AP1000DCDFileNPEm Resource

From: Buckberg, Perry
Sent: Wednesday, July 07, 2010 4:17 PM
To: Buckberg, Perry
Subject: FW: smaller files
Attachments: Copy of RAI-SRP9.1.2-SEB1-02 R2A-NRC DRAFT.doc; Copy of RAI-TR44-009 R2A-NRC DRAFTsaa.doc; Copy of RAI-TR44-16 R3B-NRC DRAFT.doc; Copy of RAI-TR44-17 R3B-NRC DRAFT.doc; Copy of RAI-TR44-25 R2A-NRC DRAFT.doc

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From: Altmayer, Scott A [mailto:altmaysa@westinghouse.com]
Sent: Sunday, June 13, 2010 11:21 AM
To: Buckberg, Perry
Subject: smaller files

Perry,

Here are nine of the main draft RAIs for your review…(designated as next rev alpha)…for audit action items: 5, 9, 10, 12, 14, 15.
Those for action items 7, 8, 16 are coming by monday, 6/14.

I am making these available to Joe/Rich since they may be in PA on the Ch. 3.7 audit.
As their/your time allows early this week (while they are in PA), Rob M./Steve S./I can be available to talk comments directly with them. Thank you. Please call me with any comments…I am out moving household on Monday.

--SCOTT ALTMAYER--
AP1000 Licensing and Customer Interface
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Hearing Identifier: AP1000_DCD_Review
Email Number: 483

Mail Envelope Properties (44CD2E65B0FF0E499CB32BC30CF781F01081527F99)

Subject: FW: smaller files
Sent Date: 7/7/2010 4:16:35 PM
Received Date: 7/7/2010 4:16:40 PM
From: Buckberg, Perry

Created By: Perry.Buckberg@nrc.gov

Recipients:
"Buckberg, Perry" <Perry.Buckberg@nrc.gov>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	Size	Date & Time
MESSAGE	811	7/7/2010 4:16:40 PM
Copy of RAI-SRP9.1.2-SEB1-02 R2A-NRC DRAFT.doc	55362	
Copy of RAI-TR44-009 R2A-NRC DRAFTsaa.doc	1988162	
Copy of RAI-TR44-16 R3B-NRC DRAFT.doc	57922	
Copy of RAI-TR44-17 R3B-NRC DRAFT.doc	492098	
Copy of RAI-TR44-25 R2A-NRC DRAFT.doc	97858	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP9.1.2-SEB1-02
Revision: 2A

Question: (Revision 0, 1)

Section 2.8.1.4 "Impact Loads" was not revised in TR-44 Rev. 1, even though shims between the new fuel rack and the fuel pit wall apparently are no longer used. Shims are still mentioned in Rev. 1. Quoting from Section 2.8.1.4, "The maximum impact load from the set of shims that close the north-south gaps at the top of the rack is summarized in Table 2-8." The staff requests Westinghouse to clarify this, and revise Section 2.8.1.4 accordingly.

The staff also notes that the maximum rack-to-wall impact load in Table 2-8 increased from 112,000# in Rev. 0 to 154,000# in Rev. 1. The staff requests Westinghouse to explain why the impact load increased, and describe how the design of the new fuel rack and the new fuel pit wall were evaluated for the significant increase (35%) in the impact load, in addition to other concurrent loadings. Also identify where this is/will be described in the AP1000 DCD.

New Question: (Revision 2A)

Following the Revision 1 response to this RAI and during the June 2010 audit; the NRC sought clarification about the basis (i.e. COF values) and location of wall impacts (if any). They requested that the RAI and TR44 technical reports be reflected to clearly show this information.

Westinghouse Response: (Revision 0)

The shims have been eliminated from the new fuel rack design and analysis. All mentions of the rack-to-wall shims should be disregarded. TR-44 Rev 1, Section 2.8.1.4 should be read, "The maximum impact load from the pit walls ~~at the top of the rack is summarized in Table 2-8~~." Also note that page 5 of 46 unintentionally continues to indicate that the shims are still included in the design and analysis, which they are not. The following sentence on page 5 (half way through first paragraph) should be deleted, "~~The rack to wall (north and south side) impact spring gaps at the top are reduced to zero to reflect the shims that are in place, which absorb the impact load and transmit them to the pool wall.~~"

There are 2 reasons why the load increased. The first is that the floor response spectra for the new fuel vault floor were revised in TR-44 Rev. 1. The second reason for the change in impact load is the elimination of the shims from the design and analysis. In TR-44 Rev. 0, the new fuel rack was shimmed against the corbels on the North and South walls of the new fuel vault. This configuration produced a maximum impact load of 112,000 lb between the top of the new fuel rack and the corbel at the location of the shims. The new design eliminates the shims at the top of the new fuel rack, as well as the corbels on the North and South walls of the new fuel vault. As a result, the minimum clearance between new fuel rack and the walls of the new fuel vault is almost 6 inches. Per the latest analysis, when the coefficient of friction between the rack

pedestals and the floor is assumed to be 0.2 (which is an extreme lower bound value for a clean and dry steel on steel interface), the rack slides along the floor and impacts the North and South walls at the rack baseplate elevation with a maximum impact force of 154,600 lbf. The cell region of the new fuel rack does not impact the vault walls under any of the analyzed conditions.

Although the seismic analysis of the new fuel rack considers three different coefficients of friction (0.2, 0.5, and 0.8 - the same conditions considered under wet conditions in the analysis of the spent fuel racks) between the support pedestals and the floor liner, the reality is that the coefficient of friction will be greater than 0.5 since the new fuel pit, unlike the spent fuel pool, is not flooded with water. Per Marks' Standard Handbook for Mechanical Engineers (Tenth Edition), the static coefficient of friction for steel on steel (dry) is between 0.74 and 0.78. Therefore, since the seismic analysis shows no rack-to-wall impacts when the coefficient of friction is equal to or greater than 0.5, the new fuel pit walls are not analyzed for any rack-to-wall impacts.

The new fuel rack base plate, which is machined from a ¾" thick stainless steel plate (SA240-304), is intentionally designed to resist high impact loads in the in-plane direction. For example, assuming that the impact spreads over a 10" horizontal baseplate width, the impacted area of the baseplate is 10" x ¾" = 7.5 sq. in. Using the Level A bearing stress limit of 0.9 Sy per ASME Subsection NF, the impact capacity of the baseplate is 7.5 sq. in x (0.9 x 25,000 psi) = 168,750 lbf. The baseplate of the rack is conservatively designed considering the statements above which indicate that in reality the new fuel rack will not impact the new fuel pit walls.

Response (Revision 1)

Westinghouse is revising this response to include justification in TR-44 to explain why the 0.2 coefficient of friction case is not credible. The 0.2 COF results are being retained in the report for information and continuity; however, only the results of the 0.5 and 0.8 COF runs should be considered to be plausible. See the "Revision 1 Update" section of the Technical Report Revision section for details.

Response (Revision 2A)

Westinghouse has reevaluated the range of appropriate friction values. To ensure that the interface between the New Fuel Storage Rack and the New Fuel Pit floor is accurately and conservatively represented; Westinghouse has concluded that that the appropriate credible lower-bound COF is presented in Run Number 5 (case for COF=0.24). This will eliminate confusion regarding what is included in the design basis. Details are included in Reference 2.

Additionally, for clarity, the Run Number 1 evaluation (case for COF = 0.2) will be eliminated from the next revision of TR44 (but maintained in supporting calculations) because this case has been demonstrated to not be credible.

Reference(s):

1) Marks' Standard Handbook for Mechanical Engineers, 10th Edition, Theodore Baumeister, 1996.
2) APP-GW-GLR-026, Revision 3, "New Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 44).

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision: (Revision 0)

The following changes should be made to TR-44; however, these changes do not necessitate a subsequent submittal of TR-44 to the NRC for review.

Section 2.8.1.4 is revised to read:

"The maximum impact load from the ~~set of shims that close the north-south gaps~~ at the top of the rack is summarized in Table 2-8."

The following sentence on page 5 of 46 (half way through first paragraph) should be deleted, "~~The rack-to-wall (north and south side) impact spring gaps at the top are reduced to zero to reflect the shims that are in place, which absorb the impact load and transmit them to the pool wall.~~"

TR Revision (Revision 1) (formerly "…Revision 1 Update…")

The "Interface Coefficient of Friction" section under Section 2.2.2.1 of Rev. 1 of TR- 44 is modified as follows:

Coefficient of friction (COF) values are assigned at each interface, which reflect the realities of stainless steel-to-stainless steel contact. The mean value of coefficient of friction considered

throughout the analysis is 0.5, and the limiting values are based on experimental data related to spent fuel racks, which are bounded by the values 0.2 and 0.8 (Reference 20).

Although the seismic analysis of the new fuel rack has been completed considering the COF cases of 0.2, 0.5, and 0.8, the results of the 0.2 COF case are not considered credible and are included for information only. The coefficient of friction will be 0.5 or greater since the new fuel pit, unlike the spent fuel pool, is not flooded with water. Per Reference 28 the static coefficient of friction for dry steel on steel is between 0.74 and 0.78; therefore only the results from the 0.5 and 0.8 runs are considered plausible.

Reference 28 is added to the end of Section 4 of Rev. 1 of TR-44 as follows:

28. Marks' Standard Handbook for Mechanical Engineers, 10th Edition, Theodore Baumeister, 1996.

TR Revision (Revision 2A)

The TR44 will be modified for clarification to show what run numbers apply to the design basis and the decisions about lower-bound coefficient of friction effects. The report will eliminate non-credible Run Number 1 (case for COF=0.2) from the report.

AP1000 TECHNICAL REPORT REVIEW
Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR44-009
Revision: 2A

Question:

Insufficient descriptive information has been included in the new fuel report to permit an adequate review of the structural/seismic analysis of the new fuel rack. Please provide descriptive information including plans and sections showing the new fuel rack and vault walls. All of the major features of the rack 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 rack 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 walls). 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.

