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Your ref: Docket No. 52-006
Our ref: DCP/NRC2166

June 20, 2008

Subject: AP1000 Response to Requests for Additional Information (TR 54)

Westinghouse is submitting a revised response to the NRC requests for additional information (RAIs) on AP1000 Standard Combined License Technical Report (TR) 54, APP-GW-GLR-033, "Spent Fuel Storage Rack Structure/Seismic Analysis." This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

A revised response is provided for RAI-TR54-015,-029,-030,-036 and -038. This response completes all requests received to date for Technical Report 54. A revision 1 response for RAI-TR54-015,-029, and -030 was provided under letter DCP/NRC2121 dated April 18, 2008. A revision 0 response for RAI-TR54-015 was provided under letter DCP/NRC1929 dated June 8, 2007. A revision 0 response for RAI-TR54-029 and -030 was provided under letter DCP/NRC1890 dated May 17, 2007. A revision 0 response for RAI-TR54-036 was provided under letter DCP/NRC1938 dated June 14, 2007. A revision 0 response for RAI-TR54-038 was provided under letter DCP/NRC1861 dated April 10, 2007.

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Requests for Additional Information on Technical Report 54

D063
NRO

00405psa.doc

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ENCLOSURE 1

Response to Requests for Additional Information on Technical Report 54

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR54-015
Revision: 2

Question:

Insufficient descriptive information has been included in the spent fuel report to permit an adequate review of the structural/seismic analysis of the spent fuel racks. As indicated in SRP 3.8.4, App. D, provide descriptive information including plans and sections showing the spent fuel racks and pool walls, liner, and concrete walls. All of the major features of the racks including the cell walls, baseplate, pedestals, bearing pads, neutron absorber sheathing, any impact bars, welds connecting these parts, and any other elements in the load path of the racks should be shown on one or several sketches. These sketches should also indicate related information which includes key: cutouts, dimensions, material thicknesses, and gaps (fuel to cell, rack to rack, rack to walls, and rack to equipment area). In addition to the above, for review of postulated fuel handling drop accident and quantification of the drop parameters, sketches with sufficient details for the fuel handling system should be provided to facilitate the review as indicated in SRP 3.8.4, App. D.

October 8-12, 2007 Audit:

Based on the original request made in the RAI, the review of the RAI response and the revised details in Section 9.1 of DCD Rev. 16, the following items still need to be provided or clarified in the TR and DCD:

(1) The key dimensions of the male and female pedestal components and bearing plates should be shown in the figures provided in the RAI response.

(2) The welds connecting the pedestals to the baseplate and the baseplate to the fuel cell walls are not shown. The information for the welds should indicate the type of the weld (e.g., fillet) and whether they are all around or the extent of the welds.

(3) Figure TR54-15.6 (in the RAI response) does not show any leak chase channels in the spent fuel pool floor. W indicated that there are leak chase channels; however they are not shown in rack layout figure. W confirmed that the fuel rack analyses did not consider the possible impact loading of a rack pedestal over the leak chase channel. Therefore, the staff request W to explain why the effects of the leak chase channel were not considered in the fuel rack analyses and the calculation that demonstrates the adequacy of the liner/concrete in the local region around the pedestal which is part of the TR report. Also, Figure TR54-15.6 which will be included in the TR should be revised to show the leak chase channels if they are used.

Westinghouse Response:

Westinghouse has provided sketches in the attachment to RAI TR54-15 response showing the major features of the racks and spent fuel pool. These sketches will be incorporated in Technical Report 54. Westinghouse has not finished the detailed design of fuel handling equipment and detailed sketches are not available at this time. However, the quantification of the drop parameters has been established in the DCD (both maximum drop weights and heights). The DCD drop heights are much greater than what is being designed for the fuel handling equipment. This is stated in the RAI-TR-54-1 response. During the NRC Structural/Seismic audit of April 16th, the complete design drawings of the spent and new fuel racks were available to the NRC for review. Holtec explained how the rack features were incorporated into the seismic/structural models.

October 8-12, 2007 Audit:

Westinghouse has revised the layout figures for Region 1 and Region 2 spent fuel racks as requested. These figures are presented below in the DCD Revision and TR Revision sections below. Leak chases are used in the spent fuel pool. The plates making up the spent fuel pool liner have been designed such that no rack pedestals are over leak chases.

Westinghouse supplemental response to NRC Technical Review Meetings May 21 & May 22, 2008

Westinghouse agreed to change spent fuel pool rack layout shown in Figure 2-1 of TR-54 Rev 2 and DCD Figure 9.1-4 to change note to All gaps are nominal and measured at the top of the rack from the exterior cell wall. Also from RAI-TR54-36 Rev 2 response, the tool area is shown to be 34 inches rather than 36 inches. In addition, Figure 2-3 and DCD Figure 9.1-3 (sheet 1 of 2) have been changed to correctly reflect the distance from the TOP of the bearing pad (not the bottom of the bearing pad) to the top of the rack.

Reference:

1. APP-GW-GLR-033, Revision 0, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54)

Design Control Document (DCD) Revision:

~~None~~

The spent fuel rack figures in section 9.1 of DCD revision 16 are replaced with the following figures:

Figure 9.1-2 (Sheet 1 of 2) Region 1 Spent Fuel Storage Rack Layout

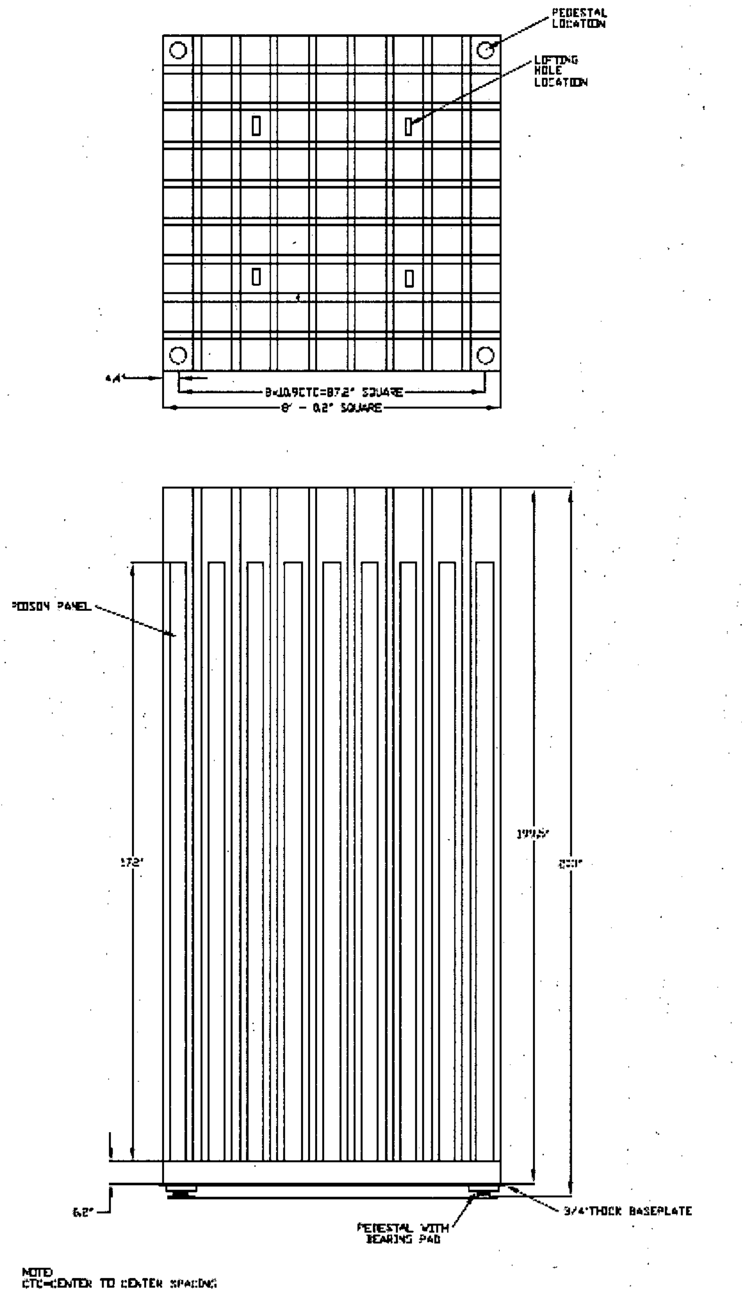


Figure 9.1-2 (Sheet 2 of 2) Region 1 Spent Fuel Storage Rack Cross Section

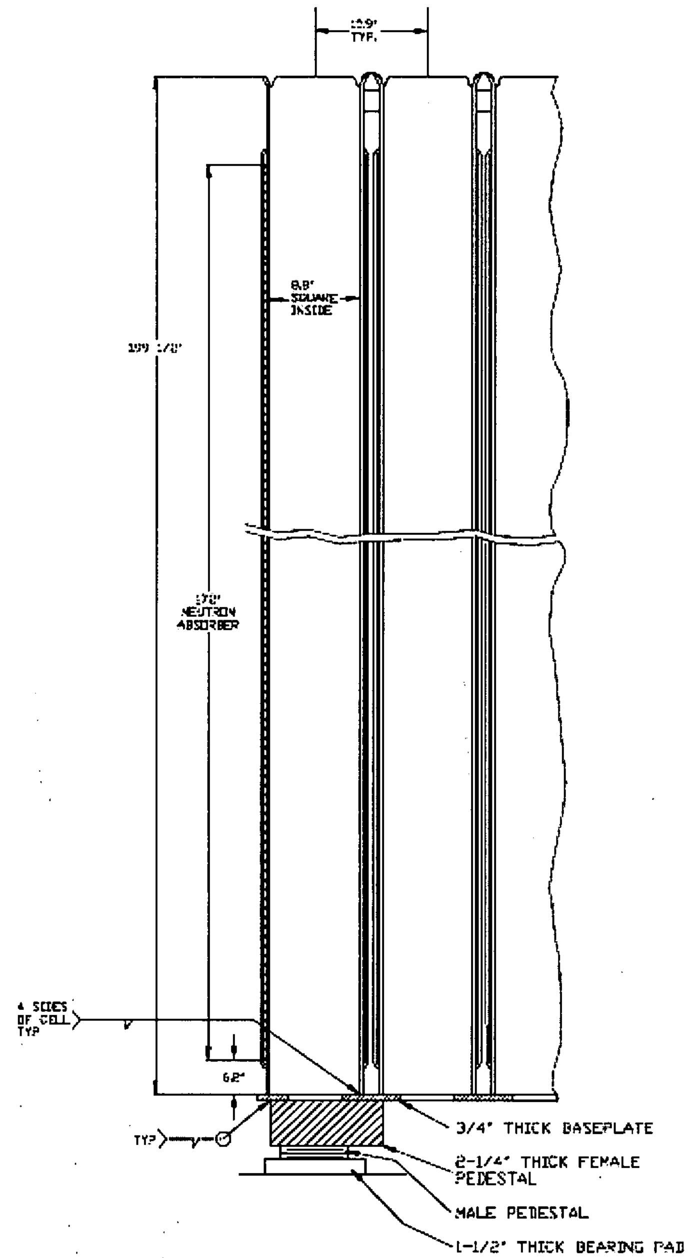
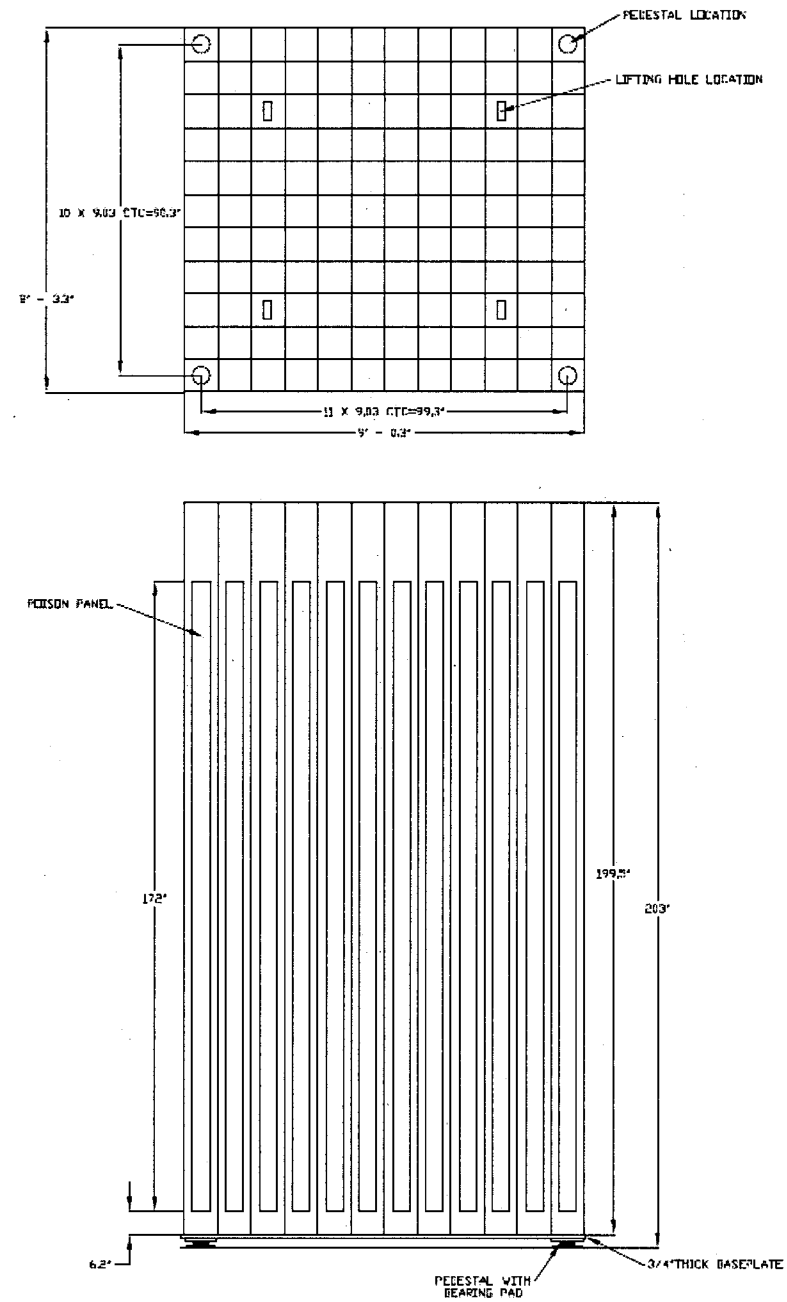


