ATTACHMENT 3 to TXX-94325

AFFECTED TECHNICAL SPECIFICATION PAGES
(NUREG-1468)

[Pages xiv, 5-6 (Inserts A and B), and
5-7 (Figure 5.6-1)]

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INDEX

DESIGN FEATURES

DESIGN FEATURES

VOLUME

5.4.2 The total water and steam volume of the Reactor Coolant System is 12,135 ± 100 cubic feet at a nominal T_{avg} of 589.5°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The primary meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

(5.6.1) CRITICALITY

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with:

(INSERT A) →

b ~~a.~~ ~~A~~ k_{eff} ~~equivalent to less than or equal to~~ ≤ 0.95 ~~when~~ if fully flooded with unborated water, which includes ~~a conservative~~ an allowance for uncertainties as described in Section 4.3 of the FSAR~~, and~~ ;

c ~~b.~~ A nominal 16 inch center-to-center distance between fuel assemblies placed in the low density fuel storage racks. ;

(INSERT B) →

~~5.6.1.2 The k_{eff} for new fuel for the first core loading stored dry in the spent fuel storage racks shall not exceed 0.98 when aqueous foam moderation is assumed.~~

(5.6.2) DRAINAGE

~~5.6.2~~ The spent fuel storage pools ~~is~~ are designed and shall be maintained to prevent inadvertent draining of the pools below elevation 854 feet.

(5.6.3) CAPACITY

~~5.6.3~~ The two spent fuel storage pools are designed and shall be maintained with a storage capacity limited to no more than ~~1116~~ 1291 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

INSERT A

a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;

INSERT B

d. A nominal 9 inch center to center distance between fuel storage locations in the high density fuel storage racks with storage restrictions specified below;

e. All new or partially spent fuel assemblies are allowed unrestricted storage in the low density fuel storage racks and restricted storage in an expanded checkerboard (1 out of 4) pattern in the high density fuel storage racks; and

f. New or partially spent fuel assemblies which meet the minimum burnup-initial enrichment requirements of Figure 5.6-1 are allowed restricted storage in a checkerboard (2 out of 4) pattern in the high density fuel storage racks.

5.6.1.2 The new fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;

b. $K_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 4.3 of the FSAR;

c. $K_{eff} \leq 0.98$ if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 4.3 of the FSAR; and

d. A nominal 21 inch center to center distance between fuel assemblies placed in the new fuel storage racks.

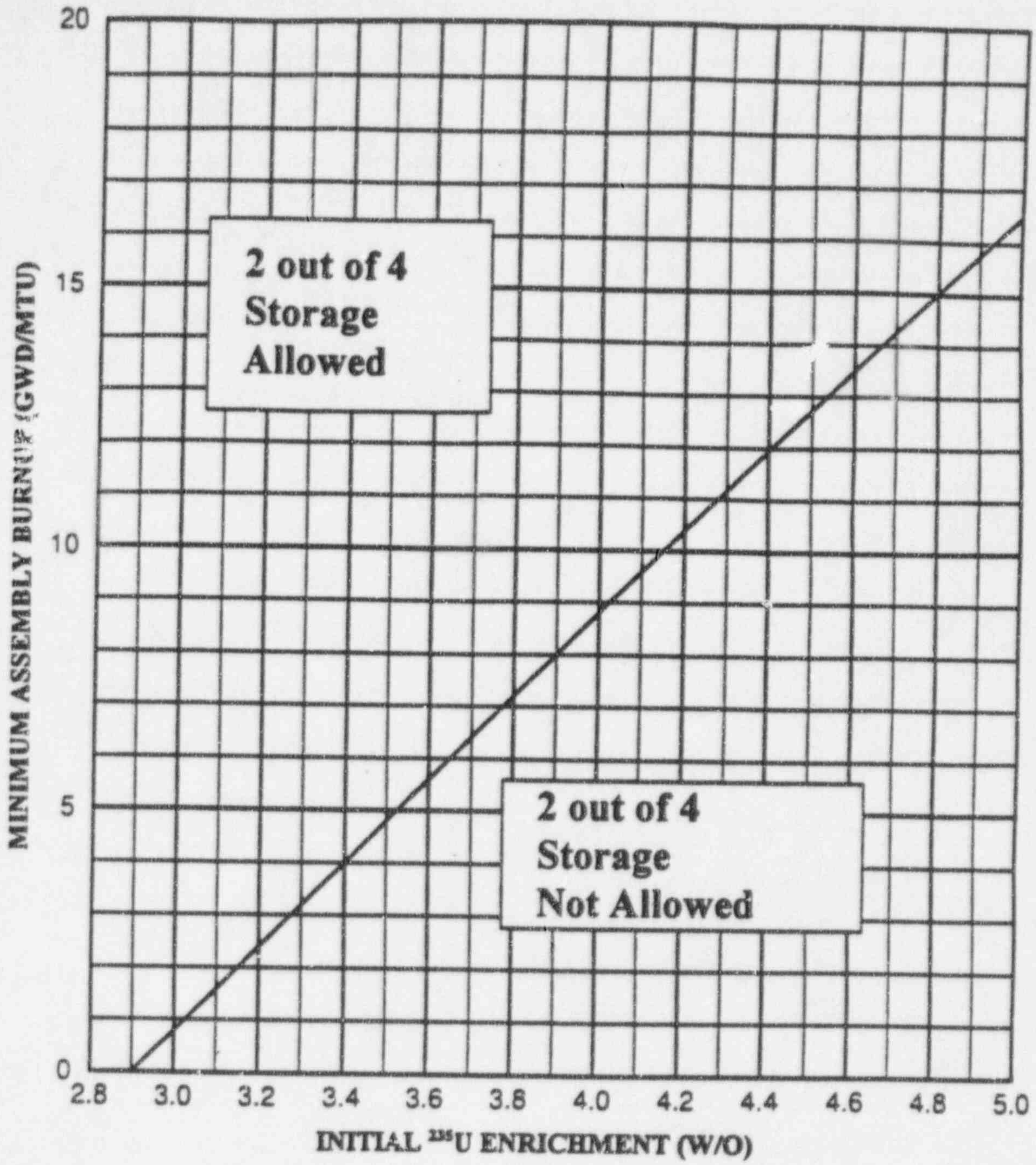

FIGURE 5.6-1

MINIMUM BURNUP VS INITIAL U-235 ENRICHMENT
FOR HIGH DENSITY (2/4) SPENT FUEL STORAGE RACKS

ATTACHMENT 4 TO TXX-94325

ADVANCE COPY OF SELECTED PAGES FROM

SECTION 1.2, "GENERAL PLANT DESCRIPTION,"

SECTION 1.3, "COMPARISON TABLES," AND

SECTION 9.1, "FUEL STORAGE AND HANDLING," OF

THE 1995 UPDATED FINAL SAFETY ANALYSIS REPORT

[This attachment is provided for information only. It describes the existing design bases for CPSES fuel storage and does not reflect the high density racks.]

65

1.2.2.8.7 Spent Fuel Pool Cooling and Cleanup System

The Spent Fuel Pool Cooling and Cleanup System serves the spent fuel pools of both units.

93 The cooling portion of this system has two trains consisting of a pump, heat exchanger, and other associated equipment.

The purification portion of this system consists of two trains containing a filter and a demineralizer which can be operated in parallel with either of the two cooling trains.

The skimmer portion of this system consists of a single skimmer train and is shared between both pools.

1.2.2.9 <u>Waste Processing Systems</u>

The waste processing systems (WPS) are designed to process liquid, gaseous, and solid waste while achieving the lowest reasonable radioactive release to the environment available through current technology. Liquid and gaseous wastes to be recycled within the plant are first segregated from those to be processed or shipped offsite.

Segregation of wastes is consistently maintained in the subsystems to ensure proper handling.