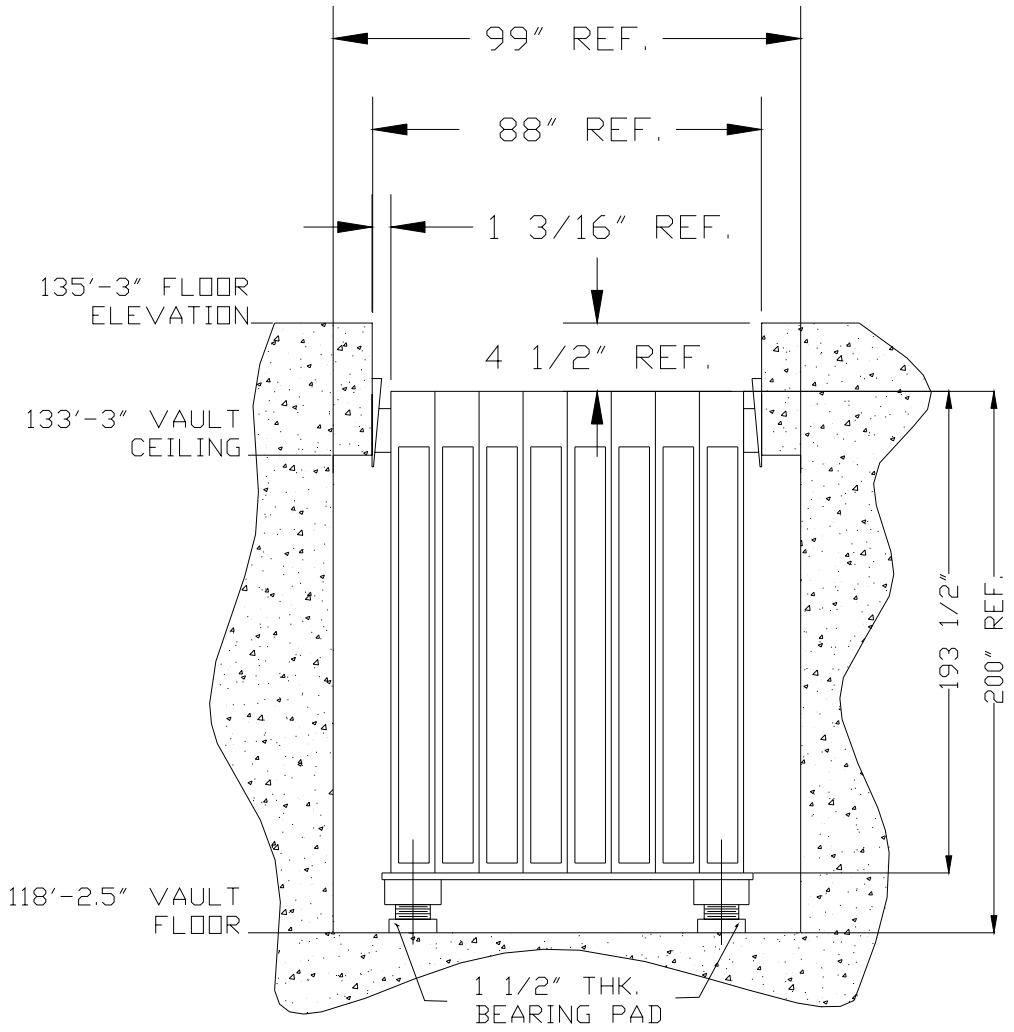
Staff Assessment: Response similar to response for spent fuel racks. See RAI -TR54-15.

New Question: (Revision 2A)

During the June 2010 audit, the NRC requested that dimension and gap information for the new fuel racks be clarified between the three similar RAIs (RAI-TR44-09, RAI-TR44-017, RAI-TR44-25) to show consistency and alignment to the current design basis shown in DCD Figure 9.1-1.

Westinghouse Response:

Figures TR44-9.1 through TR-44-9.5 provide additional descriptive information on the new fuel rack and New Fuel Storage Pit floor and walls. The new fuel handling system is still in final design and no sketches are available. The quantification of the drop parameters has been established and analyzed in Technical Report Number 44. A conservative drop height of 36 inches has been assumed even though the most likely drop height will not exceed 18 inch above the new fuel rack. The total drop weight is 2,027 pounds, which consist of a new fuel assembly, control assembly and new fuel handling tool.



ELEVATION VIEW OF NEW FUEL STORAGE RACK
(EAST WALL VIEW LOOKING WEST)

