93-020

0031544

ENGINEERING CHANGE NOTICE

1. ECN 165818

Proj. ECN

2. ECN Category (mark one)		Supplemental	[X]	Change ECN	[]	Supersedure	[]
Cancel/Void	[]	Direct Revision	[]	Temporary	[]	Discovery	[]

3. Originator's Name, Organization, MSIN, and Telephone No.: M. A. Ortega, 87340, T3-28, 3-3844

4. Date: 1/30/92

5. Project Title/No./Work Order No.: SAD/RHO-CD-356

6. Bldg./Sys./Fac. No.: 221-T/PWR

7. Impact Level: 2QS*

8. Document Number Affected (include rev. and sheet no.): RHO-CD-356 *Rev. 0

9. Related ECN No(s).: N/A

10. Related PO No.: N/A

11a. Modification Work
[] Yes (fill out Blk. 11b)
[X] No (NA Blks. 11b, 11c, 11d)

11b. Work Package Doc. No.: N/A

11c. Complete Installation Work: N/A
Cog. Engineer Signature & Date

11d. Complete Restoration (Temp. ECN only): N/A
Cog. Engineer Signature & Date

12. Description of Change

Section 3.4.5.4, Page 21

Was:

Typical Values for Water Quality

Ph	4.5 - 9.5
Conductivity	< 5 umho/cc
Chloride	< 1.5 ppm

IS:

Typical Values for Water Quality

Ph	4.5 - 9.5
Conductivity	≤ 30 umhos/cm
Chloride	10 ppm

*Added by C. Scott on 06/11/92 per telecon approval of M.A. Ortega.

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13a. Justification (mark one)		Criteria Change	[X]	Environmental	[]	Facilitate Const.	[]
Design Error/Omission	[]	Design Improvement	[]	As-Found	[]	Const. Error/Omission	[]

13b. Justification Details

A study performed by A. B. Johnson Jr. on the behavior of spent nuclear fuel in water storage (BNWL-2256/UC-70, September 1977), showed that similar fuel has been stored under the IS conditions without any adverse effects. Conductivity has a large temperature coefficient as much as 4%/°C. The standard temperature for measuring conductivity is 25°C which is 12.78°C degrees higher than the required pool temperature. In addition a 10 ppm surveillance requirement is specified in PWR CORE II Operations Safety Requirements (RHO-CD-423 Rev. 1).

14. Distribution (include name, MSIN, and no. of copies)

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15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
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[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

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Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	~~[X]~~ MLB	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
NONE		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog./Project Engineer Maria A. Ortega	2/4/92	PE	
Cog./Project Engr. Mgr. [signature]	2/4/92	QA	
QA Billy Ray [signature]	2-10-92	Safety	
Safety [signature]	3/12/92	Design	
Security		Other	
Proj. Prog./Dept. Mgr.			
Def. React. Div.			
Chem. Proc. Div.			
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Author/Requestor (Printed/Signature): Maria O. Ortega — M.A. ORTEGA — Date 5/18/92

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G. L. Hanson and R. R. Jackson

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PWR CORE 2 PROJECT

By
G. L. Hanson
and
R. R. Jackson
Safety and Environmental Engineering Analysis Department
Safety Analysis Reports

April 1978

Operated for the U. S. Department of Energy
by Rockwell Hanford Operations under Contract EY-77-C-06-1030

SAFETY ASSESSMENT DOCUMENT
PWR CORE 2 PROJECT

APPROVED BY ______________________ 4/7/78
D. C. Bartholomew, Director
Production Operations
Date

APPROVED BY ______________________ 4/10/78
W. F. Heine, Director
Health, Safety and Environment
Date

SAFETY ASSESSMENT DOCUMENT

PWR CORE 2 PROJECT

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SAFETY ASSESSMENT DOCUMENT
PWR CORE 2 PROJECT

1.0 INTRODUCTION

PWR Core 2 blanket fuel assemblies, which were used to power the Department of Energy, Division of Naval Operations, Shippingport Reactor, have been stored in the reactor basin since discharge (approximately four years). Shipment of these blanket fuel assemblies to Rockwell Hanford Operations for storage in the 221-T Canyon Pool Cell for a period of up to 20 years is planned. Each shipment, consisting of up to 12 assemblies, will be made using the Department of Transportation approved, Bettis M-160 cask. Shipments will be made via commercial rail under DOE escort. Upon receipt, the fuel assemblies will be remotely unloaded from the cask at the 221-T Canyon Building and placed into underwater storage racks in the Canyon Pool Cell. The empty cask will be returned to Shippingport for reloading. Shipment and storage of 72 blanket fuel assemblies is scheduled for fiscal year 1978 and FY 1979; however, four additional assemblies may be added later.

Prior to receipt of the first cask load of blanket fuel assemblies, a trial run utilizing the empty M-160 cask and a dummy fuel assembly will be made to familiarize personnel with the cask, tools, fuel unloading operations, equipment operation, etc.

2.0 SUMMARY AND CONCLUSIONS

This safety assessment has been prepared by Rockwell Hanford Operations in compliance with DOE Manual Chapter 0531. The impact of natural phenomena on the fuel storage site and that of normal and accident conditions during receipt, unloading and storage of the PWR Core 2 blanket fuel assemblies have been examined. It is believed that these operations can be conducted without undue risk to the health and safety of employees, the general public, and the environment.

2.1 Impact of Natural Events

The frequency and severity or magnitude of natural events (earthquake, tornado) which may be experienced at the Hanford Site are described in Reference 1. The 221-T Canyon Building (T Plant) is not capable of withstanding the safe shutdown earthquake (0.25 g)[2]; however, an earthquake having an acceleration of 0.25 g has only a 0.7 percent to 2.7 percent probability of occurring in any thirty-year period[3]. The Plant can safely withstand a 175-mph tornado and protect the stored fuel suspension system[4].

No adjacent facilities present any hazards to the fuel storage function of the 221-T Canyon Building. Interruption of site-supplied utilities and services pose no undue risk to the integrity of the fuel assemblies or to the integrity of the plant containment and confinement barriers.

2.2 Radiological Impact of Normal Operations

Cask receipt and defueling operations, as well as interim pool storage and surveillance activities, will be conducted in a manner to assure that personnel radiation exposure shall be as low as reasonably achievable (ALARA). Where possible, temporary portable shielding will be used to minimize radiation exposure during cask handling. Fuel transfers from the cask to the storage pool will be done remotely using the canyon crane. Prior to removal of a fuel assembly from the cask, all personnel will be evacuated from the railroad tunnel and the canyon deck. Doors will be locked during the fuel transfer operation to prevent inadvertent personnel entry. The total radiation exposure of personnel involved in the cask receipt and unloading operations is estimated to be 2.5 man-rem per shipment.

No measurable increase of radioactivity to the environment via normal gaseous and liquid waste effluent streams should occur. Plant generation of solid radioactive wastes requiring packaging and land burial is expected to increase by 10 to 20 percent during the two years in which cask receipt and storage operations are in progress. Except for periodic replacement of the pool cell water treatment system ion exchange resin, there will be no increase in the plant generation of solid radioactive waste during the interim fuel assembly storage and surveillance activities.

2.3 Radiological Impact from Accidents and abnormal Operations

A number of abnormal event sequences and accidents have been examined and none result in a credible situation which challenges the containment and confinement barriers so severely as to result in a risk to the offsite general population[5].

Accidents examined include

1) leaking fuel assemblies,
2) fire and explosion,
3) loss of coolant or cooling capability,
4) dropped fuel assembly, and
5) extrinsic accidents - including missile impact on facility, and natural events.

Physical and administrative controls imposed by the shipper at the cask loading site are expected to minimize the potential for receipt of damaged or leaking fuel assemblies. Personnel training, hands-on-experience during the trial run with the M-160 cask and dummy fuel element, prior experience with remote handling operations of this nature, together with engineered safety systems and compliance with administrative controls and procedures, will reduce the risk of accidents and resultant, potential, excessive personnel radiation exposure to acceptable levels during the operations associated with receiving, unloading, and storage of the blanket fuel assemblies[5].