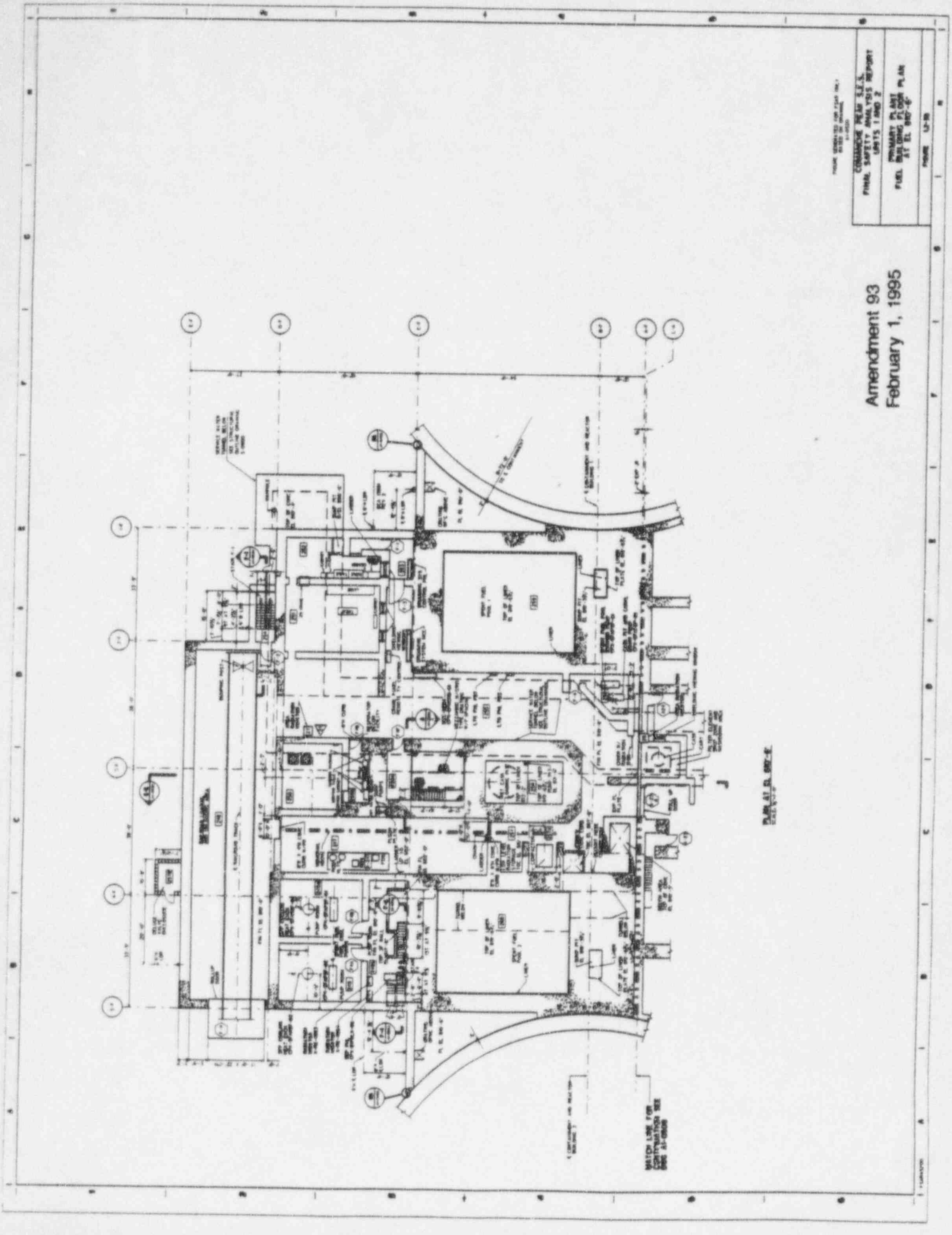
COMANCHE PEAK S.E.S.
FINAL SAFETY ANALYSIS REPORT
UNITS 1 AND 2
PRIMARY PLANT
FUEL BUILDING FLOOR PLAN
Amendment 93
February 1, 1995

TABLE 1.3-2

(Sheet 18)

DESIGN CHANGES SINCE PSAR SUBMITTAL

Systems or Components	CPSES/FSAR Section	Changes
		ANS Safety Class 3 components.
		The requirement that the total leachable chloride and fluoride content of clean elastomers and plastics placed over all openings in components fabricated from austenitic stainless steel be limited to 15 and 10 ppm, respectively, has been deleted.
V. Fuel Storage and Handling Systems:		
Fuel storage and handling system	9.1	The following changes were made to the spent fuel storage system:
93		1. An increase in total spent fuel storage space from 400 to 1166 spent fuel assemblies (1116 in spent fuel pools/25 in each Containment)
		2. A decrease in center-to-center spacing from 21 to 16 in.
		3. An increase in Keff from 0.90 to 0.95 for spent fuel assemblies if immersed in unborated water.
		Purification loop was added to the refueling cavity.
		The number of dry storage racks has been increased from 129 to 132.

9.0 AUXILIARY SYSTEMS

9.1 FUEL STORAGE AND HANDLING

9.1.1 NEW FUEL STORAGE

9.1.1.1 Design Bases

New fuel is stored in racks (Figure 9.1-1) composed of individual vertical cells fastened together in any number to form a module which can be firmly bolted to anchors in the floor of the new fuel storage pit. The new fuel storage racks are designed to include storage for two thirds core at a center-to-center spacing of 21 inches. If the new fuel assemblies are stored dry, this spacing provides a minimum separation between adjacent fuel assemblies of 12 in., which is sufficient to maintain a subcritical array (keff=0.98) even in the event the building is flooded with unborated water. All surfaces that come into contact with the fuel assemblies are made of annealed austenitic stainless steel.

The racks are designed to withstand normal operating loads as well as Safe Shutdown Earthquake (SSE) and Operating Basis Earthquake (OBE) seismic loads meeting ANS Safety Class 3 [12] and ASME B&PV Code, Section III, Appendix XVII requirements. The new fuel racks are designed to withstand a maximum uplift force of 5000 lb.

9.1.1.2 Facilities Description

Both units of the CPSES are serviced by a common Fuel Building which houses facilities for the storage and transfer of new and spent fuel. The Fuel Building is a controlled leakage building designed to seismic Category I requirements. For a description of the structural design considerations, see Section 3.8. The ventilation system is discussed in Section 9.4.4. The locations of the fuel storage areas within the

station complex are shown on plan and elevation drawings; see Section 1.2 and Figures 1.2-38 through 1.2-40. The fuel storage and handling facilities are built in accordance with NRC Regulatory Guide 1.13.

New fuel assemblies are delivered to the site in United States Department of Transportation (DOT) approved containers. The containers are brought into the new fuel receiving area by the Fuel Building crane.
86 Here a container is opened and the assemblies are unloaded and inspected.

57 Once the inspection is completed, the new fuel assembly is inserted in
78 the new fuel storage rack (see Figure 9.1-1). The protective cover on each fuel assembly must be removed from the fuel assembly or must be open at the bottom so that water will not collect in the protective cover.

New fuel assemblies and control rods are stored in a reinforced concrete pit located in the Fuel Building. The pit, an integral part of the Fuel Building, is provided for temporary dry storage and is equipped with storage racks of sufficient capacity for approximately one-third core for each unit (total 132 fuel assemblies).

All surfaces that come into contact with fuel assemblies are made of austenitic stainless steel, thus precluding significant materials compatibility problems.

For the structural design considerations, including the loading criteria (loading and load combinations) for the Fuel Building, see Section 3.8.

The probability of a dropped mass damaging a new fuel assembly is very remote, for the following reasons:

1. New fuel racks located in the new fuel pit area are protected from dropped objects by a protective steel cover.

2. Administrative controls or interlocks, or both are used to prevent the handling of loads heavier than a fuel assembly and the associated handling tools over the new fuel storage area. 46

3. Safe handling features of the new fuel assembly handling tool are discussed in Subsection 9.1.4.2.3.

In preparation for refueling, the individual fuel assemblies are transported from the new fuel storage racks to the new fuel elevator using the fuel handling bridge crane equipped with the new fuel handling tool. When an assembly has been lowered by the elevator, the fuel 38
handling bridge crane equipped with the spent fuel handling tool can be used to place it either in the spent fuel pool for interim storage or in the Fuel Transfer System fuel basket for immediate transport into the Containment. For additional information on the fuel handling system, see Subsection 9.1.4.2.

The manipulation of new fuel assemblies will be performed by personnel 38
trained in proper fuel handling techniques and, in addition, will use fuel handling procedures which contain provisions to assure that damage to fuel assemblies during movement is prevented.

Details of the seismic design and testing of the new fuel storage area are presented in Section 3.7(B).

For general arrangement of new fuel storage facilities, see Section 1.2 and Figures 1.2-38, 1.2-39, and 1.2-40.

9.1.1.3 Safety Evaluation

The design of normally dry new fuel storage racks is such that the effective multiplication factor (keff) does not exceed 0.98 with fuel of the highest anticipated enrichment in place, assuming optimum moderation (under dry or flooded conditions). Consideration is given to the
52 inherent neutron absorbing effect of the materials of construction. The detailed criticality safety evaluation is discussed in Section 4.3.2.6.

The design of the fuel storage rack assembly is such that it is impossible to insert the new fuel assemblies in other than prescribed locations, thereby preventing any possibility of accidental criticality.

The fuel storage racks are designed to withstand shipping, handling, and normal operating loads (dead loads of fuel assemblies), as well as SSE
38 loads; these racks meet ANS Safety Class 3 requirements. The fuel storage racks are also designed to meet the seismic Category I requirements of NRC Regulatory Guide 1.29, as discussed in Section 1A(B).

The fuel storage racks have adequate energy absorption capabilities and can withstand the impact of a dropped fuel assembly from the maximum lift height of the fuel handling bridge crane. The maximum drop height of the fuel assembly onto the fuel storage rack array is 3.5 feet. An analysis was done using a standard 17 by 17 fuel assembly with the handling tool and a total mass of 2000 lb falling a height of 3.5 ft (without damping or energy dissipation) on to the top of a fuel cell. (A fuel rack consists of fuel cells, and each fuel cell accepts one 17 by 17 fuel assembly.) The results of the analysis show that the fuel cell deforms in compression and shortens in length. It is concluded that the accident would not result in an unsafe geometric spacity of fuel assemblies. Handling equipment capable of carrying loads heavier

than a fuel assembly is prevented by interlocks or administrative controls, or both, from traveling over the new fuel storage area.

The fuel storage racks can withstand an uplift force equal to the uplift force of the fuel handling bridge crane, which is 5000 lb.

Shielding requirements are discussed in Subsection 9.1.4.3.4.