FIGURE TR44-9.1

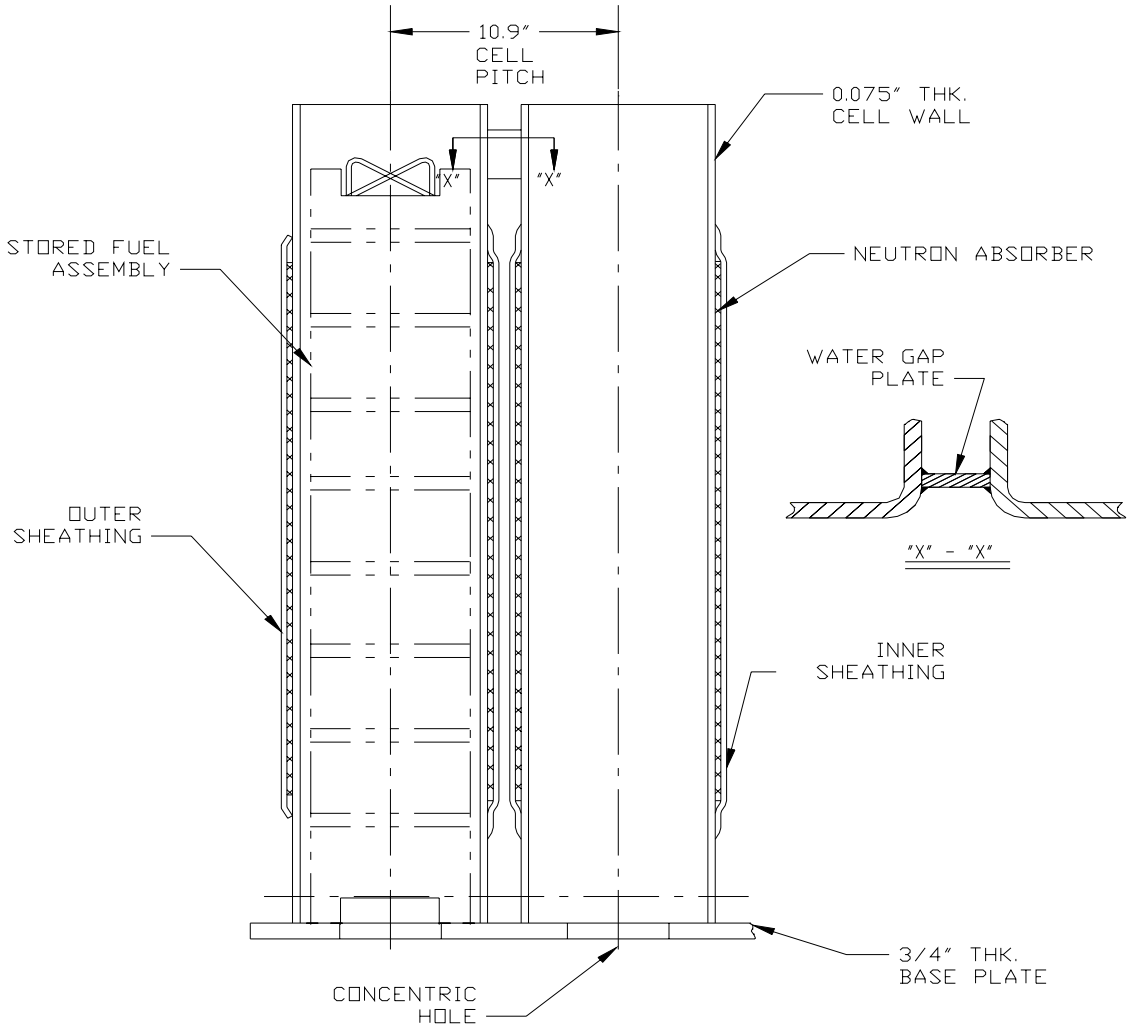


FIGURE TR44-9.2; ELEVATION VIEW OF
NEW STORAGE RACK CELLS

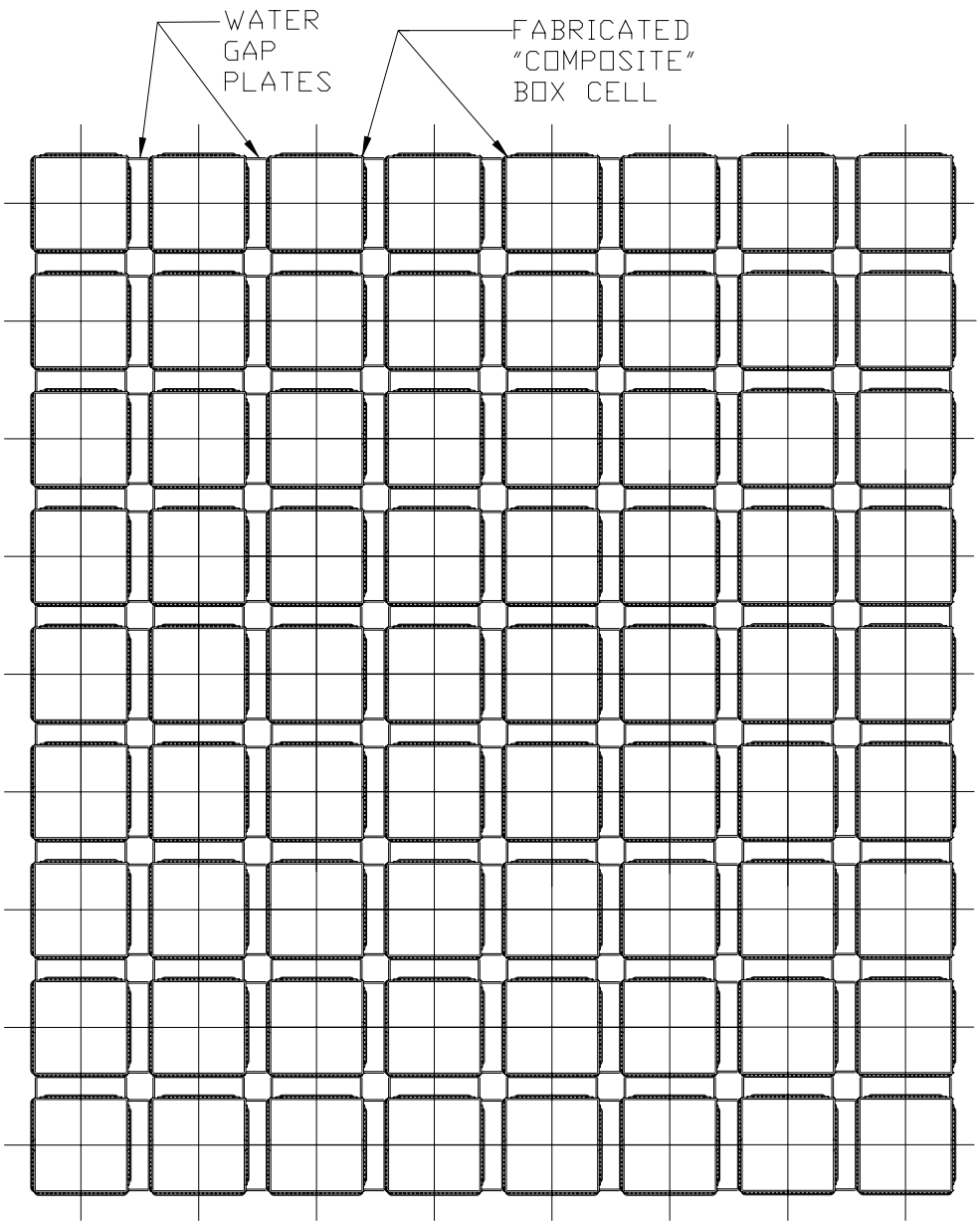


FIGURE TR44-9.3; STORAGE CELL ARRAY
FOR NEW FUEL STORAGE RACK

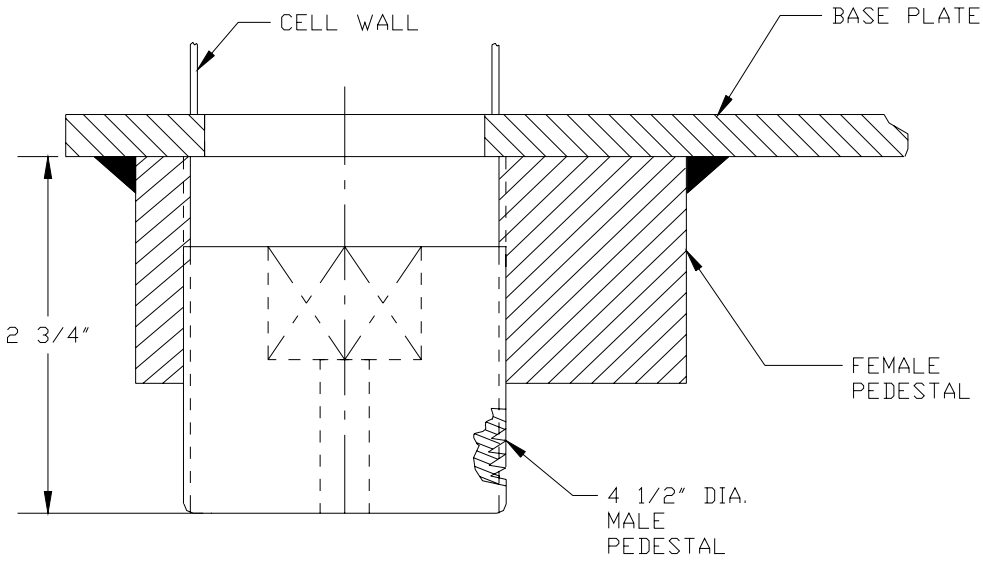


FIGURE TR44-9.4; CROSS SECTION OF ADJUSTABLE SUPPORT

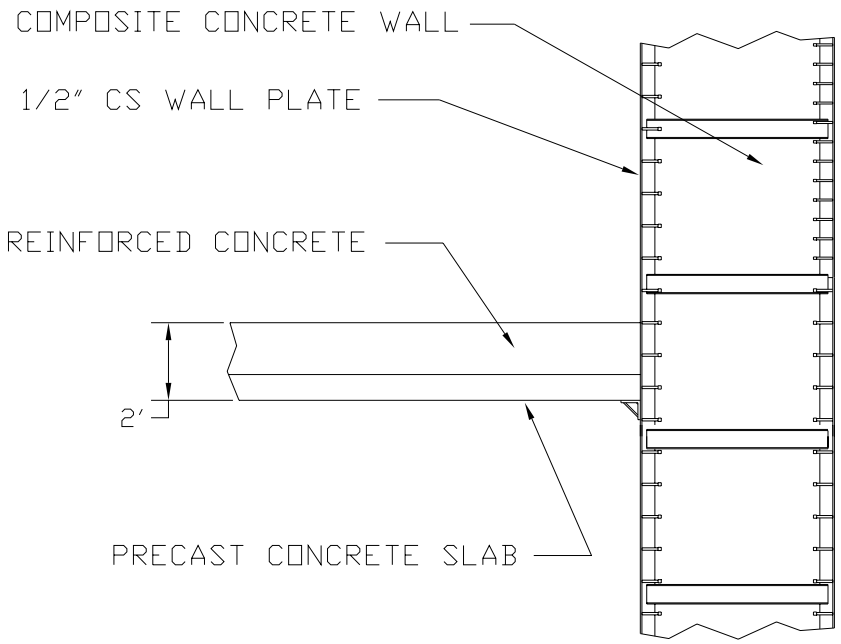


Figure TR44-9.5 New Fuel Pit Floor and Wall Detail

Westinghouse Supplemental Response following May 21 and 22, 2008 Technical Review:

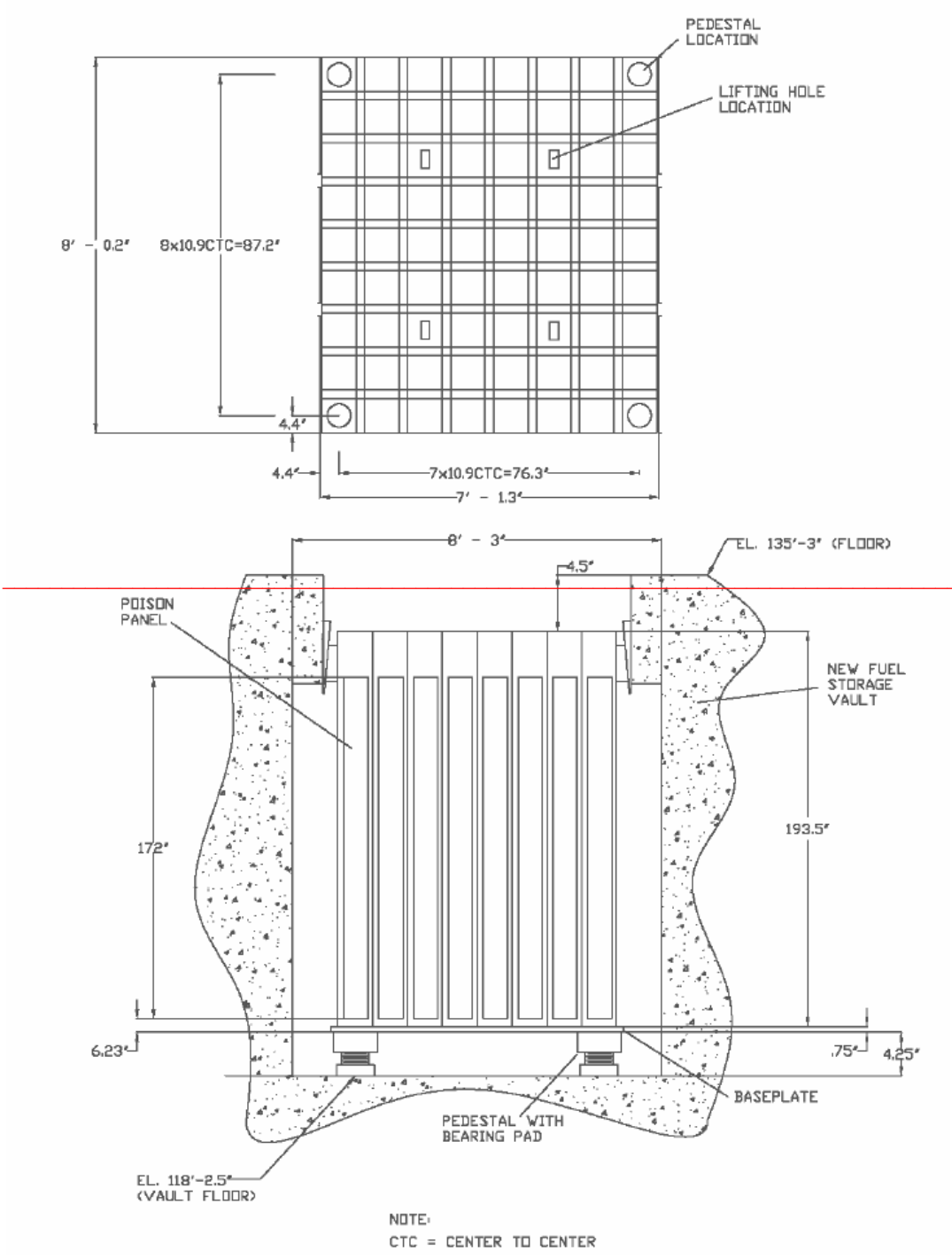
The two figures shown in the DCD and TR markup sections provide updates of the layout and cross section of the new fuel storage rack. The figures replaced Figure 2-1 of TR44 and DCD Figure 9.1-1, Sheets 1 and 2; see the DCD and TR markup sections for details.

