADE DEMOLITION

The entirety of the below-grade portion of the facility outside the SSE was completely demolished. All below-grade areas were backfilled to eliminate future subsidence.

4.10 INTERFACE AT THE 105-D WATER TUNNELS

As part of the 105-H Reactor below-grade demolition, a portion of the remaining section of water tunnel piping and conduit running from 190-H to 105-H was removed (most had previously been demolished with 190-H). The piping and tunnel was removed from the reactor SSE walls to the point where further removal would have undermined the 105-H fence and power lines. Prior to demolition of the below-grade structures, the Remedial Action Project had removed the effluent pipe up to the FSB. The remainder of the pipe was removed during demolition of the FSB.

4.11 SITE RESTORATION

Upon completion of the demolition activities, the area was backfilled to grade with soil/ aggregate and graded to match the surrounding terrain. The backfill was obtained from pit 21, the 100-D Area borrow pit.

4.12 INTERFACE WITH SURVEILLANCE AND MAINTENANCE

During the ISS Project, the 105-H Reactor was temporarily under the control of the D&D Projects to perform the ISS work (BHI 2000a). To document completion of the end-point criteria and to return the 105-H facility to S&M status, the *Turnover Package for the 105-H Reactor Safe Storage Enclosure* (WCH 2005) was sent from the Reactor Interim Safe Storage Closure Project Director to the D4 Project Director.

The *Surveillance and Maintenance Plan for the 105-H Reactor Safe Storage Enclosure* (DOE-RL 2005) was developed as one of the end-point criteria. The S&M Project has estimated that its cost will be $5,000 per year for yearly radiological surveys and tumbleweed removal. Every fifth year, the S&M cost will be $41,000 in order to perform surveillance inside of the SSE. The decreased S&M costs for the SSE result in an average annual savings of $190,000 per year (this value excludes any major costs, such as the major roof repair that would have been required).

4.13 DEMOBILIZATION

Two decontamination pads remain to be removed at the time this document was being drafted. This work has been added to FY 2006 scheduled work.

5.0 COST AND SCHEDULE

5.1 SCHEDULE

Some key dates for the 105-H ISS Project include the following:

• Trailer mobilization initiated	April 2000
• Initiated D Reactor characterization and design	April 2000
• D&D work started	November 2000
• Regulator SAP approval	July 2001
• Initiated structure demolition	December 2001
• Awarded SSE subcontract	May 2004
• Completed SSE roof	October 2005
• ISS work completed	October 2005
• S&M plan	August 2005
• 105-H returned to S&M status	October 2005.

5.2 COST

The total ISS Project cost of $28,714K (exclusive of the 1997 characterization task) is summarized by FY. The tasks associated with each FY are briefly described in Section 5.1.

FY 1998	$0K
FY 1999	$0K
FY 2000	$338K
FY 2001	$2,228K
FY 2002	$3,464K
FY 2003	$6,447K
FY 2004	$10,207K
FY 2005	$6,030K
	$28,714K

The SSE subcontractor's costs associated with FY 2004, 2005, and 2006 are summarized below:
Note: the costs for October 2005 are included in FY 2005.

FY 2004	$175K
FY 2005	$3,364K
	$3,539K

6.0 RECYCLED MATERIAL AND WASTE DISPOSAL

One of the objectives of the 105-H Reactor ISS Project was to support recycling and waste minimization.

6.1 RECYCLING AND WASTE MINIMIZATION

Materials listed in Table 6-1 were recycled during the 105-H Reactor ISS Project.

Table 6-1. 105-H Area Recycle/Redistribution Log.