Design of this storage facility is in accordance with NRC Regulatory Guide 1.13, Revision 1, December 1975, ensuring a safe condition under normal and postulated accident conditions. 4

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9.1.2 SPENT FUEL STORAGE

9.1.2.1 Design Bases

Spent fuel is stored in racks (Figure 9.1-2). Each rack is composed of individual vertical cells fastened together to form a module which is firmly bolted to anchors in the floor of the spent fuel pit.

The two spent fuel storage pools are designed to contain spent fuel 60
storage racks (including the damaged fuel containers) that have a total capacity of 1116 fuel assemblies with 16 inch center-to-center spacing.
The Number 1 pool is designed to contain twelve (12) 6x5 rack modules, 4
seven (7) 5x5 rack modules and one (1) modified 5x5 rack module which
can store 19 fuel assemblies and two damaged fuel containers. The two 60
damaged fuel containers can store one fuel assembly each. The Number 2 pool is designed to contain twelve (12) 6x5 rack modules and eight (8) 5x5 rack modules. The containment refueling cavity of each unit has additional interim storage space for one (1) 5x5 rack module. The racks maintain a separation between spent fuel assemblies sufficient to maintain a subcritical array with k_{eff} <0.95. Space between storage positions is blocked to prevent insertion of fuel. All surfaces that come into contact with fuel assemblies are made of annealed austenitic stainless steel which is resistant to corrosion during normal and emergency water quality conditions.

4 Spent fuel storage racks are designed to withstand shipping, handling, normal operating loads (dead loads of fuel assemblies), as well as SSE loads; these racks meet ANS Safety Class 3 and ASME B&PV Code, Section III, Appendix XVII requirements. The spent fuel storage racks are also designed to meet the seismic Category I requirements of Reg. Guide 1.29, Revision 2, February 1976.

The spent fuel storage racks have adequate energy absorption capabilities to withstand the impact of a dropped spent fuel assembly
60 from the maximum lift height of the fuel handling bridge crane. Cranes capable of carrying loads heavier than a spent fuel assembly are prevented by interlocks or administrative controls, or both, from traveling over the spent fuel storage areas when fuel is stored in them.

The spent fuel storage racks can withstand an uplift force equal to the uplift force of the spent fuel pool bridge hoist.

Shielding requirements are discussed in Subsection 9.1.4.3.4.

9.1.2.2 <u>Facilities Description</u>

Two pools are provided for CPSES spent fuel storage. Spent fuel assemblies and irradiated control rods are stored underwater in racks after transfer from the reactor. The fuel assemblies and control rods are held vertically in the racks located on the floor of the spent fuel storage pools. The two reinforced concrete pools are stainless- steel
4 lined and are an integral part of the Fuel Building. For the structural design considerations of the Fuel Building, including the loading criteria, see Section 3.8. The spent fuel racks are designed to accommodate an SSE, shipping, and handling loads, and the dead load of
60 the spent fuel assemblies. The spent fuel assemblies are stored in the spent fuel racks with a 16 inch center-to-center spacing. This provides a total designed storage space for the two pools of the 1116 spent fuel assemblies of which two spaces may be used for failed fuel containers.
93 At the current time Pool Number 1 has a minimum storage capacity of 556 fuel assemblies with a nominal 16 inch center to center spacing.

Each spent fuel pool is designed to safely store the irradiated fuel assemblies. A separate pit is provided as a loading area for the spent fuel shipping cask. The refueling cavities, spent fuel pools, and cask pit are connected with a common transfer canal. Each connection between 22
the transfer canal and the spent fuel pools can be closed by using gates (see Section 9.1.4.2.3 and Figure 1.2-39).

The spent fuel pools, transfer canal, and cask pit are lined with stainless steel plate.

The reactor is refueled using equipment that handles the spent fuel 86
assemblies underwater from the time they leave the reactor vessel until they are placed in a cask for shipment from the site.

The Fuel Building fuel handling bridge crane, provided for spent fuel 38
handling, has a wheel mounted walkway which spans spent fuel pools, the transfer canal, and cask pit. The bridge carries an electric monorail hoist on an overhead structure which is provided with an antiderailing device and is designed to withstand an SSE. The fuel assemblies are moved within a spent fuel pool by means of a long-handled tool suspended from the hoist. For general arrangement of spent fuel storage facilities, see Section 1.2, Figures 1.2-12, 1.2-13, 1.2-15, 1.2-18, 1.2-19, 1.2-38, 1.2-39, and 1.2-40.

The manipulation of spent fuel assemblies will be performed by personnel 38
trained in proper fuel handling techniques and, in addition, will use fuel handling procedures which contain provisions to assure that damage to fuel assemblies during movement is prevented.

Once the fuel is stored in the spent fuel pool, the Spent Fuel Pool Cooling and Cleanup System ensures continuous cooling. (See Subsection 9.1.3.3.) There are no drains or permanently connected systems or other features that can cause a loss of coolant that would uncover fuel.

Normal makeup water, to compensate evaporation losses, is supplied from the demineralized water supply system. In the case of a failure or malfunction of the demineralized water supply, the safety-related (seismic Category I, Safety Class 3, and redundant) portion of the Demineralized Water Makeup System supplies reactor coolant purity water to the spent fuel pools, For a detailed discussion, see Section 9.2.3. Water level monitoring equipment is discussed in Subsection 9.1.3.

87

93 To limit the dose rate at the surface of the pools to 2.5 mR/hr a minimum water shielding depth of 10 ft is provided above a fuel assembly. The design low-water level provides a positive margin to the minimum water shielding requirement with a fuel element located above
87 the spent fuel storage racks during fuel handling operations. The maximum height to which the fuel elements can be lifted is limited by the design of the hoist and the spent fuel handling tool controls. For a detailed description of shielding design, see Section 12.1.
52 Consideration of criticality safety analysis is discussed in Section 4.3.2.6 and Subsection 9.1.2.3.

Details of seismic design and testing are presented in Section 3.7(B).

Sealed bearings or other measures, such as protective pans, are used to prevent the lubricant of the cranes from contaminating the spent fuel pools. The crane control and power systems are capable of permitting continuous operation at minimum speed or frequent jogging without detrimental effects on any circuit or component.

60 Either spent fuel pool can be used for storage of fuel assemblies from both reactors as there are no adverse implications of sharing. In fact, sharing between the two pools permits greater flexibility.

The fuel storage facilities are designed in accordance with NRC Regulatory Guide 1.13.

When fuel assembly decay heat has reached an acceptable level, the fuel assembly can be removed from the spent fuel pool and loaded into a spent fuel shipping cask.

The following design features of the Fuel Building Overhead Crane are provided in order to prevent a cask from dropping: 38

1. The crane is designed to the requirements of seismic Category I. 66
   As such it can retain the maximum design load during a SSE and remain 12
   in place under all postulated seismic loadings.

2. To preclude any swinging or pendulum action of the block upon failure of one system, each wire rope system is reeved to both sides of the bottom block and upper block system.

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The Fuel Building Overhead Crane is prevented by interlocks from moving 38
over the new fuel pit during cask handling operations. The maximum 87
lifting height for a loaded spent fuel cask is less than 30 feet.
Mechanical antiderailing devices which prevent crane from being 38
dislodged from the rail due to horizontal and vertical motion during an earthquake are provided on the Fuel Building Overhead Crane and designed to withstand an SSE. The concrete floors can withstand a fully loaded cask drop from the maximum lifting height of 29.25 feet.

A more detailed description of the Fuel Building Overhead Crane is provided in Section 9.1.4. 38

9.1.2.3 Safety Evaluation

Design of this storage facility in accordance with NRC Regulatory Guide 4
1.13, Revision 1, December 1975, ensures a safe condition under normal
and postulated accident conditions. Consideration of criticality safety 52
analysis is discussed in Section 4.3.2.6.

The center-to-center distance between the adjacent spent fuel assemblies 60
is sufficient to ensure a keff <0.95, even if unborated water is used to fill the spent fuel storage pool.

The design of the spent fuel storage rack assembly is such that it is impossible to insert the spent fuel assemblies in other than prescribed locations, thereby preventing any possibility of accidental criticality. The Spent Fuel Pool Cooling and Cleanup System is discussed in Subsection 9.1.3.

All surfaces that come into contact with fuel assemblies are made of materials that are resistant to corrosion during normal and emergency water quality conditions.

4

9.1.3 SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

9.1.3.1 Design Bases

76 The Spent Fuel Pool Cooling and Cleanup System, a common system for both units, is designed in compliance with Title 10, Code of Federal Regulations, Part 50 Appendix A, General Design Criteria (GDC) 1, 2, 3, 4, 5, 44, 45, 46, 56, 61 and 63 [1], [2], [3], [4], [5], [6], [7] to perform the following principal functions:

1. To remove heat generated by stored spent fuel elements from the station's spent fuel pools

68 2. To maintain the clarity and purity of water in the spent fuel pools, the transfer canal, the wet cask pit, the RWST, and the refueling cavities

93 The calculations for the amount of thermal energy to be removed by the spent fuel pool cooling system are in accordance with BTP ASB 9-2, "Residual Decay Energy for Light Water Reactors for Long-Term Cooling" (Rev. 2).

Two cooling loops are provided, each capable of simultaneously servicing both of the station spent fuel pools. Two cleanup loops are also provided [14]. System design parameters are presented in Table 9.1-1.

The water depth above the top of the fuel assemblies as well as the removal of fission products and other contaminants by the system's purification loop limits the dose rate at the surface of the pools to 2.5 mr/hr.

