



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

Report Nos.: 50-269/87-31, 50-270/87-31, and 50-287/87-31

Licensee: Duke Power Company
 422 South Church Street
 Charlotte, NC 28242

Docket Nos.: 50-269, 50-270,
 and 50-287

License Nos.: DPR-38, DPR-47, and
 DPR-55

Facility Name: Oconee 1, 2, and 3

Inspection Conducted: July 27-31, 1987 at Oconee Nuclear Station
 August 3-7, 1987 at Duke General Office, Charlotte, N.C.

Inspector: Rich C. Chou 9-10-87
 R. C. Chou Date Signed

Approved by: J. J. Blake 9-10-87
 J. J. Blake, Chief Date Signed
 Materials and Processes Section
 Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection was in the areas of pipe support base plate designs using concrete expansion anchor bolts (IBE 79-02) and seismic analysis for as-built safety-related piping systems (IEB 79-14).

Results: Two violations were identified.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- **S. B. Hager, Chief Engineer, Civil Engineering Division
- *M. J. Tuckman, Station Manager
- **C. L. Ray, Principal; Engineer, Civil Engineering Division
- *R. J. Brackett, Station QA Manager
- *B. W. Carney, Station Maintenance Services Manager
- **P. F. Guill, Supervisor, Licensing Engineer
 - F. Owen, Shift Supervisor and Regulatory Compliance
 - B. Leatherwood, Project Engineer
 - P. Earnhardt, Production Specialist III
 - W. Davis, Engineering Supervisor, CMD
 - S. Crews, Supervising Design Engineer
- **J. McLean, Design Engineer I
 - *T. C. Mathews, Compliance Specialist
 - *M. R. Hemphill, QA Engineer I
- **P. J. North, Licensing, Assistant Engineer
 - D. Carpenter, QC Level II, Mechanic Inspector
 - D. Osborn, QC Level II, Mechanic Inspector

Other licensee employees contacted included engineers, technicians, mechanics, and office personnel.

NRC Resident Inspectors

- *P. H. Skinner, Senior Resident Inspector
- *L. D. Wert, Resident Inspector

- *Attended exit interview on July 31, 1987
- **Attended exit interview on August 7, 1987

2. Exit Interview

The inspection scope and findings were summarized on July 31 and August 7, 1987, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. Dissenting comments were received from the licensee about issuing Violation 269, 270, 287/87-31-01. The following new items were identified during this inspection.

Violation 269, 270, 287/87-31-01, As-Built Drawing Discrepancies Compared with As-Built Conditions.

Unresolved Item 269, 270, 287/87-31-02, Additional Information Required to Evaluate Pipe Supports.

Inspector Followup Item 269, 270, 287/87-31-03, Safety-Related Piping Systems Maintenance.

Violation 287/87-31-04, Inadequate Pipe Support Qualification

The licensee did identify specification No. OS-0027.00-00-0001, Design Specification for class A, B, C, D, and F Pipe Supports and Restraints, which was provided to Inspector, as proprietary during the exit interview. The proprietary material is not included in this inspection report.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item 287/85-31-02, Evaluation of Pipe Support/Restraint Deficiencies Identified During Inservice Inspection.

The nonconforming item reports (NCI) were written about pipe supports as part of the Unit 3 refueling outage inservice inspection (ISI). Of the 83 pipe supports subject to ISI, 59 NCI's were written. The previous inspector reviewed these NCI Reports and disclosed that approximately 25 percent of the NCI documented discrepancies between the as-built hanger/support drawings and the existing hanger/supports. The as-built drawings had been prepared during field walkdown inspection performed for the seismic analysis of as-built safety-related piping systems required by IE Bulletin 79-14. The Inspection Report Nos. 50-287/85-31 and 59-287/85-36 documented the above problems and requested that the licensee determine the cause of the inaccurate as-built drawings and of the licensee's final corrective actions. During this inspection, the inspector identified discrepancies between the as-built drawings and as-built conditions. The licensee stated that similar discrepancies were found during ISI and documented in the above two reports. After reviewing the information submitted for Unresolved Item 287/85-31-02 and comparing discrepancies identified during this inspection, the inspector decided to close the above Unresolved Item and open Violation 269, 270, 287/87-31-01, As-Built Drawing Discrepancies Comparing with As-Built Conditions, see paragraph 5.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. One resolved item identified during this inspection is discussed in paragraph 5.

