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DESCRIPTION:
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ENCLOSURES:
(1) System Design Bases Document for Installation of Radwaste Evaporator - Revision 3, dtd 10-4-74.
(2) Preliminary Safety Evaluation of the Radwaste Evaporator Addition - Revision 4, dtd 9-30-74

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PLANT NAME: H. B. Robinson Unit No. 2

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Carolina Power & Light Company

50-261

October 17, 1974

File: NG-3514 (R) Serial: NG-74-1235

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RECEIVED OCT 22 1974 U.S. ATOMIC ENERGY COMMISSION Regulatory Mail Section

Mr. Edson G. Case, Acting Director
Directorate of Licensing
Office of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Case:

H. B. ROBINSON UNIT NO. 2
LICENSE NO. DPR-23
RADIOACTIVE WASTE EVAPORATOR ADDITION

Carolina Power & Light Company intends to proceed with the design and installation of a new radioactive liquid waste evaporator to upgrade the radioactive waste disposal system at its H. B. Robinson S. E. Plant, Unit No. 2, under the provisions of 10CFR50.59.

Preliminary design and safety evaluations of this plant modification have been reviewed by various groups within Carolina Power & Light Company, including the Nuclear Safety Committees. Carolina Power & Light Company believes that the modification does not involve either a change in the Technical Specifications of the facility operating license or an unreviewed safety question but submits the enclosed documents for your information.

The performance of the existing waste evaporator has for some time been a matter of concern to both Carolina Power & Light Company and the Directorate of Regulatory Operations and has been documented in DRO inspection reports as unresolved item 72-4/3. This item has since been resolved (Ref. RO Inspection Report 50-261/74-2) as a result of our commitment to install a new waste evaporator.

Enclosure 1 of this letter details the design bases for the new evaporator installation and its associated equipment. The existing waste evaporator will remain in the waste treatment system and be operated as a backup to the new waste evaporator, the two evaporators being installed essentially in parallel in the liquid waste treatment system. In addition to the new evaporator, additional tanks for waste condensate and concentrate will be installed to increase holdup capacity and enhance operating flexibility.

10885

336 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

The new waste evaporator and its associated equipment, except for interconnections with existing plant systems, will be housed in a new seismic Category I building to be constructed adjacent to, but structurally independent of, the existing Reactor Auxiliary Building, thereby minimizing the impact of construction activities on the existing plant systems and structures. The existing liquid waste treatment system shall remain operational throughout the construction effort, except for brief periods during which connections to the new system are made. These periods of outage shall be carefully planned and scheduled and should have no significant impact on the operation of the plant.

Carolina Power & Light Company is currently engaged in preliminary discussions with various vendors of evaporators and the design which appears most suitable is a falling film, vapor-compression evaporator. This type of evaporator requires little or no heating steam and cooling water, depending on detailed design, thereby again minimizing impact on existing plant systems.

Enclosure 2 of this letter is a copy of the preliminary safety evaluation of this modification using the design bases of Enclosure 1. This Safety Evaluation and the System Design Bases have been reviewed by the Company Nuclear Safety Committee and the Plant Nuclear Safety Committee and both committees have ruled that this proposed plant modification does not involve either a change to the Technical Specifications of the facility operating license or an unreviewed safety question as defined in 10CFR50.59.

Yours very truly,

E. E. Utley
Vice-President
Bulk Power Supply

HL:mvp

Enclosures: 1. System Design Bases Document for Installation of Radwaste Evaporator at H. B. Robinson - Unit No. 2, Revision 3, dated October 4, 1974.

2. Preliminary Safety Evaluation of the Radwaste Evaporator Addition at H. B. Robinson - Unit No. 2, Revision 4, dated September 30, 1974.

cc: Messrs. N. B. Bessac
W. B. Howell
J. B. McGirt
D. V. Menscer
D. B. Waters
B. H. Webster

Received w/Ltr Dated 10-17-74

50-261

SYSTEM DESIGN BASES DOCUMENT
(LB-74-2)

FOR

INSTALLATION OF RADWASTE EVAPORATOR AT

H. B. ROBINSON - UNIT NO. 2

Reviewed By

Title	Name	Date
CE, NPE II	S. L. Pobutkiewicz	10-4-74
	D. A. Casada	10-4-74
PPE, NPE II	G. R. Winders (S. L. Pobutkiewicz for G. R. W.)	10-4-74
PC-NGS	H. Lipa	10-4-74

Revision: 3

Date: October 4, 1974

10885

System Design Bases Document (SDBD) for addition of 10-50 gpm radwaste evaporator in the waste disposal system of H. B. Robinson - Unit No. 2. 3

1. Objectives

1.1 To increase waste disposal system capacity to handle waste water during outages, shutdowns, S/G blowdown or periods of high leakage and also; 3

1.2 Meet the required limits for radioactive waste, i.e., liquid, solid and gaseous wastes, as set forth in Section 3.9 "Radioactive Effluents" of the Technical Specifications and Bases of Facility Operating License DPR-23.

2. System Requirements

The 10-50 gpm radwaste evaporator addition must be designed to meet the following requirements: 3

2.1 Design life - 35 years

2.2 Radwaste evaporator capacity approximately 10-50 gpm 3

2.3 The radwaste evaporator will normally be required to process the following contaminants:

Contaminant	Typical Process Feed
Boric Acid	10-2500 ppm (as Boron)
LiOH	0.22-2.2 ppm (as Lithium)
K_2CrO_4	0-1000 ppm
Chloride	0.15 ppm (max.)
Gross B-γ degassed activity, mixed fission and corrosion products	10^{-2} - 10^{-3} μCi/g
pH	4.5 - 9.0

In addition to the above, the radwaste evaporator will also be required to process the following contaminants in the event of steam generator tube leakage:

Contaminant	Typical Process Feed
pH	8.5-10.6
PO_4	10-80 ppm
Na/PO_4	2.3 - 2.6
Silica	<5 ppm
Chloride	<75 ppm
Oxygen	<.005 ppm
Blowdown	≥5 GPM/Generator

Revision: 3

Date: October 4, 1974

2.4 All discharges to the environment to be as low as practicable and to meet the limits as set forth in Step 1.2 above.

2.5 All radwaste equipment to be non-seismic design. 3

2.6 Include provisions (flowmeters, pressure, and temperature gages) for initial and periodic testing as required to evaluate system performance.