Two damaged fuel containers are provided to limit the fission product release from gross failed fuel assemblies. 4

9.1.3.1.1 Spent Fuel Pool Cooling

The Spent Fuel Pool Cooling and Cleanup System is designed to limit the temperature of the spent fuel pools in the following cases:

1. Maximum Design Condition 93

   The maximum design condition bounds the maximum normal heat loads which occur during refueling outages (RFOs). Temperature limits are in accordance with the ACI Code and ANSI N210.

   The spent fuel pool bulk water temperatures are maintained at less than 150°F for normal operation based on decay heat generation from a normal full core offload at 7 days after shutdown, plus decay heat from the opposite unit's last refueling discharge plus decay heat from fuel assemblies from a maximum number of previous refuelings in both pools. At least 193 spaces in the spent fuel pools are assumed to remain available to accept one full core in accordance with ANSI N18.2 [15]. Outage durations are conservatively assumed to be 30 days for 12 month fuel cycles and 45 days for 18 month fuel cycles. A normal full core offload is conservatively assumed to start at 100 hours after the reactor is subcritical and complete at 168 hours (approximately 3 assemblies per hour). Refueling discharges are assumed to be one-third of a core (either 64 of 65 fuel assemblies) for 12 month fuel cycles and 88 to 96 fuel assemblies for 18 month fuel cycles.

   The SSI conditions are assumed to be representative of one unit operation at full power and one unit shutdown during normal refueling periods (September 15th through May).

93 The normal design SFP HX outlet temperature is 140°F to protect the resins in the cleanup system.

93 2. Maximum Summer Design Conditions

The maximum summer design condition bounds the maximum normal heat loads which occur during normal power operation of both units. Temperature limits are in accordance with the ACI Code and ANSI N210.

The spent fuel pool water temperatures are maintained at less than 150°F for normal operation based on decay heat from the most recent refueling discharge at the end of the outage plus decay heat from the opposite unit's previous refueling discharge plus decay heat from a maximum number of refuelings in both pools. At least 193 spaces in the spent fuel pool are assumed to remain available to accept one full core in accordance with ANSI N18.2 [15].

The SSI temperature is assumed to be normal maximum (102°F).

The normal design spent fuel pool heat exchanger outlet temperature is 140°F to protect the resins in the cleanup system.

3. Abnormal maximum Design Conditions

The abnormal maximum design condition bounds the abnormal heat load from an emergency core offload (ECO) from either unit immediately after back to back refuelings of both units.

The spent fuel pool water temperatures are maintained as less than 212°F for two loop operation based on an emergency core offload 150 hours after shutdown, plus the most recent refueling discharge 36 days after shutdown, plus the opposite unit's previous refueling discharge 66 days after shutdown, plus decay heat from a maximum number of previous refuelings in both pools.

Two spent fuel cooling loops are assumed to be available if required to meet temperature limits for this case; a single active failure need not be considered for an emergency core offload. Also, no other coincident events are assumed.

The SSI temperature is assumed to be normal maximum (102°F). 93

For fuel assembly loading in the spent fuel pools versus time, see Table 93
9.1-4.

One train operation is not normal during maximum design conditions. For 93
the maximum normal heat load with normal cooling systems in operation, and assuming a single active failure, the design maximum pool temperature is 200°F; however, the design spent fuel pool heat exchanger outlet temperature is 140°F to protect the resins in the cleanup system. The level in the pools is maintained by makeup from the Reactor Makeup Water System which also meets the single active failure criterion.

Spent Fuel Pool Cooling to one or both pools could be lost temporarily due to an upset, emergency or faulted plant condition. There is sufficient time to restore forced spent fuel pool cooling prior to boiling. The spent fuel pool cooling system is designed to maintain water temperatures less than 212°F for one loop operation during and after plant upset, emergency, and faulted conditions coincident with maximum design or maximum summer design conditions.

In actual practice, the 193 spaces assumed in case 1 and 2 to remain 93
available for one full core offload may be used for fuel assembly storage. Based on the conservative assumptions in the cases and the insignificant decay heat from additional assemblies in these spaces, the analyses are considered valid even when these spaces are used for assembly storage.

The spent fuel pool water temperature in the above cases is based on the 93
corresponding component cooling water temperature at the inlet to the spent fuel pool heat exchanger. The maximum component cooling water supply temperature is 122°F during normal cooldown with Residual Heat
Removal System operation. This condition coincident with maximum spent 87
fuel pool heat loads is considered an unlikely event which is expected to result in a small temperature increase for a short period of time during the transient.

Table 9.4-1 provides the number of spent fuel assemblies in spent fuel 93
pools by refueling outage. Table 9.1-1 provides the decay heat

93 parameters for the three design conditions above corresponding to the spent fuel storage in Table 9.1-4.

9.1.3.1.2 Water Purification

Should a leaking fuel assembly have to be transferred from the fuel transfer canal to a spent fuel pool, a small quantity of fission products may enter the pool water. Two purification loops are provided for removal of such fission products and other contaminates by means of filtration and ion exchange. Each purification loop is capable of purifying flow from either the spent fuel pool cooling pumps or the refueling water purification pumps. The use of two loops ensures maintenance of acceptable activity and purity levels in the spent fuel
68 pools in the event of failure of one loop. Each purification loop limits the activity of fission and corrosion products in the spent fuel water to a maximum of 5×10^{-9} Ci/cm^3, exclusive of tritium, as stated in Table 9.1-1. Purification is sufficient to permit unrestricted access to the spent fuel storage area.

The optical clarity of the spent fuel pool water surface is maintained by use of the skimmer, strainer, and skimmer filter of the system. The purification loops similarly provide for cleanup of water in the Refueling Water Storage Tank, refueling cavities, transfer canal, and the cask loading pits.

27 Evaporation and gaseous activity released to the atmosphere from the spent fuel pools are controlled by an air sweep system which provides a high-velocity air curtain across the pools (see Section 9.4.2).

9.1.3.2 System Description

The Spent Fuel Pool Cooling and Cleanup System consists of two cooling loops, two purification loops, and one surface skimmer loop. The system flow diagram is shown on Figure 9.1-13. Each cooling loop includes a pump, heat exchanger, and associated piping, valving, and instrumentation. One cooling loop is normally in operation for each pool to remove decay heat generated by spent fuel awaiting shipment. Heat is transferred via the spent fuel pool heat exchanger to the Component Cooling Water System (CCWS).

During normal operation, one spent fuel pool cooling water pump takes suction from one of the spent fuel pools and discharges the pool water through the tube side of the spent fuel pool heat exchanger and back to the pool, while the second pump takes suction from the second pool and discharges back to that pool One spent fuel pool cooling water pump and one spent fuel heat exchanger are capable of cooling both pools in the event that one train is out of service. The suction lines, protected by spent fuel pool suction screens, are located approximately four ft below the normal spent fuel pool water level. The return lines terminate approximately six ft above the fuel assemblies, which prevents siphoning below this point in the event of a pipe break. To further ensure that siphoning does not occur, each return line contains an antisiphon hole approximately six in. below the low water level which corresponds to 12 in. below the normal water level.

During heat removal operations, a portion of the spent fuel pool water may be diverted through a demineralizer and filter in either of the purification loops to maintain spent fuel pool water clarity and purity.
Transfer canal water may also be circulated through a purification loop 31
by opening either of the two spent fuel pool gates and opening the valves in the cooling loop discharge lines to the transfer canal. In addition, the water in the transfer canal or the cask pits may be purified by aligning the cask pit and transfer canal drain pump to take suction from the pit or canal and to discharge through a purification loop and back to the same pit or canal.

To allow maintenance of the fuel transfer equipment, the transfer canal is drained by the cask pit and transfer canal drain pump. The transfer canal water is pumped through the purification loop and discharged into the recycle holdup tank, which is part of the Boron Recycle System (BRS). After maintenance, an auxiliary discharge is provided in the BRS to return water to the refueling transfer canal using the recycle evaporator feed pumps.

The cask pits are drained in a similar manner. The cask pit and transfer canal drain pump impels the water through the purification loop and into the recycle holdup tank and returns water to the pits by way of the recycle evaporator feed pumps.

The demineralizer and filter are isolated manually from the heat removal portion of the system. The purification equipment can thus be used to maintain refueling water purity while spent fuel pool heat removal operations proceed simultaneously. Connections are provided so that the refueling water may be pumped from either the Refueling Water Storage Tanks or the refueling cavities through a filter and demineralizer and discharged back to either the refueling cavities or the Refueling Water Storage Tanks. Purification flow is obtained by way of the refueling water purification pump.

The valve arrangement of the purification loops is such that either loop may be used to maintain refueling water purity while the heat removal portion of the system is isolated manually. It is also possible to simultaneously use one purification loop for spent fuel pools and one purification loop for refueling water.

To further assist in maintaining water clarity in the spent fuel pools and refueling cavities, the water surface is cleaned by a skimmer loop. Water is removed from the surface by the skimmers, pumped through a strainer and filter, and then returned to the pool or refueling cavity surface at remote locations from the skimmers.

86

The spent fuel pools are filled with water of approximately the same boron concentration as that of the RWSTs. Normal makeup water to compensate for evaporation losses is taken from the demineralized water supply (see Section 9.2.3).

