ENCLOSURE

REVISION 3 PAGE CHANGES TO THE

SPENT FUEL POOL RERACKING LICENSING REPORT

SAN ONOFRE NUCLEAR GENERATING STATION

UNITS 2 AND 3

Revision 3 Replacement Pages

To: Spent Fuel Pool Reracking Licensing Report

1.	Figure 3.1-1	Corrected minimum water gap value from 1.0 inch to 1.1 inch for Region I.
2.	Page 3.2-1	Paragraph added to clarify the availability of pool level and temperature alarms and indication during the reracking construction process.
3.	Page 3.2-3	Paragraph corrected to indicate that inadvertent pool draining, including siphoning is limited to Technical Specification level.
4.	Figure 3.2-2	Corrected spent fuel pool width at bottom from 23 feet to 27 feet. (There is a 4 foot overhang on the west side at the top of the pool.)
5.	Page 4.4-8	The term F_d has been eliminated since it is not applicable to current "limit analysis" approach to rack load combinations.
6.	Page 4.5-2	Paragraph revised to identify inclusion of rack induced hydrodynamic loads in fuel pool wall evaluations.
7.	Page 4.6-1	Identifies use of actual concrete strengths for determination of the allowable concrete bearing value at rack interface.
8.	Page 4.6-3	Corrected utilization factor and margin, plus new paragraph added to identify north spent fuel pool wall out-of-plane shear calculation results.
9.	Page 4.6-4	Paragraph revised to address concrete bearing pressure criteria.
10.	Page 4.6-13	Paragraph added to clarify load combinations with respect to treatment of fuel impact loads and DBE/thermal load combination.
11.	Page 4.6-28	Table 4.6-1 utilization factors modified to include rack induced hydrodynamic load.
12.	Page 4.6-29	Table 4.6-2 governing results revised to reflect modified utilization factors.

13.	Page 4.6-31, 32	Table 4.6-4 and 4.6-5 Minimum Margin to Region I and Region II allowables are modified to include, thermal loads and fuel impact loads, as well as a different cell seam weld load split, for DBE load combinations.
14.	Page 4.7-1	Paragraph modified to provide information regarding rack floor plate material.
15.	Page 4.7-14	Clarification to rack handling sequence after rack 7 and 8 placement.
16.	Pages 4.7-24, 25, 26	Reference(s) to NUREG-0612, Section 5.1.2(3) corrected.
17.	Page 5.2-14	Estimated cumulative occupational exposures changed from 47 to 82 person-rem to reflect increased manpower requirements.
18.	Page 5.2-26, 27	Table 5.2-4 modified to reflect increased estimated manpower requirements for rerack construction effort.

INSTRUCTIONS FOR INSERTING REVISION 3
SPENT FUEL POOL RERACKING LICENSING REPORT
SAN ONOFRE NUCLEAR GENERATING STATION
UNITS 2 AND 3

Revision 3 to the Spent Fuel Pool Reracking Licensing Report consists of insert pages.

The insert pages provide changes to the Licensing Report to incorporate the results of 1) additional spent fuel rack and fuel handling building structural analyses in response to NRC Action Items, and 2) clarification and corrections of text and figures. Changes are indicated by a bold line with the number 3 in the outside margin adjacent to the change. The date (8/89) and revision number (Revision 3) are provided at the bottom of each changed page.

