10 CFR 50.59
10 CFR 50.90

March 4, 2013 ZS-2013-0092

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

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

Subject: Update to the Rail Clip Analysis Supplementing the Request for Amendment to Approve Methods of Analysis, use of the Upgraded Fuel Handling Building Crane System as a Single-Failure Proof Crane and Approval of a NUREG 0612 Compliant Heavy Loads Handling Program

Reference: 1. ZionSolutions, LLC Letter, Daly to NRC, "Request for Amendment to Approve Methods of Analysis, use of the Upgraded Fuel Handling Building Crane System as a Single-Failure Proof Crane and Approval of a NUREG 0612 Compliant Heavy Loads Handling Program," dated October 25, 2012.

Reference: 2. ZionSolutions, LLC Letter, Daly to NRC, "Additional Information Supplementing the Request for Amendment to Approve Methods of Analysis, use of the Upgraded Fuel Handling Building Crane System as a Single-Failure Proof Crane and Approval of a NUREG 0612 Compliant Heavy Loads Handling Program." dated December 20, 2012.

ZionSolutions, LLC (ZionSolutions) submitted Reference 1 to request that the NRC amend the ZionSolutions licenses to allow for use of an upgraded Fuel Handling Building Crane as a single failure proof crane in accordance with the applicable criteria listed in NUREG-0554 "Single-Failure-Proof Cranes for Nuclear Power Plants" and to criteria appropriately selected from NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36" Appendix C."

In Reference 2, ZionSolutions provided the proposed modification to the runway clip arrangement and its supporting analysis that demonstrated its acceptability during a seismic event with full load. During reviews conducted during the assembly of the design change package to be used for installation of the crane rail clip modifications, ZS engineers identified one issue with the design detail, one issue with the analysis, and an issue with the basis for an assumption. These issues were:

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- Initial specification of slotted holes in the direction of the applied load for a connection designed as a bearing type connection, which is not allowed per the AISC code. The connection detail was changed.
- An analysis included establishing the bolt allowable based on taking credit for a double shear connection in the bolt design for a condition where the bolt was only subjected to single shear for the design loading condition. The bolting material was changed and the analysis revised to demonstrate compliance with the code.
- The assumption for the 175 lb crane rail being 50ksi material was insufficiently supported by basis documentation. Additional documentation and evaluation of the crane runway rail yield strength were incorporated into the calculation.

These issues resulted in updating the supporting analysis (ZION001-CALC-034) and modification of one of the drawings previously supplied to the NRC, as well as specifying a different material for the bolts. The drawing is ZION001-C-028 Sheet 3, which details the rail clip design.

Attachment 1 was previously submitted in Reference 2 and provided a summary of ZION001-CALC-034. The summary attached to this letter contains a marked up version of that Attachment that incorporates the changes as a result of the revision to the calculation. These changes include:

- Modification of the Assumption Statement: ZS performed a review of existing documentation of the crane rail material and provided a documented basis supporting the assumption for the 50 ksi material input value. This documentation is now referenced in Calculation ZION001-CALC-034Rev. 1 as a design input. Accordingly, the assumption has been removed from the calculation.

- Analysis Description and Summary Load Table: The description of the analysis in the attachment is unchanged, however, the table containing Load/Stress and Allowable has one change which is shown. Only the rail clip at the column tie-backs is affected by the issues raised above. Due to the change in bolting configuration and bolting material, Clip 1 became the limiting condition for block shear.

- Drawing Changes: The drawing changes to C-208 Sheet 3 are identified on the drawing and provide specific pretension requirements for the bolts, a change in the bolting material, eliminated the short slot holes and allow for removal of material from the nose of the clip at the tie back connection if needed.

Please consider this information as the supplement to Reference 1 to progress the staff's review.

ZionSolutions has included these occurrences in the ongoing Apparent Cause Analysis, described in Reference 2, and will be considered as part of that evaluation.

The License Amendment Request provided in Reference 1 will be updated through page changes, with the information contained in Attachments 1.

ZionSolutions is notifying the State of Illinois of this request for change to the operating license by transmitting a copy of this letter and its attachments to the designated State Official.