Figure 9.1-3 (Sheet 1 of 2) Region 2 Spent Fuel Storage Rack Layout



NOTE
CTC=CENTER TO CENTER SPACING

Figure 9.1-3 (Sheet 2 of 2) Region 2 Spent Fuel Storage Rack Cross Section

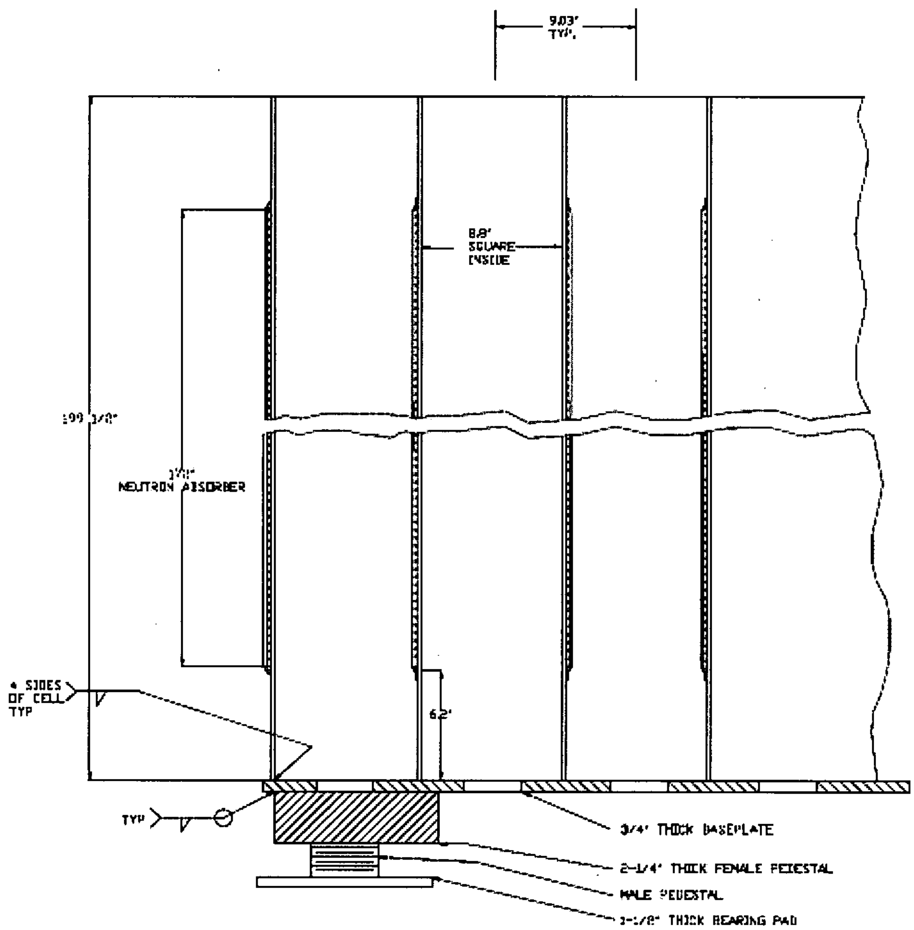
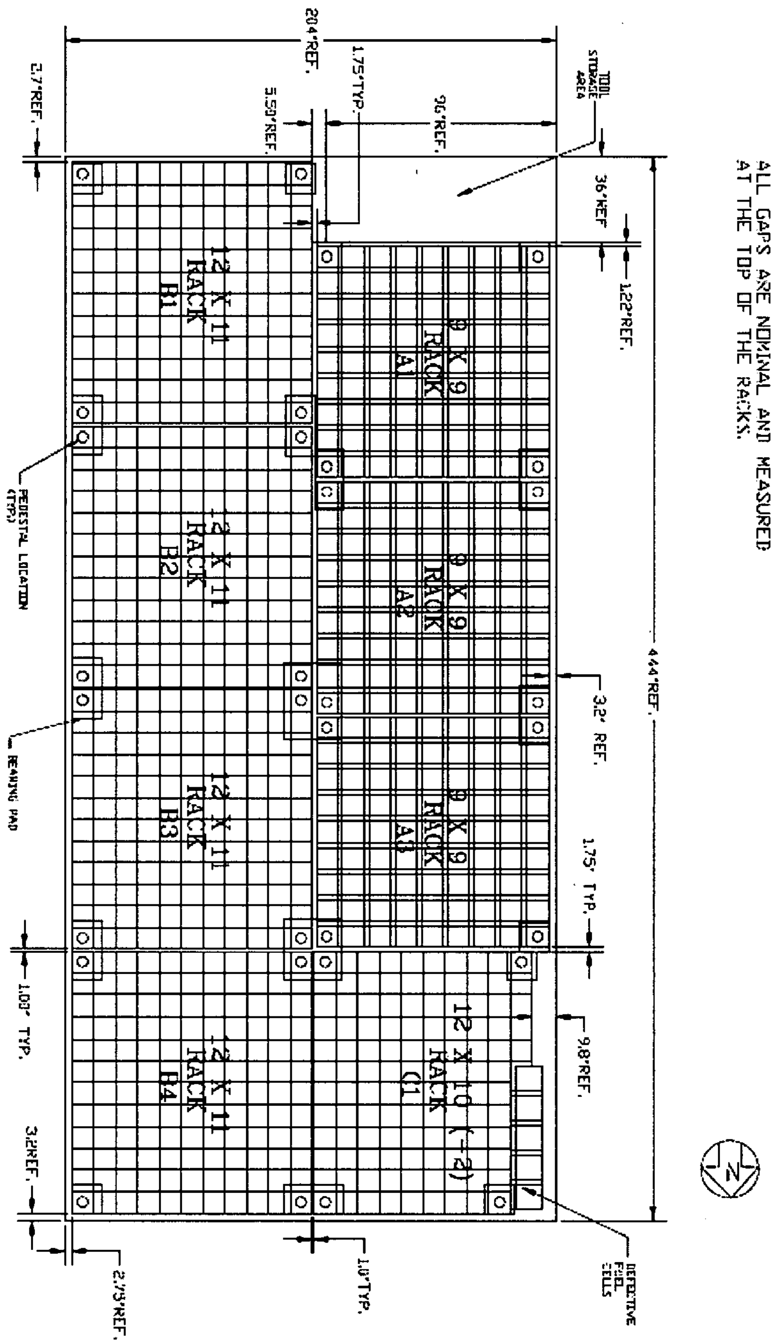


Figure 9.1-4 Spent Fuel Storage Pool Layout (889 Storage Locations)



DCD Revision from RAI-TR54-15
Replace Figures 9.1-3 (Sheet 1 of 2) and 9.1-4 with the following