Description of Material	Amount	Date	Vendor
Fluorescent tubes – 100H-00-0207	304 tubes (1,332 lin ft)	09/27/2001	CCRC
Contaminated water from the 105-H Fuel Storage Basin	26,000 gal	12/13/2001 – 12/31/2001	ETF
Contaminated water from the 105-H Fuel Storage Basin	50,000 gal	01/01/2002 – 02/26/2002	ETF
Misc. scrap steel (electrical panels, copper, etc.)	13,360 lb	03/04/2002	Pacific
Misc. scrap steel (electrical panels, copper, etc.)	12,280 lb	03/05/2002	Pacific
Contaminated water from the 105-H Fuel Storage Basin	63,500 gal	07/29/2002 – 08/20/2002	ETF
Alkaline batteries – 100H-01-0052 various AA, AAA, and D cells	85 lb	09/05/2002	CCRC
Contaminated water from the 105-H Fuel Storage Basin	9,000 gal	08/20/2002 – 09/06/2002	N/A – reused for dust suppression
Contaminated water from the 105-H Fuel Storage Basin	1,000 gal	01/23/2003	ETF
Contaminated water from the 105-H Fuel Storage Basin	4,500 gal	01/28/2003	ETF
Contaminated water from the 105-H Fuel Storage Basin	4,500 gal	01/29/2003	ETF
Contaminated water from the 105-H Fuel Storage Basin	4,500 gal	01/30/2003	ETF
Mercury switches and thermometers	1 kg	03/06/2003	CCRC
Alkaline batteries – 100H-03-0012 various AA, AAA, and D cells	114 lb	10/27/2004	CCRC
Alkaline batteries – 100H-01-0052 various AA, AAA, and D cells	94 lb	10/27/2004	CCRC

CCRC = Centralized Consolidated Recycling Center
ETF = Effluent Treatment Center
N/A = not applicable

6.2 WASTE DISPOSAL

Waste disposed, transferred, or recycled from the 105-H Reactor ISS Project included the following:

- Approximately 4,863 bulk containers of low-level debris were shipped to ERDF, accounting for approximately 73,966 metric tons (813,65 tons) (about 15,210 kg [33,463 lb] average per container).
- 22.8 metric tons (25 tons) of asbestos tiles, lagging, and transite was disposed to the ERDF.
- 341 L (90 gal) of mixed (radioactive and dangerous) waste oil was sent to the Central Waste Complex.
- More than 19,529 kg (43,056 lb) of lead (primarily shot, sheets, and bricks) was macroencapsulated at ERDF.
- More than 658 kg (1450 lb) of PCB ballasts was shipped to the ERDF.

7.0 OCCUPATIONAL EXPOSURES

7.1 PERSONNEL INJURIES

There were zero lost workdays and zero Occupational Safety and Health Administration recordable cases during the ISS subcontract. The Plant Forces personnel injury information for the work prior to the ISS subcontract is unavailable.

7.2 PERSONNEL RADIOLOGICAL EXPOSURES

There was one clothing contamination of a worker's boot and no skin contaminations during demolition of the ancillary sections of the 105-H Reactor by Plant Forces. There were no clothing contamination or skin contamination events during construction of the SSE roof by subcontractor work forces.

The total combined dose of all 105-H Reactor personnel was approximately 1,535.8 person-mrem for the entire project duration. The majority of the dose was received during basin cleanout activities.

8.0 SAFE STORAGE ENCLOSURE

The Hanford Site's 105-H Reactor was chosen as the fifth reactor to be placed into long-term safe storage (Figures 8-1 through 8-3) due to advanced deterioration on roof sections of the reactor building that would require major maintenance expenditure. The primary objective of the 105-H Reactor ISS Project is to provide storage up to 75 years, with minimal maintenance required. Design objectives are summarized as follows:

- Safe storage for up to 75 years.
- No credible releases of radionuclides to the environment under normal design conditions.
- Interim inspection required only on a 5-year frequency. Further evaluation for extending this frequency will be performed by the project group upon completion of the first 5-year surveillance.
- SSE configuration will not preclude or significantly increase the cost of any final decommissioning alternative.

8.1 ROOF

After the upper reactor demolition was completed, new structural steel was combined with the remaining existing structural steel and attached to the top of the concrete shield walls with undercut anchor bolts to form the SSE framework. Galvalum-coated steel roofing (22 gauge) and siding (22 gauge) was then attached to the framework. Galvalum (also referred to as 55% Al-Zn) is a coating that contains 55% aluminum and 45% zinc. The excellent corrosion resistance of galvalum is achieved by combining the barrier protection of an aluminum coating with the galvanic protection of a zinc coating. Refer to Section 10.1 for structural concrete, steel, and roofing/siding drawings.