2.7 An Electric Boiler of adequate capacity to supply steam to the radwaste evaporator, if required. 3

2.8 To supply permanent heat tracing of radwaste concentrate piping and permanent external back-up steam tracing (See Step 3.5.2.7) of radwaste concentrate tank for use when the electric tank heaters are out of service.

2.9 Radwaste concentrate tank to be equipped with suitable electric heating element to maintain temperature between 140-150°F and suitably insulated as required.

2.10 The radwaste evaporator concentrator shell, radwaste feed piping, radwaste condensate tanks and radwaste concentrate tank to be equipped with suitable connections for flushing with pure water (see Step 6.8) and the capability of adding decontamination solutions. The decontaminating rinsing facilities may require a common decontamination fluid feed tank and the entire facility is to be remote manual operated. The tanks to be equipped with hand holes/manways to facilitate cleaning.

2.11 The building enclosing the new radwaste evaporator will be built to Seismic Category I, SSE including the capability to withstand the Design Basis Flood (DBF), see Reference (b), and Design Basis Tornado (DBT), [1] see reference (c).

2.12 Building walls, shielding, to be of sufficient thickness to reduce the exposure of operating and maintenance personnel from radiation sources, the dose rates shall be as defined in FSAR Section 11.2.

2.13 Removable concrete block walls may be constructed and installed inside the building for internal shielding. See Step 4.2.

2.14 All pumps, tanks, valves, controllers, instrumentation to be located so as to facilitate efficient maintenance and operation with provision for biological shielding from radiation sources.

2.15 An independent cooling system utilizing one of the cooling mode options suggested in the heat rejection study to supply cooling water for the radwaste evaporator components, if required.

2.16 Upgrade the steam generator drain pump and piping as required to provide capability to transfer water from the steam generator blowdown drain tank to the waste holdup tank.

2.17 All noncondensable gases from the radwaste evaporator to be properly disposed of. See Step 6.9.5.

Note: (1) Tornado generated missiles, i.e., wooden plank, wooden utility pole, solid metal rod, pipe, metal siding and automobile. See Table 1 for tornado generated missile characteristics.

Revision: 3

2.18 The radwaste evaporator final site acceptance test will be based upon:

a. Obtaining a decontamination factor (DF) of 10^6 where

$$DF = \frac{\text{Sodium Concentrate (ppm)}}{\text{Sodium Distillate (ppm)}}$$

During the performance of the test, the minimum concentration of sodium concentrate will be 30,000 ppm.

b. Obtaining a DF of 10^3 on boric acid where

$$DF = \frac{\text{Boric Acid Concentrate (ppm)}}{\text{Boric Acid Distillate (ppm)}}$$

During the performance of the test, the minimum concentration of boric acid concentrate will be 15,000 ppm.

The analytical procedure used in determining the sodium and boric acid concentration shall be approved by Carolina Power & Light (CP&L) prior to test performance.

2.19 All components directly exposed to the concentrate fluid, i.e., within two feet of the fluid, will be exposed to 10 Rad/Hr. over the lifetime of the radwaste evaporator.

2.20 Power consumption for the evaporator should not exceed 100 kilowatt hours per thousand gallons of feed. | 3

3. Component Requirements

The components of the 10-50 gpm radwaste evaporator addition must be designed to meet the following requirements: | 3

3.1 Radwaste Evaporator and Gas Stripper

3.1.1 To be constructed of suitable corrosion resistant material in accordance with Section VIII Division 1 of ASME Code, Revision - Winter, 1973

3.1.2 Group D Quality Standards. See Reference (a)

3.1.3 All process piping on the evaporator shall be welded; however, flanges shall be used for maintenance of heat exchangers, pumps, relief valves, and where necessary for disassembly of components

3.1.4 Gravity drain capability both on the tube bundle and the evaporator shell

3.2 Pumps

3.2.1 All radioactive waste liquid pumps to be canned motor or direct motor driven centrifugal pumps

3.2.2 All radioactive waste liquid direct motor driven centrifugal pumps to be equipped with mechanical seals or buffer seals (labyrinths) and leakage collecting devices

3.2.3 Radwaste Evaporator Condensate and/or Distillate Pumps

Revision 3

3.2.3.1 Wetted surfaces to be constructed of 304 Stainless Steel (SS) or equivalent in accordance with Section VIII, Division 1 of ASME Code, Revision - Winter, 1973

3.2.3.2 Group D Quality Standards

3.2.3.3 Radwaste evaporator condensate pump capacity and head as required to suit evaporator output and to discharge condensate to service water system.

3.2.4 Radwaste Evaporator Concentrate and Feed Pumps

3.2.4.1 Wetted surfaces to be constructed of 304 SS or equivalent in accordance with Section VIII Division 1 of ASME Code, Revision - Winter, 1973.