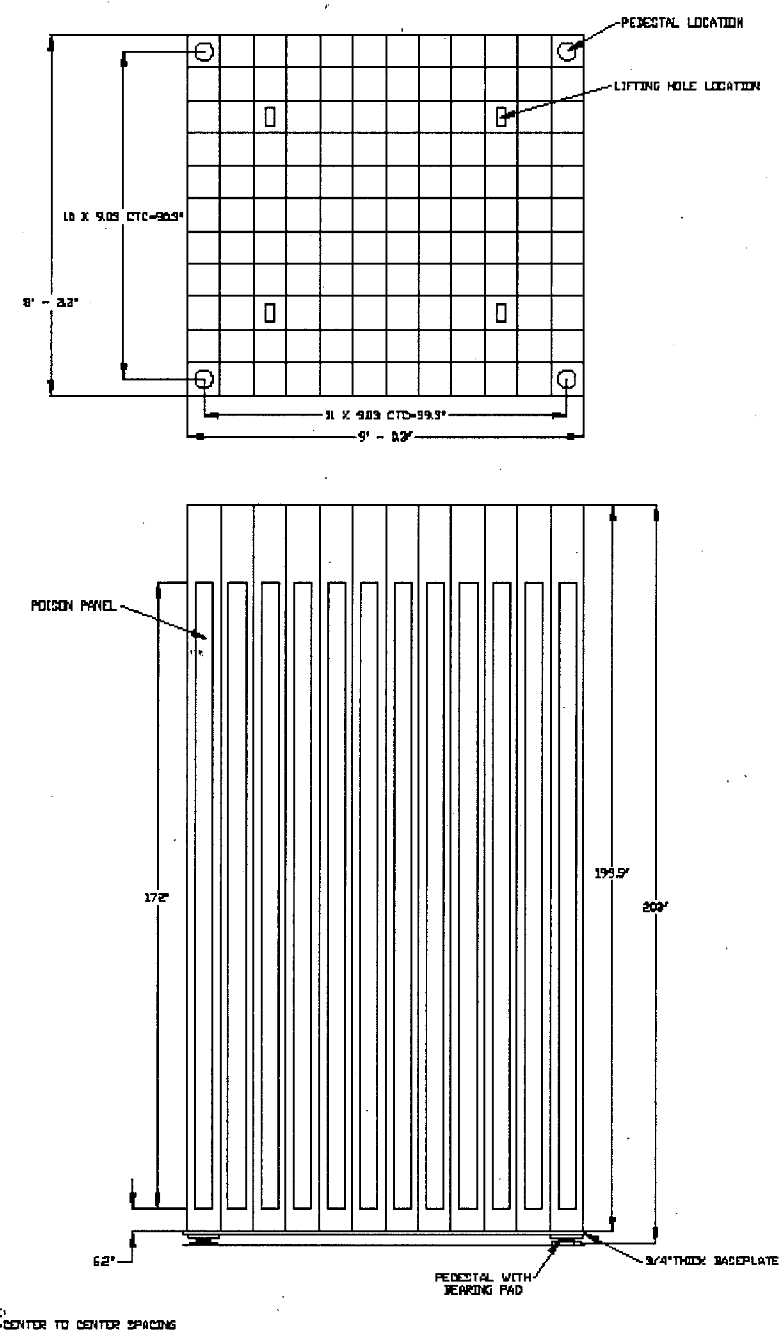


Figure 9.1-3 (Sheet 1 of 2) Region 2 Spent fuel Storage Rack Layout

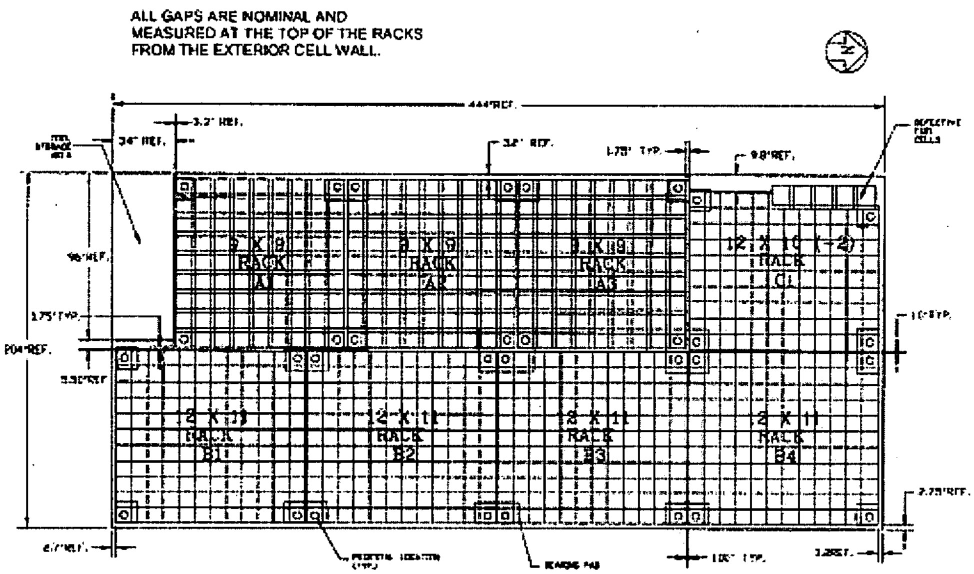


Figure 9.1-4 Spent Fuel Storage Pool Layout (889 Storage Locations)

PRA Revision:

None

Technical Report (TR) Revision:

~~Westinghouse has provide sketches in the attachment to RAI-TR54-15 response showing the major features of the racks and spent fuel pool. These will be incorporated into Technical Report 54 Revision 1.~~
The following Figures have been incorporated into Technical Report 54 Revision 1:

Figure 2-1 Spent Fuel Pool Storage Layout (889 Total Storage Locations)
Note: leak chases shown in phantom

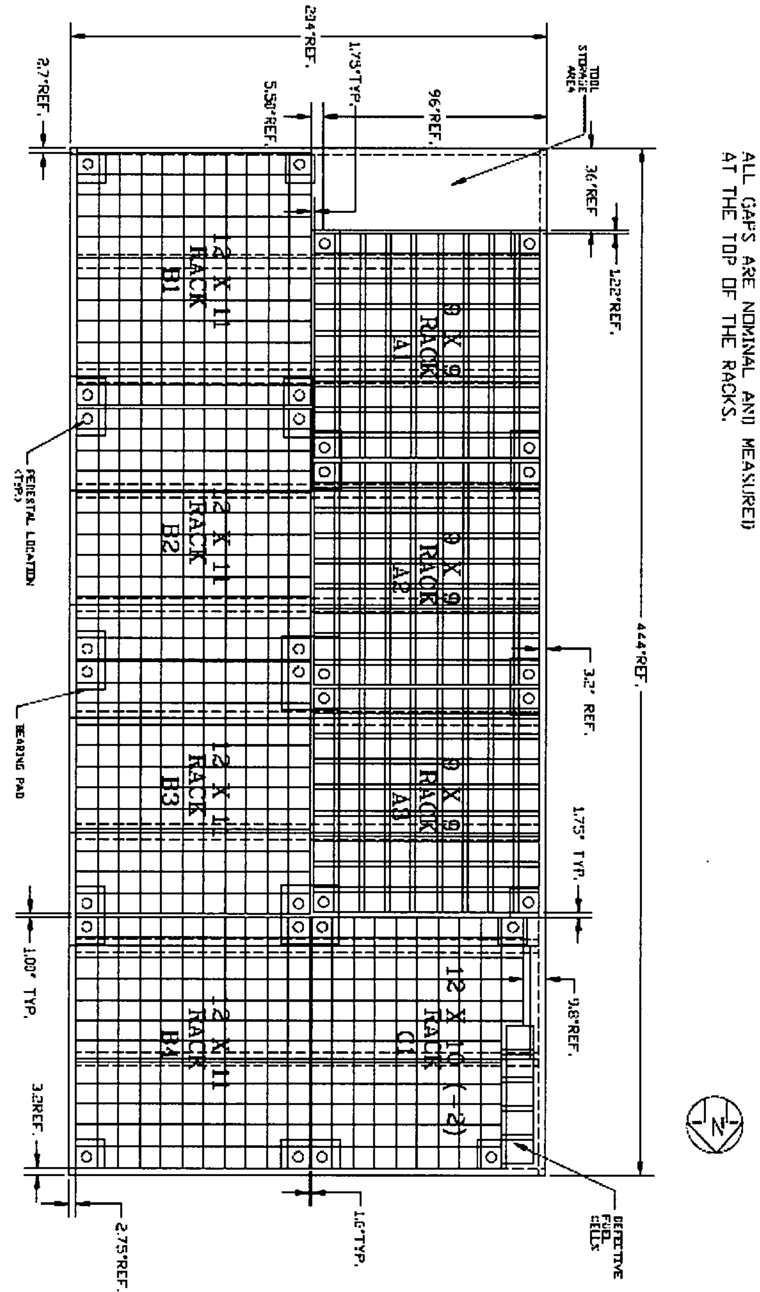


Figure 2-2 Configuration of a Region 1 Storage Cell (Sheet 1 of 2)

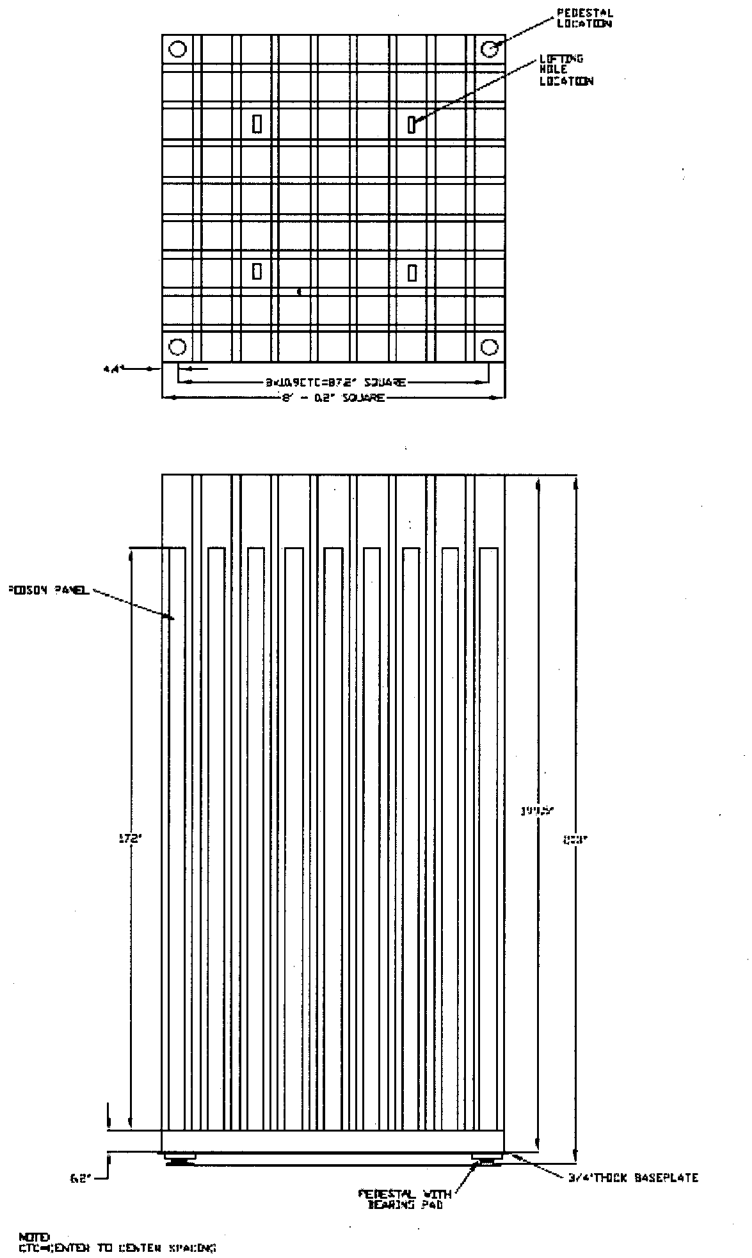


Figure 2-2 Configuration of a Region 1 Storage Cell (Sheet 2 of 2)

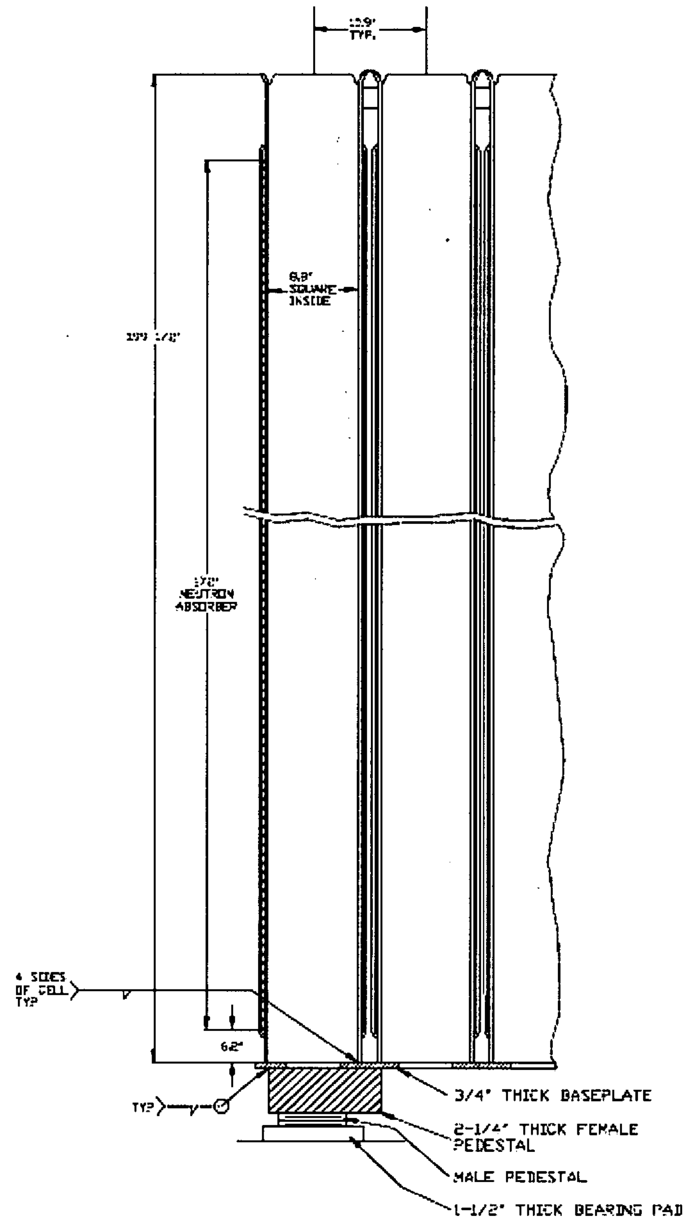


Figure 2-3 Configuration of a Region 2 Storage Cell (Sheet 1 of 2)