Reference:

1. APP-GW-GLR-026, Revision 0, "New Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 44)

Design Control Document (DCD) Revision:

Revise Figure 9.1-1, Sheets 1 and 2, as follows:



~~Figure 9.1-1 (Sheet 1 of 2)~~

~~New Fuel Storage Rack Layout (72 Storage Location)~~

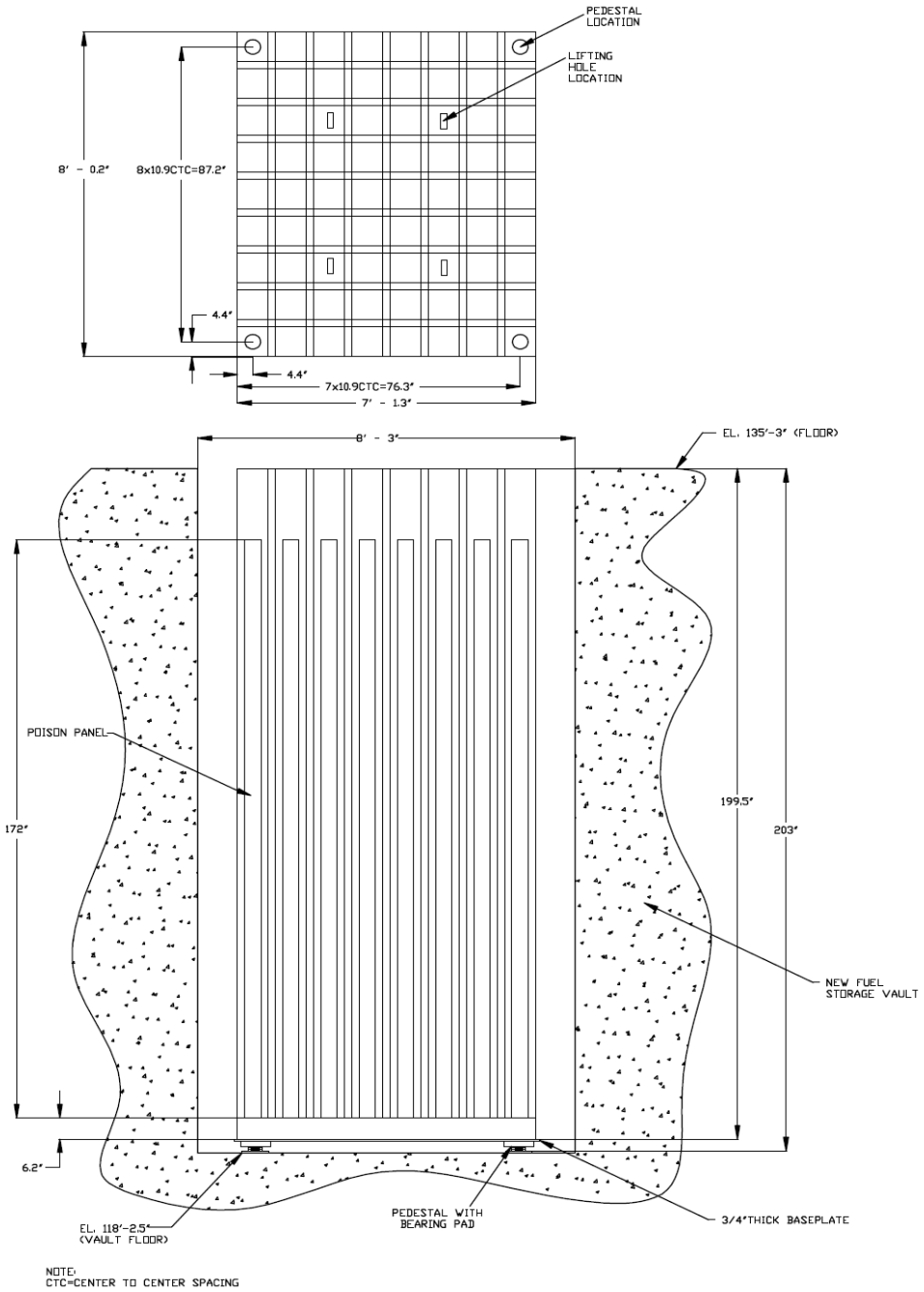
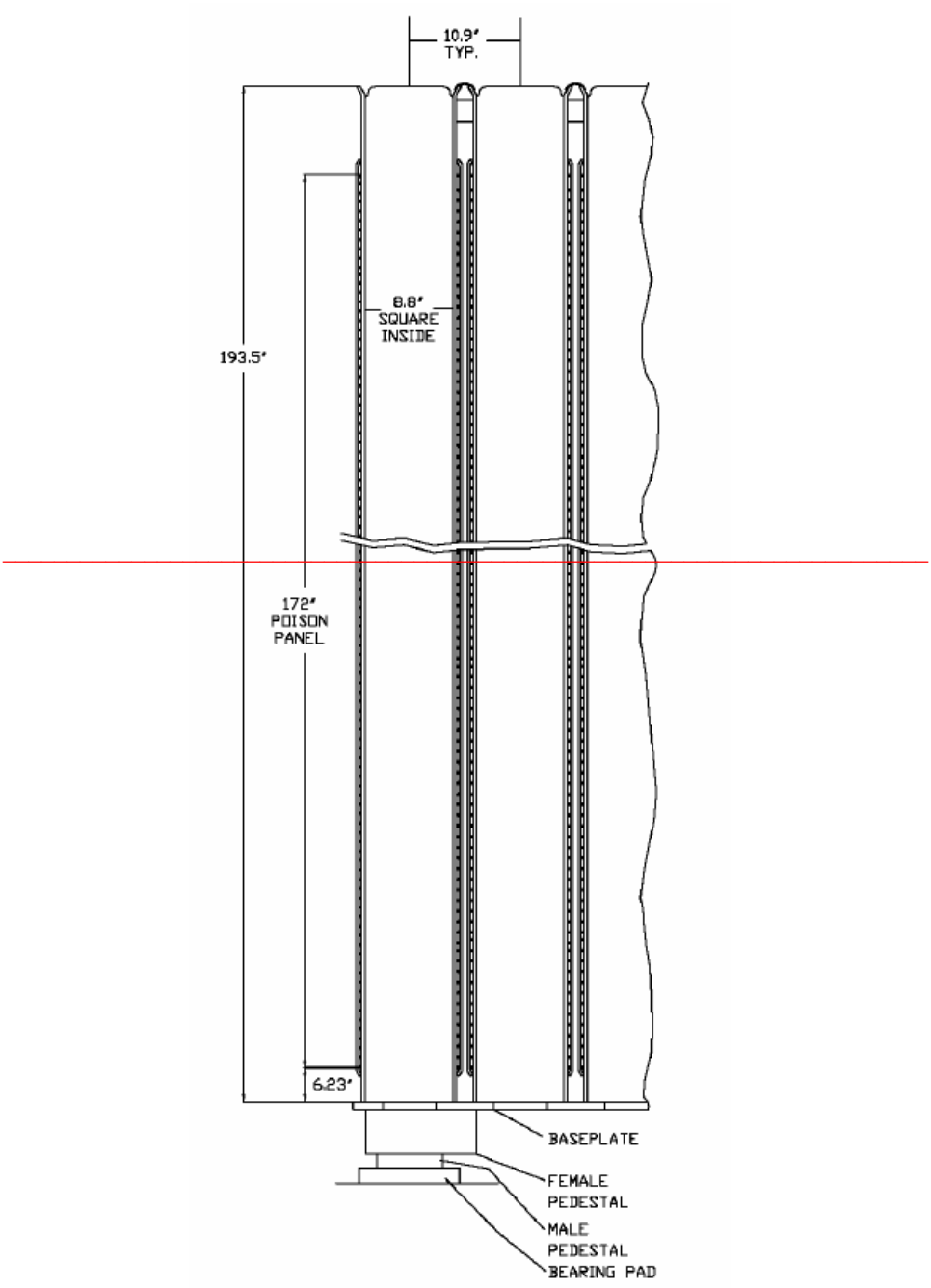


Figure 9.1-1 (Sheet 1 of 2)
New Fuel Storage Rack Layout (72 Storage Location)



~~Figure 9.1-1 (Sheet 2 of 2)~~
~~New Fuel Storage Rack Cross Section~~

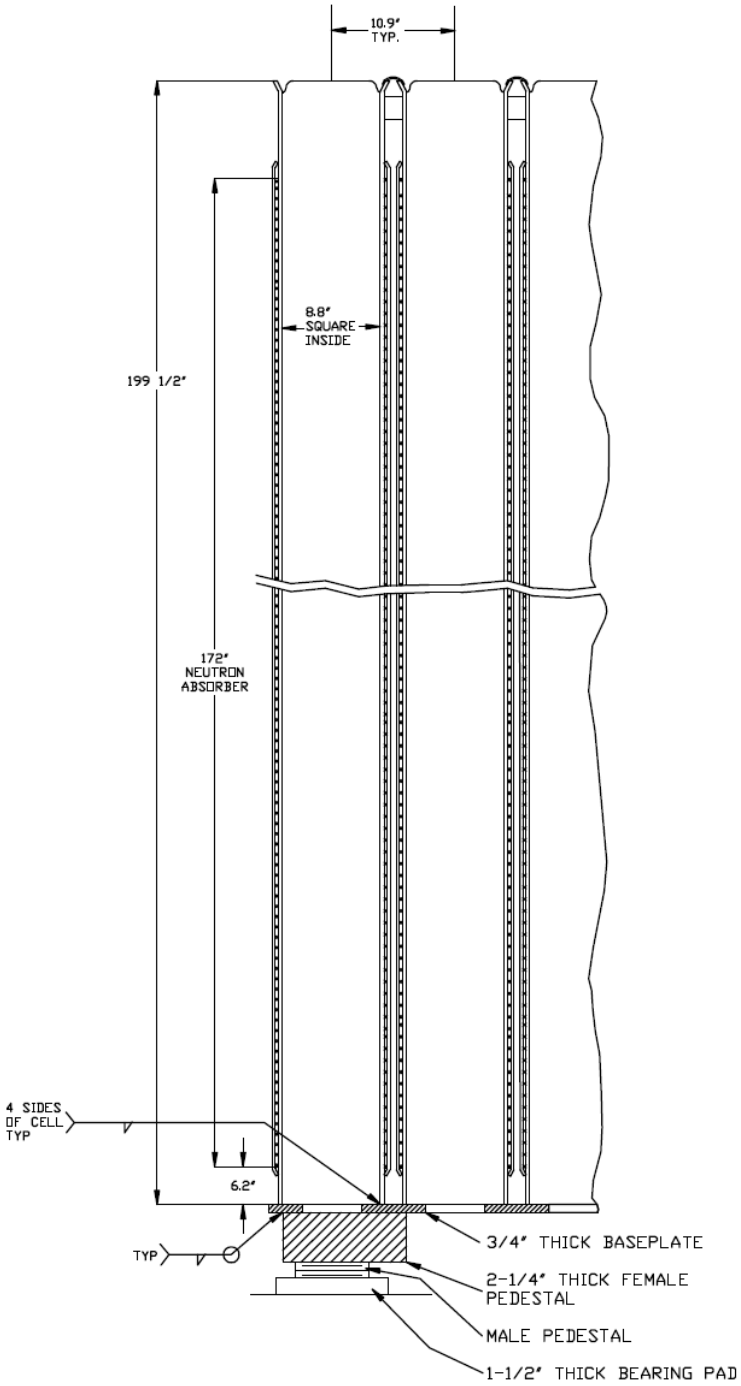


Figure 9.1-1 (Sheet 2 of 2)
New Fuel Storage Rack Cross Section

DCD Changes (Revision 2A)

