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February 21, 2012 ZS-2013-0083

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Zion Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-39 and DPR-48
NRC Docket Nos. 50-295 and 50-304

Subject: Response to Requests for Additional Information for Questions 1, 2, 4 and 5

Reference: 1. Request For Additional Information Regarding The Upgraded Fuel Handling Building Crane System As A Single-Failure Proof Crane For Zion Nuclear Power Station, Unit 1 And 2 (Tac Nos. J00433 and J00434), dated December 18, 2012

Zion*Solutions*, LLC (ZS) has reviewed the subject Requests for Additional Information (RAIs) and has attached responses for Questions 1, 2, 4 and 5 to this letter.

A calculation revision was performed to demonstrate that the interaction ratios are less than 1.0 for Questions 1, 2 and 4. Updated interaction ratios are provided for those questions. A discussion of the requirements for including wind loads is provided for Question 5.

This completes the response to the RAIs contained in Reference 1.

If you have any questions, please call Jack Bailey at (224) 789-4138.

Respectfully,

Patrick Daly
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cc: John Hickman, USNRC Senior Project Manager
Service List

Attachment 1: Responses to RAIs 1, 2, 4 and 5

NSME20

Zion Nuclear Power Station, Unit 1 and 2 License Transfer Service List

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RESPONSEs TO RAIs 1, 2, 4, & 5

Question received from, NRC on December 18, 2012:

1. Page 17 of the LAR submittal states: "All of these members pass the code check except for the girder on Column Line P for two load cases. The interaction ratios for shear capacity in these two cases were 1.038 and 1.048. This girder has gusset plates that were not included in the model." Please provide the results of the analysis with the subject gusset plates included in the model which could bring the interaction ratio to below unity.

Response:

The AMG girder along column line P, STAAD member 55, had interaction ratios (IR's) for shear capacity of 1.038 and 1.048, for two of the models in the initial code check. This member is the segment between the crane runway beam and the column line as shown in drawing B-402. This segment has 1/2" thick gusset plates either side of the AMG girder that extend for 8'-8" in the direction of the governing shear force as shown in drawing B-403, Detail E. The gussets were not included in the model and are shown in the calculation to contribute an additional 1064 kips of shear capacity.

Calculation ZION001-CALC-002 was revised to calculate an IR based on the additional shear capacity. The revised IR is 0.204 for the worst case (previously 1.048) with the other case (previously 1.038) determined to be less than 0.204 by comparison.

During the preparation of Revision 2 of ZION001-CALC-002, the contractor determined there were four other code checks producing IR's greater than 1.0. This affects the paragraph in the LAR submittal quoted above in RAI #1 accordingly, bringing the total to six load case/member combinations with IR's above one. The additional cases are for two W14x43 bracing members along column line 23 at the crane girder elevation as shown on drawings B-402 and B-403. In two load cases, the code check of these two members resulted in IR's of 1.041, 1.108, 1.197, and 1.274. The two load cases are for OBE forces. The Zion DSAR requires allowable stresses for OBE to be in accordance with the AISC specification. A 1/3 allowable stress increase is permitted for earthquake forces per the specification. The allowable stress increase is applied in the calculation and the resultant IR's are shown to be 0.78, 0.83, 0.90, and 0.96 respectively. An independent review of the STAAD output was performed by the contractor and no other members beyond those described above were determined to have IR's greater than 1.0.

Question received from, NRC on December 18, 2012:

2. The second table on page 17 of the LAR submittal shows an interaction ratio equal to 1.016 (156.39 kips [actual] versus 154 kips [allowable]) for the maximum resultant connection load under operating basis earthquake (OBE) loading. This interaction ratio is not acceptable. Please provide a conservative modification [method] that could bring the interaction ratio to below unity for the staff to review.

Response:

The loads provided in this section were developed in calculation ZION001-CALC-002 Revision 1. These values are based on a maximum axial compressive force in a beam member supporting the roof. The resultant force is caused by modeling the shear studs as special links between the centroid of the concrete roof and the centroid of the roof steel. This method of modeling induces an axial load on the beam member due to relative deformation between the slab and the beam. Any lateral load on the beams at the roof level will be due to the local effects from the braces which frame into these beams, since the roof diaphragm is the stiffest element in the lateral force resisting system and will take the majority of the global force effects.

Based on this, the maximum axial force of 49.11 kips for beam B14 calculated in Revision 2 to calculation ZION001-CALC-002 is developed from the maximum enveloped axial end forces from cross braces HB4 and HB5 that are framed into the beam. The IR for the beam is thus reduced to 0.319.

Question received from, NRC on December 18, 2012:

4. The loads identified in the "Shear Walls" table located on page 19 of the LAR submittal are very close to the allowable loads. In particular, the "maximum axial load" is greater than the allowable load (512 Kips versus 508 Kips) and the subsequent interaction ratio of 1.008 is unacceptable. Please provide a conservative reanalysis [method] that could bring the interaction ratio to below unity for the staff to review.

Response:

The loads shown were developed in ZION001-CALC-002 Revision 1. This value is based on SSE design loads compared to OBE allowable stress capacities. This is a conservative bounding evaluation performed in lieu of performing two separate evaluations for OBE and SSE. In accordance with the Zion DSAR, the capacity of concrete members under SSE load combinations is based on Ultimate Strength Design. A reanalysis was performed in Revision 2 of ZION001-CALC-002) comparing OBE loads against the 508 kip allowable and using Ultimate Strength Design to evaluate the SSE load of 512 kips. The resulting IR's are 354/508=0.698 and 512/1406=0.364 respectively.

Question received from, NRC on December 18, 2012:

5. The licensee stated that a seismic analysis was performed in accordance with ASME NOG-1, 2004, "Rules for Construction of Overhead and Gantry Cranes." However, on page 23 of the LAR submittal, "Crane operational load cases in Section 4140 of the ASME NOG-1," and "Crane seismic event loads in Section 4140 of the ASME NOG-1," the wind load for operating, design, and tornado were omitted. Please provide a technical justification regarding the absence of the wind load for operating, design, and tornado were not included in the analysis.

Response:

NOG-1 load cases for the crane with regard to wind loads are not applicable as this is an indoor crane. Zion DSAR Table 3-5 lists the seismic Class I load combinations for the Fuel Handling Building (FHB). The design wind load (W) and maximum credible tornado wind load (W') are not combined with earthquake loads in DSAR Table 3-5 or proposed Table 3-5A load cases. Since the wind loads are not included in seismic load cases, calculation ZION001-CALC-002 does not analyze the wind loading. The original FHB calculations continue to be the design basis for the DSAR required building wind load evaluations. Calculation ZION001-CALC-002 Revision 2 evaluates the effect of the additional new trolley weight (approximately 3600 lb.) on the original wind load analyses and determined the extra mass to be negligible compared to the combined mass of the bridge, trolley, and live load. The resulting change to the building members is therefore insignificant. In addition, ZS recognizes this limitation of the evaluation and has committed to control heavy load movements if a tornado watch or warning has been declared for the site by the National Weather Service. These actions are identified in the List of Regulatory Commitments already contained in the License Application Request.