A redundant makeup water source is provided from the reactor makeup system shown in Figure 9.2-5. This system, as described in Section
87 9.2.3, is a seismic Category I system. Ventilation requirements are discussed in Section 9.4.2.

9.1.3.2.1 Component Description

Codes and safety classifications for Spent Fuel Pool Cooling and Cleanup System components are given in Table 9.1-2. Major component parameters are presented in Table 9.1-3.

Q010.11

All process lines shown on Figure 9.1-13 and identified as nuclear 93
safety class are classified Seismic Category I. The boundary between 80
the Seismic Category I piping and non-Seismic Category I piping coincides with the boundary between safety class piping and
non-safety class piping. This separation appears on Figure 9.1-13 as 93
safety class 3 to piping class 5 (NSS) transition except on vent, drain and test lines which are NNS downstream of the root valve.

All piping in contact with spent fuel pool water is made of stainless steel. The piping is welded except where flanged connections are used to facilitate maintenance.

For instrumentation applications, see Subsection 9.1.3.5.

9.1.3.3 <u>Safety Evaluation</u>

Spent fuel pool water is cooled by two redundant cooling loops, each of 86
which contains a pump, heat exchanger, piping, valves, and
instrumentation. In the event of a failure of spent fuel pool cooling 93
pump or heat exchanger, the other loop ensures the continuity of effective cooling.

In case of spent fuel stored in both pools or a closely spaced refueling 93
of both reactors, the two cooling loops may be used. In the event of a failure of one loop, the second loop ensures a minimum cooling and limits the water temperature to the cleanup system to less than 140°F to protect the demineralizer resins.

93

To detect leakage through the spent fuel pool liner welds, a channel is provided in back of the welds to form a leak chase. Concrete troughs are formed under the welds in the floor plate. Sections of welds which are leaking can be determined by observing which leak chase the water is coming from before the leak chases merge into a common drain header. Once a section of weld has been determined to be leaking, the exact location can be determined by draining the pool and purging the leak chase with a gas other than air. A gas detection device can be used to pinpoint the exact location in the weld from which the gas is leaking.

76 Furthermore, as indicated in Table 9.1-1, the pool capabilities are
sufficiently large so that an extended cooling outage is required before
pool temperatures reach 212^{O}F. Thus the system can be shut down safely
for reasonable time periods for maintenance or replacement of
93 malfunctioning components. The effect of the evaporation rate from the
pools on humidity are described in Section 9.4.2.

The suction lines inside the spent fuel pools are positioned to take suction four ft below the normal water level in order to minimize vortexing and the possibility of floating debris entering the system. Return lines from the spent fuel pool heat exchangers are located so that cooled water is discharged downward approximately six ft above the fuel assemblies. This ensures adequate dispersion of the cooled water around the stored spent fuel assemblies. The suction and return lines are located on opposite sides of the pools to prevent channeling and to obtain maximum circulation.

To protect against loss of water from the spent fuel pools, the spent fuel pool cooling pump suction lines penetrate the pool wall and terminate approximately four ft below the normal water level and the return lines terminate six ft above the fuel assemblies. The return lines contain antisiphon holes. This arrangement precludes gravity draining of the pools in the event of a pipe break and ensures that sufficient shielding is maintained.

There are no drain lines connected to the pool. Appropriate redundancy, including a seismic Category I source, is provided for makeup water to the pools. Draining of either pool below the design water level is not considered credible. The rate of makeup water is greater than the rate of water loss. The radiological evaluation of the cleanup system is presented in Chapters 11 and 12.

9.1.3.4 Inspection and Testing Requirements

91 The active components of this system are in either continuous or
intermittent use during normal plant operation. Periodic visual
inspections and preventive maintenance are conducted as necessary. All
components are accessible for periodic inspection except one section of

each cooling pump suction line and one section of the cooling water return line. These sections, of all-welded construction, are embedded in concrete in the vicinity of the spent fuel pool and cask storage area.

To ensure that proper operational conditions exist for the spent fuel pool, periodic chemical analyses and operational surveillance shall be performed when this system is in use. Chemical analyses will be performed weekly for determining concentrations of chloride, fluoride and boron. Radioactivity levels and pH will be determined, as a minimum, on a weekly frequency. The chemical limits used in the monitoring of the spent fuel pool are, as follows: Q281.2 91

Chlorides	0.15 ppm (maximum)
Fluorides	0.15 ppm (maximum)
pH	Variable
Boron Concentration	2000 ppm (minimum)
Radioactivity Levels	Activity levels shall be maintained as low as reasonably achievable (ALARA)

The bases for these limits are to minimize the potential for corrosion attack, to ensure the proper reactivity control and to maintain the radioactivity levels as low as reasonably achievable (ALARA).

For information on the sampling and monitoring of the spent fuel pool demineralizers and filters, see Section 12.2.1.2.2. Q281.2 91

9.1.3.5 Instrument Requirements

The instrumentation for the Spent Fuel Pool Cooling and Cleanup System is discussed in the following paragraphs.

1. Temperature

Local temperature indicators are provided at the spent fuel panel for spent fuel pools and the refueling cavities and also provided at the outlet of the spent fuel pool heat exchanger.

Annunciation is given in the spent fuel pool panel and the Control Room when the normal temperature is exceeded.

2. Pressure

Pressure gauges are provided at the discharge of the pumps used in this system. Local differential pressure indicators are connected across the spent fuel pool filter, spent fuel pool skimmer filter, spent fuel pool demineralizer and resin trap, with an alarm on the spent fuel pool panel and on the common alarm on the main control board.

3. Flow

Local indicators are provided to indicate the flows through the purification loop and in the spent fuel pool return lines. Low flow in the pool return lines is also alarmed in the spent fuel pool panel and the Control Room panel.

4. Level

87 The spent fuel pool, refueling cavity and fuel transfer canal water levels are measured to give alarms in the local panel and a common trouble alarm at the Control Room panel for high or low water level.

5. Radiation

Area radiation monitors are located in the fuel pool area. Radiation monitors are also provided on the return lines to the spent fuel pools. High radiation is alarmed both locally and in the Control
76 Room panel. The radiation monitors provided in the return lines from the spent fuel pool demineralizers give alarms in the steam generator blowdown sample panel and the Control Room panel for high radiation. See Sections 11.5 and 12.3 for a description of the radiation monitors.

93

TABLE 9.1-1

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM DECAY HEAT PARAMETERS (NOTE 1)

PARAMETER	MAX. DESIGN		MAX. SUMMER DESIGN		ABNORMAL MAX. DESIGN	
	POOL NO. 1	POOL NO. 2	POOL NO. 1	POOL NO. 2	POOL NO. 1	POOL NO. 2
Number of fuel assemblies stored (Note 2)	486	0	389	0	582 (Note 4)	0
Decay Heat Produced (x 10^6 BTU/hr)	39.8	0	12.7	0	48.0	0
Number of cooling loops	1	0	1	0	2	0
SSI Temperature	94°F		102°F		102°F	
Maximum SFP temperature (°F)	<150	NA	<150	NA	<212	NA
Time to boiling (Hrs) (Note 3)	>4	NA	>13	NA	NA	NA

NOTES:

1. See Section 9.1.3.1.1 for the design conditions in this table.
2. Storage capacity of Pool No. 1 is 556 including two failed fuel storage containers. Storage capacity of Pool No. 2 is 560 (not installed). The number of stored assemblies is based on Table 9.1-4.
3. Assuming cooling is temporarily lost, the time to boiling is evaluated for the temperature rise from 150°F to 212°F.
4. Acutal capacity is 556. The decay heat load assumed is conservative. See Table 9.1-4.

CPSES/FSAR
TABLE 9.1-2

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM CODE AND SAFETY CLASS REQUIREMENTS

Component	Safety Class	Code	
Spent fuel pool cooling water pump	3	ASME III, Class 3	
Refueling water purification pump	NNS	Mfrs. standard	
Spent fuel pool skimmer pump	NNS	Mfrs. standard	
Spent fuel pool heat exchanger	3	ASME III, Class 3	
Spent fuel pool demineralizer	3	ASME III, Class 3	
Spent fuel pool filter	NNS	ASME VIII	
Spent fuel pool skimmer filter	NNS	ASME VIII	
Spent fuel pool suction screens	3	Mfrs. standard	
Spent fuel pool skimmer	NNS	Mfrs. standard	
Spent fuel pool skimmer strainer	NNS	Mfrs. standard	
Spent fuel pool cooling system pressure reduction orifice	3	ASME III, Class 3	33
Purficiation loop resin trap	3	ASME III, Class 3	
Cask pit and transfer canal drain pump	NNS	Mfrs. standard	
Piping and valves (nuclear)	3	ASME III, Class 3	
Piping and valves (nuclear)	2	ASME III, Class 2	
Piping and valve (non-nuclear)	NNS	ANSI B31.1	
Refueling cavity skimmer pump	NNS	Mfrs. standard	
Refueling cavity skimmer strainer	NNS	Mfrs. standard	
Refueling cavity skimmer	NNS	Mfrs. standard	
Refueling cavity purification pressure reduction orifice	NNS	Mfrs. standard	33

TABLE 9.1-3

(Sheet 1 of 5)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

MAJOR COMPONENT PARAMETERS

Spent Fuel Pool Cooling Water Pump

Quantity (shared)	2	
Design pressure, psig	150	
Design temperature, °F	200	
Design flow, gpm	3600	
Total dynamic head, ft water	209	68
Material	SS	