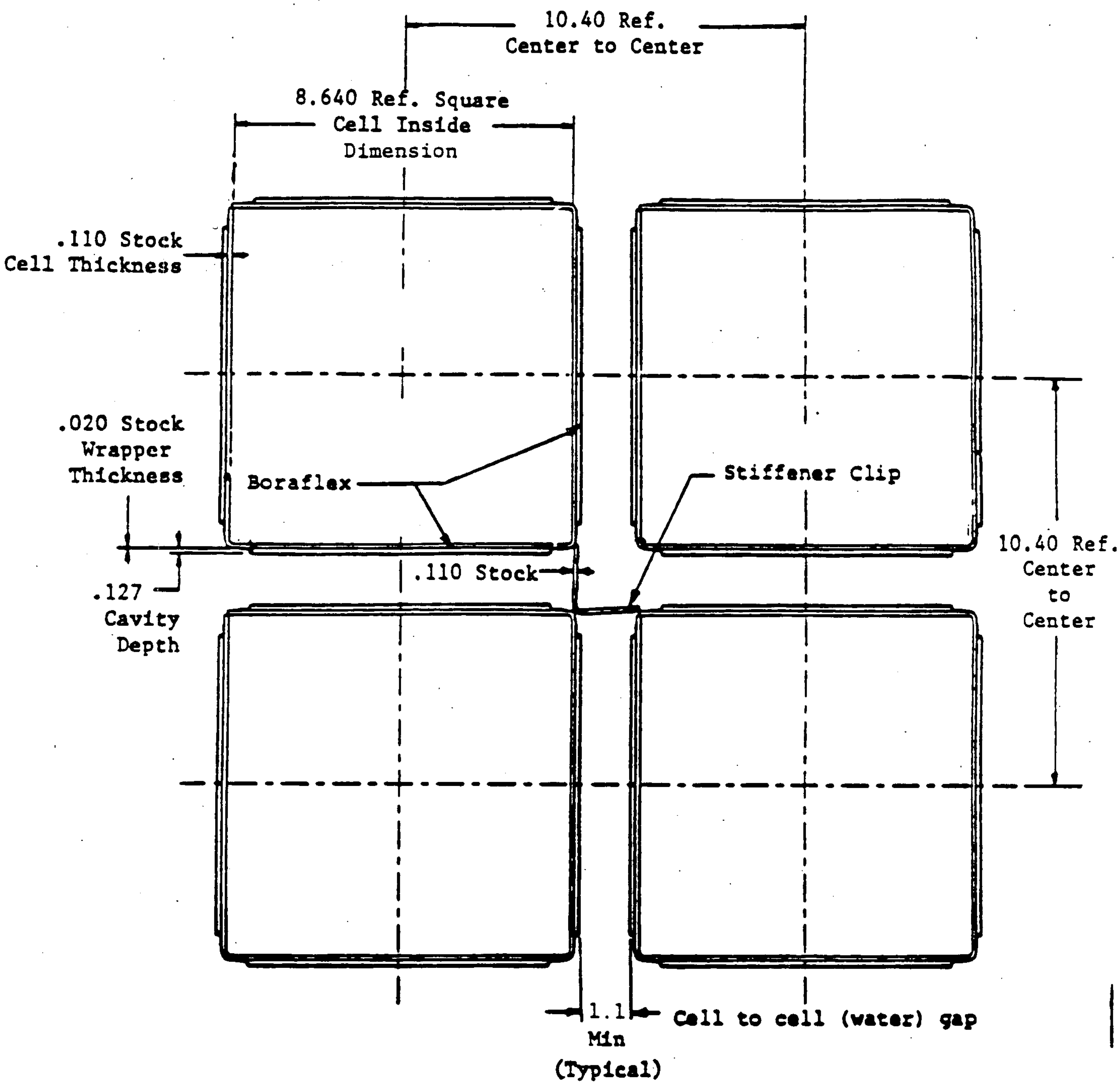
In addition, the revised List of Effective Pages (LOEP-1) replaces the existing LOEP in the manual behind the front cover.

LIST OF EFFECTIVE PAGES

This List of Effective Pages identifies those text pages and figures currently effective in the Licensing Report.

Page or Figure No.	Issue
LOEP-1	Rev 3
Description and Safety Analysis of Proposed Change NPF-10/15-287	
1	Rev 0
2	Rev 1
3 - 10	Rev 0
Attachment A	Rev 0
Attachment B	Rev 0
Attachment C	Rev 0
Attachment D	Rev 0
Attachment E	
i - vii	Rev 0
1-1 - 1-7	Rev 0
Fig 1-1	Rev 0
2.1-1 - 2.1-3	Rev 0
2.2-1 - 2.2-5	Rev 0
Fig 2.2-1 - 2.2-2	Rev 0
Fig 2.2-3	Rev 1
2.3-1	Rev 0
3.1-1 - 3.1-25	Rev 0
Fig 3.1-1	Rev 3
Fig 3.1-2	Rev 1
Fig 3.1-3 - 3.1-6	Rev 0
3.2-1 - 3.2-1A	Rev 3
3.2-2	Rev 0
3.2-3	Rev 3
3.2-4 - 3.2-21	Rev 0
Fig 3.2-1	Rev 0
Fig 3.2-2 (1 of 2)	Rev 3
Fig 3.2-2 (2 of 2)	Rev 0
Fig 3.2-3	Rev 0
3.3-1 - 3.3-7	Rev 0
Fig 3.3-1 - 3.3-3	Rev 0
3.4-1 - 3.4-3	Rev 0
3.5-1 - 3.5-3	Rev 0
3.6-1 - 3.6-3	Rev 0
4.1-1 - 4.1-11	Rev 0
Fig 4.1-1 - 4.1-3	Rev 0
Fig 4.1-4	Rev 1