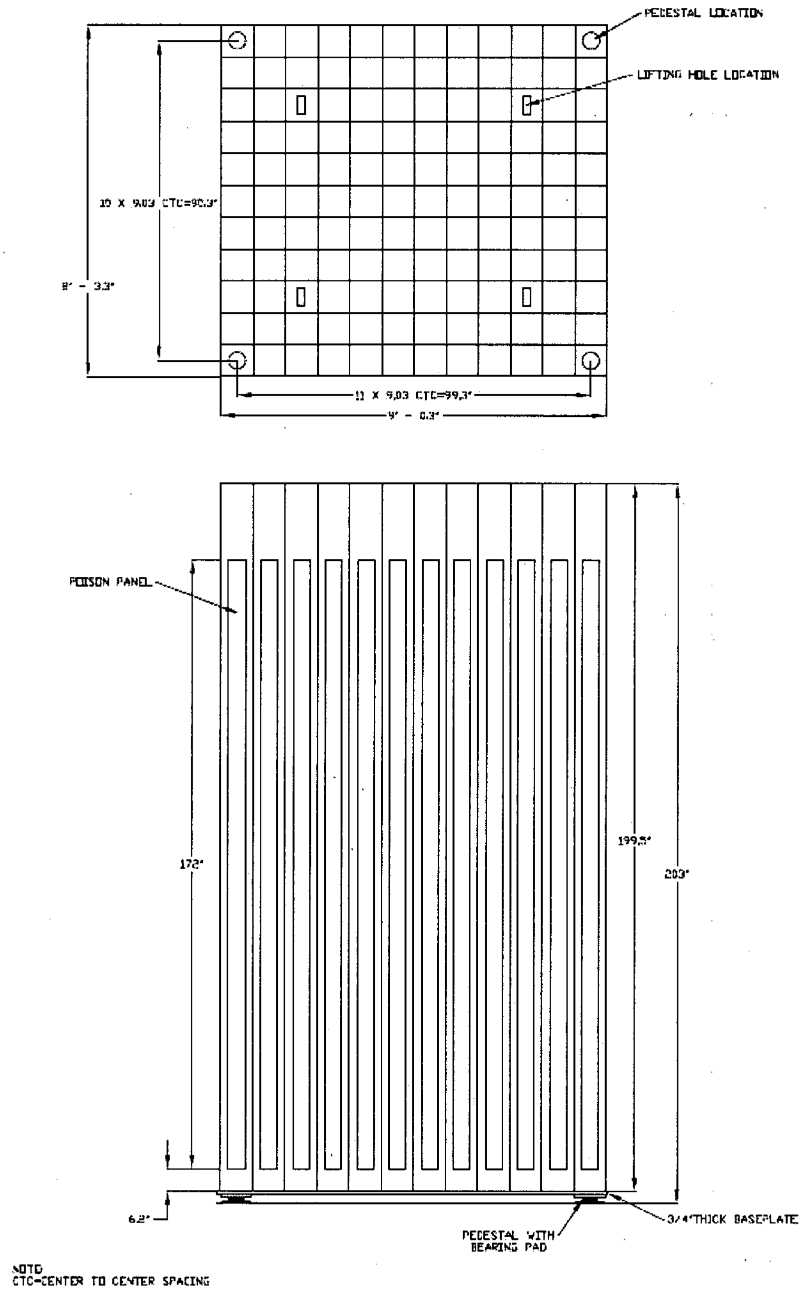
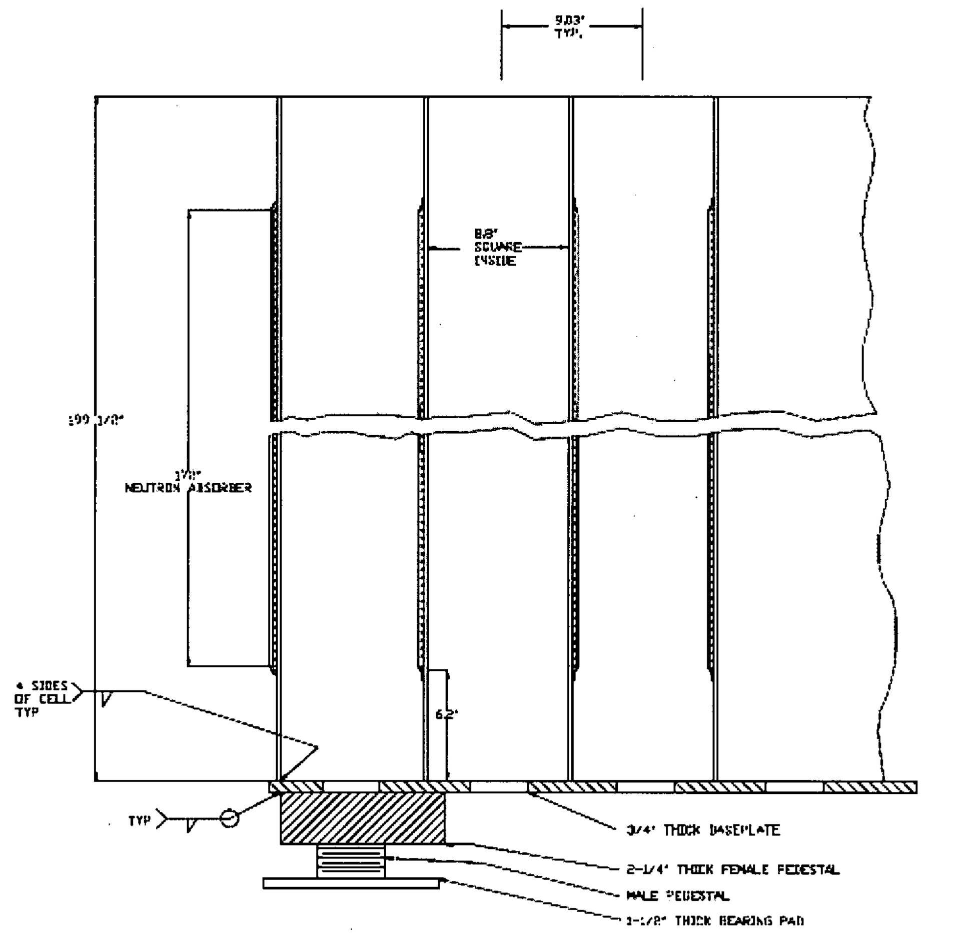


Figure 2-3 Configuration of a Region 2 Storage Cell (Sheet 2 of 2)



Technical Report Revision from RAI-TR54-15 Rev 2 response:
Figure 2-1 has been changed to reflect the requested added note All gaps are nominal and measured at the top of the rack from the exterior cell wall and the change in size of the tool storage area to accommodate rack movement during an earthquake.

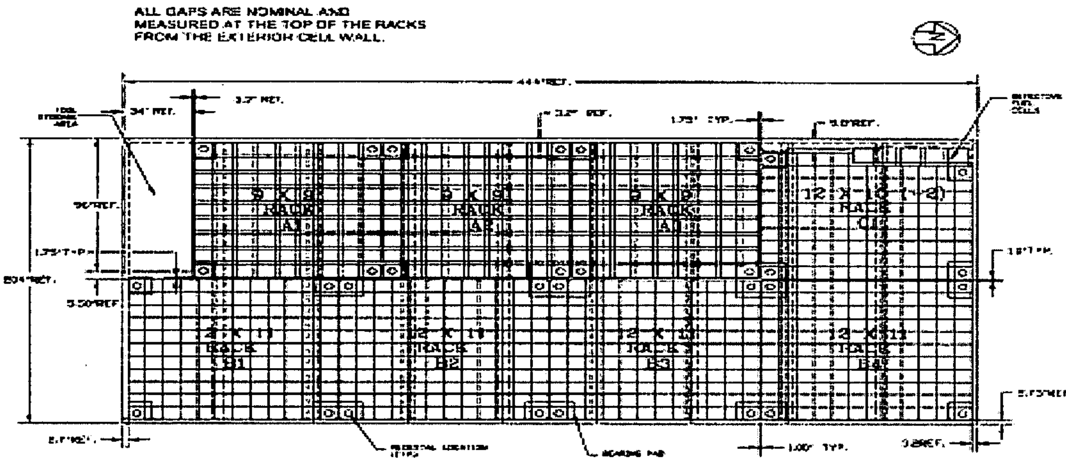


Figure 2-1 Spent Fuel Pool Storage Layout (889 Total Storage Locations) – Leak Chases Show in Phantom

Figure 2-3 (Sheet 1 of 2) has been changed to reflect the correct distance from the TOP of the bearing pad to the top of the rack

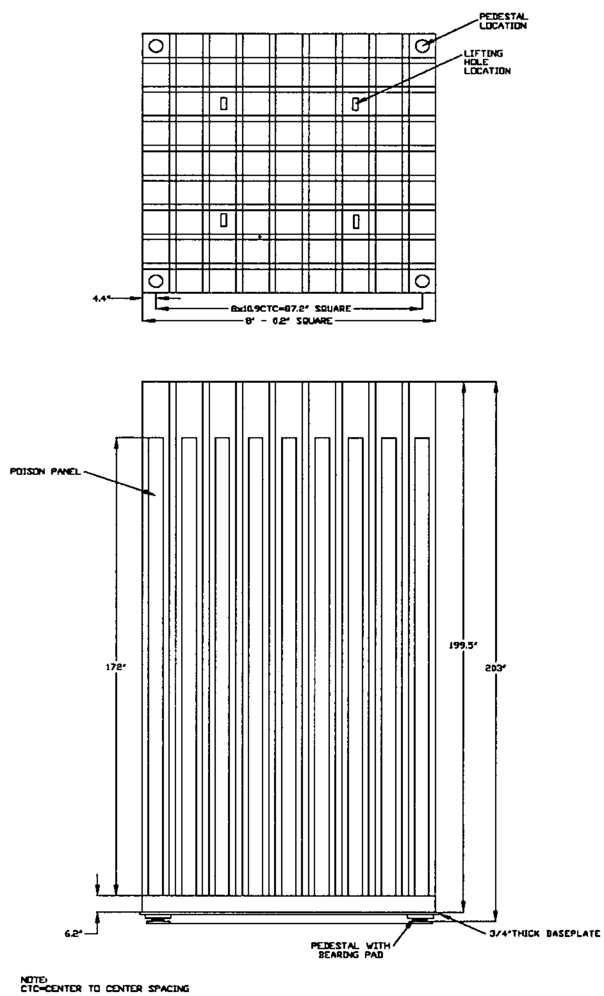


Figure 2-3 Configuration of a Region 2 Storage Cell (Sheet 1 of 2)

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR54-029
Revision: 2

Question:

The load combinations specified in Table 2-5 of the subject report and Table 9.1-1 (markup version of the DCD provided with the subject report) do not match SRP 3.8.4, App. D criteria. Therefore, explain or modify the tables to address the following:

a. No load combinations are specified for the spent fuel racks corresponding to service Level A.

b. Temperature conditions T_o and T_a are not included in Table 2-5; however, they are included in the markup DCD Table 9.1-1. A footnote in the markup of DCD Table 9.1-1 states that "For the faulted load combination, thermal loads will be neglected when they are secondary and self limiting in nature and the material is ductile. In freestanding spent fuel racks, thermal effects mainly affect the temperature that is used in specifying the allowable stress and Young's Modulus." Based on this statement:

   (i) Regarding the first quoted sentence above, Table 2-5, Load Combination corresponding to service levels A and B (which are not the faulted condition) should include T_o.