5. (Open) Pipe Support Base Plate Using Concrete Expansion Anchor Bolts (IEB 79-02) and Seismic Analysis for As-Built Safety-Related Piping Systems (IEB 79-14).

a. IEB 79-02

Ocone Nuclear Station implemented an IEB 79-02 program which was based on a factor of safety (FS) of the expansion anchor bolt obtained from tests in the field and a review of calculations. There

were three conditions for determining the FS. Condition one: $FS < 2$, the supports were required to be modified immediately to bring up $FS \geq 4$ or 5 ($FS \geq 4$ for wedge and sleeve anchors, and ≥ 5 for shell type anchors) to meet the operability requirements. Those supports were modified and completed for all three units in 1981. Condition two: $FS \geq 2$ but $FS < 4$ or 5, the supports which met the short term operability requirements but required modification to ensure expansion anchor safety factors ≥ 4 or 5 were deferred and combined with IEB 79-14. Condition three: $FS > 4$ or 5, no modifications were required for supports. Therefore, IEB 79-02 will be completed when IEB 79-14 is completed in each unit.

b. IEB 79-14

The licensee provided the summary of status for the activities on IEB 79-02 and 79-14 for Oconee Nuclear Station. The IEB 79-14 program resulted in the modification of approximately 5,900 out of 8,600 supports reviewed. There are 251 pipe supports with modification work remaining.

(1) Unit 1

There are about 240 support modifications to be completed during the upcoming outage scheduled to begin in early September.

(2) Units 2 and 3

Ten support modifications on Unit 2 and one support modification on Unit 3 are not completed due to being in inaccessible areas; new revision of drawings based on recent surveillance in areas previously inaccessible; and new revision of drawings resulting from nozzle load analysis. Of the supports remaining on Unit 2, eight can be modified at the next Unit 2 outage and two are in a high radiation area and it is unknown when these can be accessed. The support remaining on Unit 3 is in a high radiation area and will be modified whenever radiation levels drop to an acceptable level.

To check the licensee walkdown performance and to see if calculations had been revised using the walkdown information for IEB 79-02 and 79-14, the inspector selected 25 supports including gang support from component cooling, system 55 and L.P. service water -RC pumps, system 14B, for Unit 1. The walkdown packages were called piping surveillance data packages which included system summary sign-off forms, piping clearance forms, valve data forms, support/restraint data forms, support/restraint design drawings, valve vender drawings and piping design drawings. Table 1 is the list of the support partially reviewed for packages or calculations or both. The support calculations were also checked against stress calculations to see if the current loads were used in support design.

Table 1
Review of Walkdown Packages and Calculations

Support No.	Walkdown Package Reviewed	Calculation Reviewed
1-53-3-0-439C-H27	✓	
1-55-1-0-439C-SR11	✓	
1-55-1-0-439A-H37	✓	
1-55-1-0-437B-H11	✓	✓
Gang 1 GH-RS-7172-02		✓
1-55-1-0-437B-H10	✓	✓
Gang 1-GH-RS-7172-01		✓
1-55-1-0-437B-H49	✓	✓
Gang 1-GH-RS-7273-01		✓
1-55-1-0-437B--H50	✓	✓
Gang 2-GH--RS-7374-08		✓
1-55-1-0-437B-H-8	✓	✓
Gang 2-GH-RS-7374-07		✓
1-55-1-0-437B-H7	✓	
1-55-1-0-437B-H1	✓	
1-55-1-0-437B-H16	✓	✓
1-55-1-0-437B-H19	✓	
RJC-14B-439B	✓	
1-14B-439B-DE004	✓	
1-14B-439B-DE007	✓	✓
1-14B-439B-DE013	✓	✓
1-14B-437B-DE023	✓	✓
NJB-14B-439C-DE032	✓	
1-14B-439C-DE034	✓	
1-14B-439C-DE035	✓	