Respectfully,

Patrick Daly
Senior Vice President & General Manager
ZionSolutions, LLC

cc: John Hickman, USNRC Senior Project Manager
Service List

Attachment 1: Updated Crane Rail Clip Modification Description and Analysis Summary
February 2013

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

cc:

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Attachment 1:

Crane Rail Clip Modification Description and Analysis Summary Calculation ZION001-CALC-034 Fuel Handling Building (FHB) 125 Ton Crane Rail Clip Modification and Rail Evaluation

In the Seismic Analysis Summary section of the License Amendment Request a new section "h." will be added. This section will provide the calculation summary that describes the analysis of the bridge runway rail and rail clips following addition of the modified rail clips. This modification will be completed prior to use of the crane as a single failure proof crane. Drawings associated with the rail clip design and the placement of the rail clips on the runway girder are included as part of this attachment.

The addition to the License Amendment request is provided below:

h. Calculation ZION001-CALC-034, Fuel Handling Building (FHB) 125 Ton Crane Rail Clip Modification and Rail Evaluation

Summary: Calculations performed in calculation ZION001-002, Appendix B, demonstrated that the original runway rail and rail clip design is not adequate for the new design basis load case for a seismic event with a load on the hook. This new calculation evaluates the proposed rail clip modification and the runway rail with the proposed modification installed.

Model/Methodology Description: Simplified hand calculations are used to design a new crane rail clip assembly using MathCad 15. Governing crane wheel forces at the top of the crane rail for all crane and trolley positions for each of the load combinations from Attachment 56 of Ref. 3.7 are considered in the calculation for the new rail clip design. As-built survey data of the crane runway rail determined the maximum existing clip center to center spacing to be 2ft.-7in. The majority of the existing clips are 2 ft.-0 in. center to center spacing. The new rail clips will be installed between two existing rail clips providing generally the same center to center spacing (2 ft. -0 in.) as the existing design.

Conservatively, the new clips are designed for full wheel forces applied to a single rail clip without relying on the distribution of forces to the adjacent existing clips providing unanalyzed margin.

When a horizontal seismic load from the crane wheel is applied to the head of the crane rail, the force is decoupled into a bearing force on one edge of the crane rail base (bottom flange) along with the corresponding shear force and an uplift force on the opposite edge of the crane rail base (bottom flange). There are rail clips on each edge of the base (bottom flange) of the crane rail. Therefore each clip will either see force from shear with corresponding bearing or force from uplift. No credit is taken for friction between the bottom flange of the rail and the girder. On the bearing side, clips and bolts are designed for the applied shear force. On the uplift side rail clips and bolts are designed for the bending moment due to the rail bearing on the rail clip support.

The crane rail is checked for the applied forces for web shear, web bending and local rail base (bottom flange) bending.
The rail clip is connected to the top flange of the bridge runway girder. A local stress check of the crane runway girder flange for the applied rail clip forces is also performed. Crane girder global analysis for the applied new rail clip forces is not within the scope of this calculation. Calculation ZION001-CALC-002 (Ref. 3.7) describes the crane runway girder analysis.

Assumptions: ~~Assume existing 175 lb crane rail is 50ksi material. Per documentation attached to the calculation, minimum yield stress for rail head, rail web and rail base (bottom flange) for controlled cooled crane rail range from 65ksi to 90 ksi. Therefore, this is a conservative assumption and does not need to be verified.~~ None

Results: The highest loads and stress values along with allowable values are listed below. Note there are two clip styles; Clip 1 is the standard clip, Clip 2 is located at column tie-backs. The values below are for the limiting clip style for each load type.

Component/Load Description	**Load/Stress**	**Allowable**
Bending in clip due to uplift (Clip 2)	34.516 ksi	37.5 ksi
Shear in clip due to uplift at reduced section (Clip 1)	7.055 ksi	20 ksi
Bearing in clip at bolt location (Clip 1)	23.383 ksi	45 ksi
Block shear in clip (Clip ~~2~~ 1)	72.34 kip	~~85.55~~ 122.891 kip
Bolt Tension (Clip 1)	17.515 kip	53.7 kip
Bolt Shear (Clip 1)	36.17 kip	39.8 kip
Girder flange local bending due to tension in clip	5.015 ksi	27 ksi
Girder flange local bending due to compression	25.973 ksi	27 ksi
Girder flange local bearing	14.289 ksi	32.4 ksi
Girder flange local block shear	72.34 kip	299.334 kip
Crane rail local web shear	9.114 ksi	20 ksi
Crane rail local web bending	32.427 ksi	37.5 ksi
Crane rail minor axis bending	31.325 ksi	37.5 ksi
Crane rail bottom flange local bending	20.094 ksi	37.5 ksi

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: ZIONSOLUTIONS ZION NUCLEAR POWER STATION ISFSI PROJECT FHB CRANE RAIL MODIFICATION DETAILS DRAWING NO. ZION001-C-208

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