

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-282/89024(DRS); 50-306/89024(DRS)

Docket Nos. 50-282; 50-306

Licenses No. DPR-42; DPR-60

Licensee: Northern States Power Company
414 Nicollet Mall
Minneapolis, MN 55401

Facility Name: Prairie Island Nuclear Generating Station, Units 1 and 2

Inspection At: Fluor Daniel Inc. Office, Chicago, Illinois

Inspection Conducted: December 7-8, 1988, April 12, and August 29-31, 1989

Inspector: *D. H. Danielson*
J. A. Gavula

10/3/89
Date

Approved By: *D. H. Danielson*
D. H. Danielson, Chief
Materials and Processes
Section

10/3/89
Date

Inspection Summary

Inspection on December 7, 1988, through August 31, 1989 (Reports No. 50-282/89024(DRS); No. 50-306/89024(DRS))

Areas Inspected: Special safety inspection of engineering activities related to ongoing IE Bulletin 79-14 reviews (37701), Copes Vulcan Valve discrepancies and licensee action on previously identified concerns (92702).

Results: Of the areas inspected, one violation without a Notice of Violation, in accordance with 10 CFR 2, Appendix C (failure to implement adequate design control measures during the IE Bulletin 79-14 program), was identified (see Paragraph 2). Based on the results of the inspection, the NRC inspector noted the following:

- The licensee's recently completed reviews of all of the piping analyses from the original IE Bulletin 79-14 program were well managed.
- Since re-analyses of several piping systems produced stress levels outside USAR allowables and required a modification to the support configuration, the design controls in place during the original IE Bulletin 79-14 program were not completely effective.

DETAILS

1. Persons Contacted

Northern States Power Company (NSP)

- *G. Rolfson, Lead Engineer
- *J. Donatelli, Engineer
- *M. McKeown, Engineer

Fluor Daniel, Inc. (FDI)

- *T. Snyder, NSP Project Director
- *A. Settler, Project Manager
- *B. Dickerson, Senior Design Engineer
- *D. Madan, Manager, Mechanical Department
- *R. Arthurs, Quality Assurance Manager

*Denotes those attending the exit meeting on August 31, 1989.

2. Licensee Action on Previously Identified Items (92702)

- a. (Closed) Violation (282/88017-01; 306/88017-01):
The technical basis for performing safety evaluations on discrepancies in as-built piping configurations was not adequately established.

The licensee's response to the violation, dated November 11, 1988, was reviewed and determined to be acceptable. All subsequent operability evaluations used the Criteria for Determining Justification for Continued Operation When Encountering Major Discrepancies in "As-Built" Safety-Related Piping, dated September 21, 1988. Based on reviews documented in Paragraph 3 of this report, this item is considered closed.

- b. (Closed) Unresolved Item (282/88017-02; 306/88017-02):
Discrepancies between the as-built and as-analyzed configurations of piping systems need to be reconciled.

This item was associated with the ongoing program to review the original IE Bulletin (IEB) 79-14 documentation for inconsistencies in applying the reconciliation criteria. As a result of this two year program, it was determined that the original work had not reconciled and corrected all of the as-built discrepancies. Examples of discrepancies which were found during this review program are as follows:

- ° Non-conservative response spectra were used in some of the original analyses.
- ° Socket weld stress intensification factors were not included in certain analyses.
- ° Uplift loads on various rod hangers were not accounted for.
- ° Shear lugs did not exist on an axial restraint.
- ° An anchor was assumed for analytical purposes when only a two way restraint existed in the field.

In addition to the above problems, the discrepancy with the weight and center of gravity for Copes Vulcan Valves was discovered and reconciled during this program. In total approximately 25 subsystems required modification of varying degrees to bring them back to within USAR stress allowables. Although these systems exceeded the code allowable stresses, the operability evaluations provided a basis for justifying continued operation until modifications were implemented.

Based on the above discussion, it can be concluded that design controls in place during the original IEB 79-14 program were inadequate. However, the corrective actions to address this deficiency were basically implemented through the current IEB 79-14 review program. This self-initiated program reviewed all of the analytical parts from the original IEB 79-14 work and reconciled any noted discrepancies. During this program, additional as-built walkdowns were performed to verify portions of some analyses. The conclusions drawn from this phase of the program indicated that the original walkdown data was accurate and adequately provided to the stress analyst. The deficiencies in the original program appeared to have been associated with the evaluation and subsequent actions taken based on the walkdown information.

Based on the comprehensive nature of this program, as well as the multiple interim NRC inspections of the program implementation, the corrective actions to determine the full extent of the violation and followup actions to correct the present conditions have been completed. Therefore, pursuant to the NRC Enforcement Policy (10 CFR Part 2, Appendix C, Section V.G.) no Notice of Violation was issued for this item since the five criteria were met.

3. Review of IE Bulletin (IEB) 79-14 Calculations (37701)

As part of the NRC followup inspections, the following piping analyses or piping support calculations were reviewed:

- ° Pipe Stress Report No. PI-206-17
Analytical Part No. 7
- ° Pipe Stress Operability Analysis Calculation No. JC01
Analytical Part 1 (11A), Revision 0, October 20, 1988
- ° Pipe Stress Report No. PI-205-13 & 14
Analytical Part 1DB, Revision 0, May 4, 1988
- ° Pipe Stress Report No. PI-205-24
Analytical Part 122, Revision 1, July 7, 1988

During a detailed review of one of the above analyses, it was noted by the NRC inspector that the stress combination from the Pipe Stress Program did not add up correctly. When questioned, the FDI engineers stated that the B31.1, 1967 Piping Code excluded torsional movements in the stress combination and, as such, were not included in that portion of the computer program. Since this interpretation of B31.1 represented a technical difference of opinion with the NRC inspector, the licensee was asked to document their position.