   (ii) regarding the last quoted sentence above, SRP 3.8.4, App. D indicates that thermal loads due to temperature effects and temperature gradients across the rack structure need to be considered. Temperature gradients can occur due to differential heating effects between one or more filled cell(s) and one or more adjacent empty cell(s). The stresses from these types of thermal loads should be considered because they can still lead to localized failure of the structure. When responding to this, consider temperature loads due to normal and accident conditions, as noted in your Table 9.1-1 and SRP 3.8.4, App. D.

c. Table 2-5 in the report and DCD Table 9.1-1 indicate that the load term P_f is the uplift force on the rack caused by a postulated stuck fuel assembly accident condition or the force developed on the rack from the drop of a fuel assembly during handling to the top of the rack or the baseplate through an empty cell. SRP 3.8.4, App. D separates these two accident events into P_f for the uplift force event and P_d for the drop load event. This is necessary because SRP 3.8.4, App. D specifies that the acceptance limits for these two events (in combination with deadweight + live load + thermal) are different.

d. Table 2-5, last load combination with E', does not provide the Service Limit. If the same

Service Limit, D[(1)], as indicated in the load combination above the last load combination was intended, then explain whether the functionality capability requirement in footnote (1) (which is applicable to only the new racks) is in addition to or in-place of Level D limits.

October 8-12, 2007 Audit:

This RAI was not discussed because HOLTEC's audit participation was limited. Also in DCD Section 9.1 related to the design of the fuel racks, reference should be made to SRP 3.8.4 App D not to the older OT position dated 1978.

Westinghouse Response:

Table 2-5 of Technical Report 54 and DCD Table 9.1-1 will be revised as follows (which is derived from Appendix D to SRP Section 3.8.4):

Table 2-5 Loading Combinations for AP1000 Spent Fuel Storage Racks	
Loading Combination	**Service Level**
D + L D + L + T_o	Level A
D + L + T_o + P_f	Level B
D + L + T_a + E'	Level D
D + L + F_d	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in Reference 6:

D = Dead weight induced loads (including fuel assembly weight)

L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)

F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height

P_f = Upward force on the racks caused by postulated stuck fuel assembly

E' = Safe Shutdown Earthquake (SSE)

T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions

T_a = Differential temperature induced loads based on the postulated abnormal design conditions

Table 9.1-1

LOADS AND LOAD COMBINATIONS FOR FUEL RACKS

Load Combination	Service Level
D + L D + L + T_o	Level A
D + L + T_o + P_f	Level B
D + L + T_a + E'	Level D
D + L + F_d	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in NUREG-0800, Section 3.8.4 (including Appendix D) of the Standard Review Plan (SRP):

D = Dead weight induced loads (including fuel assembly weight)

L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)

F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height

P_f = Upward force on the racks caused by postulated stuck fuel assembly

E' = Safe Shutdown Earthquake (SSE)

T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions

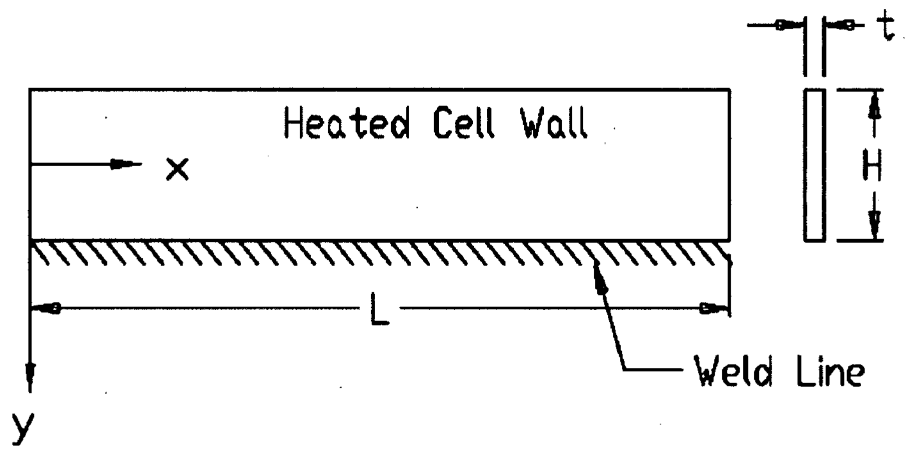
T_a = Differential temperature induced loads based on the postulated abnormal design conditions

a. Table 2-5 of the subject report and DCD Table 9.1-1 will be modified to specify the load combinations D + L and D + L + T_o for Service Level A, as shown above.

b. (i) Table 2-5 of the subject report will be modified to include T_o for Service Levels A and B, as shown above.

(ii) The temperature gradients across the rack structure caused by differential heating effects between one or more filled cells and one or more adjacent empty cells are considered. The worst thermal stress field in a fuel rack is obtained when an isolated storage location has a fuel assembly generating heat at maximum postulated rate and the surrounding storage locations contain no fuel. This secondary stress condition is evaluated alone and not combined with primary stresses from other load conditions.

A thermal gradient between cells will develop when an isolated storage location contains a fuel assembly emitting maximum postulated heat, while the surrounding locations are empty. A conservative estimate of the weld stresses along the length of an isolated hot cell is obtained by considering a beam strip uniformly heated by 50°F, and restrained from growth along one long edge. The 50°F temperature rise envelops the difference between the maximum local spent fuel pool water temperature (174°F) inside a storage cell and the bulk pool temperature (140°F) based on the thermal-hydraulic analysis of the spent fuel pool. The cell wall configuration considered here is shown in figure below.



The strip is subjected to the following boundary conditions:

1. Displacement U_x (x,y) = 0 at x = 0 and at y = H/2 for all x

2. Average force $N_x(x) = 0$ at $x = L$

Using shear beam theory and subjecting the strip to a uniform temperature rise $\Delta T = 50°F$, we can calculate an estimate of the maximum value of the average shear stress in the strip. The final shear stress result for the strip is found to be

$$\tau_{max} = \frac{E \alpha \Delta T}{0.931} \quad \text{(maximum at } x = L\text{)}$$

where $E = 27.6 \times 10^6$ psi, $\alpha = 9.5 \times 10^{-6}$ in/in °F and $\Delta T = 50°F$.

Therefore, we obtain an estimate of maximum weld shear stress in an isolated hot cell, due to thermal gradient, as

$\tau_{max} = 14{,}082$ psi

Since this is a secondary thermal stress, we use the allowable shear stress criteria for faulted conditions ($0.42*S_u$=27,804 psi) as a guide to indicate that this maximum shear is acceptable. Therefore, there is a safety factor = 27,804 / 14,082 = 1.97 against cell wall shear failure due to secondary thermal stresses from cell wall growth under the worst case hot cell conditions.

.c. The definition of P_f in Table 2-5 of the subject report and DCD Table 9.1-1 is incorrect. The referenced tables will be revised to clearly distinguish between P_f and F_d, as specified above.

d. Level D service limits apply to load combination $D + L + T_a + E'$. Per Appendix D of SRP Section 3.8.4, the functional capability of the fuel racks should be demonstrated for the accidental drop event ($D + L + F_d$). This requirement is in place of the Level D service limits since it is recognized that the rack may sustain permanent damage due to the impact force, and therefore it may not be possible to meet Level D service limits at all locations within the rack. The functional capability of the spent fuel racks is generally defined as the continued ability of rack to store spent fuel assemblies in a subcritical arrangement.

October 8-12, 2007 Audit:

Based on the Staff's assessment of the Revision 0 response to RAI TR54-29 (dated 5/17/07), the following additional information is provided:

(1) Table 2-5 of the Technical Report and DCD Table 9.1-1 will be revised, as shown below, to include the loading combination D + L + Ta under Service Level B. The latest changes to Table 2-5 and Table 9.1-1 are shown in ***italic bold font*** for identification purposes.

Table 2-5 Loading Combinations for AP1000 Spent Fuel Storage Racks

Loading Combination	Service Level
$D + L$ $D + L + T_o$	Level A
D + L + T_a $D + L + T_o + P_f$	Level B
$D + L + T_a + E'$	Level D
$D + L + F_d$	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in Reference 6:

- D = Dead weight induced loads (including fuel assembly weight)
- L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)
- F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height
- P_f = Upward force on the racks caused by postulated stuck fuel assembly
- E' = Safe Shutdown Earthquake (SSE)
- T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions
- T_a = Differential temperature induced loads based on the postulated abnormal design conditions

Table 9.1-1

LOADS AND LOAD COMBINATIONS FOR FUEL RACKS

Load Combination	**Service Level**
D + L D + L + T_o	Level A
D + L + T_a D + L + T_o + P_f	Level B
D + L + T_a + E'	Level D
D + L + F_d	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in NUREG-0800, Section 3.8.4 (including Appendix ***D***) of the Standard Review Plan (SRP):

D = Dead weight induced loads (including fuel assembly weight)

L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)

F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height

P_f = Upward force on the racks caused by postulated stuck fuel assembly

E' = Safe Shutdown Earthquake (SSE)

T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions

T_a = Differential temperature induced loads based on the postulated abnormal design conditions

(2) Westinghouse WCAP-15799, "AP1000 Conformance with SRP Acceptance Criteria" (AP1000 Document No. APP-GW-GL-001, Rev. 1) establishes NUREG-0800, SRP 3.8.4, Rev. 1 as the applicable design standard for AP1000. Therefore, Reference 6 of the Technical Report is identified correctly. With regard to DCD Rev. 16, Table 9.1-1 will be revised to refer to "NUREG-0800, Section 3.8.4 (including Appendix D)" as shown above. In addition, DCD Section 9.1 will be revised to include a reference to SRP 3.8.4 Rev. 1.

With regard to item b.(ii) from the Revision 0 response to RAI TR54-29, the following additional information is provided:

(1) The secondary stress condition caused by Ta is not combined with primary stresses from other loads because the allowable stress limits given in Section 2.3.4 of the Technical Report, which are derived from Subsection NF of the ASME Code, are for primary stresses only. Subsection NF has no stipulated limits for thermal stresses (i.e., secondary stresses) when acting in concert with SSE loads (i.e., Service Level D). In fact, paragraph F-1334 of the ASME Code, which applies to Service Level D, states that:

"Neither peak stresses nor stresses resulting from thermal expansion within the support need be evaluated."

(2) The 0.931 term used in the denominator of the shear stress equation is equal to the following quantity:

$$\sqrt{\frac{2(1+\nu)}{3}} \qquad \text{(where } \nu = 0.3\text{)}$$

This constant term results from the derivation of the shear stress equation, which is given below.

VI. ANALYSIS OF THERMAL STRESSES IN A RACK CELL

A fuel rack situated in an isothermal pool will experience no thermal stresses if the storage locations are loaded with fuels of identical reactivity. The worst case of thermal gradient will develop when an isolated storage location contains a fuel assembly emitting maximum postulated heat while the surrounding locations are empty. The thermal hydraulic calculations will show that the maximum water temperature rise is $\Delta T^{0}F$. We assume that the inside walls of the cell are in contact with water at $\Delta T^{0}F$.

We now estimate weld stresses in one wall of a cell if that wall undergoes a temperature rise and is restrained from vertical growth. We estimate the average weld stress by using beam theory.

Analysis

As an initial stress analysis problem, we consider the strip configuration in Figure 6.1 and determines the shear stress at the wall due to a uniform temperature rise ΔT in the strip. Using shear beam theory, we have the following field equations for the beam strip.

$$U_x\ (x) = U + \alpha y \qquad |y| \le w/2 \qquad (6.1)$$

$$U_y\ (x) = 0 \qquad (6.2)$$

$$\frac{dN}{dx} = \tau\ (x) \qquad (6.3)$$

$$\frac{dM}{dx} - V - \tau(x)\ \frac{W}{2} = 0 \qquad (6.4)$$

$$M = EI\ \frac{d\alpha}{dx} \qquad (6.5)$$

$$V = GA\ \alpha\ (x) \qquad (6.6)$$

$$N = EA\ \frac{dU}{dx} - \beta\Delta T \quad ;\ \beta = \text{coefficient of thermal expansion} \qquad (6.7)$$

We must also enforce the constraint of zero U_x at $y = w/2$.