3.2.4.2 Group D Quality Standards

3.2.4.3 Radwaste evaporator concentrate pump capacity and head as required to discharge concentrate to drumming station; radwaste evaporator feed pump capacity and head as required to supply evaporator with water under all operating conditions. | 3 | 3

3.2.5 Steam Generator Drain Pump

3.2.5.1 Wetted surfaces to be constructed of bronze or equivalent in accordance with Section VIII, Division 1 of ASME Code, Revision - Winter, 1973

3.2.5.2 Group D Quality Standards

3.2.5.3 Horizontal, split casing, single stage centrifugal, capacity-150 gpm, head - 75 ft. 1800 RPM, connections 2 inch discharge 3 inch suction, condensate temperature range 35°F to 212°F

3.2.5.4 Motor - Constant Speed, 3-phase 60 cycle 1800 RPM

3.3 Valves

3.3.1 To be provided in system to isolate each piece of equipment for maintenance and proper system operation

3.3.2 Relief valves, vacuum breakers or other suitable pressure protection devices to relieve back to the waste holdup tank or new building sump for all tanks containing potentially radioactive fluid. | 3

3.3.3 Valves handling radioactive liquids to be equipped with stem leakage control

3.3.4 Valves in contact with radioactive liquids to be constructed of 304 SS or equivalent in accordance with ANSI B31.1.0

3.3.5 Group D Quality Standards

3.3.6 To be constructed of Carbon Steel (CS) in accordance with ANSI B31.1.0, if exposed to gases, steam supply, and cooling water supply

3.4 Piping

3.4.1 All connections to be welded, except where flanged connections are necessary to facilitate equipment maintenance

3.4.2 No threaded connections are allowed

3.4.3 Piping in contact with radioactive liquid to be constructed of 304 SS or equivalent in accordance with ANSI B31.1.0 power piping.
Sensitization in welded piping may require the use of 304L Stainless Steel Pipe.

3.4.4 Group D Quality Standard

3.4.5 To be heat traced, to prevent boric acid crystallization, in waste concentrate piping

3.4.6 To minimize radiation buildup, use long radius bends in lieu of elbows and also minimize the dead-end connections in potentially radioactive systems

3.4.7 In determining piping sizes for potentially radioactive systems, consider velocity effects of fluid for minimizing radiation buildup

3.4.8 Piping in contact with gases, steam supply and cooling water to be constructed of carbon steel (CS) in accordance with ANSI B31.1.0 power piping

3.5 <u>Tanks</u>

3.5.1 <u>Radwaste Evaporator Condensate Tanks</u>

3.5.1.1 To be constructed of 304 SS or equivalent in accordance with API-650, AWWA D 100, or ANSI B96.1

3.5.1.2 Group D Quality Standards

3.5.1.3 Two atmospheric tanks - capacity approximately 5000 gallons each

3.5.1.4 To be equipped with sample drain on tank recirculation line on discharge side of pump

3.5.1.5 To be equipped with liquid level indication - local and remote reading

3.5.1.6 To be equipped with high/low level alarms - remote indication

3.5.1.7 To be equipped with pump cutout on high and low level alarms | 3

3.5.2 <u>Radwaste Evaporator Concentrate Tank</u>

3.5.2.1 To be constructed of 304 SS or equivalent in accordance with API-650, AWWA D 100, or ANSI B 96.1

3.5.2.2 Group D Quality Standards

3.5.2.3 One atmospheric tank - Tentative capacity 3000 gallons | 3

3.5.2.4 To be equipped with remote liquid level indicator and high/low level alarm and pump cutout on high and low level alarms. | 3

3.5.2.5 To be equipped with suitable heater to maintain 140-150°F

3.5.2.6 Heater cutout protection to be provided on low level and over temperature conditions

3.5.2.7 To be externally steam traced (emergency backup) with copper tubing or equivalent and fitted with a steam hose connection on one end and a steam trap on the other end (see Step 2.8)

3.5.3 Reagent Tank; Decontamination Fluid Feed Tank (if required)

3.5.3.1 To be constructed of 304 SS or equivalent as required by reference (a) and component design pressure.

3.5.3.2 Group D Quality Standards

3.5.3.3 Tank(s) - capacity approximately 5 gallons

4. Building Requirements | 3

The addition of the 10-50 gpm radwaste evaporator and its associated components necessitates the addition of a new building to the existing building. The new building may have to be a separate building without a common wall, as dictated by seismic and other design considerations. The building must be designed to meet the following requirements: | 3

4.1 Seismic Category 1, SSE including the capability to withstand the Design Basis Flood (DBF), and the Design Basis Tornado (DBT)

4.2 Building walls, shielding, to be of sufficient thickness to reduce the exposure of operating and maintenance personnel from radiation sources; the integrated dose rates to be in compliance with 10CFR20, i.e., dose rate outside building at less than 1.0 mr/hr and inside building, outside of shield walls at less than 2.5 mr/hr. Removable concrete block walls may be constructed for internal shielding. (see Step 2.13). The plant management will supply maximum anticipated source terms as requested for determination of wall thickness necessary to attenuate the radiation to the above limits.

4.3 To provide adequate sump capability for containing all waste concentrate liquid in event of rupture of the waste concentrate tank. The top of the sump should be located approximately 8 inches below ground level. The sump shall have the capability of being pumped back to the waste holdup tank or other suitable location. |3

4.4 The portion of the building housing the radwaste evaporator should have adequate sump capability of containing all radwaste evaporator liquids in event of rupture. This sump shall have the capability of being pumped back to the waste holdup tank or other suitable location. |3

4.5 To be equipped with adequate ventilation with exhaust connection prior to presently installed plant ventilation exhaust stack filters and radiation monitor. A slight negative pressure should be maintained in the building at all times relative to pressure outside building.

Note: Curb barriers around the radwaste concentrate sump tank and the evaporator sump tank or other suitable means are required to prevent the condensate tanks from spilling into the sumps.

4.6 The ventilation supply and exhaust systems to be designed for the following conditions:

4.6.1 Outdoor air - 95°F dry bulb and 78°F wet bulb Indoor air to be maintained at 80°F nominal and 104°F maximum

4.6.2 Direction of air flow from low activity areas to higher activity areas

4.7 Boiler with associated feed and condensate, chemical feed and blowdown systems, to be housed external to new building annex and enclosed with adequate protection from the elements, if required.

4.8 To provide adequate space for tube pulling from radwaste evaporator and heat exchangers. Overhead monorails, dolly, and special lifting equipment, as suitable, are to be provided for all major components.