The gang supports shown on Table 1 were attached by the support shown immediately above them. Those supports were found in field to have new attachments of pipes or supports. The purpose of reviewing the gang supports were to make sure that calculations for the gang supports had been revised to consider new attachments found in field. Support No. 1-14B-439C-DE032, 1-14B-439C-DE034 and 1-14B-439C-DE035 had been superseded per Section 14.1, Quality Assurance Program, Design Engineering Department. No violations or deviations were identified in this area.

To review the licensee activities on IEB 79-02 and 79-14 during the past two years, the inspector randomly selected the following 39 supports in the area of dynamic pipe supports and component support structures that had been QC final inspected to see if they complied with IEB 79-02 and 79-14. The restraints were reinspected with the assistance of the licensee's QC inspectors and engineer. Table 2 shown the list of the supports reinspected and the calculations reviewed.

Table 2

Supports Reinspected and Calculations Reviewed

Unit No.	Support No.	Rev. No.	Supports Reinspected	Calculations Comments Reviewed
1	1-03-0-551-H57	2	✓	
1	1-03A-1-0-400A-H38	2	✓	Note 1 ✓
1	1-03A-1-0-400A-H46	1	✓	
1	1-03A-1-0-400A-H47	1	✓	
1	1-03A-1-0-400B-H54	1	✓	✓
1	1-03A-1-0-400B-H59	3	✓	
1	1-03A-1-0-401A-H44	3	✓	
1	1-03A-400A-ADM-0200	2	✓	Note 2 ✓
1	1-03A-401A-DE004	1	✓	
1	1-03A-401B-MB-0701	1	✓	Note 3 ✓
1	1-07A-0-400A-SR1	2	✓	
1	1-07A-0-6-0-400A-H41	7	✓	Note 4 ✓
1	1-14B-0-436L-ASR13	1	✓	Note 5 ✓
1	1-14B-0-436L-ASR14	1	✓	Note 6 ✓
1	1-14B-0-444-ASR7	1	✓	

Unit No.	Support No.	Rev. No.	Supports Reinspected	Calculations Comments Reviewed
1	1-14B-437B-DE023	4	✓	✓
1	1-14B-0-1436D-ASR22	0	✓	
1	1-14B-4001-LRM-0601	0	✓	Note 7 ✓
1	1-54A-0-444-R14	1	✓	
2	2-01A-1-1-0-1401B-H3	6	✓	
2	2-01A-1-4-0-1401B-H19	1	✓	✓
2	2-01A-1403C-DE083	0	✓	
2	2-01A-0-1403B-DE068	1	✓	✓
2	2-01A-0-1403D-DE077	2	✓	✓
2	2-01A-4-0-1400A-H4	1	✓	Note 8 ✓
2	2-07A-0-1400A-SR1	0	✓	
2	2-14B-1436D-DE003	0	✓	
2	2-51A-436E-FAC-2803	1	✓	Note 8
2	2-51A-1444-WSS-2902	1	✓	Note 8
3	3-07A-1400B-DE032	1	✓	
3	3-07A-2400A-DE010	1	✓	
3	3-07A-2400A-DE027	2	✓	✓
3	3-07A-2400A-OL-0502	1	✓	
3	3-07A-0-2400A-R1	1	✓	Notes 9 and 11 ✓
3	3-53B-2435B-DE012	1	✓	
3	3-53B-2435B-DE023	1	✓	✓
3	3-53B-4-2435B-H26	5	✓	✓
3	3-53B-4-0-2435B-H31	1	✓	
3	3-53B-5-0-2435B-SR38	0	✓	Note 10 ✓

