



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W.
 ATLANTA, GEORGIA 30323

Report No.: 50-261/85-06

Licensee: Carolina Power and Light Company
 411 Fayetteville Street
 Raleigh, NC 27602

Docket No.: 50-261

License No.: DPR-23

Facility Name: H. B. Robinson

Inspection Conducted: January 14 - 17 and 21 - 24, 1985

Inspectors:	<u><i>J. J. Blake</i></u>	<u>2/6/85</u>
	for W. P. Ang	Date Signed
	<u><i>W. C. Liu</i></u>	<u>2/7/85</u>
	W. C. Liu	Date Signed
Approved by:	<u><i>J. J. Blake</i></u>	<u>2/6/85</u>
	J. J. Blake, Section Chief	Date Signed
	Engineering Branch	
	Division of Reactor Safety	

SUMMARY

Scope: This routine, announced inspection involved 82 inspector-hours on site in the areas of Seismic Analysis for As-Built Safety-Related Piping Systems (IEB 79-14) and pipe support baseplate designs using Concrete Expansion Anchors (IEB 79-02).

Results: Two apparent violations were found.

REPORT DETAILS

1. Licensee Employees Contacted

- *M. A. McDuffie, Senior Vice-President, Nuclear Generation
- ****G. P. Beatty, Manager, Robinson Nuclear Production
- **R. Morgan, Plant Manager
- **H. R. Banks, Manager, Corporate QA
- ****J. M. Curley, Technical Support Manager
- ***M. Page, Engineering Supervisor
- ***C. Wright, Senior Specialist, Regulatory Compliance
- **C. L. McKenzie, Principal QA Engineer
- **G. R. Campbell, Senior Engineer, Nuclear Engineering and Licensing Division
- B. Nauhria, Senior QA Engineer

Other Organization

EBASCO Services Incorporated

- **T. D. Davenport, Manager of Engineering
- **R. Lehrer, Project Manager
- **J. D. Sykes, Civil Engineering Manager
- **H. D. Borque, Project Engineer
- J. Hatcher, Lead Stress Engineer

NRC Resident Inspectors

- *H. Krug
- *W. Whitcomb

- *Attended exit interview (site)
- **Attended exit interview (EBASCO)
- ***Attended both exit interviews
- ****Attended site exit and attended EBASCO exit by telephone

2. Exit Interview

The inspection scope and findings were summarized on January 17 and 24, 1985, with those persons indicated in paragraph 1 above. The licensee was informed at the exit and on January 29, 1985, of the inspection findings listed below. The licensee acknowledged the inspection findings with no dissenting comments.

(Open) Violation 261/85-06-01, Technical Specification violation regarding piping/restraint operability, paragraph 5.

(Open) Violation 261/85-06-02, Pipe restraint calculation discrepancies, paragraph 5.

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item 83-11-01, Diesel generator exhaust piping analysis. This item identified a need for the licensee to perform a seismic analysis for the diesel generator exhaust piping. The licensee's A/E performed a chart method analysis of the piping. The analysis was inspected. This item was closed.

(Closed) Unresolved Item 80-24-03, Cross reference new loads. This item identified a need for the licensee to use new support loads generated by the IEB 79-14 program in IEB 79-02 Concrete Expansion Anchor Design Calculations. During this inspection, the licensee revised IEB 79-02 and the 79-14 program was reviewed and calculations sampled. The inspection indicated that 79-14 generated support loads are now being used for IEB 79-02 Design Calculations. See paragraph 5 for additional details. This item was closed.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Pipe Support Baseplate Designs Using Concrete Expansion Anchors (IEB 79-02) and Seismic Analysis for As-Built Safety-Related Piping Systems (IEB 79-14)

A follow-on inspection to the NRC/RII inspection documented on Report Number 50-261/84-12 was performed to verify licensee compliance with IEB 79-02 and 79-14 requirements and licensee commitments. On June 29, 1984, the licensee submitted a supplemental response providing a completion schedule for IEB 79-02 and 79-14. The response was reviewed and discussed with the licensee.