4.9 The building must include provisions for removable roof or wall plugs to allow removal and maintenance on all major components.

4.10 The building should have the capability to house a new larger capacity air compressor which will replace or complement the existing plant instrument air compressor.

5. Operating and Safety Requirements

The 10-50 gpm radwaste evaporator must be equipped with the following operating and safety requirements: 3

5.1 Provide remote, preferrably air operated valves, for system control/operation from a remote panel to be located inside the existing auxiliary building. This will require the diesel emergency batteries to be relocated from their present position.

5.2 Provide remote operation of all pumps from the remote panel. All motor control equipment and system controllers to be mounted in remote panel(s) outside radwaste evaporator room.

5.3 Provide local and remote level indication with alarms at the remote panel for the radwaste evaporator and condensate tanks.

5.4 Provide remote level indication and alarm for the radwaste concentrate tank.

5.5 Heater cutout protection to be provided on low level and over-temperature condition for the radwaste concentrate tank.

5.6 Provide temperature and pressure/vacuum gages as required for remote and local reading. Critical temperatures such as radwaste concentrate tank temperature should alarm (2) at the remote panel.

5.7 In general, design of control system shall be such as to permit startup, normal operation, shutdown, and pump-out to be performed entirely from the control panel in the existing auxiliary building.

5.8 The ventilation supply and exhaust fans to be interlocked, i.e., starting an exhaust fan will automatically start a supply fan.

Note: (2) Alarm can be construed to mean horn, siren, flashing red light, etc. The alarm should function as follows:

Action	Light	Audible
Normal	Off	Off

Revision 3

Alarm	Flashing	On
Acknowledge	Steady On	Off
Return to Normal	Off	Off
Test	Flashing	On

5.9 Ventilation system to be equipped with local and remote start features with indicating lights at the remote panel.

5.10 In order to minimize radiation exposures to personnel, the general requirements for "facility and equipment design" of reference (d) should be adhered to.

6. System Interfaces and Parameters

The 10-50 gpm radwaste evaporator will interface with the following system: 3

6.1 Plant ventilation inlet tie-in to existing ventilation system or (optional) to install new ventilation inlet for building. the new ventilation exhaust must tie in to the existing plant ventilation system prior to the plant ventilation exhaust stack radiation monitors.

6.2 Instrument air tie-in to provide operating air for control valves, normal operating pressure, 90 psig; design pressure, 150 psig; tie-in(s) to be made at any convenient location. A new instrument air system may be installed if required.

6.3 Station air tie-in to provide operating air for all pneumatic tools and air cleaning operations, normal operating pressure, 100 psig; design pressure 150 psig. Air connection to be tied-in at any convenient location and header to be installed near new building addition.

6.4 Electrical power supplies for pump motors, controllers, indications, alarms, etc. Power available 480V-3ϕ-60; 120V-1ϕ-60; and 125V DC.

6.5 A new area radiation monitoring system for new building with tie-in at existing panel in control room and alarm capability to indicate that problem does exist with the new radwaste evaporator system. The radiation monitoring system should give local and remote readout and alarm.

6.6 Deleted.

6.7 The boiler to be installed with cross-connect capabilities on both the steam supply and condensate return lines, if required. The connections should be made so that all steam supplied to the existing system can be returned as condensate back to the package boiler. 3

6.8 Pure (3) water tie-in to primary water storage tank supply (make-up) line. Tie-in to be made so as to supply flush water to the waste evaporator and tanks. If required, the

Note: (3) Demineralized Water Specifications as follows: Conductivity 2.0 Mhos/Cm@ 25°C; Oxygen = 0.1 ppm Max.; Fluoride = 0.1 ppm Max.; Chloride = 0.15 ppm Max.; pH = 6.0-8.0.

tie-in should also provide source of make-up to the packaged boiler including chemical feed, make-up to the cooling system utilized (see Step 2.10) and for supplying seal water to pump seals.

6.9 Waste disposal system tie-ins as follows:

6.9.1 Connect to waste holdup tank to provide feed supply to the radwaste evaporator. Upgrade or replace existing piping and components of the existing waste holdup tank truck hose connection line while retaining the hose connection capability as shown in Figure 1.

6.9.2 Connect condensate outlet to waste disposal line from existing radwaste condensate pumps. Three-way trip valve actuated by a conductivity monitor in line before radwaste condensate tanks to divert condensate back to the waste holdup tank. A recirculation line back to the waste holdup tank should be provided around the radwaste condensate tanks. Connect condensate to existing demineralizers before and after radwaste condensate tanks. See Figure 1. 3

6.9.3 Connect the radwaste concentrate line from the new radwaste evaporator to the existing waste concentrate line from the 2 gpm radwaste evaporator. See Figure 1.

6.9.4 Connect new building floor drains and sump pump discharge(s) back to the waste holdup tank.

6.9.5 Connect the gas stripper vent gas outlet to the radwaste disposal processing system header. Gases vented to the header will flow to the existing waste gas compressor suction header. See Step 2.17.

6.9.6 Install an evaporator bypass line from the discharge of the new evaporator feed pump to the radwaste concentrate line to the drumming station to allow direct drumming of sediment and sludge from the waste holdup tank.

7. Proposed System

A one line flow diagram of the proposed system is shown in Figure 1, revised 10/4/74 for information only. It does not include complete instrumentation, flush, or drain lines.

8. References

(a) USAEC Safety Guide 26, "Quality Group Classification and Standards" dated March 23, 1972.

(b) U.S. Atomic Energy Commission (USAEC) Regulatory Guide 1.59 "Design Basis Floods for Nuclear Power Plants" dated August, 1973

(c) USAEC Regulatory Guide 1.76 "Design Basis Tornado for Nuclear Power Plants" dated May 3, 1974

(d) USAEC Regulatory Guide 8.8 "Information Relevant to Maintaining Occupational Radiation Exposures as Low as Practicable Nuclear Reactors" dated July, 1973

9. Table

Table 1 - Tornado Generated Missile Characteristics

10. Figure

Figure 1 - H. B. Robinson Radwaste Disposal System with New Evaporator System, revised 10/4/74.