Notes

1. Extra lug at bottom of pipe used for the vertical support not shown on drawing.
2. (a) 1-1/2" and 1-3/4" bolt edge distances existing in field but Section A-A of drawing shows 2-7/8" and 3-1/8" respectively.
(b) Vertical support with 1/16" gap between the bottom of the pipe attachment and the supporting steel.
3. Sway Strut bent.
4. (a) 1" steel shim blocks under washer not shown on drawing.
(b) One support loose nearby (possibly loosened during work on this support).
5. Anchor bolt spacing approximately 3" from the adjacent support No. 1-14B-436L-WJB-1011. Appears to violate the spacing requirement. (No ladder provided during reinspection).
6. Two rod supports for the nearby pipe (5'-6" North of this support) in contact with this pipe.
7. Extra welds in field at connection between top flange of Item No. 13, TS 3"x2"x1/4" and Item No. 12, TS 2"x2"x1/4".
8. Wrong support tag number in field.
9. (a) Top flange of Item No. 5, W6x20 at south end has 1/4" gap between it and the vertical member. Bottom flange rounded off.
(b) Weld around symbol showing drawing is wrong due to item (a) above.
10. Hydraulic Snubber Reservoir contacts the vertical member of support.
11. Computer Model and Analysis (STRUDL) used the member properties of W6x20 for Item No.7 to qualify this support. Actually, the member size is W4x13 which is shown on drawing and exists in field.

The above restraints were partially reinspected against their detail drawings for configuration, identification, dimensions, fastener/anchor installation, member size, welds, rust, maintenance, and damage/protection. Design calculations were partially reviewed and evaluated for thoroughness, clarity, consistency and accuracy. The design calculations were of good quality except as noted in Note 11, Table 2. In general, the modified portion of restraints or new restraints were installed in accordance with design documents. The majority of the discrepancies noted in Table 2 were due to a lack

of detailed check during the walkdown inspection. The inspector discussed the above findings with responsible engineers at the general office. They stated that the licensee's walkdown inspectors might not have used a tape to measure dimensions or ladders for access to inaccessible areas. The walkdown inspectors might also have stood away from the support and compared the support configuration with the detail drawing and judged the support to be adequate or not for supporting the required loads. The above statements from the licensee's engineer were contrary to the requirements of Section 3.5, of Duke Specification No. OS-0020.00-00-0002, USNRC IE Bulletin 79-14 and 79-02 Pipe Support Surveillance Procedure, which was Attachment #1 of Oconee Nuclear Station, USNRC IE Bulletin 79-14, Revision 1, 30-day Response from the licensee to Region II, dated August 1, 1979. Section 3.5.1 of the above surveillance procedure partially states that dimensions, gap sizes, member sizes, weld details and general physical configuration conform to the S/R Design Drawing. Attachment #7, "Guidelines for Support Sketches"; and, Attachment #8, "Support/Restraint Design Tolerances", in the above surveillance procedure clearly define the requirements for the support detail check. The licensee's stated practice in the walkdown inspection to check as-built conditions violated the surveillance procedure and the bulletin requirements. This was a severe program defect. The similar discrepancies or deficiencies to those shown on Table 2 were also found during the Inservice Inspection, see paragraph 3. The Unresolved Item 287/85-31-02 is considered closed by the opening of Violation 269, 270, 287/87-31-01 shown below.

Based on the findings and notes shown on Table 2, plus the Unresolved Item 287/85-31-02 as stated on paragraph 3, the inspector identified the following items:

- (Open) Violation 269, 270, 287/87-31-01, As-Built Drawing Discrepancies Compared with As-Built Conditions. Oconee Nuclear Station Spec. No. OS-0020.00-00-0002 required the support details to be checked as stated above and documentation of discrepancies for reevaluation or reanalysis. Discrepancies identified below indicated that portions of the supports were not installed and verified in accordance with the design drawings.
- Support No. 1-03A-1-0-400A-H38 had a lug at the bottom of the pipe for the vertical support. The lug was not shown on drawing.
- Support No. 1-03A-400A-ADM-0200 had 1-1/2" and 1-3/4" bolt edge distances existing in field but Sections A-A of drawing showed 2-7/8" and 3-1/8," respectively, (This exceeded the 1" tolerance allowed in Section 8.0, Attachment No. 8 of Spec. No. OS-0020.00-00-0002. This vertical support also had a 1/16" gap between the bottom of the pipe attachment and the supporting steel.