Thus,

$$U(x) = -\ \alpha(x)\ \frac{W}{2} \qquad (6.8)$$

so that

$$M(x) = EI \frac{d\alpha}{dx}$$

$$V(x) = GA\ \alpha(x) \qquad (6.9)$$

$$N(x) = -EA\ \left(\frac{d\alpha}{dx} \frac{W}{2} + \beta\Delta T \right)$$

Since ΔT is assumed independent of x in this analysis, Eq. (6.3) gives

$$\tau(x) = -EA \frac{d^2\ \alpha}{d\ x^2} \frac{W}{2} \qquad (6.10)$$

Therefore, Eq. (6.4) gives the following equation for $\alpha(x)$, the cross section rotation.

$$E\ I^* \frac{d^2\ \alpha}{d\ x^2} - GA\ \alpha(x) = 0 \qquad (6.11)$$

where

$$I^* = I + A \frac{W^2}{4} \qquad (6.12)$$

and

$$I = \frac{AW^2}{12} \ ; \quad A = w\ t$$

Defining

$$\mu^2 = \frac{G\ A}{E\ I^*} = \frac{A}{2(1+\mu)\ I^*} = \frac{(1.074)^2}{w^2} \qquad (6.13)$$

yields the solution for $\alpha(x)$ as

$$\alpha(x) = C_1 \sinh\ \mu x + C_2 \cosh\ \mu x \qquad (6.14)$$

To determine C_1, C_2 apply the boundary conditions

$$\alpha(0) = 0, \quad N(x)/_{x=L} = 0.$$

We obtain

$$C_2 = 0$$

$$-\beta\Delta T = \frac{W}{2} \mu \cosh \mu L \; C_1$$

Hence

$$\alpha(x) = -\frac{2\beta\Delta T \sinh \mu x}{W \cosh \mu L} \qquad (6.15)$$

so that the wall shear "stress". $\bar{\tau}(x)$ is given by the expression

$$\bar{\tau}(x) = \frac{\tau(x)}{t} = (E\beta\Delta T)(W\mu)\frac{\sinh \mu x}{\cosh \mu L}$$

The maximum value is at X = L, and assuming $\mu L >> 1$, we find that

$$\boxed{\tau_{max} = E\beta\Delta T(W\mu)} = 1.074\, E\beta\Delta T \qquad (6.16)$$

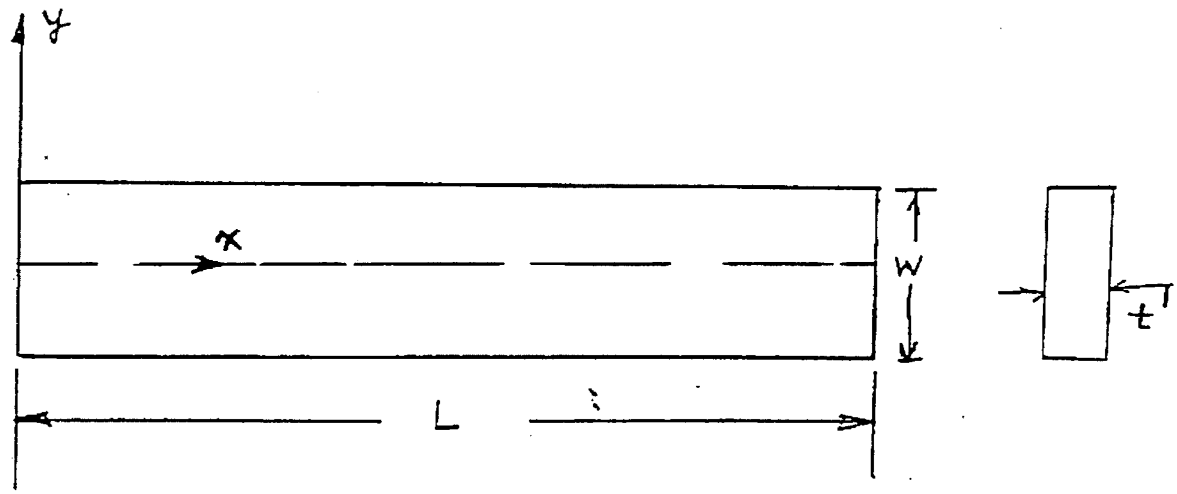


Fig 6.1 Configuration

(3) Since the shear stress is caused by thermal loading, it is classified by the ASME Code as a secondary stress. Therefore, the maximum calculated stress is compared with 0.42 Su in accordance with note (6) from Table NF-3523(b)-1 of the ASME Code. This is the only stress limit imposed by Subsection NF for the primary plus secondary stress category for Class 3 components. The base metal shear stress limit of 0.72 Sy only applies to primary stresses.

Westinghouse supplemental response to NRC Technical Review Meetings May 21 & May 22, 2008:

Reference 5 in TR-54 Revision 2 has been eliminated. Reference 6 is the basis for the analysis and evaluation. Analysis and evaluation follow the U.S. NRC Standard Review Plan 3.8.4, Revision 1. A statement has been added to section 2.0 Technical Background and subsection 2.3.1 introduction stating: Analyses and evaluations follow the U.S. NRC Standard Review Plan 3.8.4 Revision 1 (Reference 6). Although the licensing basis for the AP1000 design invokes NRC SRP 3.8.4, Revision 1, an evaluation has been performed to confirm that the stress analysis of the spent fuel racks also satisfies the applicable provisions of NRC SRP 3.8.4, Revision 2 (Reference 31).

Westinghouse has reviewed Revisions 1 and 2 of SRP 3.8.4 (Appendix D). The only difference between the two is the following paragraph (which appears in Rev. 2 only):

"If the spent fuel racks are designed to be free standing (i.e., without connections to the pool walls/floor), then their response involves a complex combination of motions that includes sliding, rocking, and twisting and involves impacts between the fuel assemblies and the fuel cell walls, rack-to-rack, and rack-to-wall. In view of this, the seismic analysis of these fuel racks is typically performed using nonlinear dynamic time history analysis methods. NUREG/CR-5912 provides further guidance on the design and analysis of free-standing racks."

Since the Holtec computer code DYNARACK is fully capable of simulating the combination of motions and the various impact scenarios described above, and it employs the time history analysis method together with nonlinear spring elements, the seismic analyses of the AP1000 new and spent fuel racks are in compliance with Appendix D of SRP 3.8.4 Rev. 2.

References:

1. APP-GW-GLR-033, Revision 0, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54)
2. US NRC Standard Review Plan, NUREG-0800 (SRP 3.8.4, including Appendix D) Revision 1.
3. APP-GW-GL-001, "AP1000 Conformance with SRP Acceptance Criteria," Rev. 1, August 2003.
3. US NRC Standard Review Plan, NUREG-0800 (SRP 3.8.4 Rev.1, Appendix D, Technical Position on Spent Fuel Pool Racks, July 1981.
4. US NRC Standard Review Plan, NUREG-0800 (SRP 3.8.4 Rev.2, Appendix D, Guidance on Spent Fuel Pool Racks, February 2007.

Design Control Document (DCD) Revision:
DCD Table 9.1-1 will be revised as shown belowabove.

Table 9.1-1

LOADS AND LOAD COMBINATIONS FOR FUEL RACKS

Load Combination	Service Level
D + L D + L + T_o	Level A
D + L + T_a D + L + T_o + P_f	Level B
D + L + T_a + E'	Level D
D + L + F_d	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in NUREG-0800, Section 3.8.4 (including Appendix D) of the Standard Review Plan (SRP):

D = Dead weight induced loads (including fuel assembly weight)

L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)

F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height

P_f = Upward force on the racks caused by postulated stuck fuel assembly

E' = Safe Shutdown Earthquake (SSE)

T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions

T_a = Differential temperature induced loads based on the postulated abnormal design conditions

PRA Revision:
None

Technical Report (TR) Revision:
Table 2.5 of Technical Report Number 54 will be revised as shown belowabove.

Table 2-5 Loading Combinations for AP1000 Spent Fuel Storage Racks	
Loading Combination	**Service Level**
$D + L$ $D + L + T_o$	Level A
$D + L + T_a$ $D + L + T_o + P_f$	Level B
$D + L + T_a + E'$	Level D
$D + L + F_d$	The functional capability of the fuel racks should be demonstrated.

Notes:

1. There is no operating basis earthquake (OBE) for the AP1000 plant.
2. The fuel racks are freestanding; thus, there is minimal or no restraint against free thermal expansion at the base of the rack. As a result, thermal loads applied to the rack (T_o and T_a) produce only local (secondary) stresses.

Abbreviations are those used in Reference 6:

D = Dead weight induced loads (including fuel assembly weight)

L = Live load (not applicable to fuel racks since there are no moving objects in the rack load path)

F_d = Force caused by the accidental drop of the heaviest load from the maximum possible height

P_f = Upward force on the racks caused by postulated stuck fuel assembly

E' = Safe Shutdown Earthquake (SSE)

T_o = Differential temperature induced loads based on the most critical transient or steady state condition under normal operation or shutdown conditions

T_a = Differential temperature induced loads based on the postulated abnormal design conditions

Revise 2 Technical Background to read

This report considers the structural adequacy of the proposed AP1000 Spent Fuel Storage Racks under postulated loading conditions. Analyses and evaluations follow the U.S. NRC Standard Review Plan 3.8.4 Revision 1 (Reference 6). Although the licensing basis for the AP1000 design invokes NRC SRP 3.8.4, Revision 1, an evaluation has been performed to confirm that the stress analysis of the spent fuel racks also satisfies the applicable provisions of NRC SRP 3.8.4, Revision 2 (Reference 31). The dynamic analyses use a time-history simulation code used in numerous previous licensing efforts in the United States and abroad. This report provides a discussion of the method of analyses, modeling assumptions, key evaluations, and results obtained to establish the margins of safety.

Revise subsection 2.3.1 Introduction to read

The AP1000 Spent Fuel Storage Racks are designed as seismic Category I. The U.S. NRC Standard Review Plan 3.8.4 (Reference 6) states that the ASME Code Section III, subsection NF (Reference 12), as applicable for Class 3 components, is an appropriate vehicle for design.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR54-030
Revision: 2

Question:

When utilizing ASME Code, Section III, Subsection NF, are all of the applicable provisions in NRC Regulatory Guide, 1.124, Rev. 1 also satisfied? This should be clearly stated in the report and the DCD.

October 8-12, 2007 Audit:

This RAI was not discussed because HOLTEC's audit participation was limited.

Westinghouse Response:

The following statement "The stress analysis of the spent fuel racks satisfies all of the applicable provisions in NRC Regulatory Guide 1.124, Revision 1 for component supports designed by the linear elastic analysis method" will be added to Technical Report APP-GW-GLR-033 and the DCD.

October 8-12, 2007 Audit:

In the previous RAI response (Rev. 0) a commitment was made to add the following statement to Technical Report APP-GW-GLR-033 and the DCD:

"The stress analysis of the spent fuel racks satisfies all of the applicable provisions in NRC Regulatory Guide 1.124, Revision 1 for component supports designed by the linear elastic analysis method."

The NRC accepted the statement; however, the staff noted that Reg. Guide 1.124 Revision 2 was published in February 2007 and should be reflected in Section 9.1 and Table 1.9-1 of the DCD. Accordingly, the above statement will be revised to change "Revision 1" to "Revision 2".