11. Appendix

Appendix A - Preliminary Safety Evaluation of the Radwaste Evaporator Addition at H. B. Robinson-Unit No. 2 3

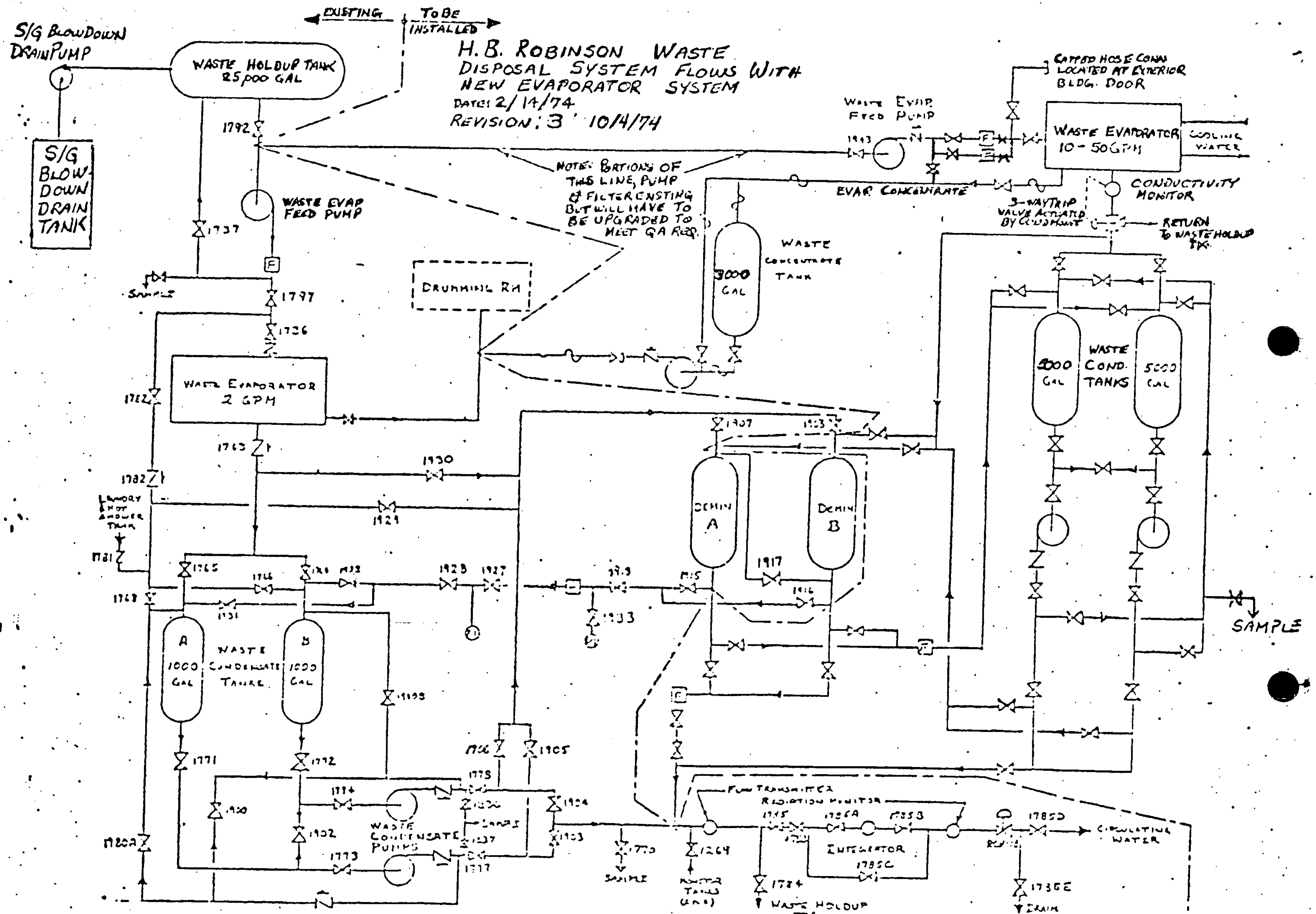
078/219

TABLE 1

TORNADO GENERATED MISSILE CHARACTERISTICS

Group		Missile Parameters		Initial Missile Elevation Ft.	Peak Velocity	Penetration*	
		Description	$C_D A/W$ Sq.Ft./Lb		FPS	Contact Area Sq. Ft.	Depth of Pene. in 24" Conc. Wall
1	1	13½" ϕ x 35' Lg. Utility Pole ς = 43 PCF, W = 1500 lbs.	0.0083	25	85	1.0	1.23"
	2	1" ϕ x 3' Lg. Steel Rod ς = 490 PCF, W = 8 Lbs.	0.0097	—	250	0.0055	10.02"
	3	6" ϕ Nominal Size Pipe 15' Lg., W = 300 Lbs.	0.0086	—	90	0.2393	1.2"
	4	12" ϕ Nominal Size Pipe 30' Lg., W = 1500 Lbs.	0.0066	—	63	0.8866	0.8"
2	5	Large Automobile A = 20 Sq. Ft., W = 4000 Lbs.	0.0082	0	76	20.0	0.25"
	6	Small Automobile A = 15 Sq. Ft., W = 2000 Lbs.	0.0113	0	128	15.0	0.2"
3	7	4" x 12" Plank x 12' Long ς = 5 PCF, W = 200 Lbs.	0.03	—	370	0.33	7.38"
	8	1½" Metal Siding 2'-6 Wide x 18'-0 Long W = 144 Lbs.	0.152	-	510	0.3125	10.72"

* Penetration Calculated from Modified Petry Formula.