- Support No. 1-03A-401B-MB-0701 had a bent sway strut.
- Support No. 1-14B-4001-LRM-0601 had extra welds in field at the connections between the top flange of Item No. 13 (TS 3"x2"x1/4") and Item No. 12 (TS 2"x2"x1/4").
- Support No. 3-07A-0-2400A-R1 had a 1/4" gap between the south end of the top flange of Item No. 5, (W6x20) and the vertical member. The bottom flange at the same end was rounded off.

All the examples indicated above plus the itmes identified in Unresolved Item 287/85-31-02 constitute a violation of 10 CFR 50, Appendix B, Criterion X and is identified as a Violation 269, 270, 287/87-31-01.

- (Open) Unresolved Item 269, 270, 287/87-31-02, Additional Information Required to Evaluate Pipe Supports. The following two supports need to be evaluated by the licensee to find out the cause and the impact on safety.
- Support No. 1-07A-0-6-0-400A-H41 has 1" steel shim blocks under the washers. This exceeds the 1/4" maximum shim allowance and are not shown on drawing.
- Support No. 1-14B-0-436L-ASR13 has an anchor bolt spacing of approximately 3" from the adjacent support No. 1-14B-436L-WJB-1011. This appears to have violated the minimum spacing requirement.

The licensee claimed Support No. 1-07A-0-6-0-400A-H41 just completed in field and not documented yet. (The anchor bolt spacing for support No. 1-14B-0-436L-ASR13 was estimated since no ladder was provided during the inspection). The inspector was told during the calculations check that the licensee's engineer went with a ladder to measure and get 4" anchor bolt spacing existing in field. Even with 4" anchor bolt spacing in field, it is still less than the minimum anchor bolt spacing required per Design Specification No. OS-0027.00-00-0001, Design Specification for class A, B, C, D and F Pipe Supports and Restraints which the licensee claimed as a proprietary document. Pending the licensee resolution, this problem is identified as Unresolved Item 269, 270, 287/87-31-02.

- (Open) Inspector Followup Item 269, 270, 287/87-31-03, Safety-Related Piping Systems Maintenance.

The following items involved maintenance in the safety-related piping systems.

- Support No. 1-07A-0-6-0-400A-H41 has one support loosened nearby. The licensee's engineer stated that this loosened support could have been loosened for repairing Support No. 1-07A-0-6-0-400A-H41.
- Two rod supports for other pipe contacting the pipe supported by Support No. 1-14B-0-436L-ASR14, see note 6, Table 2.
- Support No. 2-01A-4-0-1400-H4, 2-51A-436E-FAC-2803, and 2-51A-1444-WSS-2902 had the wrong identification tag numbers.
- Support No. 3-53B-5-0-2435B-SR38 had a Hydraulic Snubber Reservoir contacting the vertical member of the support.

Pending the licensee's resolution, this problem is identified as Inspector Followup Item 269, 270, 287/87-31-03.

- (Open) Violation 287/87-31-04, Inadequate Pipe Support Qualification.

Support Calculation No. 3-07A-0-2400A-R1 Used the member properties of W6x20 in Computer Model and Analysis (STRUDL) for Item No.7, W4x13 shown on the detail drawing to qualify the support. The actual size of Item No. 7 was verified during the inspection as a W4x13, which was same as shown on the detail drawing. 10 CFR 50, Appendix B, Criterion V, requires that activities affecting quality shall be accomplished in accordance with instructions, procedures or drawings appropriate to the circumstances. The above misuse of the large member size to qualify the support is a Violation of 10 CFR 50, Appendix B, Criterion V and is identified as a violation 287/87-31-04.

Since the modifications on Units 2 and 3 for IEB 79-02 and 79-14 are essentially complete except for a few support modifications left due to inaccessibility, and the majority of the remaining supports will be completed during the Fall 1987 outage, the licensee should submit a Final Summary Report after the completion of the outage which contains a list of unmodified supports with justification for continued operation.