8.2 ELECTRICAL SYSTEM

Electrical power for the SSE facility is 120/240 VAC, 1 phase, and is supplied from a 13.8kV overhead line. From a pole-mounted 13.8kV/120V/240V transformer, the power cables are connected to a disconnection switch (DS-1). DS-1 feeds a distribution panel (DP-1) located inside the SSE utility room. DP-1 provides power for lighting, power receptacles, and the instrumentation system. Backup power capability to these loads is not provided. Refer to Section 10.2 for power and lighting drawings.

The 105-H SSE has permanent lighting installed along the surveillance route located on the lower level, grade, and upper levels and stairwells. In the interest of safety, all facility personnel and visitors must carry a spare light source that will be used for egress if the lighting system should fail during entry.

Figure 8-1. Photograph of Completed Safe Storage Enclosure (Looking East).

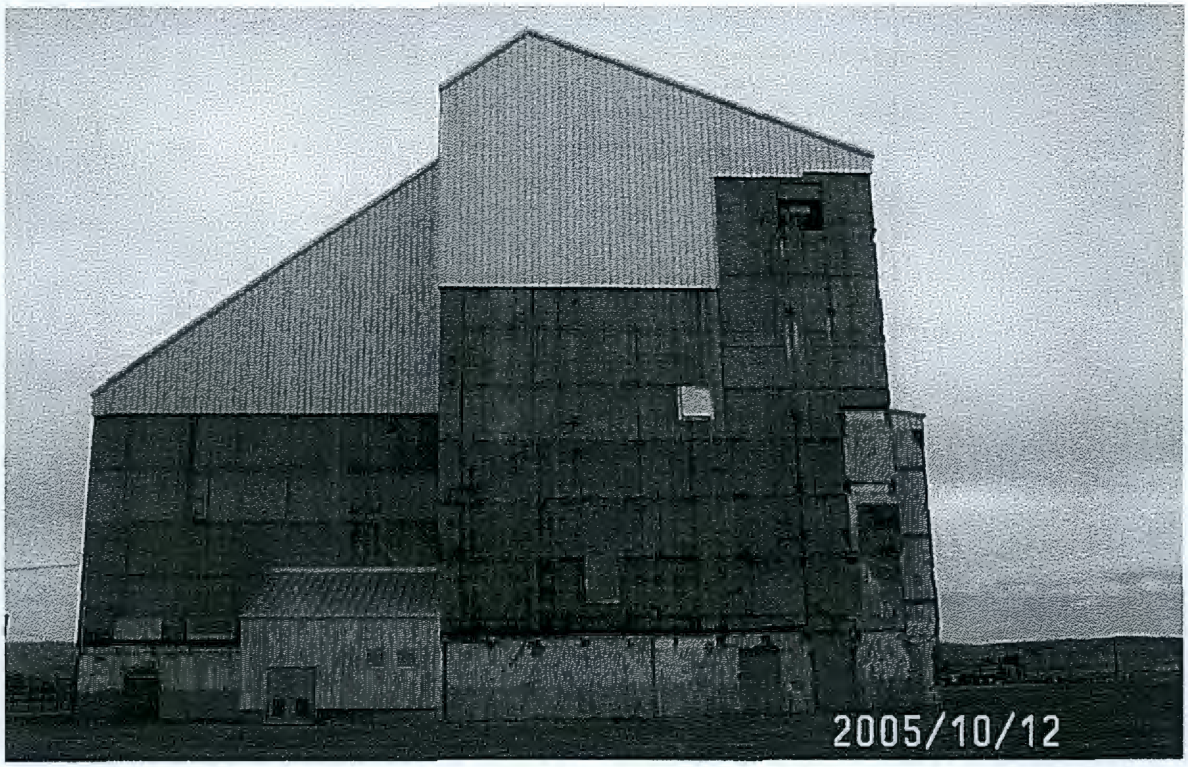


Figure 8-2. Photograph of Completed Safe Storage Enclosure (Looking West).