The seismic analysis of the spent fuel racks complies with Reg. Guide 1.124 Revision 2 based on the following:

i) The value of S_y at temperature is less than 5/6 S_u for all structural materials specified for the AP1000 spent fuel racks.

ii) The compressive stress in the rack cell structure is demonstrated to be less than 2/3 of the critical buckling limit.

iii) There are no bolts or bolted connections anywhere in the spent fuel racks.

iv) For OBE load combinations, the calculated stresses in the spent fuel racks are compared with the stress limits of NF-3220 of Section III.

v) For SSE load combinations, the calculated stresses in the spent fuel racks are compared with the stress limits of NF-3220 of Section III, increased according to the provisions of F-1334 of Section III.

Westinghouse supplemental response resulting from discussion at NRC On-Site Technical Review Meetings May 21 & May 22, 2008

The licensing basis for the AP1000 design is evaluated for conformance with NRC regulatory Guide 1.124, Revision 1 as outlined in DCD Appendix 1A. An evaluation has also been performed to assess conformance of the stress analysis of the spent fuel racks with the applicable provisions of NRC Regulatory Guide 1.124, Revision 2. This information will be added to TR-54 revision 2 subsection 2.3.1.

References:

1. APP-GW-GLR-033, Revision 0, “Spent Fuel Storage Rack Structural/Seismic Analysis,” (Technical Report Number 54)
~~2.US NRC Regulatory Guide 1.124, Revision 21, “Service Limits and Loading Combinations for Class 1 Linear-Type Component Supports,” January, 1978.~~
2. US NRC Regulatory Guide 1.124, Revision 1, “Service Limits and loading Combinations for Class 1 Linear –Type Component Supports,” January, 1978.
3. US NRC Regulatory Guide 1.124, Revision 2, “Service Limits and loading Combinations for Class 1 Linear –Type Component Supports,” February, 2007.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
A statement will be added to Technical Report Number 54 stating that the stress analysis of the spent fuel racks satisfies all of the applicable provisions in NRC Regulatory Guide 1.124, Revision 2~~1~~.

Technical Report Revision from discussion at NRC On-Site Technical Review Meetings May 21 & May 22, 2008 RAI-TR54-30 Rev 2 response

Revise Subsection 2.3.1 of TR-54 Revision 2.
The stress analysis of the spent fuel racks satisfies all of the applicable provisions in NRC Regulatory Guide 1.124, Revision 1 (Reference 28) for components designed by the linear elastic analysis method. In addition an assessment has been performed to confirm that the stress analysis of the spent fuel racks also satisfies the applicable provisions of NRC Regulatory Guide 1.124, Revision 2 (Reference 32).

Section 4 References
Add reference 32

32. US NRC Regulatory Guide 1.124, Revision 2, "Service Limits and loading Combinations for Class 1 Linear –Type Component Supports," February, 2007.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR54-036
Revision: 1

Question:

Some of the information provided in Section 2.8.2 (Rack Structural Evaluation) and Tables 2-9 through 2-15 (stress results) is not clear. Therefore, describe/explain the following:

a. Section 2.8.2.1, 2nd paragraph, indicates that the tables also report the stress factors for the AP1000 Spent Fuel Storage Racks cellular cross section just above and below the baseplate. This implies that the fuel cells continue below the baseplate. Please explain.

b. The same paragraph refers to "pedestal five in the first sheet of the summary tables for each simulation (that is, 9.M.0 where M stands for run number)." Please explain what this means since the tables do not reflect this terminology.

c. The same paragraph refers to "ensures that the overall structural criteria set forth in subsection 2.2.3 are met." Structural criteria are not presented in subsection 2.2.3.

d. Section 2.8.2.2 a., refers to a stress factor of 2.1516 which it states is given in the tables. However, no such stress factor is given, please explain. Also, are all cells welded to the baseplate on all four sides?

e. Section 2.8.2.2 a.., first bullet, calculates the stress in the weld, connecting the cell walls to the baseplate, equal to 25,047 psi; however, Table 2-12 shows a smaller (maximum) weld stress of 22,647. Please explain.

f. Section 2.8.2.2 b., indicates that a separate finite element model is used to check the baseplate to pedestal welds. Provide a short description of the model, computer code, loading, and location of the maximum tabulated stress in the weld referred to in Table 2-14.

g. Section 2.8.2.2 c., indicates that for calculation of cell welds, the fuel assemblies in adjacent cells are conservatively calculated by assuming that the fuel assemblies in adjacent cells are moving out of phase with one another. It then states that cell to cell weld calculations are based on the maximum stress factor from all runs. However, elsewhere in the report, it was stated that all of the fuel assemblies in the simulation are assumed to vibrate in phase. Provide more information to explain this. Also, this paragraph indicates that both the weld and the base metal shear results (for cell to cell) are reported in Table 2-14; however, Table 2-14 is labeled baseplate to pedestal welds. If reference was intended to Table 2-15, then note that Table 2-15 provides the shear stress only for the base metal.

h. Section 2.8.2.3 refers to Tables 2-9 through 2-14 for limiting pedestal thread shear stresses for every pedestal. These tables do not seem to apply to pedestal thread shear stress. Therefore, clarify or correct this information.

i. Table 2-9, Summary, identify what rack component/element applies to each of the column headings (i.e., Max Stress Factor, Max. Shear Load, Max Fuel to Cell Wall Impact). Similarly, for the other tables, identify what rack component/element the table applies to (e.g., Tables 2-13 and 2-15 are missing this information).

j. Table 2-10, provides maximum rack to rack displacements relative to the floor. Also provide maximum & minimum relative displacements to the walls.

k. Why are results for "Run 1 and 2" given for some tables and not others? Both should be provided or an explanation should be given why they are included for some tables and not for others.

l. Table 2-15, why is this table labeled "Allowable Shear Stress ..." versus the labeling of other tables and why is it labeled Level D, versus other tables where there is no indication of Levels? All tables should identify which load level they apply to.

Westinghouse Response:

a. The fuel cells do not continue below the baseplate. Stress factors are computed just above the baseplate, where the fuel cells are welded to the baseplate, and just below the baseplate where the support pedestals are welded. Section 2.8.2.1 (2^{nd} paragraph, 2^{nd} sentence) will be revised as follows:

> "The tables also report the stress factors for the AP1000 Spent Fuel Storage Racks cellular cross section just above the baseplate."

b. The computer code DYNAPOST, which is listed in Table 2-8, computes the stress factors for the four support pedestals and for the cellular structure just above the baseplate based on the time history analysis results. For convenience, these five locations are identified as pedestal numbers 1 through 5 in the DYNAPOST output tables, which are not included in Technical Report APP-GW-GLR-033. Therefore, the sentence, "The locations above the base plate ... are referred to as pedestal five in the first sheet of the summary tables for each simulation (that is, 9.M.0 where M stands for run number).", is not relevant to the report and will be deleted.

c. The reference to subsection 2.2.3 is a typo. The correct reference is subsection 2.3.3.

d. The factor of 2.1516 is not provided in the tables as stated in text. Section 2.8.2.2 a. (2nd paragraph) will be revised as follows:

> "Weld stresses are determined through the use of a simple conversion (ratio) factor (based on area ratios) applied to the corresponding stress factor in the adjacent rack material. This conversion factor is developed from the differences in base material thickness and length versus weld throat dimension and length:"

All fuel cells are welded to the baseplate on all four sides.

e. The correct stress in the weld is 25,047 psi. Table 2-12 will be revised to change 22,647 psi to 25,047 psi, as shown below.

Table 2-12 Baseplate-to-Rack Maximum Weld Stress		
Weld Stress (psi)	**Allowable Stress (psi)**	**Safety Factor**
25,047	35,748	1.58

f. The finite element code ANSYS is used to resolve the tension and compression stresses in the pedestal weld due to the combined effects of a vertical compressive load in the pedestal and a bending moment caused by pedestal friction. The compression interface between the baseplate and the pedestal is modeled using contact elements. The perimeter nodes on the pedestal are connected to the baseplate by spring elements in order to simulate tension in the weld. The maximum instantaneous friction force on a single pedestal from the rack seismic analysis is conservatively applied to the finite element model in the horizontal x- and y-directions simultaneously, along with the concurrent vertical load, at the appropriate offset location. The perimeter nodes on the pedestal are restrained to move only in the vertical direction so that the spring elements only resist bending. The limiting ANSYS results are combined with the maximum horizontal shear loads to obtain the maximum weld stress. The maximum weld stress reported in Table 2-14 occurs at the corner of the pedestal where the tensile stress in the weld due to bending is maximum.

g. All stored fuel assemblies within a rack are assumed to rattle in phase for the seismic analysis of the spent fuel racks using the Holtec proprietary computer code MR216 (a.k.a. DYNARACK). This analysis yields the maximum impact force between a single fuel assembly and the surrounding cell walls. When evaluating the weld connection between adjacent storage cells, the maximum fuel-to-cell impact force from the dynamic analysis is conservatively multiplied by a factor of 2 to consider out-of-phase fuel rattling. The reference to Table 2-14 in Section 2.8.2.2 c is incorrect. The shear stress results for the cell to cell weld connection are not provide in Table 2-14 or Table 2-15. The shear stress in the cell to cell weld and the adjacent base metal are 11,646 psi and 8,235 psi, respectively. The allowable stress limits are 35,748 psi and 18,000 psi, respectively. Tables 2-16 and 2-17(see below) will be added to Technical Report APP-GW-GLR-033 to provide the shear stress results for the cell to cell weld and the adjacent base metal, respectively.

Table 2-16 Maximum Cell-to-Cell Weld Stress		
Weld Stress (psi)	**Allowable Stress (psi)**	**Safety Factor**
11,646	35,748	3.07

Table 2-17 Maximum Base Metal Shear Stress at Cell-to-Cell Weld Location		
Base Metal Shear Stress (psi)	**Allowable Stress (psi)**	**Safety Factor**
8,235	18,000*	2.19
Note: * Based on yield strength of SA240-304 at 200°F (0.72 x 25,000 psi = 18,000 psi).		

h. The reference to "Tables 2-9 through 2-14" in Section 2.8.2.3 is incorrect. The first sentence in Section 2.8.2.3 will be revised as follows: "Table 2-15 provides the limiting thread stress under faulted conditions."

i. In Table 2-9, the "Max. Stress Factor" column applies to the rack cell structure. The "Max. Vertical Load" and "Max. Shear Load" columns apply to a single rack pedestal. The "Max. Fuel-to-Cell Wall Impact" column provides the maximum impact force between a single fuel assembly and the surrounding cell wall at any of the five rattling fuel mass elevations (refer to Figure 2-5 of the report).

Table 2-13 applies to the base metal adjacent to the baseplate to cell welds. Table 2-15 applies to the pedestal internal threads.

j. Table 2-10 provides the maximum displacement in any direction (x or y) for all racks, relative to the floor. In other words, the rack displacements in Table 2-10 are the bounding displacements for all rack-to-rack and rack-to-wall gaps. The results in Table 2-10 also represent the maximum rack displacements relative to the pool walls since the SFP structure is assumed to be rigid for the purpose of the rack seismic analysis (i.e., the SFP floor and walls displace equally). The minimum rack displacement relative to the SFP walls (which is interpreted as maximum distance that a rack displaces away from the SFP walls) is also bounded by the results in Table 2-10, since the reported displacements are the maximum (absolute value) displacements for all racks.

k. The stress results in Tables 2-12 through 2-15 are the maximum values from Run 1 and Run 2.

l. Table 2-15 should be labeled "Pedestal Thread Shear Stress" instead of "Allowable Shear Stress for Level D". The allowable stresses reported in Tables 2-12 through 2-15 are Level D stress limits since the design basis ASB99 earthquake is a faulted condition (Level D).

Westinghouse supplemental response to NRC Technical Review Meetings May 21& 22, 2008

Westinghouse was requested and has agreed to revise Figures TR-54 Rev. 2 Figure 2-1 and DCD Figure 9.1-4 Spent Fuel Pool Layout to show rack-to-rack and rack-to-wall gaps, note where the gaps are measured and to indicate the smaller tool storage area. These are shown in the DCD and TR Revisions sections. These same changes were also implemented in RAI-TR54-36 Rev.1.