The change provided in the Revision 1 DCD Markup Section to Sheet 1 of Figure 9.1-1 is outdated. The most recent change to this DCD figure is included in the Revision 3 response to RAI-TR44-17. The change provided in the Revision 1 DCD Markup Section of this RAI to Sheet 2 of Figure 9.1-1 is still applicable.

PRA Revision:
None

Technical Report (TR) Revision:

Figure 2-1 was renamed and replaced by the following 2-sheet figure:

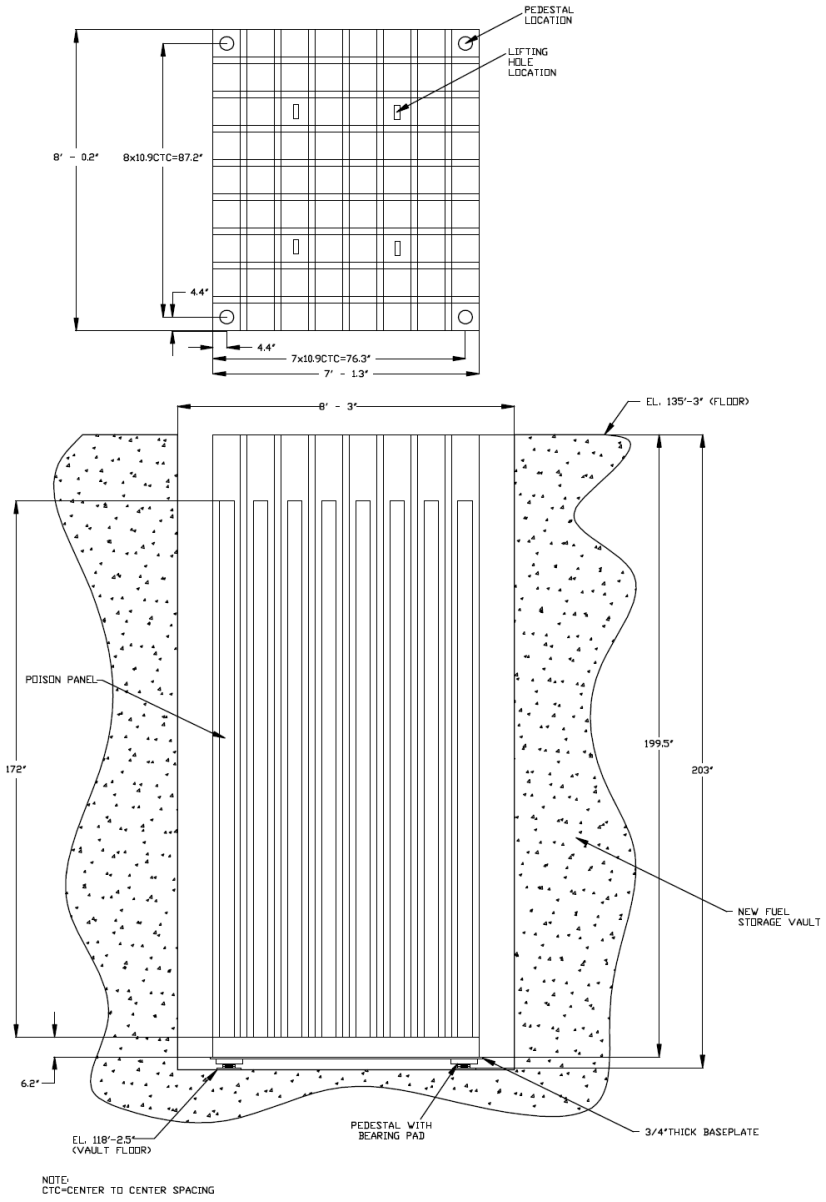


Figure 2-1 New Fuel Storage Rack Layout (72 Storage Location) (Sheet 1 of 2)

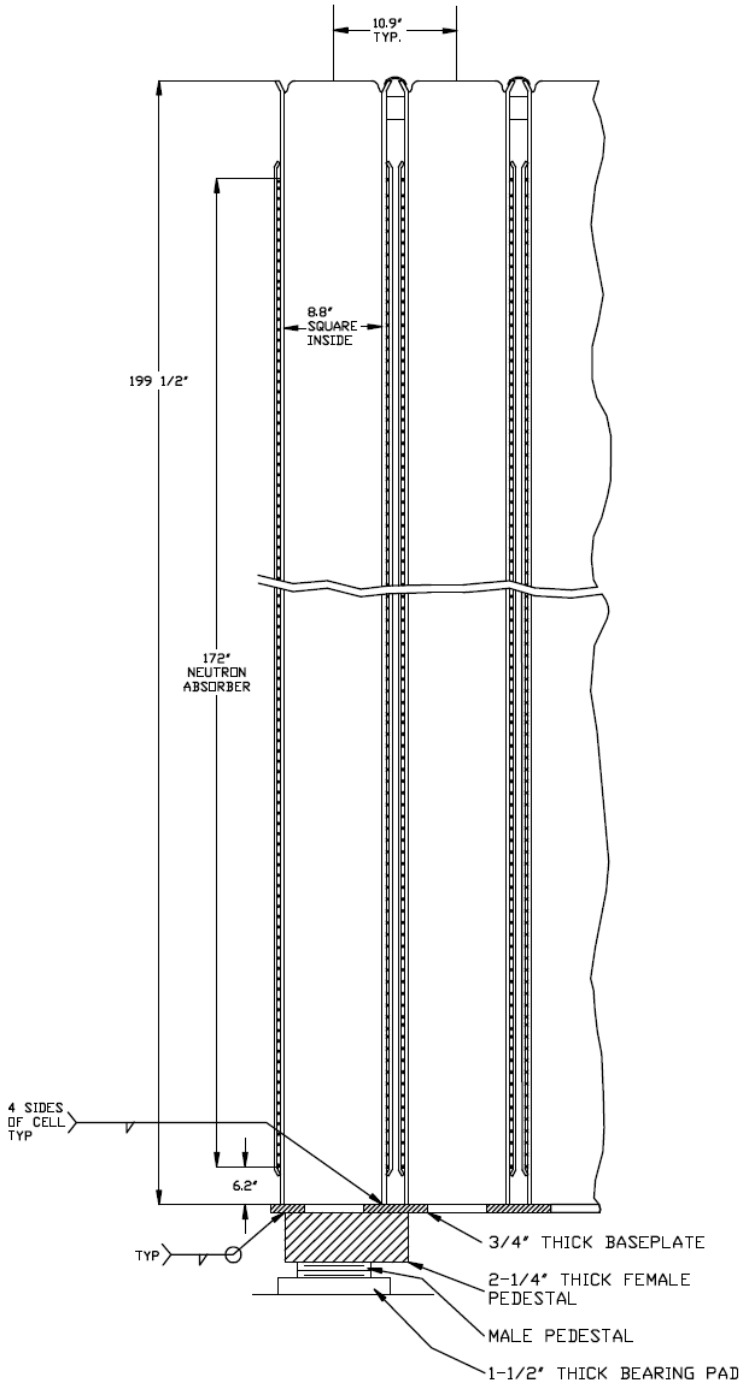


Figure 2-1 New Fuel Storage Rack Cross Section (Sheet 2 of 2)

TR Changes (Revision 2A)

The equivalent new fuel rack layout figures (Sheets 1 and 2 of Figure 2-1) currently shown in the latest revision of TR44 (Reference 1) are correct.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR44-016
Revision: 3B

Question: (Revision 0, 1, 2)

Explain whether only a full fuel rack is considered in the simulation, or if several scenarios are considered; i. e., different fill ratios, from empty to full. Provide the technical justification if only a full rack is considered.

Staff Assessment: Response similar to response for spent fuel racks. See RAI-TR54-025.

New Question: (Revision 3B)

After NRC reviewed the supplemental RAI response from the August 2009 audit, they requested that the RAI response be revised to delete the argument that the partial loading case is not controlling.

Westinghouse Response: (Revision 0)

The new fuel rack is assumed to be fully loaded with maximum weight fuel assemblies in all three simulations. This scenario bounds any partially loaded configuration since it (1) maximizes the vertical compression and lateral friction loads on the support pedestals and (2) produces the maximum rack displacements and fuel-to-cell wall impacts. The displacements are larger for a fully loaded rack, as opposed to a partially filled rack, because the dynamic model conservatively assumes that all stored fuel assemblies rattle in unison. Hence, the momentum transferred between the rattling fuel mass and the spent fuel rack is maximum for a fully loaded rack. For a partially filled rack, the decrease in rattling fuel mass outstrips the destabilizing effect of an eccentric fuel loading pattern.