Page or Figure No.	Issue
Fig 4.1-5 - 4.1-11	Rev 0
4.2-1 - 4.2-6	Rev 0
4.3-1 - 4.3-2	Rev 0
Fig 4.3-1 - 4.3-6	Rev 0
4.4-1 - 4.4-2	Rev 0
4.4-3 - 4.4-4A	Rev 2
4.4-5 - 4.4-7	Rev 0
4.4-8	Rev 3
4.5-1	Rev 0
4.5-2 - 4.5-2A	Rev 3
4.5-3 - 4.5-37	Rev 0
Fig 4.5-1 - 4.5-20	Rev 0
4.6-1 - 4.6-1A	Rev 3
4.6-2	Rev 0
4.6-3 - 4.6-4A	Rev 3
4.6-5 - 4.6-5A	Rev 2
4.6-6 - 4.6-7	Rev 0
4.6-8 - 4.6-8A	Rev 2
4.6-9 - 4.6-12	Rev 0
4.6-13 - 4.6-13A	Rev 3
4.6-14 - 4.6-27	Rev 1
4.6-28 - 4.6-29	Rev 3
4.6-30	Rev 0
4.6-31 - 4.6-32	Rev 3
4.6-33 - 4.6-34	Rev 0
Fig 4.6-1 - 4.6-10	Rev 0
4.7-1 - 4.7-1A	Rev 3
4.7-2 - 4.7-13	Rev 0
4.7-14 - 4.7-14A	Rev 3
4.7-15 - 4.7-23	Rev 0
4.7-24 - 4.7-26	Rev 3
Fig 4.7-1 - 4.7-14	Rev 0
4.8-1 - 4.8-5	Rev 0
4.9-1 - 4.9-4	Rev 0
5.1-1 - 5.1-16	Rev 0
5.2-1 - 5.2-13	Rev 0
5.2-14	Rev 3
5.2-15 - 5.2-25	Rev 0
5.2-26 - 5.2-27	Rev 3
5.3-1 - 5.3-10	Rev 0
5.4-1	Rev 0
6-1 - 6-15	Rev 0



3

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Units 2 & 3

REGION I
CELL LAYOUT

FIGURE 3.1-1

3.2 DECAY HEAT CALCULATIONS FOR THE SPENT FUEL POOL (BULK)

3.2.1 SPENT FUEL POOL COOLING SYSTEM DESIGN

Figure 3.2-1 illustrates the SFP cooling system outside the SFP. Figure 3.2-2 shows the pool cooling piping in the pool. Table 3.2-1 contains a summary of system operating parameters. The system is controlled manually from the main control board. Control room alarms for high fuel pool temperature, high and low liquid level in the fuel pool, and low fuel pool pump discharge pressure are provided to alert the operator to abnormal circumstances. A local alarm for low liquid level in the fuel pool is also provided. The SFP cooling system has two trains of cooling pumps, heat exchangers, and related piping. Spent fuel pool water is circulated by the cooling pumps taking suction near the top of the pool and directing flow through the heat exchangers where the heat is transferred to the non-critical loop of the component cooling water (CCW) system described in UFSAR 9.2.2. From the outlet of the SFP heat exchangers the cooled water is discharged to the bottom of the SFP by a distribution header. The SFP cooling piping system will be modified by removal of the existing sparger lines on the discharge distribution header. All evaluations for the reracking of the SFP are based on this modification.

Alarms in the control room for SFP water high and low level and
high temperature, plus local indication of these parameters, will 3
be maintained during the construction process except for a brief

period when the control room alarm function will be disconnected
to allow changeover to the new indication and sending unit which
will be installed for each pool. Local indication of pool level
will be maintained throughout construction independently by
surveillance of the pool level indicating scale in the pool 3
itself. Additionally, an independent pool temperature alarm
which secures the pool purification system pump, is available
during the construction process.

Normal operation of the SFP cooling system currently occurs with a maximum of 2-2/3 cores stored in the SFP and is proposed with a maximum of 6-1/4 cores stored in the SFP. This allows enough

The possibility of inadvertant draining including siphoning of the pool below the Technical Specification level is precluded through the design of the system and the use of administrative controls. Leakage from the fuel pool cooling system is detected by a reduction in pool inventory and a leak sump high level alarm. Makeup to the SFP is from the Seismic Category I refueling water storage tank. 3