A letter was subsequently submitted by NSP on January 10, 1989, documenting the basis for their position. In that letter, NSP committed to provide a more detailed technical justification for their position by March 1989. On March 8 and May 1, 1989, supplemental information was supplied to the NRC by NSP, with the results of additional investigations into the applicability and significance of torsional moments in B31.1-1967 piping analyses. All of the above information was reviewed by the NRC staff at the Office of Nuclear Reactor Regulation (NRR). The staff's August 16, 1989, evaluation of the licensee's submittals concluded the following:

- a. It is understood that all Codes have been changed over a period of time to incorporate improvements and new criteria resulting from evolution of knowledge and available data. We further concur that the licensee did not violate the Code in this specific case of application, simply because B31.1-1967 Code did not explicitly require inclusion (or exclusion) of torsional moments in seismic design.
- b. As indicated in the preface of B31.1-1967 Code, the Code is not intended to be a handbook and, in certain circumstances, cannot substitute for education, experience, and sound engineering judgement. The effects of torsional moment depend on configuration of a pipe run and amount of eccentricity of connected components,

such as pumps and valves. As shown in Figure 1 of the Teledyne study in the licensee's submittal, although a small amount of torsion is inconsequential, a large amount will reduce piping structural capability significantly. Thus, we conclude that as a good engineering practice, torsional moment should be included in calculating resultant stresses due to occasional (including seismic) loads.

- c. In the licensee's later submittals, a sample study to assess the impact of neglecting torsion effects on piping stresses analyzed using the B31.1-1967 Code was discussed. Samples of existing piping analyses were selected randomly, using a sample size that provides a confidence level of 95%. Reanalysis of selected samples indicated that their resultant stresses, with torsional effects included, are within the USAR allowables with ample margin. Therefore, our evaluation concludes that the issue of neglecting torsional effects on the resultant stresses in the plant constitutes no safety concern.
- d. The licensee shall include torsional effects in calculating resultant stresses under occasional loads in all future piping analysis or reanalyses.

The licensee's July 31, 1989, letter to the NRC provided NSP's commitment for compliance with item "d." above. Based on this information, the torsional moment issue has been resolved and this issue is closed.

The following additional calculations were also reviewed by the NRC inspector:

- ° Support No. 2-RS1H-283, Revision A, December 23, 1988
- ° Support No. 2-RRCH-269, Revision 1, January 9, 1989
- ° Support No. 2-RRCH-271, Revision A, December 29, 1988
- ° Pipe Stress Report No. PI-206-X
Analytical Part 1 (115, 116), Revision 0, June 27, 1988
- ° Support No. 2AFWH-77, Revision A, January 14, 1989

During the course of the above reviews, the NRC inspector noted that for integral attachments, there were no evaluations of localized stresses induced into the piping due to increased support loads. ANSI B31.1-1967, Paragraph 121.3.2.a. requires that localized stresses be considered when evaluating the effects of support loads on piping.

In response to this concern, the FDI engineers stated that the original localized stress consideration was very conservative. As such, it was judged that during the IEB 79-14 program, further evaluation would not be needed. Pending the licensee's review of all integral attachments with load increase for localized stress effects or the substantiation of the conservative nature of the original evaluation criteria, this is considered an Unresolved Item. (282/89024-01; 306/89024-01)

Other than noted above, no violations or concerns were noted during these reviews.

4. NSP Quality Assurance Audit

During a review of the drawings for the above support modifications it was noted by the NRC inspector that sketches sometimes were issued to the field and control of the documents was questionable. Based on this comment, the licensee requested that an internal NSP QA audit be performed on the overall IEB 79-14 project.

In January 1989, NSP's Nuclear Operation Quality Assurance Department performed an audit on the modification aspect of the IEB 79-14 project. The following two findings/deficiencies were issued as a result of this audit:

- a. The project did not formally invoke the current requirements for implementation of the Uniform Modification Process.
- b. For IEB 79-14 modifications completed during 1988, there was no formal control for reviews, approvals, revisions, distribution, indexing or filing of drawings.

Corrective action implemented to address the above concerns included a walkdown of all of the recent installations related to the IEB 79-14 project. These were verified to be in accordance with the design requirements. In addition, all future modifications were incorporated under a new modification number and performed in accordance with the current administrative requirements.

Based on the review of NSP Audit Report No. AG 89-3-12, the previous concerns of the NRC inspector have been adequately addressed.

5. Unresolved Items

An unresolved item is a matter about which more information is required in order to ascertain whether it is an acceptable item, an open item, a deviation or a violation. One unresolved item was disclosed during this inspection and is discussed in Paragraph 3.

6. Exit Interview

The Region III inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on August 31, 1989. The inspector summarized the purpose and findings of the inspection. The licensee representatives acknowledged this information. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed during the inspection. The licensee representatives did not identify any such documents/processes as proprietary.