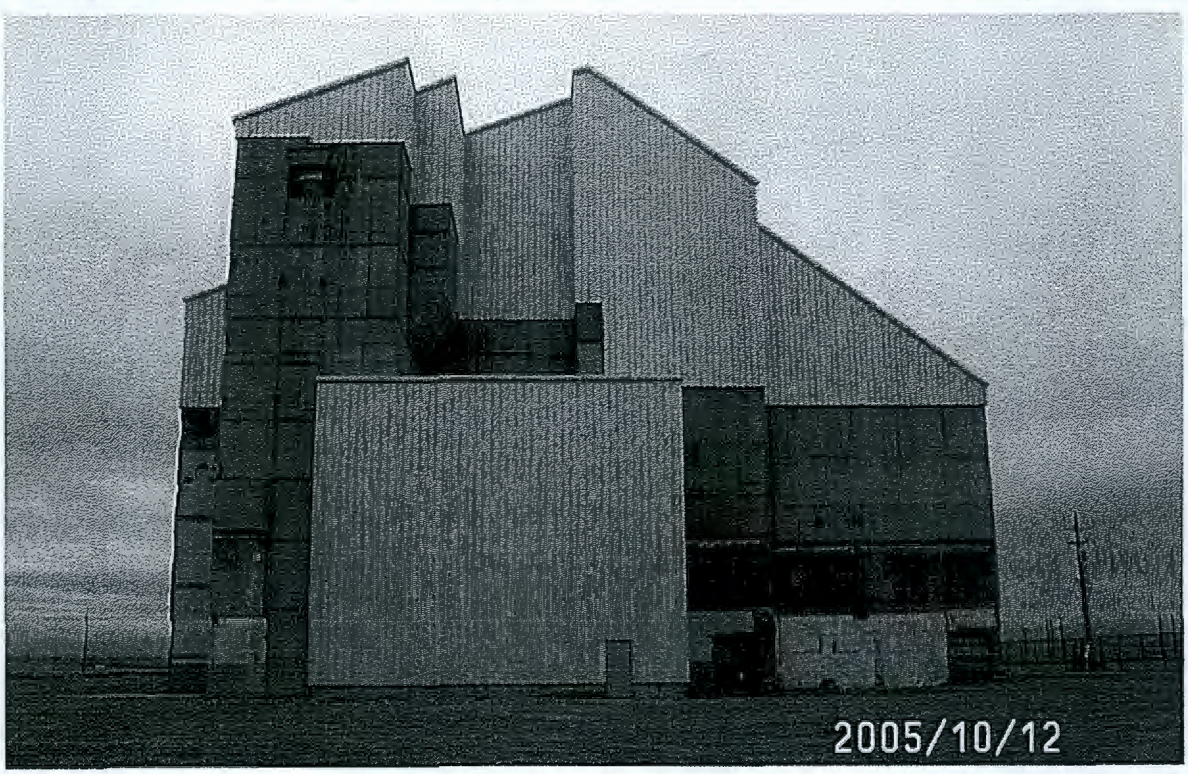


Figure 8-3. Arial Photograph of Safe Storage Enclosure (Looking Northeast).

The passage leading to the lower instrument room and tunnels contains 110 VAC receptacles at the below-grade 1 and below-grade 2 levels. Several receptacles are located at the 0-ft level along the surveillance route and in the SSE access room. Additional receptacles are located on the 12-ft, 23-ft, 42-ft, 59-ft, and 80-ft levels.

NOTE: See Section 8.4 for information regarding portable generator power for the portable ventilation exhauster.

8.3 REMOTE MONITORING SYSTEM

The 105-H SSE is configured with two sets of temperature sensors (resistance temperature detectors) and a set of flooding sensors (float switches), which include the installed spares for each sensor. Temperature sensors are located at grade level on the south side of the reactor, near the south stairwell. Temperature sensors are also located at the 80-ft level in the center of the east and west interior walls of the attic space. The flooding sensors are located at the west side of the below-grade 2 level near the interior stairwell.

The remote sensors are controlled through a programmable logic controller powered from DP-1. Signals are transmitted (via cellular modem) and routinely monitored at the operation supervisor workstation currently located in the 1112-N Building. (NOTE: The system is portable and can be relocated if the monitoring location changes.) When an alarm is received at the remote monitoring station, personnel will evaluate the alarm and, if required, will go to the 105-H Reactor and take appropriate corrective actions.