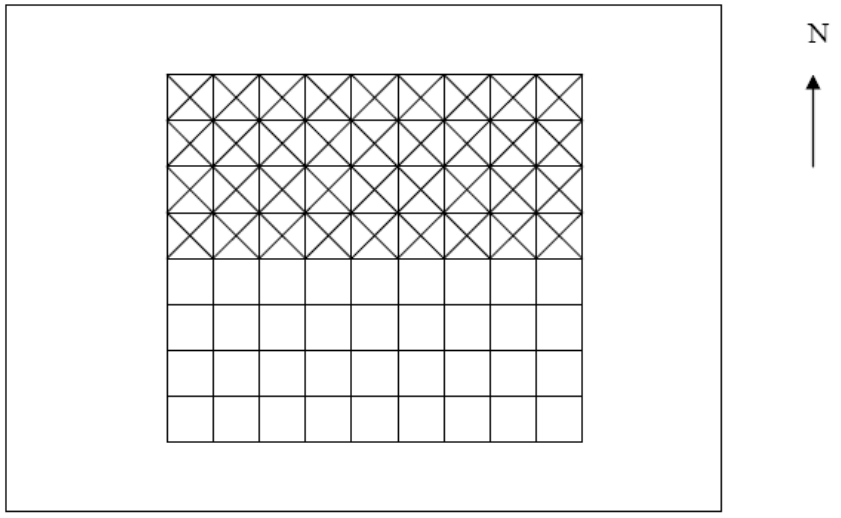
Westinghouse Supplemental Response following May 21 and 22, 2008 Technical Review: (Revision 1)

For the similar spent fuel racks RAI-TR54-025, the NRC found that the Westinghouse response "does appear to support the conclusion that generally the fully loaded racks would be expected to maximize impact forces and displacements." The NRC reviewer also concluded that "the use of the maximum weight for the fuel assemblies, the analysis assumption that all stored fuel assemblies rattle in unison, and consideration of the upper and lower bound coefficient of friction at all support legs provide added conservatism to bound the results from the other possible variations." Therefore, Westinghouse considers the above response to RAI-TR44-016 to be resolved for the new fuel rack.

Section 9.1.1.2.1 of the DCD will be revised to eliminate the reference to performing seismic and stress analyses that evaluate partially full and empty fuel assembly loadings of the new fuel rack.

Additional Response: (Revision 2)

Following the August 2009 audit with the NRC, Westinghouse has completed an additional run (Run Number 4) to examine the effects of the worst possible partial rack loading scenario (half full, all on one side, as depicted in the following figure). The results of this additional run will be included in Revision 2 of TR-44. Also, DCD Section 9.1.1.2.1, Item A, is modified to indicate that a partially filled loading case was evaluated.



Response (Revision 3B)

The responses to Revision 0 and 1 of this RAI are retracted in their entirety. They were superseded by the Revision 2 response of this RAI which committed to add a partially loaded rack simulation to TR44. TR44 (Reference 1) confirms that the partial rack loading scenario described in the Revision 2 response to this RAI generates limiting results for certain cases.

Reference:

1. APP-GW-GLR-026, Revision 3, “New Fuel Storage Rack Structural/Seismic Analysis,” (Technical Report Number 44)

Design Control Document (DCD) Revision:

(Revision 0, 1 changes have been included in DCD R17)

Additional Response (Revision 2):

The first paragraph under Item A of Section 9.1.1.2.1 of Rev. 17 of the DCD is revised as follows:

The new fuel storage rack array center-to-center spacing of nominally 10.9 inches provides a minimum separation between adjacent fuel assemblies sufficient with neutron absorbing material to maintain a subcritical array. The seismic and stress analyses of the new fuel rack consider the conditions of full and partially filled fuel assembly loadings. The rack is evaluated for the safe shutdown earthquake condition against the seismic Category I requirements. A stress analysis is performed to verify the acceptability of the critical load components and paths under normal and faulted conditions. The rack rests on the pit floor.

DCD Changes (Revision 3B)

No additional DCD changes. The changes provided in the Revision 2 DCD Markup Section (above) are still applicable

PRA Revision:
None

Technical Report (TR) Revision:

(Revision 1):
The results of the ANSYS analysis of cell wall buckling at the base of the rack will be included in the next revision of TR-44. This revision is expected to be available in November, 2009.

Additional Response (Revision 2):
The results of the partial rack loading analysis will be included in the next revision of TR-44. This revision is expected to be available in November, 2009.

TR Changes (Revision 3B)

No additional TR changes. The changes discussed in the Revision 2 TR Markup Section have been incorporated in the latest version of TR44.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR44-017
Revision: 3B

Question: (Revision 0, 1, 2)

What are the gaps and tolerances for each of the gaps between the fuel assembly and cell wall, and between the rack and vault wall? What are the assumed initial locations of the various components (fuel assemblies and rack) and what is the technical basis for this assumption. Were any studies done for different initial conditions (considering tolerances); if not, explain why it was not necessary. Are there requirements in the DCD to ensure that the assumed gaps (considering tolerances) are maintained throughout the operating license period?

Staff Assessment: Response similar to response for spent fuel racks. See RAI-TR54-026.

New Question: (Revision 3B)

During the June 2010 audit, the NRC requested that dimension and gap information for the new fuel racks be clarified between the three similar RAIs (RAI-TR44-09, RAI-TR44-017, RAI-TR44-25) to show consistency and alignment to the current design basis shown in DCD Figure 9.1-1.

Westinghouse Response: (Revision 0)

All gaps between fuel assemblies and cell walls and between the rack and vault walls are set to match the nominal gaps provided on the layout drawing. Table TR44-017.1 summarizes the gap information used in the dynamic analyses.

	Fuel-to-Cell Wall	Rack-to-Wall
Nominal Gap (inch)	(8.8”-8.404”)/2 = 0.198”	North – 0” (see note 1) East – 28.7” South – 0” (see note 1) West – 28.7”

Table TR44-017.1 Gap Information used in the Dynamic Analysis of the New Fuel Rack

Note:
1. The new fuel storage rack is braced against the north and south walls of the New Fuel Storage Pit by inserting stainless steel wedges in the interstitial space between the top of the new fuel storage rack and the New Fuel Storage Pit opening (see TR44-009 RAI Response Figure TR44-9.1).

Fuel is assumed centrally located in cell. This is conservative since minimizing gap on one or two walls will generally produce a larger hydrodynamic coupling effect.

Some numerical studies were done on other rack projects; the results generally showed a small influence on results. A larger influence occurs if the gaps are assumed to be displacement dependent, rather than always being held constant at their initial value. The neglect of this effect is conservative.

Once the new fuel rack is installed, the “as-built” gaps are reconciled with the gaps initially used for analysis by evaluation of the numerical results and the predicted motions. The new fuel rack will be positioned in the New Fuel Storage Pit per the gap information provided in Table TR44-017.1. The only way the gaps would change over time would be by the action of a seismic event. Combined License applicants will have a procedure in place to address measurement of the post design-basis seismic event gaps, and to evaluate the acceptability of the configuration showing it is acceptable, or to take appropriate corrective actions. A statement will be added to the Technical Report addressing the design-basis seismic event potential change in gaps between the new fuel rack and New Fuel Storage Pit walls.

Westinghouse Supplemental Response following May 21 and 22, 2008 Technical Review: (Revision 1)

Since the Westinghouse submittal of the Revision 0 response to this RAI, the design of the new fuel storage pit was changed to remove the concrete corbels at the top of the pit and the stainless steel wedges that were to be welded in the interstitial space between the top of the new fuel storage rack and the pit opening following installation of the rack. As a result of the changes to the new fuel storage pit, the updated gap information is provided in the table below and was used in the dynamic analyses. Note that a conservative gap size was used for the fuel-to-cell wall gap in the dynamic analysis based on the smallest fuel assembly cross-section of 8.404 inches. The largest fuel assembly cross-section is 8.426 inches which equates to a 0.187 inch fuel-to-cell wall gap.

	Fuel-to-Cell Wall	Rack-to-Wall (top of rack)
Nominal Gap (inch)	(8.8”-8.404”)/2 = 0.198”	North – 6.88” East – 28.93” South – 6.88” West – 61.97”

Per the structural/seismic calculation for the new fuel rack, APP-FS01-S3C-001, Revision 1, the maximum displacement at the top of the new fuel rack is 6.35”. Therefore, the minimum gap between the new fuel rack and the pit walls (at the top of rack elevation) will be specified on Rev. 1 of Drawing APP-FS01-V2-002 as 6-3/8”.

Additional Response: (Revision 2)

Following the August 2009 audit, Westinghouse is updating DCD Figure 9.1-1 to include additional details related to the placement of the New Fuel Storage Rack within the New Fuel Pit. Figure 9.1-1 will be updated as shown in the DCD Revision section below to show the general position of the rack within the pit, including a definition of the minimum gaps. The only changes to the figure are that the rack is now shown within the vault and the 4 inch minimum typical gap dimension along with the clarifying note about where the gaps are measured from have been added. The 4 inch minimum gap is conservative based on the maximum rack displacement of 3.2 inches (which occurs at the top of the rack; the maximum displacement at the baseplate elevation is only 0.5 inches) when the 0.2 COF is ignored (justification for ignoring the 0.2 COF case is discussed in the response to RAI-SRP9.1.2-SEB1-02, Revision 1).

Response (Revision 3B)

This RAI Revision 3 response is provided to update information to be consistent with the current design and analysis.

The last statement in the Revision 0 response states, “A statement will be added to the Technical Report addressing the design-basis seismic event potential change in gaps between the new fuel rack and New Fuel Storage Pit walls.” However, as discussed in the response to RAI-SRP9.1.2-SEB1-01, the appropriate place for this statement is the DCD so it can be ensured that this requirement is communicated to the COL Holder. Because this statement has been added to the DCD via RAI-SRP9.1.2-SEB1-01, which is the correct place to capture a requirement of this nature, the equivalent statement has been removed from TR44.

The table in the RAI Revision 1 response (above) which lists the rack-to-wall gaps (top of rack) is updated for clarification to reflect the current nominal placement of the New Fuel Storage Rack within the New Fuel Storage Pit:

- The nominal rack-to-wall gap in the East direction is 6.88”.
- The nominal rack-to-wall gap in the West direction is 61.97”.

Additionally, the maximum displacement that results from the design-basis seismic event and the corresponding minimum rack-to-wall gap limitation was revised to be consistent with the current results of the seismic analysis and changes to the friction assumptions that affect rack movement. The current analysis now uses a credible lower-bound coefficient of friction (COF) of 0.24. Justification of this lower-bound COF is included in the latest revision of TR44 (Reference 1).