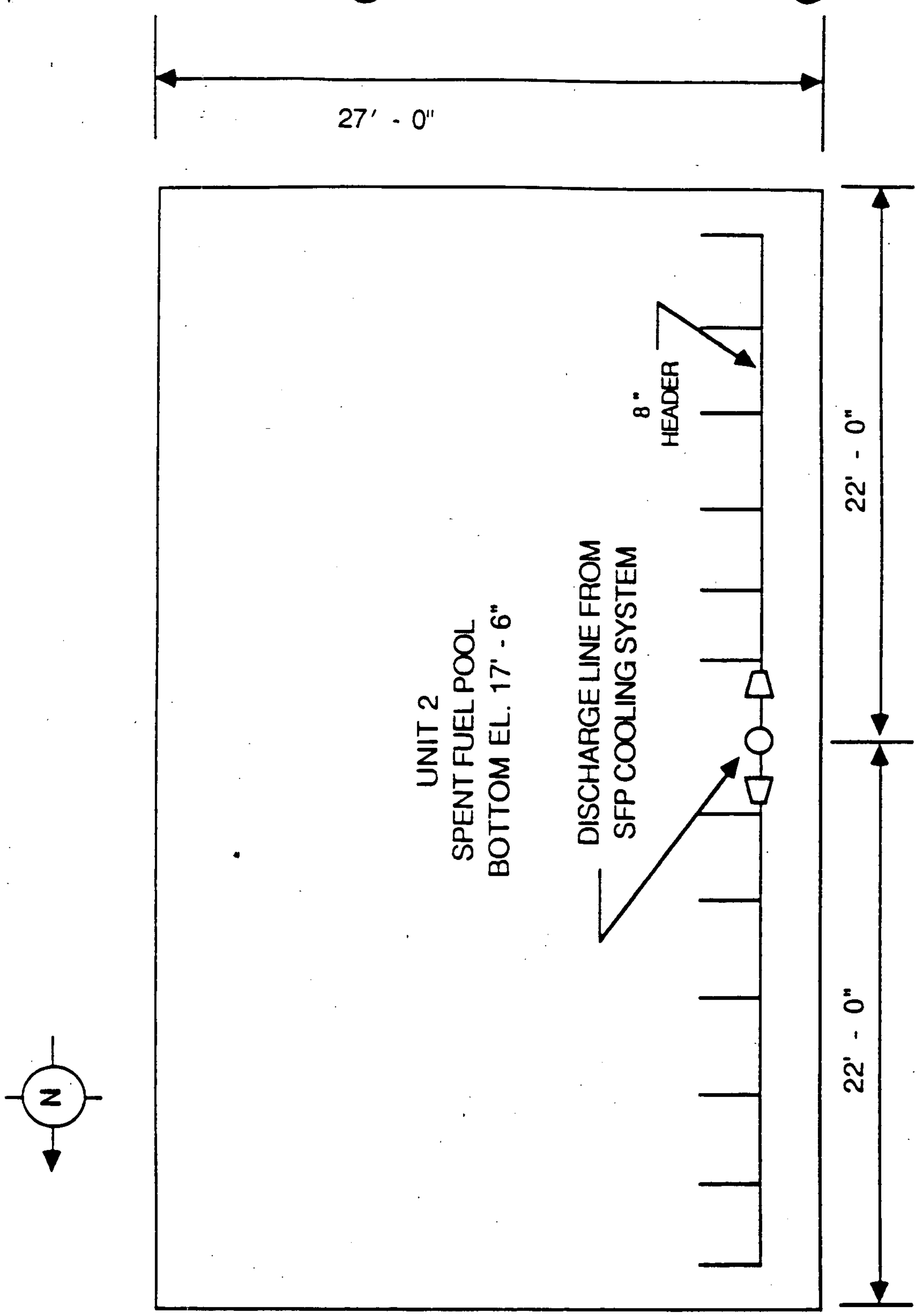
Alternate makeup water sources are also available from the nuclear service water, primary plant demineralized water via the reactor coolant or boric acid recycle subsystem, and refueling water via the low pressure safety injection or containment spray or SFP cooling pumps. Makeup from the refueling water tank via the low pressure safety injection or containment spray pumps is available only if the entire reactor core is unloaded.

3.2.2 DECAY HEAT ANALYSIS

3.2.2.1 Basis

The SONGS 2&3 reactors are rated at 3390 MW thermal. Each core contains 217 fuel assemblies. Thus, the average operating power per fuel assembly, P_o, is 15.6 MW.

Unit 1 fuel will also be stored in the Unit 2 and 3 fuel pools. Unit 1 has 157 fuel assemblies and is rated at 1347 MW thermal. This corresponds to a P_o of 8.6 MW/assembly.



PLAN

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Units 2 & 3

PROPOSED UNIT 2
SPENT FUEL POOL COOLING PIPING
SHEET 1 OF 2

FIGURE 3.2-2

Table 4.4-1

LOADS AND LOAD COMBINATIONS FOR SPENT FUEL RACKS

Load Combination	Acceptance Limit
1.7 (D + L)	NF 3340 of ASME Code Section III
1.3 (D + L + T_o)	
1.7 (D + L + E)	
1.3 (D + L + E + T_o)	
1.3 (D + L + E + T_a)	
1.3 (D + L + T_o + P_f)	
1.1 (D + L + T_a + E')	

1. The abbreviations in the table above are those used in Section 3.8.4 of the Standard Review Plan (SRP) where each term is defined except for T_a and P_f. The term T_a is 3
defined here as the highest temperature associated with the postulated abnormal design conditions. The term P_f is the 3
upward force on the racks caused by a postulated stuck fuel assembly.

2. The provisions of NF-3231.1 of ASME Section III, Division I, shall be amended by the requirements of Paragraph c.2.3 and 4 of Regulatory Guide 1.124, entitled "Design Limits and Load Combinations for Class A Linear-Type Component Supports."

3. For the faulted load combination, thermal loads will be neglected when they are secondary and self limiting in nature and the material is ductile.

concern (SFP basemat). This results in a finite element model with a fine mesh in the spent fuel area which yields accurate results in the area to be evaluated. Figure 4.5-1 provides an isometric view of the model.