3.0 BASES FOR ASSESSMENT

3.1 Site Characteristics

3.1.1 Geography and Demography of Site

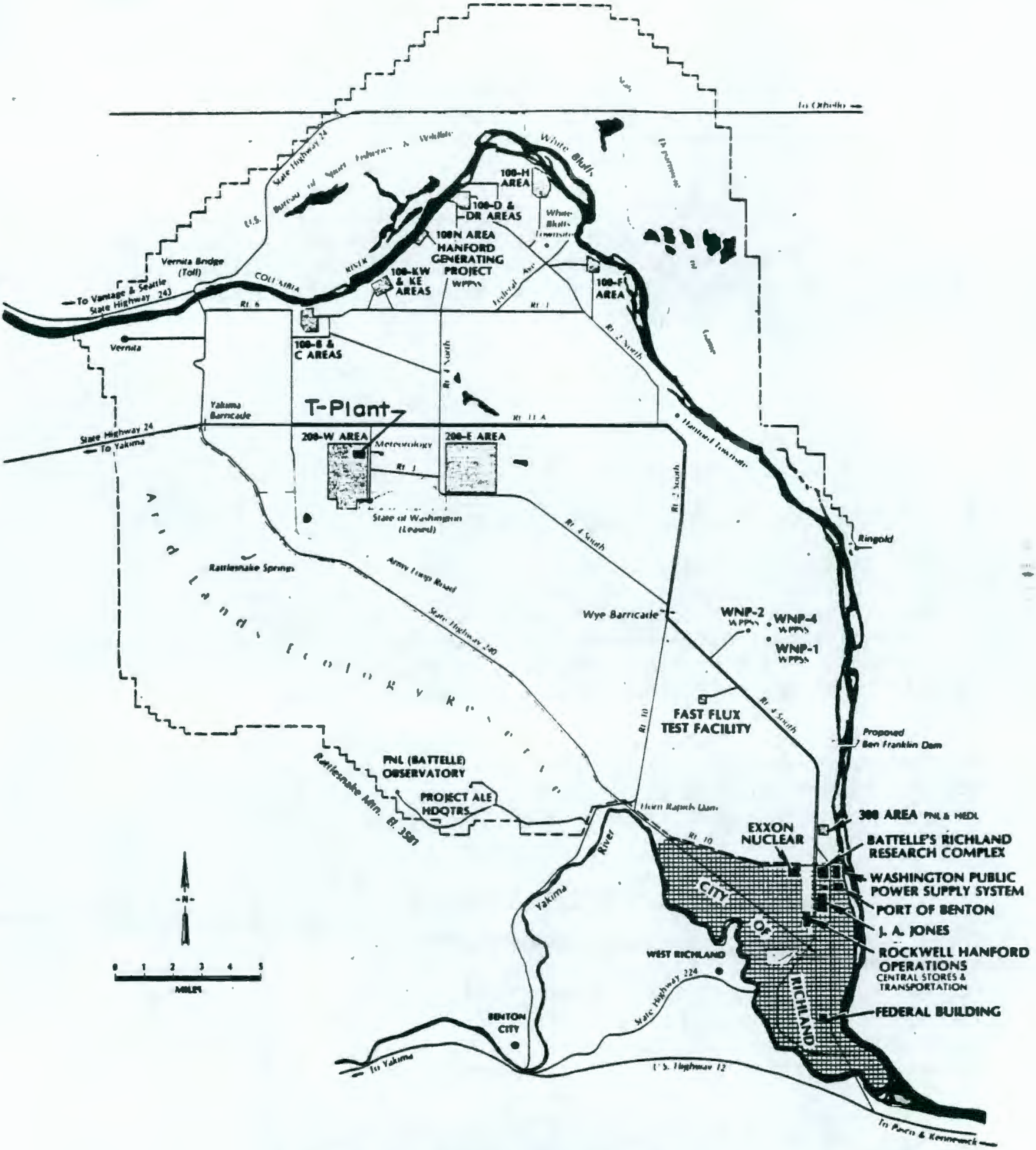
T Plant is located in the 200 West Area near the center of the Hanford Reservation, a 570 square mile area to which access is controlled for reasons of national security (Figure 3.1-1). Measurements and comprehensive evaluation programs in radiation, biology, ecology, hydrology, and meteorology are maintained to measure the direct impact of the Hanford operations on the environment and to help assure adequate process controls.

The 1970 estimate of population living within a 50-mile radius of the Hanford Meteorological Station (1/2 mile east of T Plant) was 246,000[6]. The onsite work force population is described in Reference 7. Land uses in the surrounding area include urban, industrial, and irrigated and dry land farming.

3.1.2 Nearby Industrial, Transportation, and Military Facilities

There are no nearby non-nuclear industrial or military facilities. Public transportation facilities near T Plant are State Highways 24 and 240. Nuclear facilities within 50 miles of 221-T Plant are the Exxon Nuclear Plant located in Richland, three Washington Public Power Supply System reactors under construction, and the various DOE facilities located within the Hanford Reservation. For facility descriptions, see ERDA-1538[8].

There are ancillary nuclear operations in progress at T Plant which share equipment and facilities of the deactivated spent fuel separations plant. They are (1) Equipment Decontamination Facility - 221-T Canyon, (2) Containment Systems Test Facility - 221-T Head End, (3) Plutonium Storage and Radiation Protection Laboratory - 224-T, and (4) office space for service groups - 222-T and 271-T. No adverse impact is foreseeable from these ongoing activities upon the receipt and storage of PWR Core 2 blanket assemblies at T Plant. However, all other canyon activities will be suspended during receipt and handling of PWR Core 2 blanket assemblies.



HANFORD RESERVATION

Energy Research and Development Administration

FIGURE 3.1-1

3.1.3 Climatology and Meteorology

The climate in the vicinity of Hanford has been recorded since 1912 and is characterized as mild and dry, with occasional periods of high wind[9]. High wind conditions will at times preclude outside activities involved in cask uprighting and transporting.

The average annual precipitation is 6.25 inches. Tornadoes are rare in this region and tend to be small, with little damage when they do occur. Water erosion on the plateau around T Plant is minor because of the minimal precipitation, high soil porosity, and lack of sufficient relief to initiate runoff.

3.1.4 Surface Hydrology

The surface hydrology of the Hanford Reservation has been extensively studied[10]. These studies include not only an analysis of the Columbia and Yakima Rivers, but also extensive investigations as to the nature of a number of man-made ditches and ponds which are used for the disposal of low-level radioactive liquid waste, certain industrial waste, and cooling waters from various processes.

Neither the maximum expected rainfall over the next 1,000 years nor the effect of the 100-year probable flood of the Columbia River would pose any added hazards to the 200 Areas operations[11].

3.1.5 Regional Hydrogeology

From a hydrologic standpoint, the regional geology of the Hanford Reservation presents a series of confined aquifers (primarily basaltic interbeds of the Columbia River Group) overlaid by an unconfined aquifer formed by permeable beds in the upper and middle Ringold Formation and in the Pasco Gravels. Over 1,500 wells have been drilled to provide data for evaluating the chemical and physical properties of the underlying materials and to study movement of radioactive materials in soils[12].

3.1.6 Geoseismology

Hanford facilities are exposed to the possibility of moderate earthquake damage (Zone 2) from two sources: (1) the active seismic zones of western Washington; and (2) closer shocks originating in the seismic zone that includes Walla Walla. However, the underlying sands and gravels in the Hanford Reservation provide excellent protection against damage.

A design basis earthquake of 25 percent gravity (0.25 g) on the Hanford Reservation allows for a Modified Mercalli Scale (MM-VIII) intensity quake (Richter magnitude up to 6.8) for an earthquake epicentered at the same site. This is highly conservative since no such quake has ever been recorded in eastern Washington or Oregon. Although earthquakes with intensities as high as MM-V have occurred in surrounding areas, none with intensities greater than MM-IV have occurred in the immediate Hanford Area[13].

3.2 Principal Design Criteria

3.2.1 Purpose of Plant

PWR Core 2 blanket assemblies are to be received in the M-160 cask, unloaded in the 221-T Canyon Facility railroad tunnel, and stored in the pool cell. The PWR Core 2 blanket module is shown in Figure 3.2-1. Table 3.2-1 lists the radionuclide content of the most depleted assembly. The current program calls for receipt and storage of 72 assemblies, 12 or less per shipment, with the possibility of receiving four additional assemblies at some later date. Table 3.2-2 shows the uranium and plutonium isotopic masses for 76 fuel assemblies.

3.2.2 Structural and Mechanical

3.2.2.1 M-160 Cask

The design and engineered safety features of the M-160 cask are described in the technical manual[14] and in the safety analysis report for transport of irradiated PWR Core 2 fuel assemblies in the M-160 cask[15].

3.2.2.2 221-T Plant

Facility design, safety protection systems and engineered safety features are described in the facility technical manual[16], training manual[17], and a previous spent fuel storage hazards review[18]. Facilities added for storage of PWR Core 2 spent fuel include water treatment and cooling systems and fuel storage racks. Design criteria are specified in Reference 4.

The 221-T Canyon Facility was designed and built in 1943-44 in accordance with the then applicable Uniform Building Code and was designed for static, vertical live and dead loads. The then applicable building code had no seismic provisions. Lateral wind forces, based on projected area, were included in the design.

The maximum credible earthquake for the Hanford Site is postulated to be a Richter Magnitude 6.8 earthquake (with an epicentral distance approximately ten miles from the facility) which produces a maximum horizontal ground acceleration at the facility of 0.25 g and a simultaneous vertical ground acceleration two-thirds of the horizontal acceleration. The 0.25 g earthquake has an occurrence associated with an unlimited time span per occurrence whereas the probability of 0.20 g would be once in 16,700 years, 0.15 g once every 4,000 years, 0.10 g once every 1,850 years, and 0.05 g once every 840 years[19].

A preliminary assessment of the capability of the 221-T Building[2] and its twin, the 221-B Building, to withstand the 0.25 g earthquake has been made. Results of a first phase elastic analysis indicate that the canyon walls would be substantially overstressed near the roof (above the canyon rails) and at the canyon wall-gallery slab intersections. Primary load bearing reinforced concrete in the canyon would be damaged. Technical judgement is that these walls will not collapse, and that the process cell integrity will be maintained[19].