H.B. ROBINSON WASTE DISPOSAL SYSTEM FLOWS WITH NEW EVAPORATOR SYSTEM
DATE: 2/14/74
REVISION: 3 10/4/74
EXISTING
TO BE INSTALLED
S/G BLOWDOWN DRAIN PUMP
S/G BLOWDOWN DRAIN TANK
WASTE HOLDUP TANK 25,000 GAL
WASTE EVAP FEED PUMP
DRUMMING RM
WASTE EVAPORATOR 2 GPM
NOTE: PORTIONS OF THIS LINE, PUMP & FILTER EXISTING BUT WILL HAVE TO BE UPGRADED TO MEET QA REQ.
WASTE CONCENTRATE TANK
3000 GAL
CAPPED HOSE CONN LOCATED AT EXTERIOR BLDG. DOOR
WASTE EVAPORATOR 10 - 50 GPM
COOLING WATER
EVAP CONCENTRATE
CONDUCTIVITY MONITOR
3-WAY TRIP VALVE ACTUATED BY COND. MONIT.
RETURN TO WASTE HOLDUP TK.
WASTE COND. TANKS
5000 GAL
5000 GAL
DEMIN A
DEMIN B
SAMPLE
LAUNDRY HOT SHOWER TANK
A 1000 GAL
B 1000 GAL
WASTE CONDENSATE TANKS
WASTE CONDENSATE PUMPS
FLOW TRANSMITTER
RADIATION MONITOR
INTEGRATOR
CIRCULATING WATER
MONITOR TANKS (UNIT)
WASTE HOLDUP TANK
DRAIN
SAMPLE
1792
1737
1797
1726
1762
1763
1782
1781
1768
1765
1930
1929
1928
1927
1933
1915
1907
1917
1916
1771
1772
1773
1774
1775
1777
1905
1904
1903
1902
1900
1770
1264
1784
1785C
1785D
1785E
1780A

FIGURE 1

PRELIMINARY SAFETY EVALUATION OF THE
RADWASTE EVAPORATOR ADDITION AT H. B. ROBINSON - UNIT NO. 2
(LB-74-1)

Reviewed by

Title	Name	Date
CE, NPE II	D A Casada D. A. Casada	9-30-74
PPE, NPE II	S J Pothitsmay for G. R. Winders / GRW	10-4-74
PC - NGS	H Lipa H. Lipa	10-4-74

Revision 4

Date: September 30, 1974

PRELIMINARY SAFETY EVALUATION OF THE RADWASTE EVAPORATOR ADDITION AT H. B. ROBINSON-UNIT NO. 2

SECTION A

EVALUATION OF CAPABILITY TO WITHSTAND NATURAL PHENOMENA

I. Safe Shutdown Earthquake

A. Requirement

The Radwaste Evaporator package and the Radwaste Evaporator building design must include provisions which will ensure the containment of concentrated radioactive fluid in the event of the occurrence of the Safe Shutdown Earthquake, as defined in Regulatory Guide 1.48.

B. The Waste Evaporator Building design will be Seismic Category I.[1] 4

This design feature will ensure that even in the event of the rupture of the Radwaste Concentrate tank or the Radwaste Evaporator, a Seismic Category I barrier will remain between the fluid and the environment.

II. Design Basis Flood

A. Requirement

The design of the Radwaste Evaporator Building must include provisions which will ensure the containment of concentrated radioactive fluid in the event of the occurrence of the Design Basis Flood (defined in Regulatory Guide 1.59).

B. Justification

As set forth in the Design Bases Document-System Requirements, Section 2.11, the design of the Waste Evaporator Building will be such that in the event of the Design Basis Flood, the building's integrity will be maintained, providing a secondary boundary between

[1] Defined in Regulatory Guide 1.29

the radioactive material contained within the Radwaste Evaporator System and the environment. The Waste Evaporator Building will have this capability since the existing plant grade on which the building will be constructed is above the maximum impoundment level which the impoundment dam and associated components can maintain.

III. Design Basis Tornado

A. Requirement

The design of the Radwaste Evaporator Building must include provisions which will ensure the containment of concentrated radioactive fluid in the event of the occurrence of the Design Basis Tornado (defined in Regulatory Guide 1.76).

B. Justification

As set forth in the System Design Bases Document - System Requirements, Section 2.11, the Waste Evaporator Building will be designed in such a manner that it will continue to provide a secondary barrier between the radioactive material and the environment in the event that the building is subjected to Design Basis Tornado conditions.

SECTION B
ACCIDENT ANALYSIS

The postulated worst credible accident is the rupture of the Radwaste Evaporator or the Radwaste Concentrate Tank. 4

The gaseous release from such a postulated accident is negligible as the fluid contained within is in a degassed state, having previously passed through the gas stripper.

There is no credible mechanism for liquid release to the environment, due to the Seismic Category I barrier provided by the Radwaste Evaporator Building. 4

SECTION C
INTERFACES

I. Heating Ventilation and Air Conditioning (HVAC) System

A. Operation

Objective - The HVAC System will be capable of maintaining the air quality within the Radwaste Evaporator Building at a level which is desirable from the standpoints of reliable equipment operation, personnel safety and control of releases to the environment.

Justification - Pertinent design criteria are contained in Sections 4.5, 4.6, 5.8, 5.9, and 6.1 of the System Design Bases Document. Specified design requirements included are:

1. Slightly negative pressure with respect to the atmosphere to be maintained within the building.

2. Nominal temperature of 80°F and maximum of 104°F inside the building.

3. Direction of internal air flow from low radiation level areas to higher level areas.

4. Exhaust from building to be routed to existing Auxiliary Building ventilation exhaust ductwork upstream of presently installed exhaust stack filters and radiation monitors.

5. Start of exhaust fan automatically starts supply fan.

Control of releases - By installing exhaust fan capacity which exceeds supply fan capacity, a slightly negative pressure with respect to atmospheric is achieved, resulting in a net inward flow of air through building openings. This pattern precludes the possibility of an unmonitored flow out of the building by providing a controlled exhaust path. The design criterion which stipulates that the building exhaust connection be made upstream of the stack

monitors ensures that the releases from the building are not only controlled, but are also monitored prior to release.