A loss of continuity to a resistance temperature detector will result in a loss-of-signal error to the monitoring station. The flooding sensor is normally closed-circuit so that a loss of continuity failure will result in a flooding alarm at the monitoring station. The flooding circuit is directly wired to the programmable logic controller. The temperature monitoring circuits operate on a 4-20-mA current loop from transmitters. The transmitters are supplied with 120 VAC for operating power. In the event of an instrument failure, monitoring for the temperature sensors can be manually switched to previously installed spares from the SSE utility room, eliminating the need to make a special entry into the SSE. The redundant flooding sensors are both displayed at the remote monitoring station. Thus, instrument replacements will normally be accomplished during regularly scheduled surveillance periods.

8.4 VENTILATION

The 105-H Reactor SSE is a deactivated facility that is uninhabited and locked during storage, except during S&M activities. Many of the reactor's components were removed as part of the stabilization effort for SSE. Remaining equipment and components that contain radiological inventory were sealed during implementation of the SSE Project. Many accessible areas of the building's interior have had a fixative applied to limit the potential spread of contamination.

No mechanical ventilation of the building is necessary, either during normal storage or during periodic surveillance. A provision has been made to ventilate the facility with exhaust fans for entry and/or maintenance. The 105-H Reactor SSE has been designed to use a 255-m^3/min (9,000-ft^3/min) portable exhauster for building exhaust ventilation during nonroutine maintenance. If building exhaust ventilation is required, the interior access door to the SSE shall be placed in the open position. Air is drawn into the SSE through the utility room vents. The size of these openings is sufficient to provide proper flow, even when the exterior door to the SSE utility room is closed. A separate ventilation system is provided for the inner rod room through the steel door exhaust ventilation flange connection and a door makeup air vent that is accessed from the platform inside the north-side sheet-metal enclosure.

A ventilation system flow diagram can be found on drawing 0105H-DD-M0004 (see listing in Section 10.4). The exhauster draws air through flanged, galvanized carbon-steel vent openings located on the north side of the SSE. When the portable exhauster is not connected, the connection point is sealed with bolted flanges. Additionally, welded stainless-steel security bars are provided behind the bolted flanges in the event the flanges are maliciously removed.

8.5 SECURITY

Access to the 105-H Reactor SSE is through the utility room. During periods of storage, the door to the SSE (located inside the utility room) will be locked and welded shut. The door to the utility room will be locked except during routine S&M activities. The SSE is entered only for periodic S&M activities. The 0.9- to 1.5-m (3- to 5-ft)-thick concrete walls and the welded door provide the security barrier for the facility; therefore, a locked fence around the SSE is not required. There are no intrusion alarms or routine security patrols for the 105-H Reactor SSE. The Hanford Patrol continues to provide routine security patrols in the vicinity as part of its patrol throughout the 100 Areas. There are two other welded doors into the SSE (the inner rod room interior door and the rear face) to allow greater flexibility if maintenance is required, but these doors will not be used as entrances for typical surveillance activities.

9.0 LESSONS LEARNED AND RECOMMENDATIONS

The 105-H Reactor was the fifth ISS project to complete placement of the reactor core into an SSE. The ISS work was accomplished with some significant problems, mainly due to a new subcontractor. Lessons learned from the 105D, 105-DR, and 105-F Reactor ISS projects continue to provide benefits. Delays and efficiency improvement are noted for future projects, which include the following examples.

- Fall protection training was important for the SSE subcontract coverage, as most of the work requires its use. It is also vital that replacement radiological control technicians receive the appropriate training to ensure availability.

- Difficulties at 105-D reaffirmed the lessons learned at 105-F. The 105-F Reactor was the second reactor in a design/build SSE subcontract. Issuing multiple reactors in the same subcontract worked well for the following reasons:

  - Design and construction lessons learned by the subcontractor and subtiers were automatically applied to the design and construction at 105-F.

  - Many aspects of the work for 105-DR and 105-F were the same/similar, which reduced the design and submittal process.

  - The subcontractor was able to bring back most of the same craft personnel for 105-F, which resulted in completion of the 105-F SSE portion of the subcontract 6 weeks and 5,000 man-hours earlier then the 105-DR portion of the subcontract.