The static and dynamic analysis models are identical except for the boundary elements (soil springs) used for each model. Additionally, the dynamic model has spring elements added to represent the hydrodynamic loads of the oscillating water.

The springs representing the oscillating water are modeled based upon AEC Report TID-7024, Chapter 6 "Dynamic Pressure on Fluid Containers"(1). In addition to the oscillating water hydrodynamic loads discussed above, hydrodynamic forces are created due to the motion of the racks relative to the pool walls. This rack induced hydrodynamic load is included in the fuel pool wall evaluations. 3

The six soil boundary elements (three translational and three rotational) are attached to the basemat master node located at the center of gravity of the basemat. The soil boundary elements are based on the FHB soil stiffness parameters listed in the SONGS 2&3 UFSAR, table 3.7-6.

Masses are lumped to the appropriate nodes of the model and a free-vibration modal analysis is performed in which enough modes are extracted to achieve 100% participation of the mass.

The results of the free-vibration modal analysis are then used to perform OBE and DBE response spectra analyses. The damping values used in the analyses are shown below. The values listed are in agreement with the SONGS 2&3 UFSAR, table 3.7-3.

4.6 STRUCTURAL ACCEPTANCE CRITERIA

4.6.1 STRUCTURAL ACCEPTANCE CRITERIA FOR SPENT FUEL POOL STRUCTURE

4.6.1.1 Criteria

The stresses/strains resulting from the loading combinations described in subsection 4.4.1 satisfy the following acceptance criteria:

- Spent Fuel Pool Concrete Structure
  The design stress limits described in paragraph 3.8.4.5 of the SONGS 2&3 UFSAR were used for the evaluation of the SFP reinforced concrete structural components.

4.6.1.2 Material Properties

The following material properties were used in the analysis of the SFP structure:

A. Concrete

Young's modulus E_c = 530,000 kips/ft^2

Poisson's ratio νc = 0.17

f'_c = 5.1 kips/in^2 for concrete bearing stress at rack and concrete interface (based on concrete placement tests) 3

f'_c = 4 $kips/in^2$ concrete strength used for all other fuel handling building evaluations 3

thermal expansion coeff. ε = 0.0000055

1. North and south SFP walls
2. East SFP wall
3. West SFP wall
4. SFP basemat

The loading cases 6 and 7, which have large temperature gradients, have the most significant effect on concrete compressive stresses for both mat and wall locations. The utilization factors for the maximum stress are presented in table 4.6-1. The largest utilization factor for
concrete section is 88.4% (at least a 11% margin remains 3
against the section allowable), which resulted from
loading case 7. The utilization factor is defined as the 3
percentage of resistance of the reinforced concrete section that has been utilized relative to the zero curvature line. A utilization factor of 100% indicates that the section is fully utilized by the design load.

The north spent fuel pool wall is the critical wall for out-of-plane shear. The maximum calculated value is 78
kips/ft which corresponds with an allowable value of 151 3
kips/ft, resulting in a minimum 48% margin.

B. Liner and Anchorage

The existing liner plate system is evaluated for the new spent fuel rack induced loads and for two postulated load drops. Both local and overall effects on the liner plate system are evaluated. The ACI and AISC codes were used for the liner plate evaluation.

Local effects due to the rack vertical loads are evaluated
based on the worst case single support pad loads for the
spent fuel racks for both Region I and Region II. The pad
loads are derived for load combinations defined in the 3
Standard Review Plan, Section 3.8.4, subsection II.3.b.
The evaluation shows that the single support pad loads are
acceptable except when applied directly over or
immediately adjacent to the leak chase, channel weld seams
or embedment plates. The support pads over or adjacent to 3
the leak chase channels will be provided with load
spreading or bridging plates to assure the actual concrete
bearing is within the ACI allowables. The allowable
concrete bearing strength was determined from Section 3
10.15 of ACI 349.

Overall rack horizontal loads due to friction were evaluated for both Regions I and II racks in the SFP. The evaluation shows that the liner plate system can withstand the loads imposed by the new spent fuel racks without any required liner plate system modifications.

Actual horizontal rack loads	5,132 kips
Reliner plate capacity	20,500 kips
Original liner plate capacity	19,330 kips
Anchorage system capacity	8,240 kips

The liner plate and anchorage system capacities are based on AISC material allowables increased by a factor of 1.6 for DBE conditions as allowed by UFSAR paragraph 3.8.4.5 [e.g.: tension = 1.6 (0.6 F_y)].

Limit Analysis

Load Combination	Acceptance Limit
1. 1.7 (D+L)	NF 3340 of ASME
2. 1.3 ($D+L+T_o$)	Code Section III
3. 1.7 (D+L+E)	
4. 1.3 ($D+L+E+T_o$)	
5. 1.3 ($D+L+E+T_a$)	
6. 1.3 ($D+L+T_o+P_f$)	
7. 1.1 ($D+L+T_a+E'$)	

Abbreviations are defined in paragraph 4.4.2.1. Note that SRP 3.8.4 Appendix D lists XVII 4000 rather than NF 3340 for the acceptance limit. However, Appendix XVII has now been incorporated into Subsection NF and what was XVII 4000 is now NF 3340.