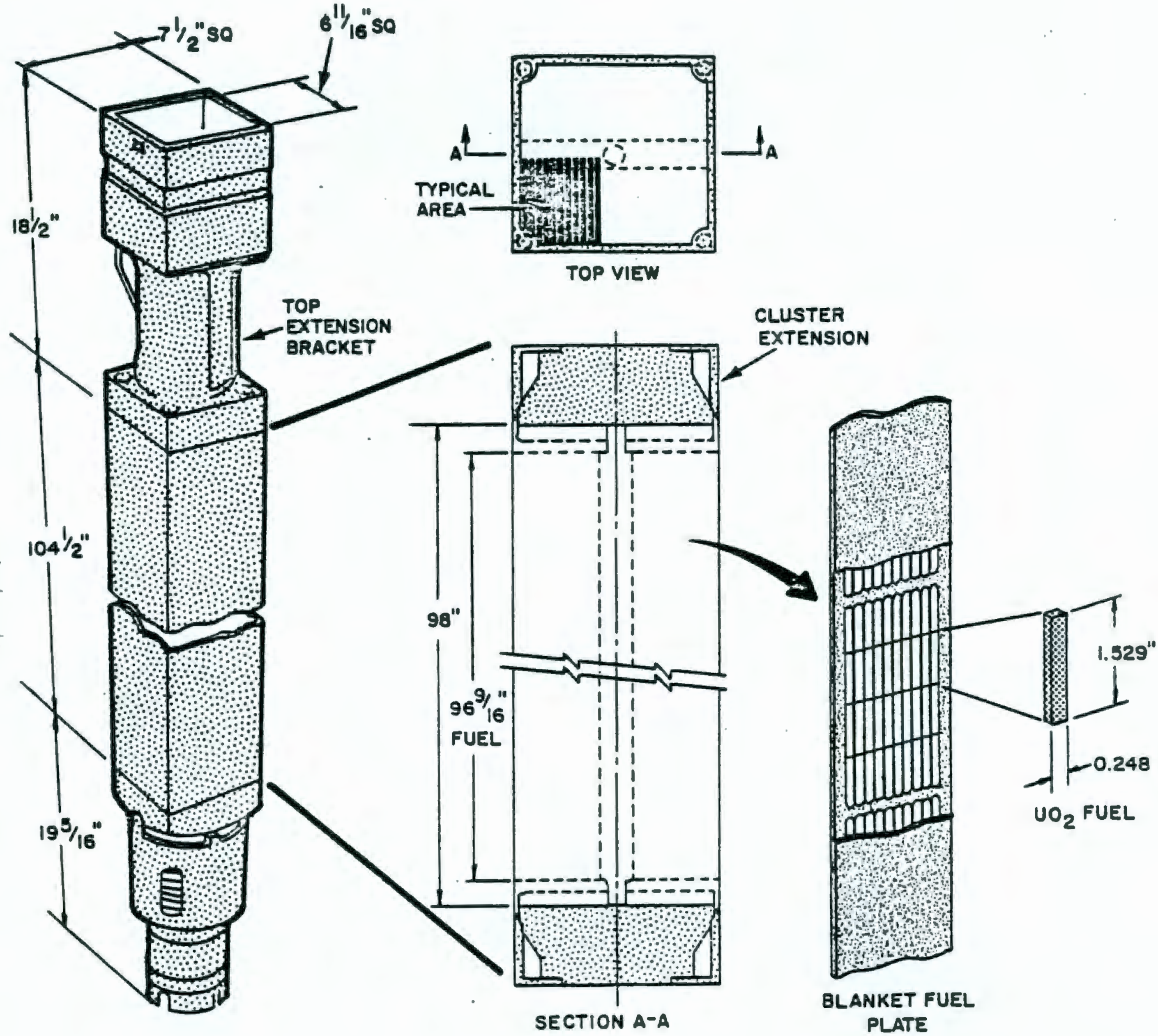


FIGURE 3.2-1 Fuel Assembly

TABLE 3.2-1

Radionuclide Content - PWR-2 Blanket Assembly*

Radionuclide	Curies per Assembly
^{85}Kr	8.2×10^2
^{90}Sr	7.5×10^3
^{90}Y	7.5×10^3
^{106}Ru	1.4×10^3
^{106}Rh	1.4×10^3
^{125}Sb	1.5×10^2
^{125}Te	4.1×10^1
^{134}Cs	4.3×10^2
^{137}Cs	9.5×10^3
^{137}Ba	8.7×10^3
^{144}Ce	1.5×10^3
^{144}Pr	1.5×10^3
^{147}Pm	8.5×10^3
^{151}Sm	2.4×10^1
^{154}Eu	7.9×10^1
^{155}Eu	4.3×10^1
TOTAL CURIES	4.9×10^4

* Decayed to 1978, four years post reactor discharge.

TABLE 3.2-2

Uranium and Plutonium Isotopic Mass for 76 Assemblies

Isotope	Mass (Kg.)	Isotope	Mass (Kg.)
^{234}U	1	^{239}Pu	84
^{235}U	33	^{240}Pu	35
^{236}U	14	^{241}Pu	15
^{238}U	16,418	^{242}Pu	5
TOTAL U	16,466	TOTAL Pu	139

Preliminary analysis of the sand filter indicated serious structural deficiencies, but in-depth analysis has not been performed[19]. The stack has not been analyzed though stacks of this type have historically proved resistant to seismic forces[19]. The roof exhaust filter and discharge is expected to remain intact.

Current policy and practice impose a criterion that those facilities which contain fissile radioactive materials such as reactors and structures for the storage of plutonium shall be able to withstand a tornado and associated forces as defined below:

a. Wind force - horizontal wind of 175 mph, over the full height of the structures;

b. Pressure transient - 0.75 psi atmospheric pressure drop in three seconds, and return at the same rate; and

c. Missiles

- o 2" x 12" plank, 12-foot long, traveling end-on at 100 mph, at any height,
- o 4' x 8' plywood sheet, 3/4" thick, traveling end-on at 150 mph, at any height, and
- o 26" x 20' sheet of Number 20 corrugated steel siding traveling end-on at 150 mph, at any height.

The 221-T Canyon Facility was designed to withstand straight winds per the then applicable Uniform Building Code. Based on the results of the seismic analysis, it is concluded that the structure can safely withstand the forces associated with a 175-mph tornado[4].

The site-supplied support services consist of steam, normal electrical power, and raw water. Depending on the specifics of the tornado and the area hit, part of most of these utilities could be interrupted as a result of damage to distribution lines or to production centers. The impact of loss of utilities and services are analyzed in the accident analysis document and no adverse consequences are expected[5].

3.2.3 Safety Protection Systems

3.2.3.1 Containment and Confinement Barriers and Systems

All operations involving PWR Core 2 blanket module handling outside the M-160 cask are conducted within the confines of the 221-T railroad tunnel and canyon areas. The railroad tunnel is an integral part of the plant structure, isolated from the outside by a roll-up sheet metal door. The floor of the tunnel is 30 feet below the canyon deck. Normal movement of equipment, etc., from the tunnel to the canyon, or the reverse, is via the canyon crane. A guard rail is installed on the tunnel-canyon deck perimeter to provide a protective personnel barrier.

Airborne radioactivity is confined by ventilation flow balance such that air flow is from areas of no contamination to potentially contaminated areas. Ventilation exhaust air is filtered prior to discharge to the environment and is sampled and monitored for radioactivity. Liquid wastes generated within radioactive contaminated zones are collected in a canyon vessel via a header system and batch transferred to the 200 West Area Waste Evaporation Facility.

3.2.3.2 Nuclear Criticality Safety

The unloading and storage of the PWR Core 2 blanket fuel assemblies requires no special handling for criticality control since the infinite multiplication factor is less than 0.95[20].

3.2.3.3 Radiological Protection

Portable and temporary shielding is available to ensure personnel exposure is as low as reasonably achievable during cask uprighting operations and preparation for unloading the fuel modules. This shielding is expected to reduce personnel radiation exposures to meet the requirements of Rockwell Radiation Protection Standards[21,22]. All personnel will be evacuated from the tunnel and the canyon areas during transfer of fuel assemblies from the cask to pool storage. Administrative controls for prevention of inadvertent personnel access to the tunnel and canyon areas during fuel transfer are in place[23].

A radiation field level detector equipped with audible and visual alarms is located in the vicinity of the pool storage cell to warn of high radiation levels in the canyon (see Section 4.2.3).

3.2.3.4 Fire and Explosion

Fire and explosion in the 221-T Canyon Facility are unlikely due to the small combustible loading, which consists primarily of solid wastes from decontamination activities. Accumulation of combustible materials is prevented by prompt packaging and disposal as waste is generated. Introduction of PWR Core 2 blanket modules will result in the generation of small quantities of radiolytic hydrogen, which is diluted to safe concentrations by the canyon volume immediately upon release from the pool surface[5].

Portable fire extinguishers are provided at identified locations in the tunnel and in the canyon. Upon detection of a fire, personnel notify the Fire Department by telephone or by pull box alarms located at the 2706-T Building, west side of the 271-T Building, 222-T Building, or on the northeast corner of the 221-T Building, and proceed to fight the fire with available extinguishers. The Fire Department will arrive in less than five minutes after notification.

3.3 Facility Design

3.3.1 PWR Core 2 Program Interfaces

The 221-T Canyon Facility is located in the northeast corner of the 200 West Area on the Hanford Reservation. The plant is described in Reference 16. It is served by the Hanford rail system and the 200 West electrical distribution network. It is supplied with steam and raw water from the 200 West Area Power House. Figure 3.3-1 is a layout of the facility and nearby buildings.