- The following lesson learned from 105-F was applied to the 105-D and 105-H ISS Projects.

  - SSE subcontractor forces should include a full-time field engineer during construction. Many fit-up problems resulting from differences between design and actual conditions discovered after demolition would have been discovered prior to fabrication had a field engineer been onsite verifying the design as demolition opened up new areas. The field engineer would also be able to assist the quality assurance representative to ensure that the proper work processes (e.g., installation techniques, placement, and details) and materials were being used. When field changes arose, the field engineer would be able to relay pertinent information and suggestions to the design group and coordinate the change process to reduce construction delays. For these reasons, addition of a full-time field engineer during SSE construction activities should be added to the key personnel list in future SSE subcontracts.

  - The 105-D Project showed that it is important for the field engineer to have field experience in heavy iron construction. Lack of familiarity with craft and steel construction led to erection errors and delays in resolution.

  - The 105-H Project showed the need to stress that the field engineer be dedicated solely to field engineering duties. The field engineer was also acting as a subtier project manager. As such he was not in the field enough to recognize ahead of time and address differences between the design and the buildings actual configuration during demolition. Had these discrepancies, such as missing steel and differing steel sizes, been observed during demolition design and fabrication, changes could have been completed prior to starting erection and with minimal or no field delays.

- Design and quality assurance requirements need to be continually stressed and reviewed to ensure subcontractor understanding and compliance. In particular, the flow down to subtiers both on and off site needs to be reviewed.

- Better coordination with Field Remediation Closure Project is needed to ensure that sample planning appropriately addresses any Waste Information Data System identified waste sites affected by decommissioning activities and takes advantage of site closure opportunities.

10.0 DRAWINGS

The following drawings show the as-built configurations for the 105-H Reactor SSE.

10.1 STRUCTURAL

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-C0003	H-1-88861 SHT01	0105H-DD-T0.00 -SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, TITLE SHEET
DWG	0105H-DD-C0004	H-1-88862 SHT01	0105H-DD-S0.0-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, GENERAL NOTES
DWG	0105H-DD-C0005	H-1-88863 SHT01	0105H-DD-S1.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, FOUNDATION PLAN
DWG	0105H-DD-C0006	H-1-88864 SHT01	0105H-DD-S1.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, PLAN AT TOP OF EXISTING STRUCTURE
DWG	0105H-DD-C0007	H-1-88865 SHT01	0105H-DD-S2.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, UPPER LEVEL ROOF FRAMING PLAN
DWG	0105H-DD-C0008	H-1-88866 SHT01	0105H-DD-S2.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, LOWER LEVEL ROOF FRAMING PLAN
DWG	0105H-DD-C0009	H-1-88867 SHT01	0105H-DD-S2.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, UPPER LEVEL BRACING FRAMING PLAN
DWG	0105H-DD-C0010	H-1-88868 SHT01	0105H-DD-S3.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, EXTERIOR BUILDING ELEVATION
DWG	0105H-DD-C0011	H-1-88869 SHT01	0105H-DD-S3.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, EXTERIOR BUILDING ELEVATION
DWG	0105H-DD-C0012	H-1-88870 SHT01	0105H-DD-S3.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, EXTERIOR BUILDING ELEVATION
DWG	0105H-DD-C0013	H-1-88871 SHT01	0105H-DD-S3.4-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, EXTERIOR BUILDING ELEVATION
DWG	0105H-DD-C0014	H-1-88872 SHT01	0105H-DD-S3.7-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, 3D EXTERIOR ELEVATIONS
DWG	0105H-DD-C0015	H-1-88873 SHT01	0105H-DD-S3.8-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, 3D EXTERIOR ELEVATIONS
DWG	0105H-DD-C0016	H-1-88874 SHT01	0105H-DD-S4.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0017	H-1-88875 SHT01	0105H-DD-S4.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0018	H-1-88876 SHT01	0105H-DD-S4.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0019	H-1-88877 SHT01	0105H-DD-S4.4-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-C0020	H-1-88878 SHT01	0105H-DD-S4.5-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0021	H-1-88879 SHT01	0105H-DD-S4.6-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0022	H-1-88880 SHT01	0105H-DD-S4.7-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0023	H-1-88881 SHT01	0105H-DD-S4.8-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0024	H-1-88882 SHT01	0105H-DD-S4.9-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0025	H-1-88883 SHT01	0105H-DD-S4.10-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0026	H-1-88884 SHT01	0105H-DD-S4.11-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0027	H-1-88885 SHT01	0105H-DD-S4.12-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0028	H-1-88886 SHT01	0105H-DD-S4.13-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0029	H-1-88887 SHT01	0105H-DD-S4.14-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, STRUCTURAL FRAMING ELEVATION
DWG	0105H-DD-C0030	H-1-88888 SHT01	0105H-DD-S5.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0031	H-1-88889 SHT01	0105H-DD-S5.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0032	H-1-88890 SHT01	0105H-DD-S6.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0033	H-1-88891 SHT01	0105H-DD-S6.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0034	H-1-88892 SHT01	0105H-DD-S6.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0035	H-1-88893 SHT01	0105H-DD-S7.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0036	H-1-88894 SHT01	0105H-DD-S7.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0037	H-1-88895 SHT01	0105H-DD-S7.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0038	H-1-88896 SHT01	0105H-DD-S7.4-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0039	H-1-88897 SHT01	0105H-DD-S7.5-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0040	H-1-88898 SHT01	0105H-DD-S8.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0041	H-1-88899 SHT01	0105H-DD-S8.2-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-C0042	H-1-88900 SHT01	0105H-DD-S8.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0043	H-1-88901 SHT01	0105H-DD-S8.4-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0044	H-1-88902 SHT01	0105H-DD-S8.5-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0045	H-1-88903 SHT01	0105H-DD-S9.1-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS
DWG	0105H-DD-C0046	H-1-88904 SHT01	0105H-DD-S5.3-SSE SYSTEM DESIGN DRAWINGS - 105-H AREA, 105-H REACTOR SSE, SECTIONS AND DETAILS