Included in the seismic loads (E and E') are the overall rack loads due to seismic loading plus the local loads due to fuel impact. It should also be noted that for loading condition 7, 3
although the thermal loads tend to be self-limiting (produce secondary stresses), they have conservatively been combined with the DBE seismic loads.

Margins to Allowable shown in tables 4.6-4 and 4.6-5 are for the limiting load combinations 3, 5, and 7. The Margin to Allowable (MA) is calculated, as shown in equation form below, by comparing the acceptance limit with the applied load. The acceptance limit is the limit load of the structural component (see NF 3340 of ASME Code Section III), and the applied load is the factored load obtained from the load combinations specified above. Since the acceptance limit is the same for all seven load combinations, it is possible to meet the requirements of the load combinations by addressing three limiting combinations. Load combination 7 is limiting because it is the only combination involving the DBE

Table 4.6-1

CURRENT EVALUATION RESULTS FOR THE SPENT FUEL POOL WALLS AND BASEMAT

	Governing UFSAR Load Combination	Utilization Factor (%)	
North and South Walls:			
Horizontal Reinforcement	7	88.4	3
Vertical Reinforcement	7	37.4	
East Wall:			
Horizontal Reinforcement	7	23.1	
Vertical Reinforcement	7	47.0	
West Wall:			3
Horizontal Reinforcement	7	28.1	
Vertical Reinforcement	6	79.5	
Basemat:			
North-South Reinforcement	7	51.7	
East-West Reinforcement	6	81.4	

a. Refer to Section 4.4.1.2.

b. The Utilization Factor is defined as the percentage of resistance of the reinforced concrete section that has been utilized relative to the zero curvature line.

Table 4.6-2

COMPARISON OF GOVERNING RESULTS FOR THE ORIGINAL DESIGN VERSUS THE CURRENT EVALUATION FOR THE SPENT FUEL POOL

Location in Spent Fuel Pool	(a)	Governing Load Combination (b)	Axial Load Pu (kips) (c)	Flexural Load Mu (K-ft/ft)	Max Flexural Load Mu(Max) (K-ft/ft) (d)	Mu/Mu(Max)
7-Foot Thick Basemat in Pool Area (E-W Reinf)	UFSAR	7	-527	2604	2660	0.98
	CURRENT EVALUATION	6	92	1465	1793	0.82
4-Foot Thick (N or S) Spent Fuel Pool Wall (Vert Reinf)	UFSAR	7	-404	445	947	0.47
	CURRENT EVALUATION	7	-67	208	554	0.38
5-Foot Thick (West) Spent Fuel Pool Wall (Vert Reinf)	UFSAR	7	0	666	674	0.99
	CURRENT EVALUATION	6	208	215	257	0.84 3

a. The UFSAR values are from UFSAR table 3.8-10. The current evaluations are the maximum values obtained and not necessarily at the previous locations.
b. Refer to Section 4.4.1.2.
c. Sign convention for Pu: Compression (-), Tension (+)
d. Maximum flexural interaction capacity (Mu(Max)) given the axial load shown (Pu).

Table 4.6-4

MINIMUM MARGIN TO ALLOWABLE
REGION I

	OBE[a]	DBE[b]	
Support Pads	0.89	0.40	
Cells	0.78	0.32	
Grids	2.42	1.38	
Cell to Cell Clips	1.49[c]	2.08	3
Welds			
Cell to Grid	0.46	0.21	
Cell to Clip	1.67	0.38	3
Grid to Grid	4.04	1.90	
Grid to Base Plate	1.70	0.71	
Cell Seam	1.22	0.21	3
Cell to Wrapper	0.63	0.41	

a. Load Combination 3 [1.7(D+L+E)] unless otherwise specified.

b. Load Combination 7 [1.1(D+L+T_a+E′)].

c. Load Combination 5 [1.3(D+L+E+T_a)].

Table 4.6-5

MINIMUM MARGIN TO ALLOWABLE
REGION II

	OBE[a]	DBE[b]	
Support Pads	0.84	0.35	
Cells	0.74	0.27	
Welds			
Cell to Base Plate	1.54	0.56	
Cell to Cell	0.68[c]	0.48	3
Cell Seam	0.85[c]	0.24	
Cell to Wrapper	0.61	0.40	

a. Load Combination 3 [1.7(D+L+E)] unless otherwise specified.

b. Load Combination 7 [1.1(D+L+T_a+E')].

c. Load Combination 5 [1.3(D+L+E+T_a)].

