PMSTPCOL PEmails

From: Foster, Rocky
Sent: Thursday, September 05, 2013 4:33 AM
To: Chakrabarti, Samir
Cc: STPCOL; Wunder, George
Subject: FW: Holtec fuel rack report review questions
Attachments: Comments on Holtec Responses 9-4-13.docx

Samir,

Attached are STP's initial response to the SFP Rack submittal. They will further this discussion during the September 18, 2013 public meeting, which I noticed yesterday.

Thanks,

Rocky

From: Bill Mookhoek [mailto:WEMookhoek@ninallc.net]
Sent: Wednesday, September 04, 2013 3:01 PM
To: Foster, Rocky
Cc: Scott Head
Subject: Holtec fuel rack report review questions

Rocky,
Please find attached our response to the question the staff reviewer had on the Holtec spent fuel rack report. We will also be discussing these further at the scheduled meeting on September 18. Please contact me if you have any questions.
Thank you,

Bill Mookhoek
wemookhoek@ninallc.net
office - 979-316-3014

Hearing Identifier: SouthTexas34Public_EX
Email Number: 3678

Mail Envelope Properties (26E42474DB238C408C94990815A02F09F412D17B83)

Subject: FW: Holtec fuel rack report review questions
Sent Date: 9/5/2013 4:32:36 AM
Received Date: 9/5/2013 4:32:38 AM
From: Foster, Rocky

Created By: Rocky.Foster@nrc.gov

Recipients:
"STPCOL" <STP.COL@nrc.gov>
Tracking Status: None
"Wunder, George" <George.Wunder@nrc.gov>
Tracking Status: None
"Chakrabarti, Samir" <Samir.Chakrabarti@nrc.gov>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	800	9/5/2013 4:32:38 AM
Comments on Holtec Responses 9-4-13.docx	18915	

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

Question 1:

The length of the tie-bar is not shown. (09.01.02-2 item a)

Response:

Tie bar details are shown in Figures 2.10 and 2.11. Figure 2.11 gives the tie bar length as "8 [203.2] MIN. LG. TIE BAR (TYP.)", where the value in brackets is the length in millimeters. This figure will be updated to improve readability in the next revision of the report.

Question 2:

The Tie-bar weld details are not legible.

Response:

Figure 2.11 shows that both sides of the tie bar are welded to the adjoining cell via a single sided fillet weld. The complete details are provided on the design drawing.

Question 3:

Table 6.1.1 shows load combinations for Level B which includes a stuck assembly. The report does not include this loading. (09.01.02-3 item c)

Response:

The stuck fuel assembly load is evaluated in the calculation package (HI-2135615 R1). The results for this load combination, however, are not summarized in the licensing report, since the seismic loads are the governing loads.

Question 4:

The report does not include fuel to cell gap. (Audit item 10 after 1-17-2012 audit)

Response:

The mean fuel to cell gap is 0.26" inches, which is documented in Appendix A of the calculation package (HI-2135615 R1). This dimension is based on a cell ID of 6.00" (which is given in Table 4.5.3 of the report) and a maximum fuel envelope dimension of 5.48" which is obtained from Table 1.3-1 of the DCD.

Question 5:

Fuel rattling is in unison. The report does not address out-of-phase which may be more critical.

Response:

The global dynamic response of the rack (i.e., rack displacements, pedestal loads) due to seismic loading is maximized if the stored fuel assemblies are assumed to rattle in unison. This is because the momentum transfer between the fuel assemblies and the spent fuel rack is maximized. This conservative modeling assumption has been used by Holtec and accepted by the NRC on numerous rack licensing applications over the past 20 years. Out-of-phase fuel motion, however, is considered when evaluating the stress in the tie bar welds. For this local stress evaluation, which is presented in Section 6.7.9.c of the Licensing Report, the stored fuel assemblies in two adjacent cells are assumed to move out-of-phase and simultaneously impact the cell walls producing the maximum tensile load on the tie bar (equaling the maximum fuel-to-cell impact load).

Question 6:

How is shear transferred from on cell to cell through the tie bars? (09.01.02-5 item (i) , 09.01.02-31).

Response:

During seismic loading, the flexural shear acting on the gross cell cross section is resisted by the six equally spaced tie bars (along the height of the cell) at every cell-to-cell corner location. The tie bar fillet welds are sized to resist the combined shear stress due to flexure and fuel-to-cell impacts. This is shown in the calculation package (HI-2135615 R1) and will be discussed in more detail at the September 18 meeting with the Staff.