Personnel Safety - The criterion which establishes the internal flow pattern from low radiation areas to higher level areas guarantees a minimal number of areas whose activity is in excess of any designated level. This in turn minimizes radiation dosage to operational and maintenance personnel.

Reliable equipment operation - Equipment reliability is augmented by maintaining the building temperature at a moderate level. Equipment is protected by virtue of the criterion which requires that start-up of an exhaust fan automatically initiates supply fan operation, preventing excessive pressure differentials.

B. Connection

The connection to the existing HVAC System will be made into ductwork in the vicinity of Diesel Generator Room A. As the connection will require isolation of the connection point, the connection will be made at a time when the requirements of the areas to be deprived of HVAC are minimal.

II. Radiation Monitoring System

A. Operation

1. Area Monitoring

<u>Objective</u> - Ensure that the Radwaste Evaporator Building internal area is monitored, and that warning signals are developed in case of high radiation levels and/or monitoring system malfunction.

<u>Justification</u>

1. There will be at least one, gamma sensitive, fixed position area monitor installed in the Radwaste Evaporator Building. Supplementary periodic surveys throughout the building will be performed.

2. The radiation level will be indicated both locally at the detector and remotely at the existing Radiation Monitoring System cabinets in the control room. The radiation level will also be recorded at the Radiation Monitoring System cabinets.

3. High-radiation level will be alarmed at the RTG board, at the Radiation Monitoring System cabinets, and locally at the detector.

4. Detector system malfunction will be indicated by an amber light at the Radiation Monitoring System cabinets.

2. Process Monitoring

Objective - Ensure that all effluents are monitored prior to release, as required by 10CFR50.36a(a) (2). In addition, all releases to the environment must be as low as practicable and within the limits of Section 3.9, "Radioactive Effluents" of the Technical Specifications and Bases of Facility Operating License DPR-23. Provide a means for avoiding Radwaste Condensate Tank contamination by Radwaste Evaporator condensate whose activity is above a desirable level.

Justification

1. Liquid discharges to the environment will be initiated only after the Radwaste Condensate Tank contents are sampled. If the condensate activity is acceptable, it will be discharged into the existing radioactive liquid waste line which runs from the present Radwaste Disposal System to the Service Water System. This line is continuously monitored by the Waste Disposal System Liquid Effluent Monitor. Automatic valve closure is initiated upon high-radiation level indication from this monitor, preventing further release.

2. As indicated in the HVAC System section, the Radwaste Evaporator Building exhaust will be routed through the plant stack,

where it will be monitored before release. All vented equipment within the building will be vented to the vent header.

3. All plant releases are recorded by a chart recorder in the control room.

4. Condensate from the Radwaste Evaporator will be monitored en route to the Radwaste Condensate Tanks by a conductivity monitor. 4
Upon high conductivity signal from this monitor, a three-way valve will trip, diverting the condensate via a return line to the Waste Holdup Tank, thereby minimizing Radwaste Condensate Tank contamination.

B. Connections

Connections or additions must be made to the existing Radiation Monitoring System as follows:

1. High Radiation Alarms:
   a. RTG Board
   b. At detector location
   c. Radiation Monitoring System cabinets
2. Radiation level readout at Radiation Monitoring System cabinets and at detector location
3. Chart recorder
4. Detector system malfunction indication at Radiation Monitoring System cabinets

If possible, these connections will allow continued functioning of all Radiation Monitoring System components while the connections are being made. All effluent stream monitors, high-radiation signals, and effluent recording components must remain functional at all times. If any part of the Radiation Monitoring System operation must be temporarily discontinued during installation, connection procedures

will be developed to minimize the impact on the system. A temporary monitoring program will be implemented for the duration of the system downtime.

III. Pure Water System

A. Operation

Objective - Provide pure (DI) water for the following:

1. Boiler make-up, if required
2. Closed cooling loop make-up, if required
3. Flush water for the evaporator, tanks and associated piping

The supply of DI water for these needs must not impair the Pure Water System's ability to meet the requirements of those components which are presently utilizing the Pure Water System.

Justification - A connection will be made to a line from the Deaerator to the Primary Water Storage Tank. The aforementioned items which will be utilizing DI water will impose an infrequent and minimal demand upon the Pure Water System. The additional demand will not present a significant problem to the Pure Water System capacity.

Piping and valves associated with the supply line will be designed as described in Sections 3.3 and 3.4 of the System Design Bases Document.

B. Connection

The connection will require isolation of the line to which the connection will be made. This isolation will temporarily halt the supply of processed water to the Primary Storage Tank. The capacity of this tank is 150,000 gallons, and temporary deprivation of supply will not be significant relative to this capacity.

IV. Waste Holdup Tank

A. Operation

Objective - Connections for Radwaste Evaporator supply and recirculation lines will be made to the existing Waste Holdup Tank, with all associated line components to be of appropriate design quality.

Justification

1. A Radwaste Evaporator feed line connection will be made to the Waste Holdup Tank at the point where the temporary truck fill line is connected. The feed line will also utilize the routing of the truck fill line. However, the line components will conform to the specifications contained in Sections 2.5, 3.2, 3.3, and 3.4 of the System Design Bases Document.

2. A connection will be made to the recirculation line which runs from the presently installed condensate discharge line to the Waste Holdup Tank. This line is designated as 2-WD-151R-28. This line will provide a route for return and subsequent reprocessing of water from the floor drain sump pump and for condensate whose conductivity level causes a trip of the three wav valve located between the Radwaste Evaporator and the Radwaste Condensate Tanks. All components will conform to the design specifications of the sections listed in Section IVA.1 above. 4

B. Connections

Prior to the connection for a Radwaste Evaporator feed line, the point of connection will be examined for excessive residual radioactivity levels and for isolation capability. If the activity level at the point is excessive and the connection point is not isolable, the entire Waste Hold-up Tank may be required to be drained, flushed, and isolated.