Other activities which have an impact on or are impacted by storing PWR Core 2 blanket fuels are the safety system development work conducted by the Hanford Engineering Development Laboratory (HEDL) in the head-end of the 221-T Canyon Facility and the equipment decontamination and repair work conducted by Rockwell Hanford Operations. Work in the head-end of the T Plant Canyon will be stopped and personnel will be locked out of that portion of the canyon whenever fuel unloading operations take place. The T Plant Canyon decontamination and repair work will be discontinued and the operating crew will be assigned to unloading fuel. Close coordination and control will be maintained between the crane operator and the work crew so that the canyon is cleared of personnel when fuel elements are out of the cask or out of the storage pool.

Adjacent facilities include the 224-T Building, where plutonium scrap and wastes are stored, and personnel offices in the 271-T and 222-T Buildings. Potential plutonium storage accidents have been analyzed and it was concluded that they do not adversely impact on the PWR Core 2 fuel receiving and storage program or other canyon activities[24]. All of the adjacent facilities are protected from PWR Core 2 program activities by shielding and distance. No adverse impacts on these areas are expected.

3.3.2 Facility Layout

Figure 3.3-1 shows the general layout of the facility and nearby buildings. The 221-T Canyon Facility structural description is given in detail in References 2 and 16. At present, the canyon area and certain process cells are utilized for a diversity of decontamination and equipment repair activities and will not be described further in this report.

Figure 3.3-2 is a section view of the railroad tunnel and storage pool depicting PWR Core 2 blanket fuel assembly unloading activities. The Cell 4 storage pool has been decontaminated and painted. Service connections not required for PWR Core 2 blanket storage have been blanked. A water treatment system providing pool cooling and water purification capability is installed. Racks for storing the blanket modules have been installed.

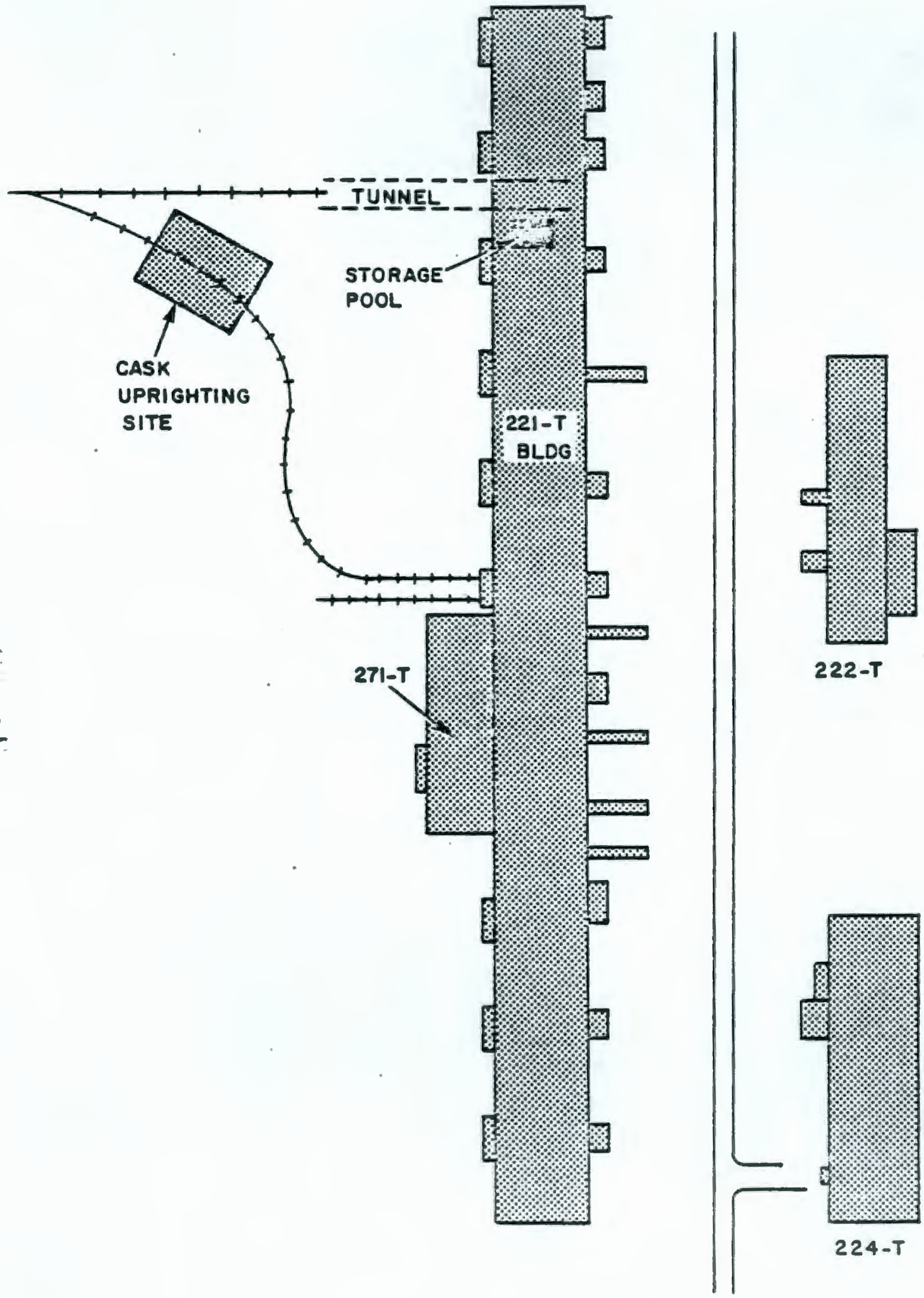


FIGURE 3.3-1 221-T Building

3.3.3 Support Systems

3.3.3.1 Cask Handling

A site adjacent to 221-T has been prepared for the uprighting of the M-160 cask. The location of this site is shown on Figure 3.3-1. The uprighting site has been provided with concrete footings to support the weight of the cask and rail car which must be jacked up during cask uprighting operations.

A mobile 150-ton crane has been provided for uprighting the 123-ton cask (loaded weight). This crane is certified annually, by a third party inspection, to its 150-ton manufacturer's maximum rated capacity. Uprighting of the cask will be done using government-furnished lifting equipment, which has been certified according to GFE-76 lifting standards[(25)].

Transport of the uprighted cask to the 221-T tunnel at two miles per hour or less ($\leq$ 2.9 ft/sec) will be by Hanford rail service using a single engine. Car handling and spotting will be per standard rail practices. No other rail traffic will be permitted in the vicinity of the uprighting site or the 221-T tunnel during cask transport.

3.3.3.2 Blanket Assembly Handling

The cask unloading will be accomplished with DOE-supplied hardware, as detailed in Reference 14. A specially designed grappler will be used to remove the PWR Core 2 blanket assemblies from the M-160 cask and for transfer to the pool storage rack[(26)].

The canyon crane, modified to permit full horizontal travel over the railroad tunnel[(27)], will transport the blanket assemblies, singly, from the cask to the pool cell, using the 10-ton hoist. A two-speed 3-ton hoist, with a load limiter, is attached to the 10-ton hook, and is used to raise the fuel assembly from the cask and for lowering it into the pool cell storage rack. The 10-ton hoist can also be used to raise and lower the assembly, if necessary, to preclude a single failure of the hoisting equipment from causing problems during defueling. The fuel assembly is attached to a grappler and to an auxiliary grappler, each independently suspended from the 3-ton hoist, to preclude a single failure dropping the fuel assembly.

The canyon crane and associated lifting devices will be inspected, tested, and approved for this operation in accordance with Accident Prevention Standard Number 9_b[(28)].