Question 7:

Section 6.7.5 indicates that cell deformation remains elastic. The evaluation needs to include information about loads, structural configuration used in the evaluation, stress and acceptance criteria used in order for staff to determine acceptance. (9.01.02-5)

Response:

The complete details of the calculation are provided in Appendix D of the calculation package (HI-2135615 R1). This will be discussed in more detail at the September 18 meeting with the Staff.

Question 8:

In section 6.7.6 there is no discussion about the structural configuration used for computing the maximum allowable stress or how the stress was determined. Report does not include width of the bumper bar. (RAI same as 7)

Response:

More detailed information is included in the calculation package (HI-2135615 R1). The bumper bars are 1/2" thick and 6" wide. This will be discussed in more detail at the September 18 meeting with the Staff.

Question 9:

Report does not include information on how baseplate or bearing pad stresses were evaluated or acceptance criteria. (RAI same as 7)

Response:

The compressive stress on the baseplate due to rack-to-rack impacts is discussed in Section 6.7.6 of the report. The bearing pad acceptance criteria and qualification are presented in Sections 6.3 and 6.9. Further information is included in the calculation packages (HI-2135615 R1 & HI-2135569 R0).

Question 10:

Report does not include a comprehensive discussion on how various spring constants are determined and their values. Staff needs this information to determine if the methodology was acceptable. (09.01.02-5)

Response:

The determination of the spring constants is documented in Appendix A of the calculation package (HI-2135615 R1). The methodology used to determine the spring constants is consistent with previous rack licensing applications supported by Holtec (e.g., Clinton, AP1000, and Beaver Valley). Sensitivities runs were also performed in which the spring constant values were uniformly increased or decreased by 20% (see runs 18 and 19 in the table on page 6-23 of report). This will be discussed in more detail at the September 18 meeting with the Staff.

Question 11:

Sliding occurs at the interface of the rack pedestal and bearing pads. No discussion on why does not happen at bearing pad to pool liner.

Response:

The friction interface between the bearing pad and pool liner is not included in the WPMR model. This is because both components are fabricated from the same material (SA-240) and therefore this interface experiences more sliding resistance due to susceptibility to galling than the support/bearing pad interface (since the support pedestal is made from hardened alloy steel). As a result, frictional sliding is expected to occur at the support/bearing pad interface. This modeling assumption has been employed by Holtec and accepted by the NRC on numerous rack licensing applications over the past 20 years.

Question12:

Very little displacement data provided. Very close to the minimum distance to the edge of the bearing pad. Report does not include sensitivity studies to confirm that the rack displacement will be within the limits of the bearing pad for partial loadings - empty, half etc.

Response:

The maximum rack displacements given in Table 6.6.2 are the overall maximum displacements for all 7 racks in the SFP from all 21 runs (see table on page 6-23 of report). The 21 runs performed consider all degrees of rack loading (i.e., full, half loaded, empty). In particular, run 21 assumes that all racks are empty (i.e., no fuel). Run 17 considers a "mixed loading" configuration wherein the number of fuel assemblies stored in each rack varies. The exact arrangement of the stored fuel assemblies in the spent fuel racks for run 17 is depicted in Figure 6.6.1. The remaining 19 runs assume that all seven spent fuel racks are fully loaded, which tends to be controlling for displacement.

Question 13:

Chapter 7 does not clearly indicate the drop location for the deep drop scenario relative to the location of the support leg. Energy balance model using MATHCAD is a significant departure from LS-DYNA analysis presented at the March 20, 2013 meeting. Applicant needs to clearly describe in the report the energy balance model used and how it is benchmarked in to order to determine acceptability. (09.01.02-4)

Response:

Two deep drop scenarios are considered. The first is a deep drop of a fuel assembly into a cell that is directly above a support pedestal. The second is a deep drop of a fuel assembly into the cell nearest the center of the rack with no credit taken for the center support leg. The energy balance method yields conservative results as compared to the more detailed LS-DYNA finite element approach based on previous experience. Since the STP 3&4 racks are designed with thicker base plates (1.5") and thicker cell walls (0.094") than the typical spent fuel rack, it has greater capacity to absorb the impact load from a drop fuel assembly, which allows the use of the more conservative approach.