4.7 MATERIALS, QUALITY CONTROL, AND SPECIAL CONSTRUCTION TECHNIQUES

4.7.1 CONSTRUCTION MATERIALS

Construction materials for spent fuel racks conform to the requirements of ASME Boiler and Pressure Vessel Code, Section III, Subsection NF. All the materials used in the construction are compatible with the SFP environment and do not contaminate the fuel assemblies or the SFP water. The racks are constructed from Type 304LN stainless steel except the leveling screws which are SA-564 Type 630 stainless steel. The floor plates under the rack support pads are made from SA-240 Type 304 stainless steel, which has the same corrosion resistance characteristics as the rack materials. 3

Welds for the rack fabrication will be visually examined. Westinghouse has used visual examination (in lieu of liquid penetrant) for all rack orders. Only under special conditions and only for a very small percentage of the welds was dye penetrant ever previously used. The basis for the use of visual examination is (ASME Code) Section NF-5230, which allows visual examination for welds with a throat thickness of less than 1 inch. Welds with a throat thickness greater than 1 inch are examined in accordance with that code section.

The visual examination is performed immediately after the weld is made. The inspection is recorded on shop routings for record-keeping purposes. The visual examination for the particular weld size (less than 1 inch) and type (single pass) gives assurance comparable to a dye penetrant examination.

washdown area to the fuel transfer pool. Load paths and lift points within the SFP are shown in figure 4.7-9. Subsequent to 3
the placement of racks 7 and 8, the temporary gantry crane will hoist material off the cask pool cover and move it to point 3 (W rack 7 location, see figure 4.7-3) where it will be lowered into the pool to a depth of within 1 foot of the top of rack 7. The material will then be moved northward until it clears rack 7, at point 4 (rack 5 position in figure 4.7-3), where it will be lowered to within 2 feet of the pool bottom (to assure adequate clearance over items residing on the pool floor). It will then proceed along the east side of the SFP until it is at the northern-most location. It will then be moved to its final location (point 5) and lowered into place on the pool floor.

Material leaving the pool will be moved in the reverse order of that presented above, with the load being placed on the cask pool cover for transfer to the cask handling crane. The path from point 2 to point 6, shown in figure 4.7-9, will be used for the temporary storage of items entering/leaving the pool as required. Material leaving the pool will normally be taken from the cask pool cover (by the cask handling crane) to the cask washdown area (point 7) for further decon/packaging prior to leaving the building. From point 7 the material will be moved by the cask handling crane to the access hatch (point 1) and lowered to grade.

As described above and previously in the rerack sequencing (paragraph 4.7.4.1), at no time during the reracking process is any heavy load (greater than 2000 pounds, present Technical

Also, all of the applicable requirements of the existing SONGS 2&3 NUREG 0612 program will be complied with for the existing cask handling crane.

G. Crane Design

The design of the existing cask handling crane is qualified under the established NUREG 0612 heavy loads program for SONGS 2&3. The design for the temporary gantry crane will be in accordance with the applicable criteria of Chapter 2-1 of ANSI B30.2-1976, and CMAA-70 and therefore, will comply with the guidelines of NUREG 0612 Subsection 5.1.1 (7).

The specific requirements (five items listed in Section 5.1.2 (3) of NUREG 0612) for SONGS 2&3 reracking heavy loads program will consist of the following.

A. No "hot" spent fuel (as defined in Section 2 of NUREG 0612) will be stored in a SFP during the reracking of said pool. Therefore, the guidelines of NUREG 0612 Subsection 5.1.2(3)(a) are not applicable. 3

B. This item has two specific requirements, namely, that no movement is made within 25 feet of "hot" fuel and that movements of loads within 25 feet of decayed fuel has the shift supervisor's approval. Since no "hot" spent fuel will be stored in a pool during its reracking the guidelines of NUREG 0612 Subsection 5.1.2(3)(b) which apply to "hot" fuel are not applicable. Sufficient fuel decay of approximately 70 days (as shown in Figure 2.1-1 of NUREG 0612) will have taken place prior to any heavy load being moved over or within the SFP or within 25 feet (horizontal) of any spent fuel (complies with NUREG guideline). In order to meet the second requirement of this guideline, administrative controls will be established through procedure application and scheduled work activities to govern the movement of heavy loads within 25 feet (horizontal) of spent fuel. The associated procedures and work activities will have the approval of the shift supervisor prior to their implementation (complies with the intent of NUREG guidelines). Therefore, the intent of the applicable guidelines of NUREG 0612 Subsection 5.1.2(3)(b) will be complied with. 3

C. The areas covered (at the pool deck elevation and below) by the cask handling crane and the temporary gantry crane do not include any equipment associated with redundant or alternate safe shutdown paths; therefore, the requirement for mechanical stops or electrical interlocks is not applicable. Postulated load drops will be analyzed to demonstrate that they will not cause damage that could result in criticality, cause leakage that could uncover the fuel, or cause loss of safe shutdown equipment. Therefore, the applicable guidelines of NUREG 0612 Subsection 5.1.2(3)(c) will be complied with. 3