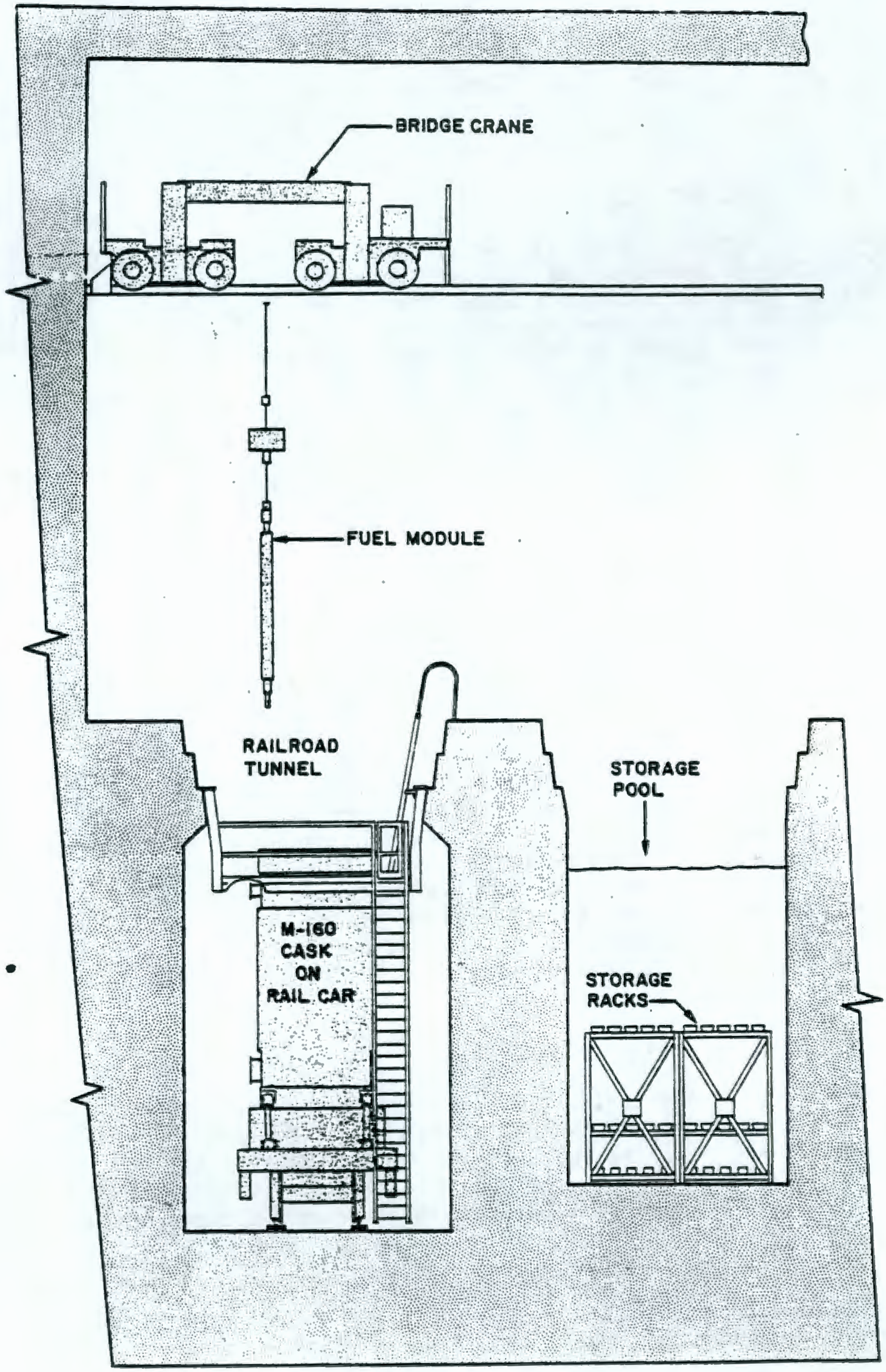


FIGURE 3.3-2 Cask Unloading Schematic

3.3.3.3 Storage Pool

Filtered, demineralized, raw water is used for the initial pool fill. An installed demineralizer provides make-up water to replenish pool water lost by evaporation. An ion-exchange column, installed in a radiation shielded structure near the pool, is provided for removal of radioactivity from the pool water and for maintaining water quality. Two pumps, each capable of providing a flow of 10 gpm, are installed for recirculation of pool water through the ion exchange column and the water chillers. Two chillers, each capable of removing up to 126,000 BTU per hour of radioactive decay heat, are installed near the pool. One pump and one chiller will normally be on standby. The storage pool support services are more fully described in Reference 4.

3.3.4 Services and Utilities

3.3.4.1 Site-Supplied Utilities and Services

Electrical power, from the Hanford 230 KV power system, is supplied to T Plant via two independent 2.4 KV services, either of which is capable of handling the normal power needs. Steam, raw water, and emergency electric power are supplied from the 200 West Area Power House. The site distribution and in-plant distribution systems are discussed in Reference 29. Emergency backup D.C. electrical power to provide lighting and power some instrumentation is provided by a bank of batteries. The lack of emergency backup on utilities and services poses no additional risk to the safe storage of PWR Core 2 blanket assemblies. No sequence of events involving PWR Core 2 blanket assemblies, initiated by loss of utilities or services, results in adverse impact upon the facility, operating personnel, environment, or off-site public (see Section 4.3 and Reference 5).

3.3.4.2 Building Ventilation Systems

Figure 3.3-3 is the ventilation flow diagram for the 221-T Canyon Facility. The roof-mounted canyon exhaust system (296-T-13) and the canyon air supply system (221-TA) will be operated during periods when personnel are working in the canyon. A canyon pressure of -0.025 to -0.75 inches of water, relative to atmospheric, is maintained when both systems are operating.

3.3.4.3 Building Services

Compressed air, for both canyon service and instruments, is supplied by headers throughout the facility. Fresh air/breathing air is supplied to manifolds at various points on the canyon deck for use on those occasions when airborne radioactivity exceeds allowable concentrations for assault mask usage.

The in-plant communications system consists of a plant internal telephone system (PAX system) and of an outside access network of telephones with tie-ins to the 200 Areas' wide crash alarm network.

Fire protection is provided by the 200 Areas' Fire Department located between the 200 East and West Areas. Notification of a fire is by telephone or by fire alarm pull box (see Section 3.2.3.4).

3.4 Fuel Receipt, Handling and Storage

3.4.1 Description of Operations

The general sequence of operations entailed in the receipt and unloading of the M-160 cask and PWR Core 2 blanket assembly handling and storage are shown in Figure 3.4-1. The interested reader is referred to the operating procedure package for details[23].

3.4.2 M-160 Cask Shipment and Receipt

The M-160 cask transport is covered in Reference 15. The M-160 cask and associated equipment are described in Reference 14.

3.4.3 Unloading of PWR Core 2 Blanket Modules

Upon cask receipt at the 221-T Canyon Facility, the cask car is moved to the uprighting site (previously shown in Figure 3.1-1). After blocking the car, it is jacked up and leveled, the polyethylene shield removed, and the cask raised to the vertical position on the car with a 150-ton mobile crane. The cask is locked into position by wedges, car jacks are removed, and the cask and car moved into the 221-T canyon railroad tunnel. The cask and rail car surfaces are draped with plastic and/or sisalcraft paper to minimize potential radioactive contamination of the rail car or of cask external surfaces during the defueling operations.

In the tunnel, the rail car is blocked to prevent car movement, the working platform moved into position, and the cask dust cover removed using the canyon crane. Sampling, fill, and drain line piping are then connected to the cask.[23]

The cask inner void space atmosphere is sampled to determine gas flammability (due to radiolytic hydrogen) and to assay for the presence of ^{85}Kr (which would indicate an assembly cladding failure). If the cask atmosphere is flammable, a nitrogen gas purge of the cask is required. However, all cask atmosphere, including that removed by a nitrogen purge, is sampled for ^{85}Kr. If ^{85}Kr is present as determined by gas sample analysis, cask unloading is allowed to proceed, but the assemblies are isolated in the pool for inspection and identification of the leaker(s). If pool water quality would be affected by the presence of the leaker(s), the leaker will be placed in a sealed container (overpack).