The updated analysis shows maximum rack-to-wall displacement is 5.54” at the top-of-rack location (note that this is equal to 4.92” at the baseplate location since the new fuel rack baseplate extends nominally 1” beyond the cell envelope in each horizontal direction.) Based on accessibility considerations, the rack-to-wall gaps are measured at the top-of-rack. To minimize/avoid the rack impacting the new fuel pool wall, the minimum rack-to-wall gap has been set to $\geq$6” which is slightly more than the maximum displacement.

To ensure that criticality safety assumptions are met, a maximum rack-to-wall gap of $\leq$ 8” has been added to the North and South walls, where there are no neutron absorber panels. The 8” maximum gap precludes the possibility of a fuel assembly (with minimum nominal fuel assembly dimensions greater than 8.4” square) being inadvertently placed into the space next to the exterior of the New Fuel Storage Rack on the North and South faces where no neutron absorber panels exist. There are neutron absorber panels provided on the East and West faces; so is no need to limit the maximum gap in these directions.

References:

1. APP-GW-GLR-026, Revision 3, “New Fuel Storage Rack Structural/Seismic Analysis,” (Technical Report Number 44)

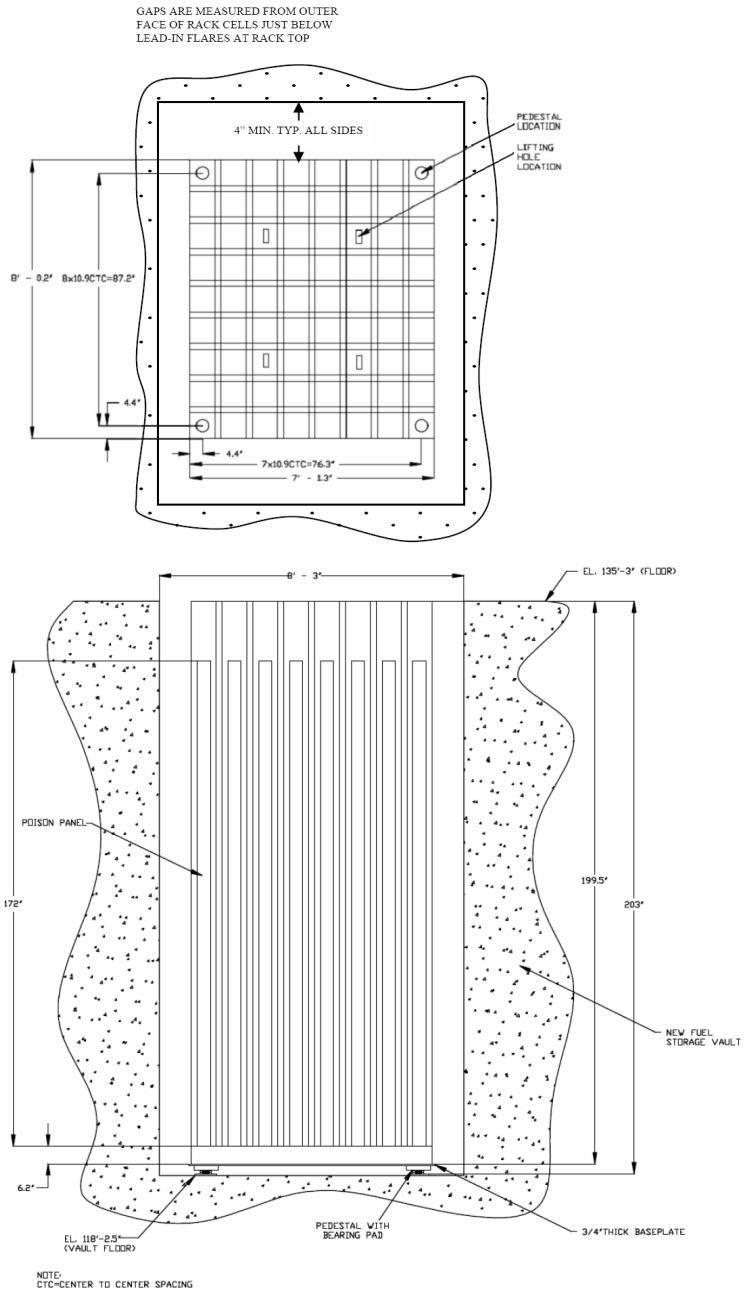
2. APP-FS01-S3C-001, Revision 1, “New Fuel Storage Rack Structural/Seismic Analysis”

3. Westinghouse Drawing APP-FS01-V2-002, Revision 1, “New Fuel Storage Rack Layout”

Design Control Document (DCD) Revision: (Revision 0, 1)

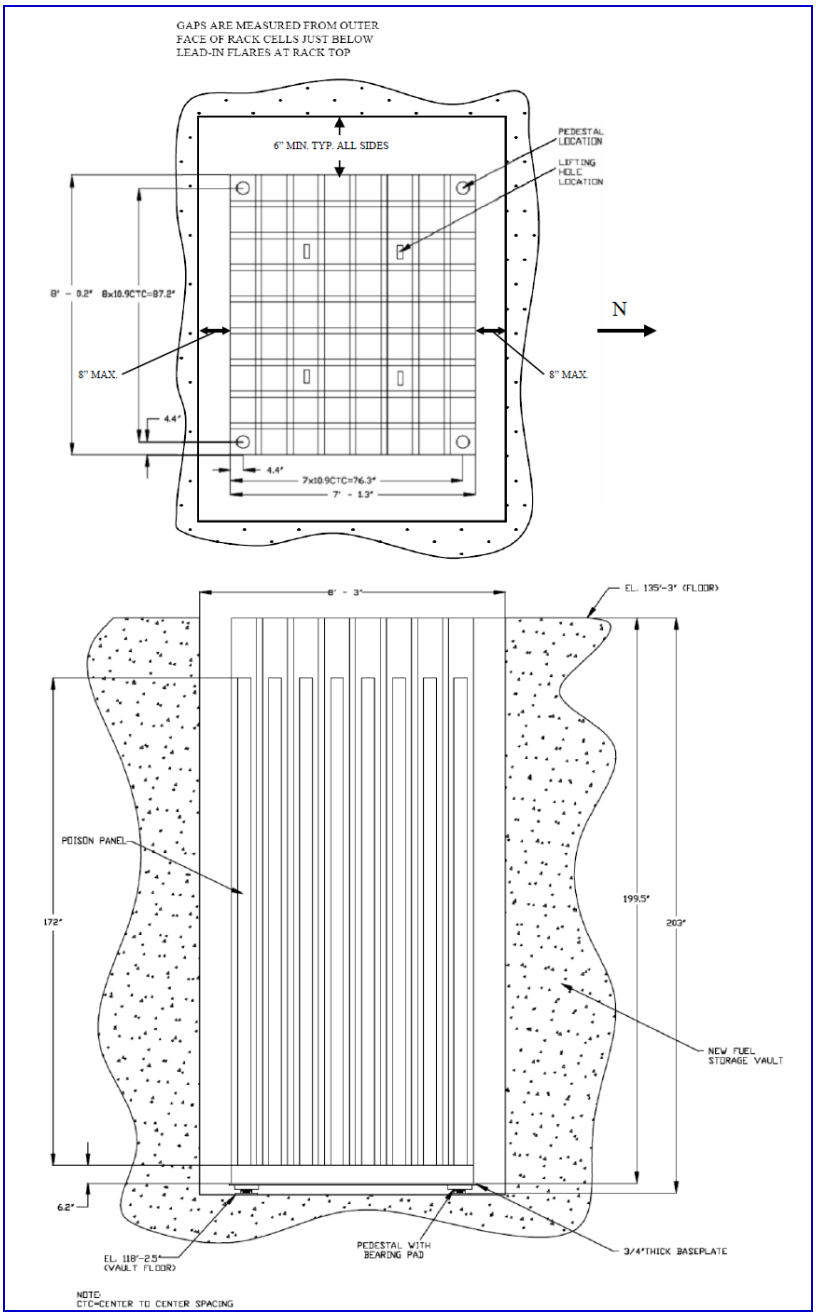
(Revision 2)

Replace DCD Figure 9.1-1 with the following figure:


GAPS ARE MEASURED FROM OUTER
FACE OF RACK CELLS JUST BELOW
LEAD-IN FLARES AT RACK TOP
4" MIN. TYP. ALL SIDES
PEDESTAL LOCATION
LIFTING HOLE LOCATION
8' - 0.2" 8x10.9CTC=87.2"
4.4"
4.4"
7x10.9CTC=76.3"
7' - 1.3"
8' - 3"
EL. 135'-3" (FLOOR)
POISON PANEL
172"
199.5"
203"
NEW FUEL STORAGE VAULT
6.2"
EL. 118'-2.5" (VAULT FLOOR)
PEDESTAL WITH BEARING PAD
3/4"THICK BASEPLATE
NOTE:
CTC=CENTER TO CENTER SPACING

DCD Changes (Revision 3B)

The DCD Change proposed by RAI Revision 2 above is no longer current. The following change to DCD Figure 9.1-1 (Sheet 1 of 2) represents the current design basis in TR44. The DCD Figure 9.1-1 (Sheet 2 of 2) is not modified by any revision of this RAI response.


GAPS ARE MEASURED FROM OUTER
FACE OF RACK CELLS JUST BELOW
LEAD-IN FLARES AT RACK TOP
6" MIN. TYP. ALL SIDES
PEDESTAL LOCATION
LIFTING HOLE LOCATION
8" MAX.
8" MAX.
4.4"
4.4"
7x10.9CTC=76.3"
7' - 1.3"
N
8' - 3"
EL. 135'-3" (FLOOR)
POISON PANEL
172"
199.5"
203"
NEW FUEL STORAGE VAULT
6.2"
EL. 118'-2.5" (VAULT FLOOR)
PEDESTAL WITH BEARING PAD
3/4"THICK BASEPLATE
NOTE:
CTC=CENTER TO CENTER SPACING

PRA Revision:
None

Technical Report (TR) Revision: (Revision 0, 1) (No changes for Revision 2)

The following statement will be added to Technical Report 44 addressing the design-basis seismic event potential changes in gaps between the new fuel rack and walls of the new fuel storage pit:

"Per DCD subsection 3.7.5.2, Combined License applicants will prepare site-specific procedures for activities following an earthquake. These procedures will be used to accurately determine both the response spectrum and cumulative absolute velocity of the recorded earthquake ground motion from the seismic instrumentation system. An activity will be to address measurement of the post-seismic event gaps between the new fuel rack and walls of the new fuel storage pit and to take appropriate corrective actions."