Refueling Water Purification Pumps

Quantity (shared)	2	76
Design pressure, psig	150	
Design temperature, °F	200	
Design flow, gpm	250	
Total dynamic head, ft water	200	76
Material	SS	

Spent Fuel Pool Skimmer Pump

Quantity (shared)	1
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	200
Fluid	Spent fuel pool water
Material	SS

TABLE 9.1-3

(Sheet 2)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

MAJOR COMPONENT PARAMETERS

Spent Fuel Pool Heat Exchanger

Quantity (shared)	2		
Design heat transfer, btu/hr	13.6×10^6		71
	Shell	Tube	
Design pressure, psig	165	150	77
Design temperature, °F	200	200	
Design flow, lb/hr	2×10^6	1.80×10^6	
Inlet temperature, °F	105	120	
Outlet temperature, °F	111.8	112.5	
Fluid circulated	Component cooling water	Spent fuel pool water	
Material	CS	SS	

Spent Fuel Pool Demineralizer

Quantity (shared)	2	
Design pressure, psig	200	68
Design temperature, °F	200	
Design flow, gpm	150 (maximum - 278)	76
Resin volume, ft^3	50	
Material	SS	
Resin type	Rohm and Hass Amberlite IRN-150 or equivalent	

TABLE 9.1-3

(Sheet 3)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM
MAJOR COMPONENT PARAMETERS

Spent Fuel Pool Filter

Quantity (shared)	2	
Design pressure, psig	150	
Design temperature, °F	200	
Design flow, gpm	150 (maximum = 278)	76
Micron Rating (^{M})	0.45 to 6 absolute (100% retention)	90
Material, vessel	SS	

Spent Fuel Pool Skimmer Filter

Quantity (shared)	1	
Design pressure, psig	150	
Design temperature, °F	200	
Design flow, gpm	200	
Micron Rating (^{M})	0.45 to 6 absolute (100% retention)	90

Spent Fuel Pool Suction Screens

Quantity (shared)	4 (2 per pool)	
Design flow, gpm	3600	
Perforation, in.	0.08, slotted	66
Material	SS	

Spent Fuel Pool Skimmer

Quantity (shared) 4 (2 per pool)

TABLE 9.1-3
(Sheet 4)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM
MAJOR COMPONENT PARAMETERS

Design flow, gpm	50	

Spent Fuel Pool Skimmer Strainer

Quantity (shared)	1	76
Design flow, gpm	200	
Maximum particle size, microns	150	76
Material	SS	

Purification Loop Resin Trap

Quantity (shared)	2	76
Design flow, gpm	250	
Perforation, mm	0.15	68
Material	SS	

Cask Pit and Transfer Canal Drain Pump

Quantity (shared)	1	
Design pressure, psig	150	
Design temperature, ^{o}F	200	
Design flow, gpm	100	
Fluid	spent fuel pool water	
Material	SS	

Piping and Valves (Nuclear and Non-Nuclear)

Design pressure, psig	150	
Design temperature, ^{o}F	200	
Material	SS	

TABLE 9.1-3

(Sheet 5)

SPENT FUEL POOL COOLING AND CLEANUP SYSTEM

MAJOR COMPONENT PARAMETERS

Refueling Cavity Skimmer Pump

Quantity (per unit)	1
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	100
Fluid	refueling water
Material	SS

Refueling Cavity Skimmer Strainer | 76

Quantity (per unit)	1	76
Design flow, gpm	100	76
Maximum particle size, microns	150	76
Material	SS	76

Refueling Cavity Skimmer | 76

Quantity (per unit)	2	76
Design flow, gpm	50	76

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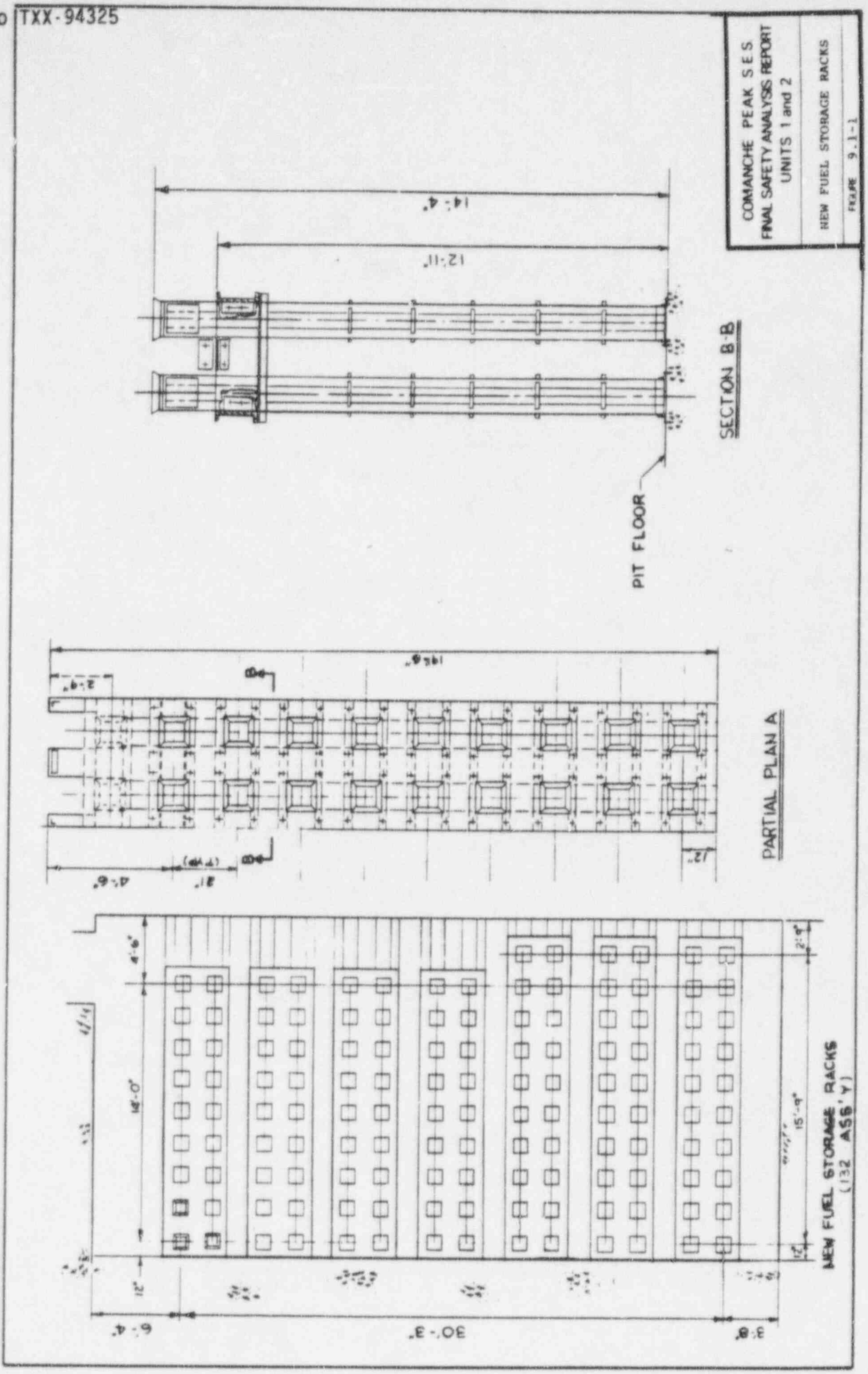
TABLE 9.1-4