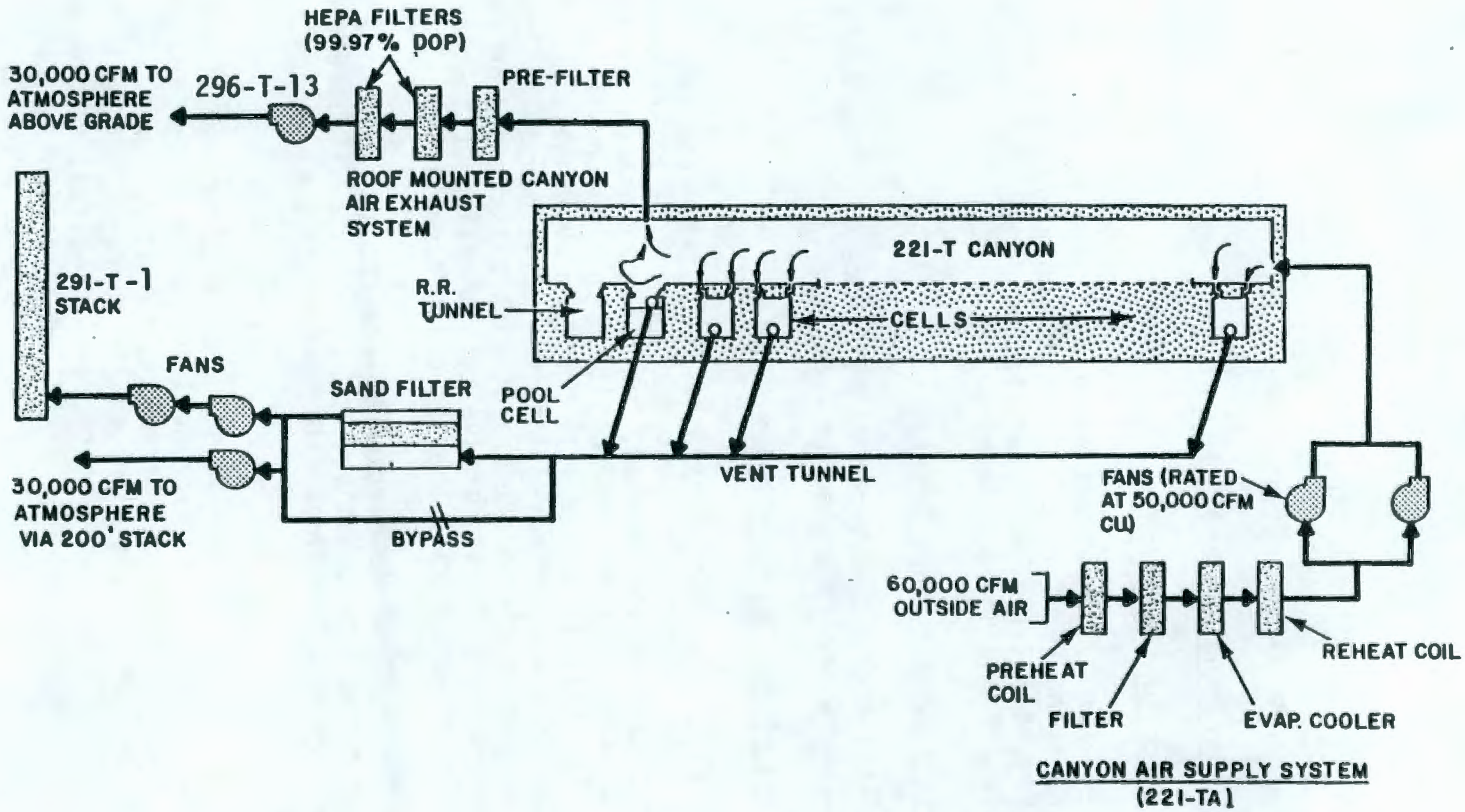


FIGURE 3.3-3 Ventilation Flow Diagram - T Plant

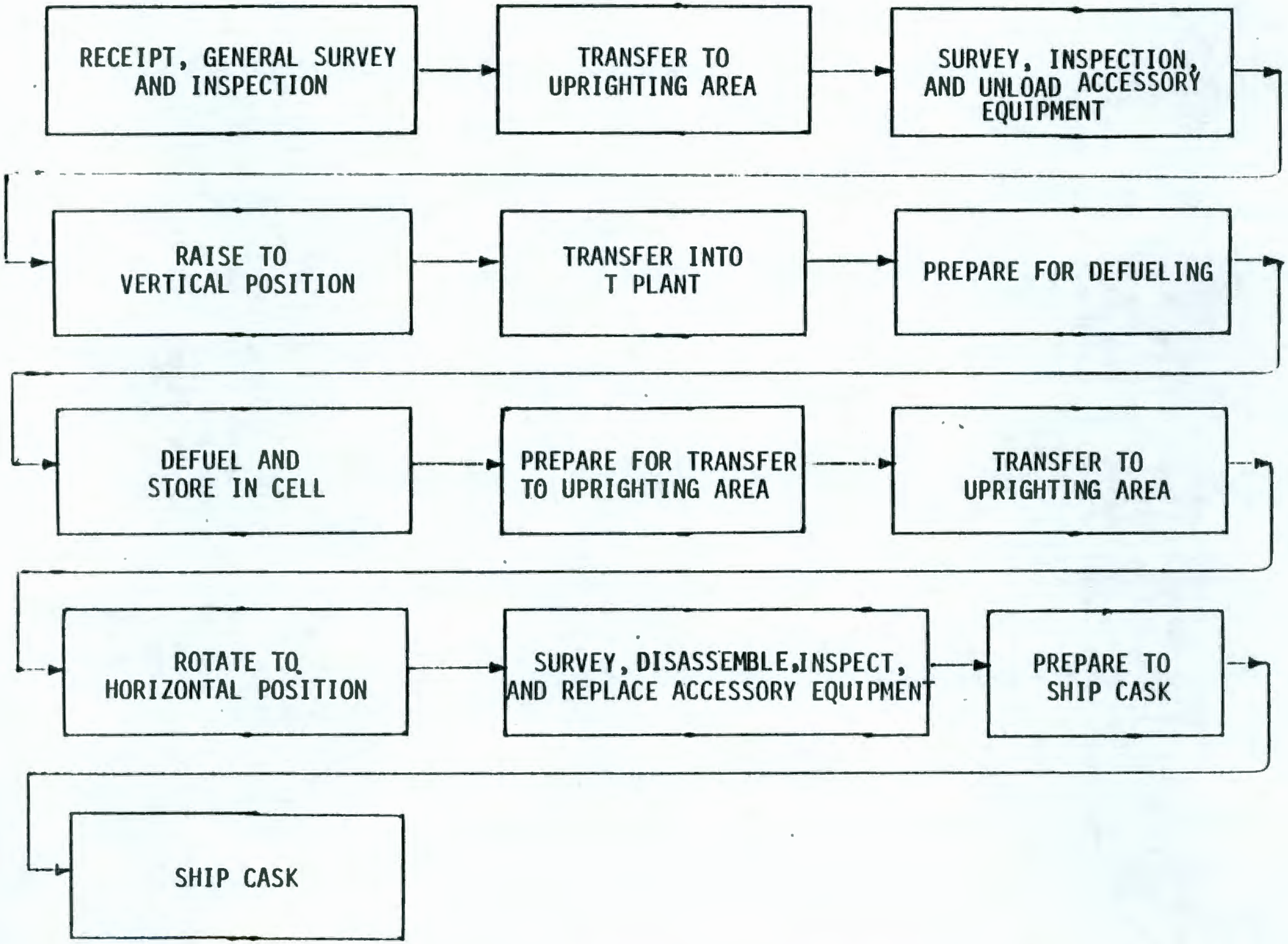


FIGURE 3.4-1 Sequence of Defueling Operations

When the cask atmosphere sampling is completed, the cask is filled with water, and the access port in the cask rotating top plate is indexed above a fuel assembly. The access port plug in the rotating top plate is removed and operating personnel secure the grapplers (primary and auxiliary) to the first blanket assembly. All personnel are now evacuated from the tunnel and canyon areas. The assembly is then lifted from the cask and transported to the Cell 4 pool storage rack. When the assembly has been positioned in the underwater storage rack, personnel re-enter the canyon, verify the assembly serial number against the shipping invoice, and detach the grapplers from the assembly. The above defueling operations are repeated until all fuel assemblies are in pool storage.

When all fuel is unloaded, the cask is drained of water, piping removed, the dust cover replaced, and the car unblocked. The rail car and cask are moved out of the canyon to the uprighting site (at less than 2 mph - 2.9 ft/sec), jacked and leveled, and the cask is lowered using the 150-ton mobile crane. The cask is surveyed and the neutron shield is replaced for return to Shippingport. Additional details may be found in the operating procedures[23].

3.4.4 Operations Evaluation

The above operations have been successfully performed at other sites using the standard M-160 cask handling procedures[49]. The only significant deviation from past practices is the transport of the 16'9" tall, 6'7" diameter cask in the vertical position for short distances. Transport of the cask, in the vertical position, at speeds $\leq$ 2 mph ($\leq$ 2.9 ft/sec) is within the design limitations of the cask and support assembly[14]. Added precautions are taken to insure safe operation, including imposition of administrative controls to suspend cask uprighting and transport operations during periods of erratic or high winds or other inclement weather.

3.4.5 PWR Core 2 Blanket Assembly Pool Storage

3.4.5.1 Pool Cell and Support Systems

The pool cell was previously shown in a cross sectional view (Figure 3.3.2), and its location indicated in Figure 3.3.1. The 13-foot by 27.5-foot by 28-foot deep pool holds approximately 50,000 gallons of water when filled to a depth of 19 feet. The assemblies are stored in racks at one end of the pool. That end is covered by concrete cover blocks during periods when fuel is not being charged to the pool to prevent fuel assembly damage by falling objects. The remainder of the pool surface is open to the canyon. This opening plus a small ventilation flow exhausted to the 221-T Wind Tunnel vents the surface of the pool. A guardrail is installed around the perimeter of the pool cell to provide a protective personnel barrier.

Pool support services, including pool water recirculation, cooling and purification equipment, are described in Vitro-R-499[4]. The only deviation from the referenced design criteria has been the use of Bettis-supplied storage racks instead of fabrication of new ones.

3.4.5.2 Storage and Surveillance

Prolonged water basin storage of Zircaloy-clad pressurized water reactor spent fuel has been demonstrated at commercial and government facilities. Parameters for heat removal, water quality, and radioactivity levels in pool water are well defined. Facilities required, surveillance requirements and spent fuel handling techniques are extensively documented[30].

3.4.5.3 Heat Removal

The storage basin cooling system is designed to remove 126,000 BTU/hr (or approximately 150 percent of the anticipated load) and maintain pool water temperature between 42° F and 54° F. This temperature range is comparable to that for other spent fuel storage facilities[30].

The PWR Core 2 blanket modules have been out of the reactor for approximately four years. Consequently, the heat load is quite low (on the order of 850 BTU/hr per assembly). As a result, complete loss of cooling results in only a gradual increase in the pool water temperature (equilibrium temperature <150° F). Heat dissipation from the pool surface and heat loss to the concrete is such that the pool water will not boil solely as the result of loss of the cooling system. Should the contents of the pool be lost, the only result would be extremely high radiation field readings in the 221-T Canyon Area. The equilibrium module skin temperature is less than 250° F in air due to heat dissipation by air convection.

3.4.5.4 Water Quality

Typically, storage pool water quality is maintained in the ranges shown in Table 3.4-1 by ion exchange purification and filtration.

TABLE 3.4-1

Typical Values for Water Quality

pH	4.5 - 9.5
Conductivity	< 5 μ mho/cc
Chloride	< 1.5 ppm

Zircaloy-clad irradiated fuel assemblies have been stored under these conditions for periods up to 18 years without any evidence of cladding degradation[30].

3.4.5.5 Pool Water Radionuclide Concentration

The primary sources of radioactivity in PWR storage pools are activation products associated with "crud" adhering to the module cladding and radioactivity leached from the spent fuel should cladding failure occur. Radioactivity levels in basins currently used for storage or high-integrity fuels is on the order of 1×10^{-3} to 1×10^{-7} µCi/ml[30]. This is due to the insolubility of the "crud" and of the fuel matrix. The PWR Core 2 fuel matrix is UO_2 powder compressed to approximately 90 percent theoretical density, quite similar in behavior to a ceramic.

Over a prolonged period of time, the ion exchange column resin used for water purification may become radioactively contaminated. Since the spent column in the 221-T canyon may be a potential source of gamma radiation (up to 1R/hr at contact), the column is designed to be disposed of as a unit and replaced in kind to minimize personnel exposures[4]. Further, the column is located in a shielded cubicle to minimize the radiation field levels on the 221-T canyon deck.