TR Changes (Revision 3B)

As discussed in the RAI Revision 3 response above, the quoted TR44 change associated with post-seismic gap discussions (included above from the previous revisions of this RAI) has been removed from TR44 for completeness and continuity. The RAI-SRP9.1.2-SEB1-01 response took the key applicable portion of this quoted statement "An activity will be…..appropriate corrective actions," and added it as a confirmatory change to DCD Section 3.7.5.2.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR44-025
Revision: 2A

Question:

In the markup of the DCD, provided in Section 5 of the topical report, Figure 9.1-1, New Fuel Storage Rack, is identified for deletion. Please explain why you are deleting this figure. This figure should be retained in the DCD.

New Question: (Revision 2A)

During the June 2010 audit, the NRC requested that dimension and gap information for the new fuel racks be clarified between the three similar RAIs (RAI-TR44-09, RAI-TR44-017, RAI-TR44-25) to show consistency and alignment to the current design basis shown in DCD Figure 9.1-1.

Westinghouse Response: (Revision 0)

We are in agreement. Revision 16 of the DCD will have a revised Figure 9.1-1 New Fuel Rack Layout. This figure will show the new fuel rack configuration in plan and elevation views identifying significant features and dimensions.

Westinghouse supplemental response from NRC Technical Meetings May 21 & 22, 2008 (Revision 1)

The new fuel rack has been changed to have additional storage cell height to protect control elements that are stored in the new fuel assemblies. Also the rack is not wedged in place in the North –South directions and is free to move within the new fuel storage vault. Revision 17 of the DCD and TR-44 revision 1 will have figures showing significant features and dimensions of the new fuel rack. The format for the new fuel rack significant features and dimensions is the same format reviewed and accepted by the NRC for the spent fuel racks. See changes in DCD revision and TR revision.

References:

1. APP-GW-GLR-026, Revision 3, “New Fuel Storage Rack Structural/Seismic Analysis,” (Technical Report Number 44)

Design Control Document (DCD) Revision: (Revision 0)

Yes- Figure 9.1-1 New Fuel Rack Layout will be revised in DCD Revision 16 to show the new fuel rack configuration in plan and elevation views identifying significant features and dimensions.

Westinghouse supplemental response from NRC Technical Meetings May 21 & 22, 2008 (Revision1)

Figures 9.1-1 (Sheet 1 of 2) and Figures 9.1-1 (Sheet 2 of 2) are changed as shown below.

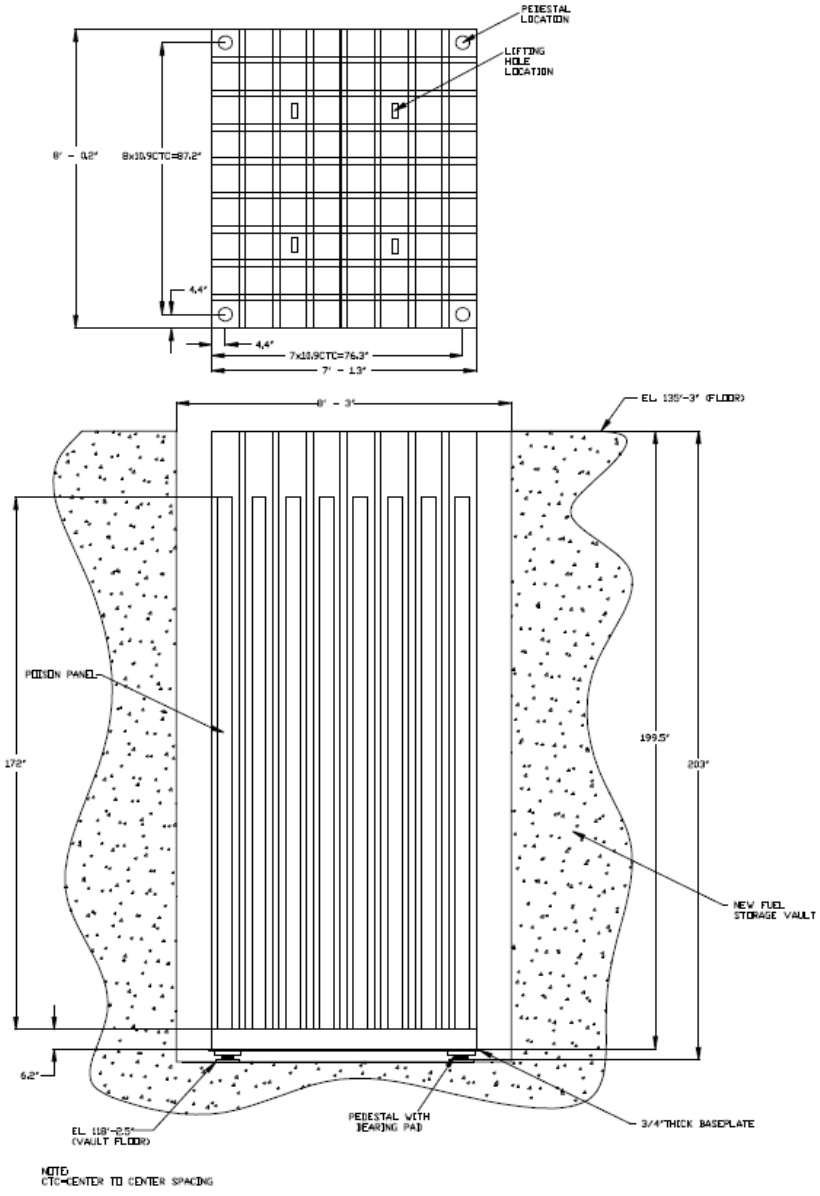


Figure 9.1-1 (Sheet 1 of 2)
New Fuel Storage Rack Layout (72 Storage Locations)

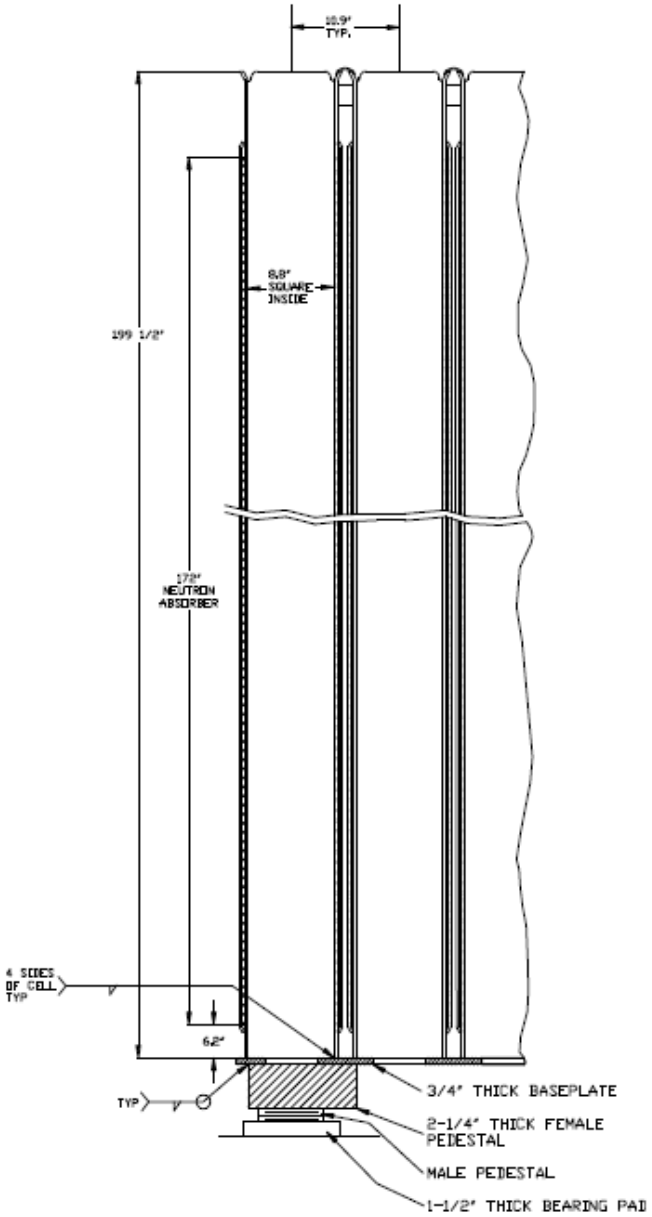


Figure 9.1-1 (Sheet 2 of 2)
New Fuel Storage Rack Cross Section

DCD Changes (Revision 2A)
The change provided in the Revision 1 DCD Markup Section to Sheet 1 of Figure 9.1-1 is outdated. The most recent change to this DCD figure is included in the Revision 3 response to RAI-TR44-17. The change provided in the Revision 1 DCD Markup Section of this RAI to Sheet 2 of Figure 9.1-1 is still applicable.

PRA Revision:
None

Technical Report (TR) Revision: (Revision 0)
Yes- Figure 9.1-1 New Fuel Rack Layout will be will be added to the revision of APP-GW-GLR-026, Revision 0, "New Fuel Storage Rack Structural/Seismic Analysis," (Technical Report Number 44).

Westinghouse supplemental response from NRC Technical Meetings May 21 & 22, 2008 (Revision 1)

Figures 9.1-1 (Sheet 1 of 2) and 9.1-1 (Sheet 2 of 2) shown in DCD revision are also placed in TR 44 Revision 1 subsection 2.1.1.

TR Changes (Revision 2A)

The equivalent new fuel rack layout figures (Sheets 1 and 2 of Figure 2-1) currently shown in the latest revision of TR44 (Reference 1) are correct.