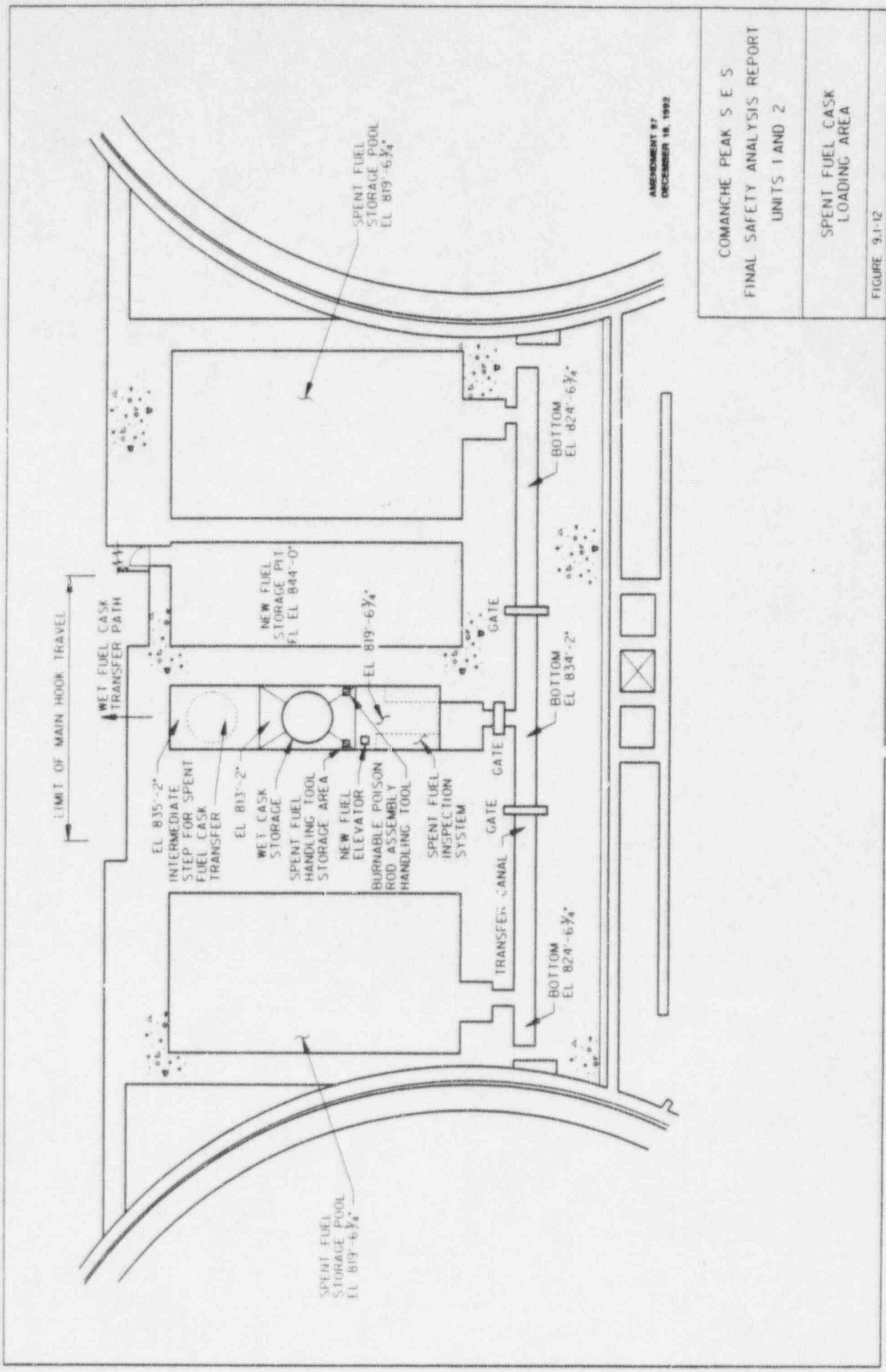
93 NUMBER OF FUEL ASSEMBLIES IN SPENT FUEL POOLS
BY REFUELING OUTAGE

OUTAGE	POOL NO. 1	POOL NO. 2
1RF01	56	0
1RF02	61	0
1RF03	88	0
2RF01	88	0
1RF04	96*	0
TOTAL	389**	0

* Estimated

** Emergency Core Offload Reserve is not available in Pool No. 1 during or after 1RF04.


COMANCHE PEAK SES
FINAL SAFETY ANALYSIS REPORT
UNITS 1 and 2
NEW FUEL STORAGE RACKS
FIGURE 9.1-1
14'-4"
12'-11"
SECTION B-B
PIT FLOOR
PARTIAL PLAN A
NEW FUEL STORAGE RACKS
(132 ASS'Y)
6'-4"
30'-3"
3'-8"