3.4.6 Instrumentation and Control Systems

Eberline* beta-gamma continuous air monitors (CAMS) are provided in the tunnel and canyon area for detection of radioactive contamination in air. Continuous air monitors will be set to alarm within one hour at 20 times the allowable concentration listed in Table 1, Appendix A, DOE Manual Chapter 0524[31]. An area high radiation alarm is also provided in the canyon with its detector located near the fuel storage pool. This system will have a readout from one R/hr up to 100 R/hr and an alarm system which annunciates at the R-3 entry into the canyon, near the detector at poolside, and in the control unit located at the Radiation Monitoring station outside of Section 20 of the canyon.

Personnel involved in the fuel unloading operation will wear protective clothing and a full-face filter respirator. In the event that a CAM or the area high radiation alarm sounds, all personnel will evacuate the area and will not re-enter until an evaluation of radiological conditions is made and requirements for re-entry are agreed to by Radiation Monitoring and the fuel unloading director.

3.4.6.1 Storage Pool Level Instrumentation

Instrumentation is provided to measure the water level within the storage pool and alarm on a high-or-low-water-level condition. Water level data is transmitted along with the high-and-low-water-level alarms to the Operating Gallery where the data is recorded and the water level alarms are annunciated.

Storage pool water temperature instrumentation is provided to measure the water temperature and alarm on an adjustable high temperature set point. Water temperature data is transmitted along with the high temperature alarm to the Operating Gallery where the data is recorded and the high temperature alarm is annunciated.

*Eberline Instrument Corporation

Storage pool heat exchanger cooling water instrumentation is provided to indicate a loss in heat exchanger cooling water. Loss of cooling water initiates an annunciator alarm in the Operating Gallery.

Grab sampling capability from the discharge of the water chillers, ion exchange discharge, and from the pool is provided. Periodic sampling and analysis will be used to control pH, conductivity, chloride, and radioactive content of the pool cell water.

4.0 SAFETY ASSESSMENT

4.1 Waste Confinement and Management

4.1.1 General Comments

General criteria for disposal of radioactive wastes are set forth in Reference 32, as modified by References 33, 34, and 35.

Normal operations associated with receipt, handling, and storage of PWR Core 2 blanket assemblies will not result in significant increases in gaseous or liquid borne radioactivity released to the environment. Some additional solid waste results from protective measures taken to prevent radioactive contamination of the external surfaces of the M-160 cask, rail car and the adjacent tunnel and canyon surfaces, from any required decontamination activities after completion of assembly transfer, and from periodic replacement of the ion exchange resin in the pool water purification system.

4.1.2 Liquid Waste Disposal

Radioactivity in liquid wastes released to the environs from the 221-T Canyon Facility is not expected to increase as a result of the PWR Core 2 project. Typical annual liquid waste releases are documented in Reference 1.

Liquid wastes generated in the 221-T canyon and tunnel areas are collected in the deep cell tank (Cell 5). A batch (11,000 to 13,000 gallons) is collected, sampled, analyzed, and routed to an underground waste storage tank. Process steam condensate and waste cooling water were in the past disposed of via a 24-inch collection header and from there to a percolation pond; however, the 24-inch collection header and retention basin are now inactive. The intertie allowing the module storage pool to overflow to the 24-inch header will be blanked prior to receipt of PWR Core 2 blanket modules. Should the pool water inventory become excessively contaminated with radioactivity, provisions exist to transfer the pool inventory, and flushes, to the deep cell collection tank for sampling and disposal to underground waste storage tankage.

Pool water cooling is performed by a closed loop refrigeration system. Waste cooling water from the secondary coolant system on the chillers is discarded to the chemical sewer which is routed to a percolation pond. Although this liquid waste stream normally is free of radioactive contaminants, it will be periodically sampled and analyzed for radioactive contamination.

4.1.3 Gaseous Waste Disposal

Exhaust air from the 221-T CAnyon Facility is filtered for removal of radioactive particulates and discharged via the 291-T-1 and 296-T-13 stacks as shown in Figure 3.3-3. Discharges via the 200-foot tall 291-T-1 stack are filtered via a sand filter which has a nominal efficiency of 98.6 percent for 0.3 micron diameter particulates. Discharges via the 296-T-13 canyon roof stack are filtered via a prefilter and two stages of HEPA filters which provide a nominal efficiency of > 99.9 percent for 0.3 micron diameter particulates. Operations associated with the PWR Core 2 project are not expected to result in any increase in radioactive discharges to atmosphere. Typical annual discharges are documented in Reference 1.

Both stacks are equipped with continuous samplers and radiation alarms. Since a recent evaluation concluded that neither sampler obtains a truly representative sample [36,47], the samplers will be upgraded prior to receipt and storage of the fuel assemblies. Stack radioactivity releases above permissible limits are resolved in accordance with Emergency Procedures [37].

4.1.4 Solid Waste Disposal

Solid wastes such as decontamination materials or failed canyon equipment are packaged and buried in earth trenches. The spent ion exchange resin is disposed of in a similar fashion. After the inlet and outlet nozzles of the ion exchange column are blanked, the column is removed as a unit and buried with other canyon wastes. Organic resins, such as used in this service, may form unstable nitrates if exposed to nitric acid. However, this condition is precluded since the resin will only have been exposed to water during its service, and by sealing the column the resin will remain wetted by the residual pool water [38].

An approximate 10-20 percent increase in the solid waste generation rate is anticipated for the period during which the series of cask receipt and unloading operations occur due to the use of plastic and/or sisalcraft protective coverings and from possible decontamination activities. Subsequent PWR Core 2 blanket assembly storage will have minimal impact on the 221-T annual solid waste output. A typical annual solid waste generation for 221-T is given in Reference 1.

4.2 Radiation Protection

4.2.1 Personnel Radiation Exposure

The activities of Rockwell Hanford Operations' employees shall be controlled so that their radiation exposure is limited to as low as is reasonably achievable [22], and should not exceed the administrative control limits specified in ARH-220, "Radiation Protection Standards and Controls" [21].

All equipment is designed, and operating and radiation work procedures are written, approved, and implemented, to minimize radiation exposure to personnel. Where practicable during cask handling and unloading, the dose rate is lowered to less than 10 mrem/hr through use of portable polyethylene shielding. Where this is not practicable, access controls are in place to either preclude personnel entry into the radiation field, or to control zone entry to a minimal number of personnel and to limit the duration of the entry. With all modules stored in racks under seven feet of water in the pool, the dose rate at the surface of the pool will be < 5 mrem/hr.

4.2.2 Radiation Sources

The radiation sources, which will be encountered in unloading the M-160 shipping container, are associated with the fuel assemblies. These sources are: the blanket fuel plates (fuel matrix); the material which has adhered to the surfaces of the fuel plates (crud); and the activated core support assemblies (hardware).

Each PWR core blanket fuel plate (previously shown in Figure 3.2-1) is an essentially sealed source containing about 3.6 kilograms of uranium (initially 0.7 percent ^{235}U), 30 grams of plutonium, and fission products including ^{85}Kr, ^{90}Sr-^{90}Y, ^{137}Cs, ^{106}Ru, ^{106}Rh, ^{137}Ba, ^{144}Ce, ^{144}Pr, ^{147}Pm, and others of less than one percent of the total fission product inventory (see Table 3.2-1 for a detailed fission product inventory). Each blanket assembly contains 60 fuel plates.

The material adhering to the surfaces of the blanket fuel module is "crud" containing approximately 5 curies of activity (primarily ^{60}Co and ^{55}Fe)[15]. The "crud" derives from the reactor coolant and is of concern only in the unlikely event of its sloughing off. Activation products are also associated with the fuel assembly hardware, e.g., the top and bottom extension brackets (stainless steel) and the outer fuel cluster can (Zircaloy). The associated hardware activation products add less than 3 mrem/hr to the total dose rate from the fuel assembly[39]. The expected maximum dose rate from a single blanket module is estimated to be less than 4,000 rem/hr gamma and 20 rem/hr neutron[40] at contact.

4.2.3 Radiation Protection Design Features

4.2.3.1 Facility

Due to the high exposure levels, the M-160 shipping container unloading will be done remotely, from shielded areas, wherever practicable. Specialized tools will be used in many operations to decrease the time required in unloading the fuel. The uprighting and preparation of the shipping container for unloading will require contact maintenance, although shielding will be used wherever practicable to reduce personnel exposure. The grappling of the fuel assemblies will be done using extension tools through water shielding. The actual transfer will be accomplished remotely using the canyon crane.

4.2.3.2 Shielding

A significant amount of personnel exposure is anticipated from the neutron dose rates associated with the fuel when handling and unloading the M-160 shipping container. Therefore, polyethylene shielding will be used to reduce exposures. Wherever practicable, the dose rate to personnel will be controlled at less than 10 mrem/hr (whole body). In many cases, the shielding thickness required to reach 10 mrem/hr would not be practicable. In these cases, less shielding will be used and exposures will be minimized by controlling the residence time in these areas. All work associated with handling and unloading of the M-160 cask will be in compliance with approved procedures.[23]

4.2.3.3 Radiation Alarm Systems

A radiation field level detector equipped with audible and visual alarms is located in the vicinity of the pool. The alarm signal is also transmitted to a canyon entry point (R-3) and a Radiation Monitoring station outside of Section 20 of the canyon. The detector and alarm system is equipped with battery-supplied auxiliary power, capable of two hours of continuous operation if there is a failure of normal power.