A third party audit for the licensee's IE Bulletin 79-02/79-14 program was prepared by the Impell Corporation, (Impell) for the licensee. Impell's final report dated March 7, 1984, was reviewed and discussed with the licensee. Various open items identified by Impell were evaluated and resolved by the licensee and its A/E, EBASCO. An Impell follow-up audit was performed and a report issued on September 5, 1984. The report was reviewed and discussed with the licensee. As a result of the open NRC items regarding IEB 79-02/79-14 and the Impell findings, the licensee and its A/E re-performed walkdowns on 20 stress problems, identified generic concerns from the sample and performed a walkdown on the remainder of the stress problems for any missing information and generic findings. In addition, the licensee re-performed inspections of all seismic restraints. Subsequent to the walkdowns/inspection the licensee's A/E re-performed piping analysis and restraint calculations as required. The above noted work resulted in the

A/E's identifying a need to perform 662 modifications on 580 restraints. The licensee reported that 450 restraints were modified during the recent SG replacement outage. The licensee stated that operability evaluations were performed on the remaining 130 pipe restraints. The restraints were considered operable and would be modified by the end of the next refueling outage. Discussions with the licensee revealed that the operability criteria used for concrete expansions anchors was a safety factor of one. The licensee was informed by the NRC inspector that IEB 79-02, Revision 1, Supplement 1 required the following:

For the following two cases, plant operation may continue or may begin:

- a. For the support as a unit, the factor of safety compared to ultimate strengths is less than the original design but equal to or greater than two.
- b. For the anchor bolts, the factor of safety is equal to or greater than two and for the support steel the original design factor of safety compared to ultimate strengths is met.

The above criteria may be applied provided that the affected systems are upgraded to design margins of safety expeditiously for normally accessible supports and by the next refueling for nonaccessible supports. Accessibility is as defined in Bulletin No. 79-14 where "normally accessible" refers to those areas of the plant which can be entered during reactor operation.

Any support not satisfying the criteria should be classed as inoperable and the Technical Specification action statement met unless it can be shown that the system can function in a design basis seismic event without the support.

The licensee and its A/E promptly performed evaluations on the restraints using the IEB 79-02 criteria. Based on this evaluation, the licensee determined that the following restraints and its associated piping were inoperable, declared the systems inoperable, entered its Technical Specification limiting condition for operations and proceeded to shut the plant down.

MS-1C-1062
 SI-20-158
 SI-20-71
 SI-20-2310
 SI-20-186
 AC-3-150/1
 SI-20A-85/1
 SI-6-23
 CP-1-2
 SW-9-23/8A
 C-1-35/5
 AC-5-40/2
 SW-13-H6

H. B. Robinson Technical Specification, paragraph 3.3.1, requires that piping associated with the safety injection pumps, residual heat removal pumps and residual heat exchangers be operable for reactor criticality. NRC IE Bulletin 79-02, Revision 1, Supplement 1, defines pipe supports with concrete expansion anchor safety factors less than two as inoperable.

Contrary to the above, the reactor had been started up and was critical at about 50 percent power and the above noted piping and eight associated pipe supports were determined by the licensee to have been inoperable due to concrete expansion anchor safety factors that did not comply with the above noted IEB 79-02 operability definition. The reactor was subsequently shutdown by the licensee. Subsequent licensee and A/E evaluation resulted in 44 additional inoperable pipe supports on piping required by Technical Specifications to be operable for reactor criticality. This was identified as Violation 261/85-06-01 - Technical Specification violation regarding piping/restraint operability.

An inspection was performed at EBASCO services/incorporated to verify compliance with IEB 79-02 and IEB 79-14 requirements and licensee commitments. The following pipe restraint design calculations and piping seismic stress analysis were inspected.

Pipe Restraint Calculations

MS-1C-1062

SI-20-2310

AC-2-28/1

C-1-35/5

AC-5-40/2

AC-3-150/1

Piping Seismic Stress Analysis

MS-1C

Diesel Generator Exhaust

SI-20

EBASCO Services Incorporated Procedure Number 79-14/C-3, Revision 3, Seismic Restraint Analysis and Design, paragraph 6.6 requires that "new" loads documented by the Mechanical Stress Analysis Department be used for modification design. The baseplate and concrete expansion anchors design loads resulting from the maximum new pipe restraint loads were not used in the modification design calculations for restraint MS-1C-1062. However, subsequent A/E reperformance of the calculations showed the restraint to still be acceptable for interim operability.