The connection to the existing recirculation line will be made after checking for excessive residual line activity levels and flushing if necessary. The line will be isolated during the connection.

V. Drumming Station

A. Operation

Objective - Provide a path for the concentrate to the Drumming Station, ensuring that the line components are of appropriate quality.

Justification - A line from the Radwaste Concentrate Tank will cut into an existing concentrate line to the Drumming Station. The line components are to be designed in accordance with Sections 2.5, 3.2, 3.3 and 3.4 of the System Design Bases Document.

B. Connection

The connection will be made to piping from the existing Radwaste Evaporator to the Drumming Station. The connection will be made after checking for excessive residual line activity levels and flushing if necessary. The line will be isolated during the connection.

VI. Service Water System

A. Operation

Objective - Provide a release path for the condensate, ensuring that the condensate is monitored prior to release.

Justification - The condensate from the Radwaste Condensate Tank will be indirectly injected into the Service Water System via an existing waste disposal line. This line is continuously monitored as indicated in the Radiation Monitoring System section

of this document. The line components will be designed to the relevant specifications of sections 3.2.3, 3.3 and 3.4 of the System Design Bases Document.

B. Connection

The connection will be made after having drained and isolated the waste disposal line. Excessive residual line activity is not expected to present a problem, but the line connection point will be checked for excessive levels, and flushed if necessary, prior to the connection.

VII. Building Interaction

A. Operation

Objective - Provide necessary connections between the Radwaste Evaporator Building and the Auxiliary Building without impairing their respective independent design capabilities.

Justification - All connections between the buildings will be designed so as not to introduce an interaction between the buildings which would cause their independent seismic and other design capabilities to be depreciated.

VIII. Instrument Air System

A. Operation

Objective - Provide operating air for control valves, ensuring the continuation of the system's ability to supply operating air to components presently utilizing the Instrument Air System.

Justification - Instrument air will be supplied either from the existing system or, in the event that some obstacle (system over-load, loss of safety related service, etc.) precludes this connection, an independent air system will be installed in the Auxiliary Building.

B. Connection

If a connection is made to the existing system, the connection will be made after isolating the connection point and draining off the residual pressure within the isolated section. The connection point isolation must not cause a safety related component to be deprived of service during the connection.

IX. Fuel Oil Supply

A. Operation

Objective - Provide a supply of fuel oil for the Packaged Boiler operation, if necessary.

Justification - The fuel oil for Packaged Boiler operation will be supplied from the IC Turbine fuel oil storage tank, if necessary.

B. Connection

The connection to the IC Turbine fuel oil storage tank will be made after isolating the connection point. If necessary, a back-up supply of fuel oil will be provided for all users of the oil supply during the connection.

X. Station Air System

A. Operation

Objective - Provide station air for air tool use in the Radwaste Evaporator Building.

Justification - Station air will be provided from a convenient, isolable location.

B. Connection

Prior to making the connection, the point of connection will be isolated and residual pressure drained from within the isolated section.

XI. Power Supply

A. Operation

Objective - Provide electrical power for the Radwaste Evaporator System, avoiding the Engineered Safety System supply.

Justification - Connection to the existing Power Supply System will be made at a convenient point to provide 480V AC, 120V AC and 125V DC power to the Waste Evaporator Building. Existing bus loads will be analyzed to preclude overloading of any buses as a result of adding equipment.

B. Connection

The connection will be made after isolating the connection point by breaker action. There will be no connections to the emergency buses. The isolation of the connection point must not cause a break in the emergency buses' circuits.

SECTION D
LICENSING REQUIREMENTS

According to 10CFR50.59(a), "The holder of a license authorizing operation of a production or utilization facility may (1) make changes in the facility as described in the safety analysis report. . . unless the proposed change involves a change in the technical specifications incorporated in the license or an unreviewed safety question."

Whether or not a change involves an unreviewed safety question is discussed in 10CFR50.59(c). The change is deemed to be an unreviewed safety question (1) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (2) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (3) if the margin of safety as defined in the basis for any technical specification is reduced.

Structures, systems and components important to safety are those that provide reasonable assurance that the facility can be operated without undue risk to the public (see Introduction to Appendix A of 10CFR50). Inasmuch as the Radwaste System will contain radioactive fluid, the system may be considered as being important to safety.

Addition of a Radwaste Evaporator System would not result in changes in the Technical Specifications, provided the release from the system is within the limits specified in the Technical Specifications.

The Radwaste Concentrate Tank and the Radwaste Evaporator will be situated within a sump in the Seismic Category I Radwaste Evaporator Building. The sump will be of sufficient capacity to contain their combined volume. The waste feed will be degassed before being concentrated. Thus, even in the extremely unlikely event of Radwaste Evaporator or Radwaste Concentrate Tank rupture, there would be no threat to public safety, as the fluid would be contained within the building, and the gaseous release would be negligible. 4

Revision 4

In order to protect against accidental release due to operator error, the administrative controls will be similar to those presented in section 14.2.2 of the Robinson No. 2 FSAR, with the added protective feature of a three way valve located in the condensate line between the Radwaste Evaporator and the Radwaste Condensate Tanks. This valve will provide automatic return to the Waste Holdup Tank upon high condensate conductivity signal, thereby preventing Radwaste Condensate Tank contamination, and providing additional protection against accidental release to the environment. 4

Due to the design of the Radwaste Evaporator System and the administrative procedures to be imposed, the addition will not increase the probability of occurrence nor the consequences of an accident or malfunction of the radwaste processing system. In addition, the possibility of an accident or malfunction of a different type than previously evaluated will not be created. No margin of safety will be reduced. Hence, this modification to the plant is deemed not to involve a change in technical specifications or an unreviewed safety question. 4