Continuous airborne radioactivity monitors are in place and tied to a common visual and audible alarm system. The alarm system alerts personnel in the canyon to airborne radioactivity levels in excess of allowed assault mask limits (see Section 3.4.5).

4.2.4 Estimated Man-Rem Onsite Dose Assessment

The total exposure for unloading each M-160 shipping container is expected to be approximately 2.5 man-rem[41]. This is a conservative estimate using the highest exposure level expected for any of the fuel modules and estimated contact times, plus a 20 percent contingency, since all activities were assumed to proceed as planned. This estimate includes no adjustments for accidents or the additional handling which would be required by a leaking fuel element. The latter are included in Section 4.3, Accident Analysis.

The uprighting of the loaded M-160 shipping container will require an estimated 1.8 man-rem. Most of this exposure will be sustained during work under the rail car in removing the transportation polyshield and in the rotating trunnion area of the container once the shielding between the container and rail car is removed. In both of these cases, there is no practicable method for shielding available; administrative controls are used to limit personnel radiation exposure. The actual unloading of the fuel within the 221-T canyon and its positioning in the storage rack will require an estimated 0.4 man-rem.

4.2.5 Health Physics Program

The Rockwell Hanford Operations' Health Physics Program for the PWR Core 2 project includes the personnel concerned with radiation safety and protection, the instruments and equipment employed in this function, and the surveillance of radiation sources, working areas and personnel, involved in carrying out this program, as described in the Preliminary Purex Safety Analysis Report[42].

4.2.6 Estimated Man-Rem Offsite Dose Assessment

Since the fuel transfer and storage operations are conducted in the canyon area which provides containment of radioactivity, no increase in offsite population exposure is expected to occur as a result of PWR Core 2 project operations, either from normal conditions or from abnormal/accident conditions[5,48].

4.3 Accident Analysis

A system accident analysis was performed for the PWR Core 2 project[5]. Event sequences analyzed for potential accidents included (1) leaking fuel assemblies, (2) fire and explosion, (3) loss of coolant or cooling capability, (4) dropped and/or damaged fuel assemblies, and (5) extrinsic occurrences, including missile impact and natural occurrences (e.g., earthquake, tornado). The analysis was responsive to the requirements stated in U. S. DOE Regulatory Guide 3.24, "Guidance on the License Application, Siting, Design, and Plant Protection for an Independent Spent Fuel Storage Installation".

Accident frequencies were determined to be very low ($\sim 10^{-4}$/hr). Accident consequences are greatly mitigated by the safety and containment features designed into the fuel modules and shipping cask, the long cooling time since reactor discharge ($\sim$ 4 years), and the redundant safety features designed into the facilities, equipment, and operating procedures for the PWR Core 2 project. No analyzed accident results in a significant offsite population dose.[48] Tables 4.3-1 and 4.3-2 reproduced from Reference 5, summarize the risk determining accidents, giving accident frequency, curies released, and associated dose commitments to operating personnel for recovery operations.

Recovery from accidental release of radioactive "crud" and/or mixed fission products from a dropped or damaged fuel assembly, in the tunnel or on the canyon deck, could result in dose rates up to 1.5 R/hr, after remote recovery and packaging of the fuel assembly. Initial remote decontamination efforts are expected to reduce the dose rates to < 100 mrem/hr prior to contact decontamination by operations personnel.

TABLE 4.3-1

Accident Risk to Environment[5]
(Risk = Frequency x Curies Released)

Accident	Frequency	Release	Risk
Cask Containment Breached*	8×10^{-2}/year	12 curies	∿ 1 ci/year
Module Dropped in Tunnel**	3×10^{-3}/year	12 curies	∿ 0.036 ci/year

* Cask containment breached (Transfers A and I to 4.0). High wind blows cask out of vertical. Cask tips off car. Cask vent line broken open. Pressurized cask vents loose contamination (predominantly ^{55}Fe and ^{60}Co) to the environs. This accident may happen during cask uprighting, or during transport with cask in vertical position.

** PWR-2 module containment breached (Transfer G to Transfers B and C to 1.1, gaseous release to 1.0 UCRR - 221-T Plant). During module removal from cask, or transport to storage, module is either dropped and the cladding breached; or the module strikes an obstruction with sufficient impact to breach cladding. The major release is ^{85}Kr. A potential release of 2 - 3 curies of non-volatile fission products is possible as a result of recovery efforts should the module fall in the tunnel.

TABLE 4.3-2

Impact on Facility and Personnel of In-Plant Accidents [5]

Damaged	Frequency	Curies Released in Canyon	Man-Rem Exposure for Recovery
1. Module Damaged by Impact			
a. "Crud" Dislodged	2.8×10^{-3}/year	5	3
b. Cladding Breached	2.8×10^{-3}/year	57	4
2. Module Cladding Breached in Pool Storage	2×10^{-4}/year	108 (Water concentration 6×10^{-1} μCi/ml)	7

5.0 ADMINISTRATIVE CONTROL SYSTEM

5.1 Conduct of Operations

5.1.1 Organizational Structure

The Rockwell Hanford Operations' organizational structure and the respective function responsibility and authority of each component are defined in the Rockwell Hanford Operations' Policy Manual[22]. A matrix management system is in place and consists of parallel program and functional organizations.

Full responsibility for the management of the PWR Core 2 receipt and storage is assigned to the Chemical Processing Program organization headed by a program director. The management of this project is delegated by the program director to a project manager, who represents Rockwell in all project matters with the customer and other project participants, and provides overall program technical and administrative direction to the project representatives provided from the appropriate functional organizations.

Responsibility for operation of the 221-T Canyon Facility is assigned to the Director, Production Operations Function. This responsibility, which includes storage and surveillance of the PWR Core 2 fuel assemblies, is delegated to the Manager, Plutonium Operations.

The PWR Core 2 project receives support from the Research and Engineering Function, the Health, Safety and Environment Function, the Quality Assurance Function, and the Production Support Function.

Design and construction activities associated with this project (e.g., cask uprighting station, canyon crane modifications, pool cell modifications), not performed by Rockwell, were performed by Vitro Engineering Corporation and J. A. Jones Construction Company, respectively, under contracts administered by Rockwell Hanford Operations.

5.1.2 Normal Operations

Overall coordination and direction of the PWR Core 2 defueling activities is provided by the Defueling Director. Storage and surveillance activities are the responsibilities of the Plutonium Operations Manager.

All activities associated with this program will be conducted in compliance with Operational Safety Requirements, which are being provided as a separate document by Research and Engineering Function personnel, and with formal operating procedures. Operating procedures are prepared, reviewed and approved by knowledgeable functional representatives from such organizations as Health, Safety and Environment, Maintenance, Production Operations, Quality Assurance, Research and Engineering, Production Support, and Safeguards and Security, depending upon the subject procedure. Procedures provide general instructions, safety requirements, equipment requirements and stepwise instructions for performance associated with receiving, handling, defueling, and return of the M-160 shipping cask, and for storage and surveillance of the fuel assemblies.[23] Performance of procedural items is done by various personnel (radiation monitors, crane operators, riggers, pipefitters, chemical operators, etc.), who have received training on the M-160 Cask System[17] together with "hands on" experience during the trial run with the M-160 Cask and dummy fuel element. Procedures contain numerous hold and check points, requiring responsible supervisory signoff, to assure that procedural requirements are met prior to further activity.

5.1.3 Emergency Response System

The Rockwell Hanford Site Emergency Plan is documented in RHO-MA-111[43]. Detailed procedures for specific facilities and operations covering response to potential plant emergencies are documented in the Emergency Procedures Manual[37]. Incorporated in these emergency procedures are the emergency notification requirements and the identities of those personnel with responsibility and authority in an emergency situation. Detailed information on emergency notification, communication, emergency chain of command, and the Emergency Control Center are given in RHO-MA-111.

5.2 Quality Assurance

5.2.1 Quality Assurance in Design, Construction and Facility Acceptance

Quality Assurance requirements for all contractors involved in the design, construction and testing of the facilities for receipt, handling and storage of PWR Core 2 blanket modules are set forth in ARH-MA-150[44].

Three levels have been established for classifying structures and components according to safety considerations for system designs as defined in ARH-MA-150. The fuel element suspension system and the primary piping and ion exchange column are designated QA Level II; the structural shielding is QA Level III. Failure of these systems would not have significant impact on personnel, the environment, or the offsite public.

5.2.2 Quality Assurance in Operations

The Quality Assurance Function is responsible for monitoring and surveillance of the conduct of operations to insure adequate and safe control. Operating procedures are reviewed and approved for proper inclusion of quality requirements and inspection verification check points, where appropriate. These requirements are defined by RHO-MA-102, Quality Engineering Instructions[45].

5.3 Safeguards and Security

Protection of the PWR Core 2 blanket modules from theft and sabotage is afforded by the following provisions[46].

a. The modules are stored within a water-filled canyon cell, covered by 6-foot thick concrete "cover blocks", located in a controlled access building (221-T) within a limited access security area (200 West).

b. Radiation detection instrumentation in the vicinity of the pool gives timely indication of module removal from the storage pool.

c. Administrative control systems are in place to assure that operating and support personnel working within the facility are aware of the presence of the modules and are alert to potential acts of diversion or sabotage.

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