EBASCO procedure for Inspection and Testing of Existing Concrete Expansion Anchor Bolts, Revision 4, Table 4 requires reduction of the capacity of concrete expansion anchors that are less than $7\frac{1}{2}$ inches from a concrete wall edge. Concrete expansion anchor bolt design calculations for restraint SI-20-2310 did not document a capacity reduction for concrete expansion anchors that were designed to be less than $7\frac{1}{2}$ inches from a concrete wall edge. Subsequent re-performance of the calculations showed the restraint to be technically acceptable.

The calculation discrepancies noted above for restraints MS-1C-1062 and SI-20-2310 appear to be in violation of 10 CFR 50 Appendix "B" Criterion V and were identified as Violation 261/85-06-02, Pipe restraint calculation discrepancies. Similar discrepancies were not identified on the remainder of the restraint calculations inspected. During the inspection, the licensee's QA and Nuclear Engineering and Licensing Department also performed audits on EBASCO pipe restraint design calculations and piping seismic stress analysis for H.B. Robinson. Discussions with personnel involved indicated that no additional pipe restraint calculation discrepancies similar to those noted above were identified.

During review of the calculations and piping analysis and subsequent discussion with the licensee and its A/E, the following items were noted.

- a. IEB 79-02 and 79-14 require verification that the seismic analysis of piping, pipe supports and concrete expansion anchors show their capability of performing their intended function during a Design Basis Earthquake (DBE). Section 3.7.3.2 of the Updated Robinson FSAR provides the licensee's static piping analysis commitments for both the Operating Basis Earthquake (OBE) and DBE. For the 1984 IEB 79-14/79-02 re-analysis of piping, the A/E performed a static OBE Analysis and a Dynamic DBE analysis, where applicable seismic response spectra were available. Furthermore, the Dynamic Analysis utilized multi-building and multi-level seismic response spectra for single stress problems in lieu of enveloping the seismic response spectra or using the criteria of NUREG-51357. The maximum pipe support was combinations generated by either the static OBE analysis or dynamic DBE analysis were used for pipe support and concrete expansion anchor design. In most cases, the static OBE support loads were greater than the dynamic DBE loads but would have been lower than the FSAR static DBE loads. In a telephone conversation with NRC IE on January 23, 1985, the licensee was informed that the static OBE analysis and dynamic DBE analysis would be sufficient to meet IE Bulletin criterion for interim operability evaluation. However, the licensee was further informed that an FSAR change should be submitted to NRR for review and approval of its current piping analysis methods or the FSAR and IEB 79-02/79-14 requirements should be complied with prior to the end of the next refueling outage.
- b. The licensee identified that in addition to evaluating concrete expansion anchors to a safety-factor of one, pipe support structural members were evaluated to ultimate strength in lieu of 0.9 Sy for interim operability. In a telephone conversation with NRC IE on January 23, 1985, the licensee was informed that the more liberal allowables of Section NF of the ASME Code (approximately 70 percent of ultimate) would be sufficient to meet IE Bulletin criterion for interim operability but the applicable allowables and IEB 79-02 safety factors should be met by the end of the next refueling outage.

- c. It was noted by the NRC inspector that the deflection/frequency criteria had not been considered in the final design of the pipe restraints. To assure compatibility with the piping stress analysis, pipe restraint evaluation for deflection/frequency should be considered in conjunction with the licensee's action for piping analysis described in paragraph 5.(a) above.

(Open) Unresolved Item 79-25-01, OBE/DBE Design Comparisons, addresses similar concerns to those noted in paragraphs 5.(a), (b) and (c) above. The above noted items will be included as part of the unresolved item.

The licensee's activities for IEB 79-02/79-14 have been numerous and varied and have involved several NRC/licensee open items. The NRC inspector recommended that the licensee submit a final report for both Bulletins. The report should tie together all previous responses and should address on an item by item basis how compliance was achieved with the various Bulletin requirements.

Pending licensee completion on IEB 79-02/79-14 requirements and licensee commitments, the Bulletins were left open.

Within the areas inspected, two violations were identified.