References:

1. APP-GW-GLR-033, Revision 0, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54)
2. APP-GW-GLR-033, Revision 2, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54), May 2008.

Design Control Document (DCD) Revision:

~~None~~

Westinghouse supplemental response to NRC Technical Review Meetings May 21& 22, 2008

Revise Figure 9.1-4 as follows:

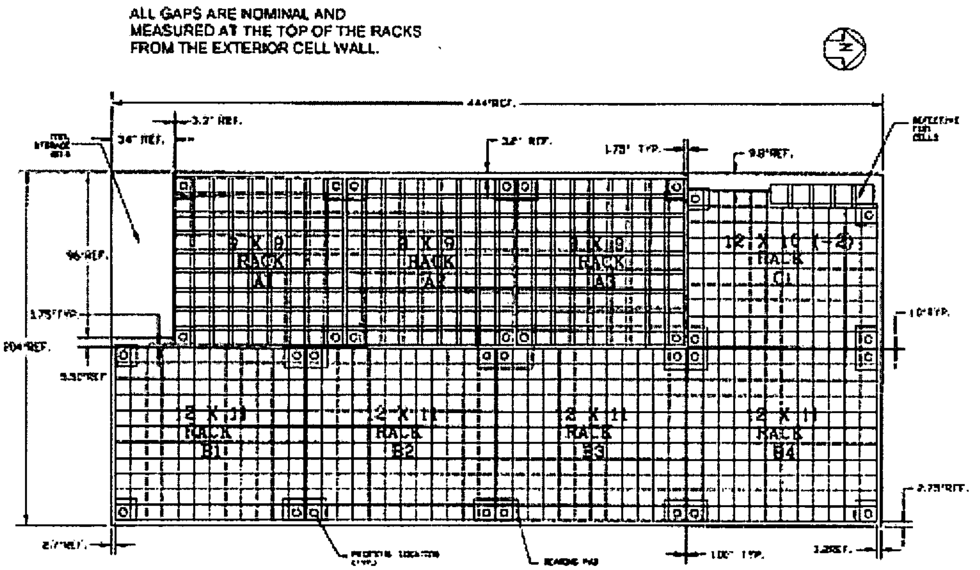


Figure 9.1-4

Spent Fuel Storage Pool Layout (889 Storage Locations)

PRA Revision:
None

Technical Report (TR) Revision:
The revised text provided in response to RAI-TR54-036 questions part a,c,d,e,g,h and i will be incorporated into TR-54 Revision 1 as follows:

a) Section 2.8.2.1 (2nd paragraph, 2nd sentence) will be revised as follows:

> "The tables also report the stress factors for the AP1000 Spent Fuel Storage Racks cellular cross section just above the baseplate."

c) Section 2.8.2.1, 2nd paragraph will be revised as follows:

> "ensures that the overall structural criteria set forth in subsection 2.3.3 are met."

d) Section 2.8.2.2 a. (2nd paragraph) will be revised as follows:

> "Weld stresses are determined through the use of a simple conversion (ratio) factor (based on area ratios) applied to the corresponding stress factor in the adjacent rack material. This conversion factor is developed from the differences in base material thickness and length versus weld throat dimension and length:"

e) Table 2-12 will be revised to change 22,647 psi to 25,047 psi, as shown below.

Table 2-12 Baseplate-to-Rack Maximum Weld Stress

Weld Stress (psi)	Allowable Stress (psi)	Safety Factor
25,047	35,748	1.58

g) The following tables will be added to Subsection 2.8.2.2 to provide the shear stress results for the cell to cell weld and the adjacent base metal, respectively:

Table 2-16 Maximum Cell-to-Cell Weld Stress

Weld Stress (psi)	Allowable Stress (psi)	Safety Factor
11,646	35,748	3.07

Table 2-17 Maximum Base Metal Shear Stress at Cell-to-Cell Weld Location		
Base Metal Shear Stress (psi)	**Allowable Stress (psi)**	**Safety Factor**
8,235	18,000*	2.19
Note: * Based on yield strength of SA240-304 at 200°F (0.72 x 25,000 psi = 18,000 psi).		

h) The first sentence in Section 2.8.2.3 will be revised as follows:

"Table 2-15 provides the limiting thread stress under faulted conditions."

I) Table 2-15 will be renamed as follows:

"Pedestal Thread Shear Stress"

Westinghouse supplemental response to NRC Technical Review Meetings May 21& 22, 2008

Revise Figure 2-1 in TR-54 Rev.2 as follows:

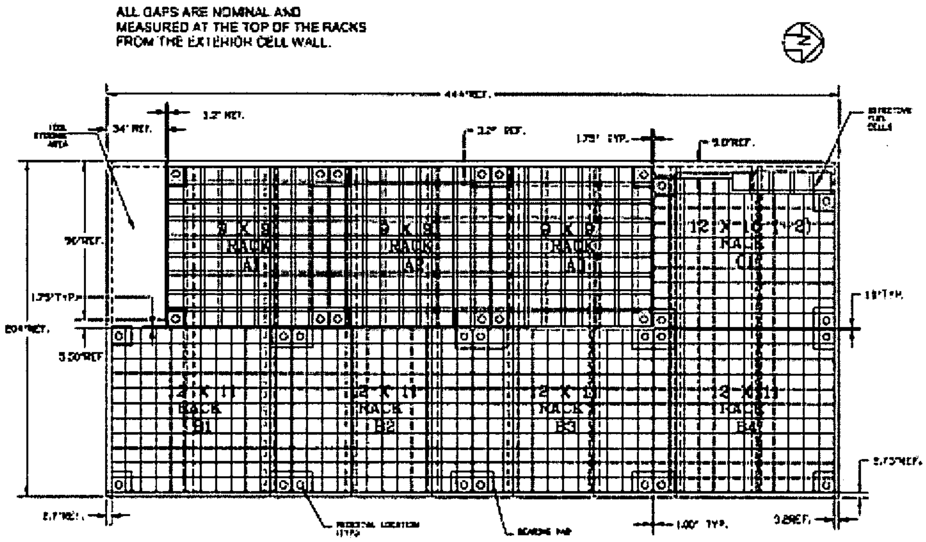


Figure 2-1 Spent Fuel Pool Storage Layout (889 Total Storage Locations) – Leak Chases Show in Phantom

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR54-038
Revision: 1

Question:

A number of figures in the markup of the DCD, provided with this report, were eliminated. Even if the new configuration is different, basic outline sketches and key dimensions need to be provided in the DCD.

Westinghouse Response:

We are in agreement. Revision 16 of the DCD will have revised Figures: Figure 9.1-2 Region 1 Spent Fuel Rack Layout and Figure 9.1-3 Region 2 Spent Fuel Rack Layout

Westinghouse Supplemental response to NRC Technical Review Meeting May 21 & 22 2008

Westinghouse agree to change the spent fuel pool layout figure (Figure 2-1 in TR-54 Rev 2 and Figure 9.1-4 in the DCD) to show the rack-to-rack and rack-to-wall gaps, to change the note as to where the gaps were measured and to indicate the smaller (34 inch vs. 36 inch) tool storage area dimension. These changes are shown in the DCD and TR Revision sections.

References:

1. APP-GW-GLR-033, Revision 0, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54)
2. APP-GW-GLR-033, Revision 2, "Spent Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 54), May 2008

Design Control Document (DCD) Revision:

Figure 9.1-2 Region 1 Spent Fuel Rack Layout and Figure 9.1-3 Region 2 Spent Fuel Rack Layout will be revised in DCD Revision 17 to show both new Region 1and Region 2 rack configurations.

Westinghouse Supplemental response to NRC Technical Review Meeting May 21 & 22 2008
Figure 9.1-4 is revised as shown below

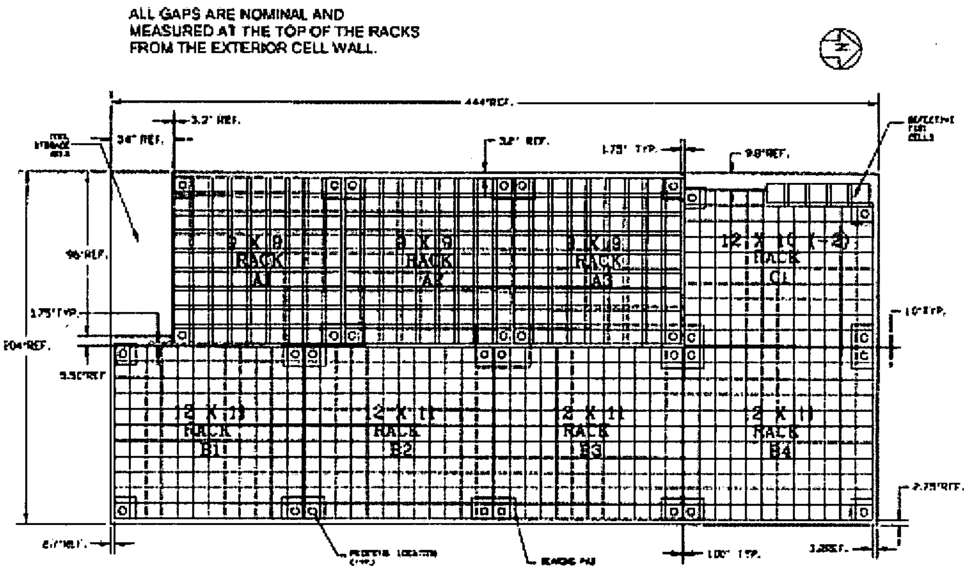


Figure 9.1-4

Spent Fuel Storage Pool Layout (889 Storage Locations)

PRA Revision:
None

Technical Report (TR) Revision:
Figure 9.1-2 Region 1 Spent Fuel Rack Layout and Figure 9.1-3 Region 2 Spent Fuel Rack Layout will be will be added to the revision of APP-GW-GLR-033, Revision 0, “Spent Fuel Storage Rack Structural/Seismic Analysis,” (Technical Report Number 54).

Westinghouse Supplemental response to NRC Technical Review Meeting May 21 & 22 2008

Figure 2-1 of TR-54 Rev. 2 has been revised as shown below

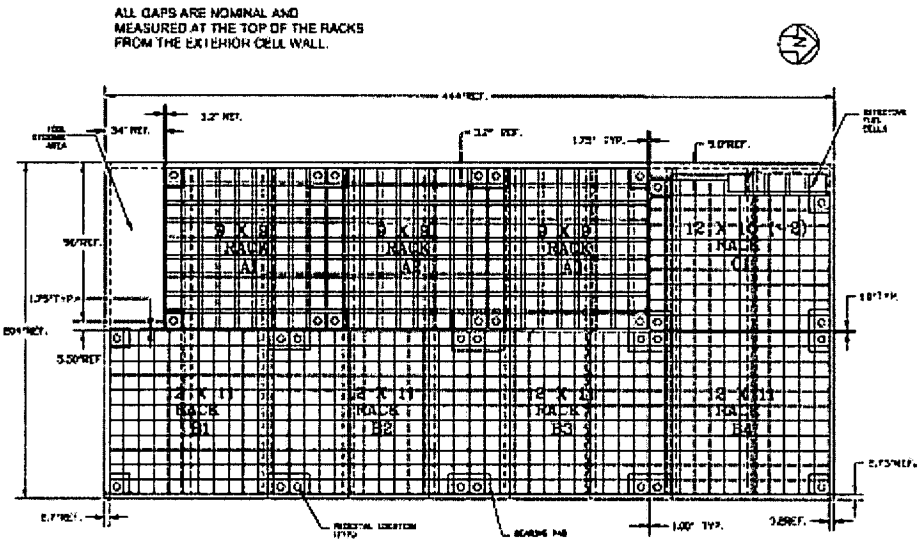


Figure 2-1 Spent Fuel Pool Storage Layout (889 Total Storage Locations) – Leak Chases Show in Phantom