10.2 ELECTRICAL

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-E0001	H-1-87598 SHT01	100H AREA SSE PERMANENT POWER & LIGHTING SYSTEM ONE LINE DIAGRAM
DWG	0105H-DD-E0002	H-1-87599 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT (-) GRADE / GRADE LEVEL
DWG	0105H-DD-E0003	H-1-87600 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT @ ABOVE GRADE 1 - 2
DWG	0105H-DD-E0004	H-1-87601 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT @ ABOVE GRADE 3 - 5
DWG	0105H-DD-E0005	H-1-87602 SHT01	100H AREA PERMANENT ELECTRICAL DISTRIBUTION SYSTEM GROUNDING PLANS, ELEVATIONS AND DETAILS
DWG	0105H-DD-E0006	H-1-87603 SHT01	100H AREA PERMANENT ELECTRICAL DISTRIBUTION SYSTEM XFMR AND CUTOUT POLE DETAILS

10.3 INSTRUMENTATION

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-E0001	H-1-87598 SHT01	100H AREA SSE PERMANENT POWER & LIGHTING SYSTEM ONE LINE DIAGRAM
DWG	0105H-DD-E0002	H-1-87599 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT (-) GRADE / GRADE LEVEL
DWG	0105H-DD-E0003	H-1-87600 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT @ ABOVE GRADE 1 - 2
DWG	0105H-DD-E0004	H-1-87601 SHT01	100H AREA SSE POWER AND LIGHTING SYSTEM ELECTRICAL ARRANGEMENT @ ABOVE GRADE 3 - 5
DWG	0105H-DD-E0005	H-1-87602 SHT01	100H AREA PERMANENT ELECTRICAL DISTRIBUTION SYSTEM GROUNDING PLANS, ELEVATIONS AND DETAILS
DWG	0105H-DD-E0006	H-1-87603 SHT01	100H AREA PERMANENT ELECTRICAL DISTRIBUTION SYSTEM XFMR AND CUTOUT POLE DETAILS

10.4 MECHANICAL

Type	Number	Cross-Reference Number	Subject
DWG	0105H-DD-M0004	H-1-87614 SHT01	100H AREA SSE VENTILATION SYSTEM FLOW DIAGRAM

11.0 REFERENCES

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