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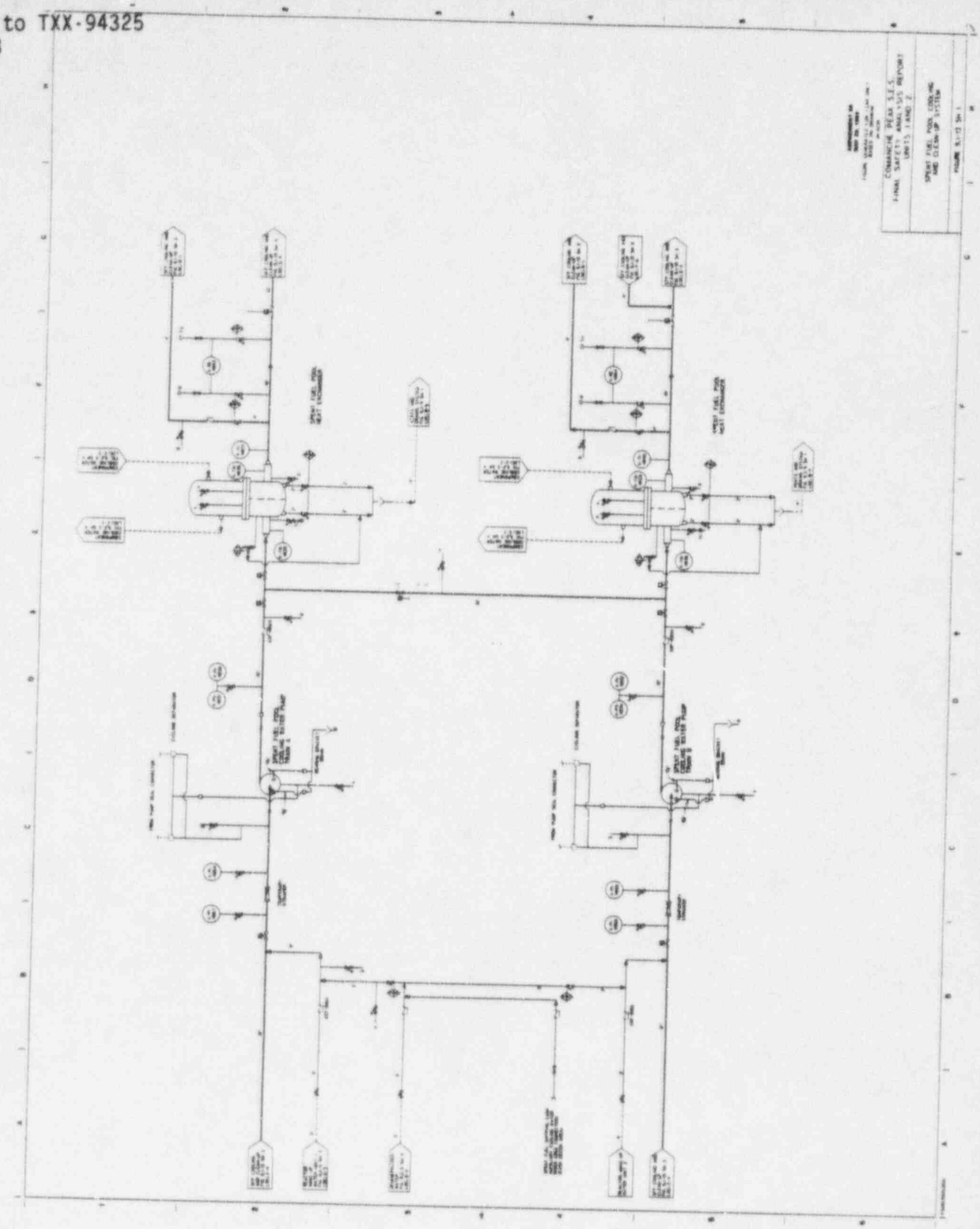
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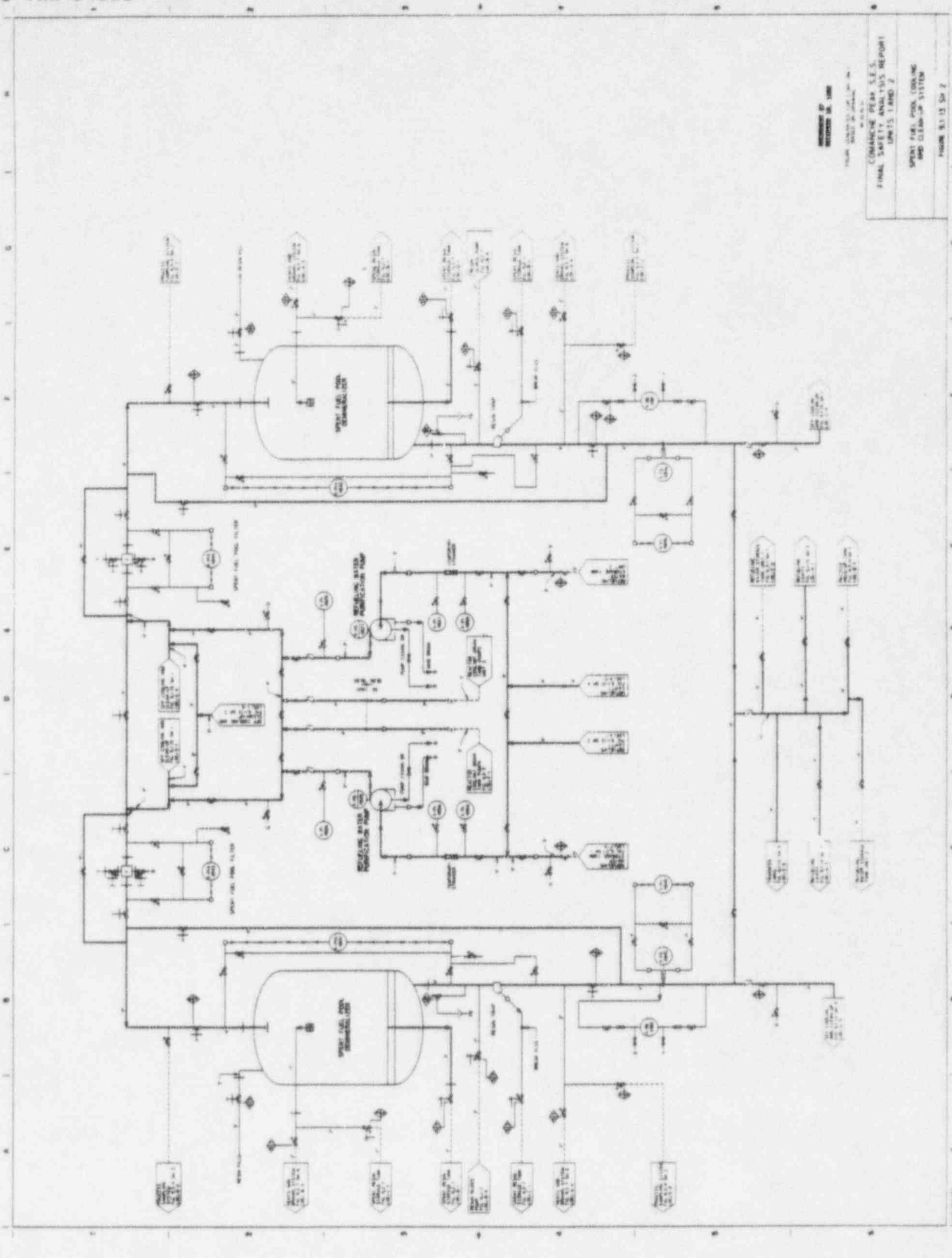
SPENT FUEL POOL HEAT EXCHANGER
SPENT FUEL POOL HEAT EXCHANGER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UNITS 1 AND 2
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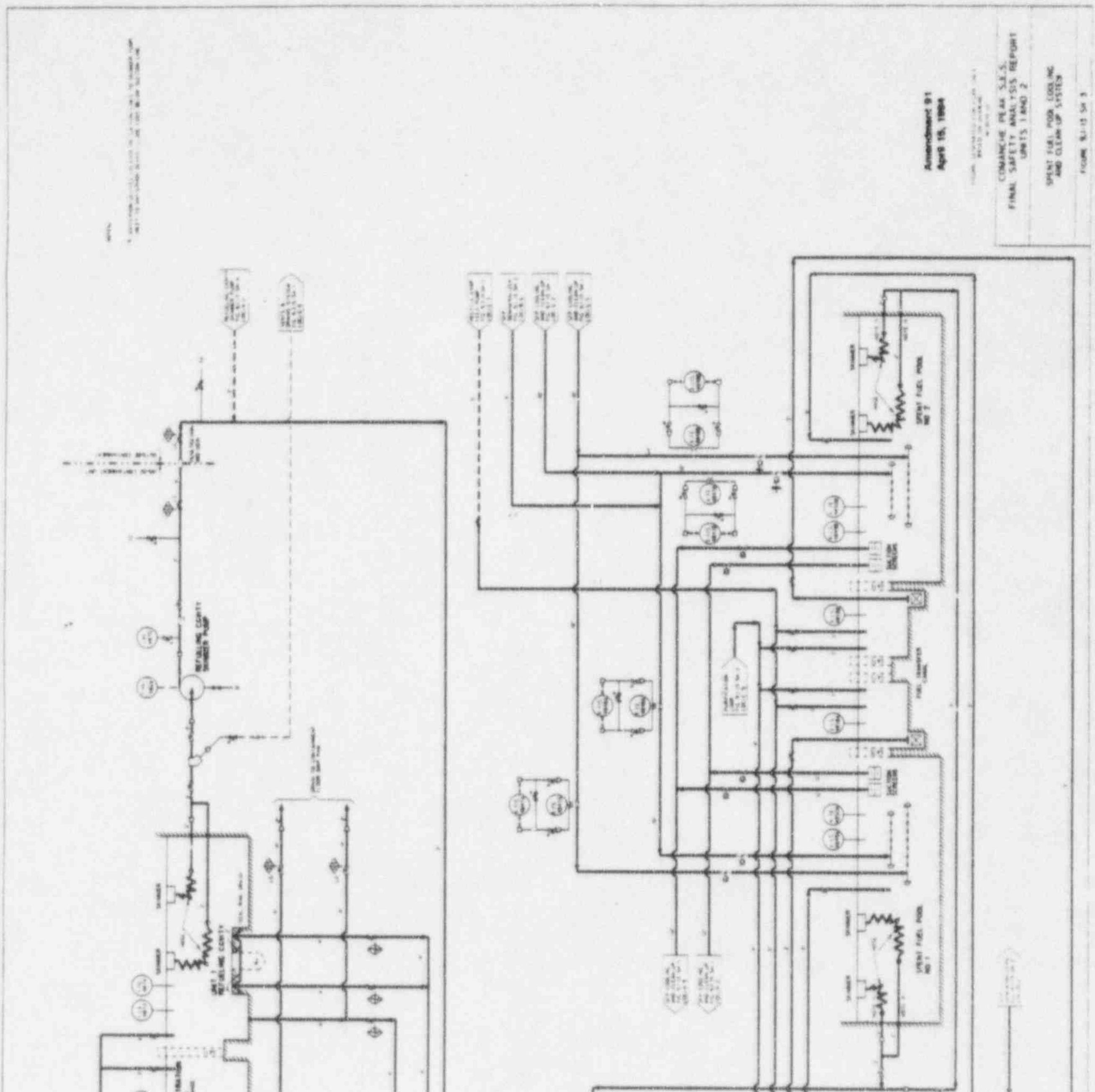
AND CLEAN-UP SYSTEM
SPENT FUEL POOL DEMINERALIZER
SPENT FUEL POOL FILTER
REFUELING WATER PURIFICATION PUMP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April 15, 1994
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UNITS 1 AND 2
SPENT FUEL POOL COOLING
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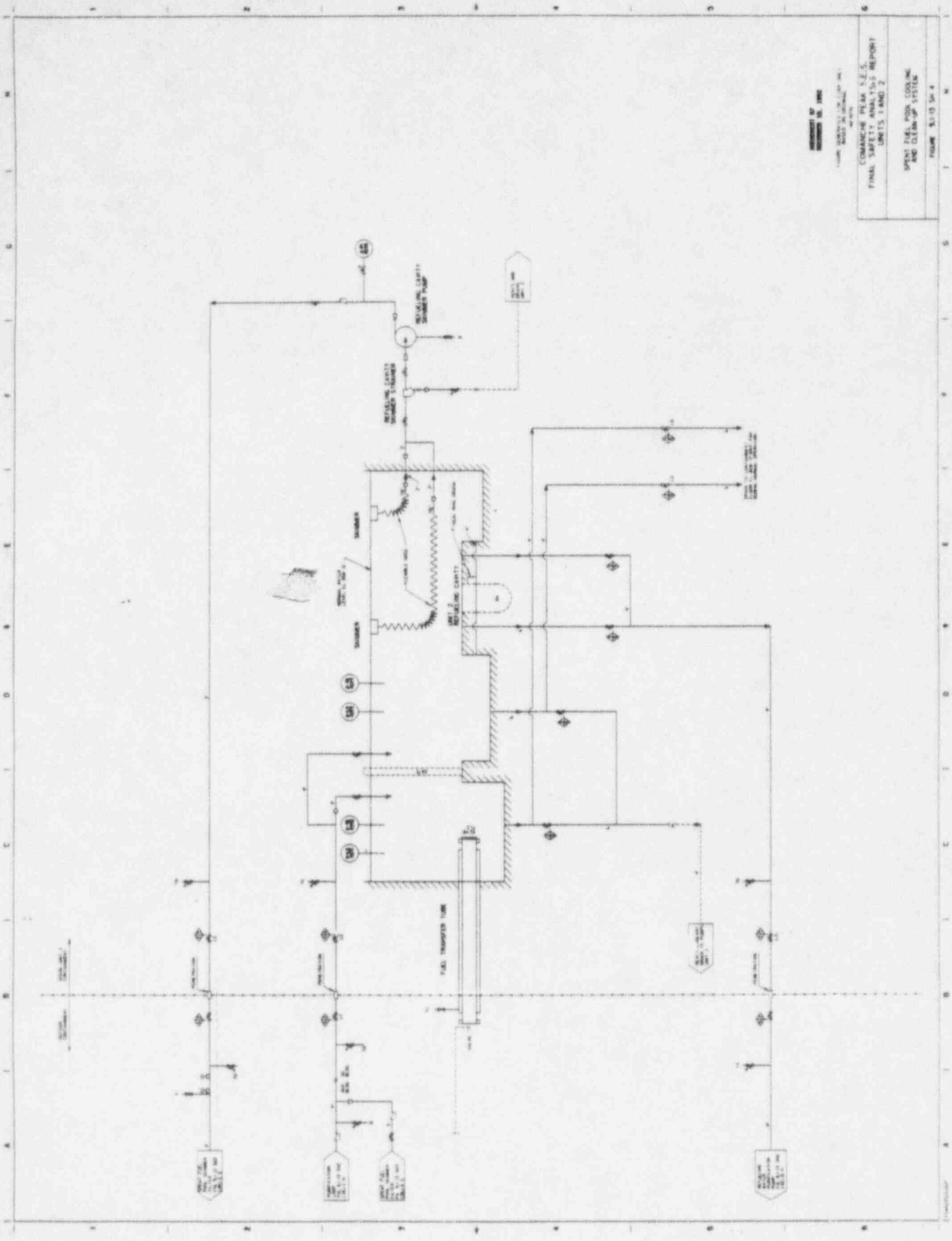
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AND CLEAN-UP SYSTEM
FUEL TRANSFER TUBE