D. Administrative controls will be established to limit the maximum lift height of heavy loads within the FHBs. Within the SFP the maximum lift height will be 24 inches above the pool floor (except when entering/leaving the pool as described in paragraph 4.7.4.2). The 24-inch lift height in the pool is to assure adequate clearance over items existing on the pool floor (piping, supports, etc.). The allowable lift height when moving heavy loads about the slab at elevation 63 feet-6 inches (pool deck) and over the cask pool cover will be limited to 12 inches except at lifting points. The heaviest anticipated load will be about 30 tons (temporary gantry crane) which is considerably less than a fuel cask (subject of this section of the NUREG). Therefore, the intent of the guidelines in NUREG 0612 Subsection 5.1.2(3)(d) will be met. 3

E. Postulated load drops along the specified safe load paths will be analyzed in accordance with the guidelines of Appendix A of NUREG 0612. Therefore, the guidelines of NUREG 0612 Subsection 5.1.2(3)(e) will be complied with along the designated safe load paths. 3

predicated on the approach that remote efforts prove impractical and diving operations are required for in-pool work. The total combined occupational exposures for the Units 2 and 3 reracking is estimated to be approximately 82 person-rem. This value is an estimate of the expected accumulative dose and does not represent the maximum or upper bound conditions. 3

5.2.4.3 Exposure Controls During Diving Operation

The use of remote methods will be evaluated for each aspect of the work. Divers will be used only when remote and other methods have been determined by both Health Physics and Construction to be impractical as determined by pre-established criteria.

Construction will develop each diving plan and Health Physics shall concur with it prior to each diving evolution. Health Physics and Construction maintain approval authority for each diving evolution. A parallel effort is being applied to planning for this possibility. Major activities in this preparatory effort include: the incorporation of diving operations "lessons learned" from those utilities which reracked with divers, including revision of the "Radiological Controls for Nuclear Diving" procedure, the formal SFP characterization effort, and appropriate diver-specific actions in areas such as ALARA prejob planning, training, contamination control, surveys, and management oversight.

Table 5.2-4

ESTIMATED RADIATION DOSES FOR CONSTRUCTION ACTIVITIES
(Sheet 1 of 2)

Item Description	Column 1 Anticipated Project Approach (rem)	Column 2 Diver Only Approach (rem)	
Install/remove cask pool rack	0.94	0.94	
Shuffle fuel	1.41	1.41	
Install/remove cask pool cover	0.93	0.93	
Install/test/remove work platforms and crane	1.35	1.35	
Remove old racks			
o Preparation of work site (prior to shift)			
- Health Physics	0.00	0.42	
- Other (RMC)	0.42	0.42	
o Tie-down bolt removal (top of rack)	3.32	3.42	
o Installation of lifting fixture (top of rack)	1.34	1.57	
o Monitor the lifting and rigging activities	1.99	2.41	
o Hydrolaze/vacuum rack	3.13	3.13	
o Vacuum path/work area before work	0.00	0.18	
o Vacuum path/work area after work	0.00	0.18	
Remove support structure and piping			
o Unbolt support beams	0.72	0.76	
o Remove and cut support beams	0.62	0.65	
o Cut and remove purification piping	0.77	1.00	
o Cut and remove purification supports	1.53	0.82	
o Cut and remove sparger piping	3.07	2.89	
o Cut and remove sparger supports	4.60	3.76	3
o Cut and remove miscellaneous piping	0.58	0.60	
o Cut and remove miscellaneous items	0.58	0.50	
o Vacuum path/work area before cutting	0.00	0.36	
o Vacuum path/work area after cutting	0.19	0.36	
Install new racks			
o Install floor plates	1.30	1.07	
o Release rigging	0.33	0.34	
o Elevation survey	0.55	0.55	
o Install, level and torque new rack	5.14	4.42	
o Remove lift fixture from new rack	0.33	0.31	
Drag test new racks	2.14	2.14	
Prepare racks and other radwaste for offsite shipment	6.30	6.30	
Miscellaneous (including mobilization and demobilization)	4.64	2.30	
TOTAL FOR UNIT 2	48.2	45.5	
TOTALS FOR BOTH UNITS *	81.9	77.3	

* Assumes Unit 3 requires 30% less person-rem due to learning curve efficiency increase.

Table 5.2-4

ESTIMATED RADIATION DOSES FOR CONSTRUCTION ACTIVITIES
(Sheet 2 of 2)

Assumptions:

1. Column 1 values are based on the anticipated construction approach where the in-pool work is accomplished by a combination of diving operations and remote technology.
2. Column 2 values are based on the approach where all remote efforts prove to be impractical and diving operations are required for all in-pool work. 3
3. The current measured radionuclide concentrations in the SFP water remain constant throughout the work.
4. All values are estimates of expected cumulative dose and do not represent maximum or upper bound conditions.