U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-305/87002(DRS)

Docket No. 50-305 License No. DPR-43

Licensee: Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54037-9002

Facility Name: Kewaunee Nuclear Power Plant

Inspection At: Kewaunee Site, Kewaunee, Wisconsin
Fluor Engineers, Inc. (Fluor), Chicago, Illinois
U.S. Nuclear Regulatory Commission, Region III (Region III)

Inspection Conducted: November 13-14, 1986, at Fluor
December 2-3, 1986, January 6-8 and 28-29, 1987, at the site
February 13 and 26, 1987, at Region III

Inspectors: I. T. Yin I. Yin 3/2/87
Date

I. Yin
for J. R. Fair 3/2/87
(January 28-29, and February 26, 1987) Date

Approved By: D. H. Danielson, Chief D H Danielson 3/2/87
Materials and Processes Section Date

Inspection Summary
Inspection on November 13, 1986, through January 29, 1987 (Report No. 50-305/87002(DRS))
Areas Inspected: Special announced inspection of licensee actions relative to IE Bulletin No. 79-14 (IEB No. 79-14), and followup on previously identified inspection findings.
Results: Within the areas inspected, six apparent violations were identified (failure to conduct indoctrination and training for personnel conducting piping walkdown inspections - Paragraph 4.a; inadequate procedures for performing piping walkdown inspections and engineering evaluation - Paragraphs 4.a, 4.c(1) and 5.a; failure to execute the pipe hanger QC inspection program - Paragraphs 4.b(2) and 4.c(3); failure to follow inspection procedure - Paragraph 4.b; inadequate design basis and evaluations of IEB No. 79-14 walkdown inspection findings - Paragraphs 4.c(2), 5.a, 5.b, and 6; failure to adequately resolve WPS QA audit findings - Paragraph 7).

DETAILS

1. Persons Contacted

a. Inspection Conducted on November 13, 1986 through January 29, 1987

Wisconsin Public Service Corporation (WPS)

*D. C. Hintz, Vice President, Nuclear Power
*C. Steinhardt, Plant Manager
*D. J. Ropson, Superintendent, Nuclear Licensing and Systems
*C. A. Schrock, Assistant Manager, Nuclear Engineering
R. E. Draheim, Assistant Manager, Plant Services
K. H. Weinhauer, Assistant Manager, Plant Maintenance
K. Evers, Assistant Manager, Plant Operations
R. P. Pulec, Superintendent, Plant Technical
*D. W. Sauer, Nuclear Licensing Supervisor
A. J. Ruege, Quality Assurance (QA) Supervisor
V. J. LeGreve, QA Auditor
T. V. Webb, Licensing Engineer
*P. Lindberg, Technical Projects Engineer
C. Torres, Plant Nuclear Engineer

Fluor Engineers, Inc. (Fluor)

M. L. Hintz, Vice President
C. E. Agan, Project Manager
*D. E. Cole, Project Manager
*P. L. Lin, Project Piping Engineer
H. Bartholomees, Quality Assurance (QA) Engineer
R. Berzins, Project Mechanical Engineer
B. L. Dickerson, Principle Mechanical Engineer
D. Wheeler, Site Representative

U. S. Nuclear Regulatory Commission Region III (Region III)

*R. L. Nelson, Senior Resident Inspector

*Denotes those attending the management exit meeting on January 29, 1987.

b. Enforcement Conference on February 13, 1987, at Region III

WPS

G. Mathews, Senior Vice President, Power Supply and Engineering
D. Hintz, Vice President, Nuclear Power
C. Steinhardt, Plant Manager
C. Schrock, Assistant Manager, Nuclear Power

D. Ropson, Superintendent, Nuclear Licensing and Systems
D. Ristau, Superintendent, Nuclear Services
D. Berg, Superintendent, Plant Quality Control
R. Pulec, Superintendent, Plant Technical
K. L. Hull, Nuclear Design Change Engineer
D. Sauer, Nuclear Licensing Supervisor

Fluor

D. E. Cole, Project Manager
R. J. Hollmeier, Manager, Operating Fossil Plant Projects

Region III

C. J. Paperiello, Acting Deputy Regional Administrator
N. J. Chrissotimos, Acting Director, Reactor Safety Division (DRS)
J. J. Harrison, Chief, Engineering Branch, DRS
D. H. Danielson, Chief, Materials and Processes Section, DRS
R. DeFayette, Chief, Section 2B, Division of Reactor Projects (DRP)
J. A. Gavula, Reactor Inspector
P. D. Milano, Enforcement Staff
W. H. Schultz, Enforcement Coordinator
M. B. Fairtile, Project Manager, NRR
I. T. Yin, Senior Mechanical Engineer

c. Followup Meeting on February 26, 1987 at Region III

WPS

D. C. Hintz, Vice President, Nuclear Power
C. Schrock, Assistant Manager, Nuclear Power
D. Ropson, Superintendent, Nuclear Licensing and Systems
D. J. Ristau, Superintendent, Nuclear Services
K. L. Hull, Nuclear Design Change and Training Engineer

Flour

D. E. Cole, Project Manager
R. J. Hollmeier, Program Manager
A. Morshedi, Consulting Engineer

Region III

A. B. Davis, Acting Regional Administrator
N. J. Chrissotimos, Acting Director, DRS
J. J. Harrison, Chief, Engineering Branch, DRS
D. H. Danielson, Chief, Materials and Processes Section, DRS
R. DeFayette, Chief, Section 2B, DRP
J. R. Fair, Senior Mechanical Engineer, IE
I. T. Yin, Senior Mechanical Engineer

2. Licensee Action on Previous Inspection Findings

a. (Closed) Unresolved Item (305/78014-05): Temporary installation of a non-nuclear certified relief valve in the RHR system. The NRC inspector reviewed the following documents and had no adverse comments:

- Maintenance Work Request No. 13581 was issued on March 12, 1980, to replace the non-certified valve with a qualified valve. The QA/QC paper work was lost; however, evaluation was made by WPS on June 21, 1982, for installation acceptance.
- WPS Purchase Order No. 66584 to Crosby Valve and Gage Company, May 7, 1980.
- Crosby Certificate of Compliance, September 30, 1980.
- Crosby Valve Test Report, April 24, 1980.
- Crosby Seismic Qualification Report, March 29, 1979.

b. (Closed) Unresolved Item (305/80004-04): Support installation drawings needed updating to include the latest design loading and configuration. See Paragraph 4.b(2) for details.

c. (Closed) Unresolved Item (305/80004-05): IEB No. 79-02 inspections can not replace the actions set forth in IEB No. 79-14. Hanger inspections should be documented. See Paragraph 4 for details.

d. (Closed) Unresolved Item (305/80004-07): Lack of measurement for pipe support clearance including floor and wall penetrations. See Paragraph 4 for details.

e. (Closed) Open Item (305/80012-01): WPS evaluation of effects on steam generator support cut bolts. The WPS reports were reviewed and closed in Region III Inspection Report No. 50-305/84-09, Paragraph 2.b (closed Unresolved Item No. 305/80-09-02).

3. Licensee Action on NRC IE Bulletins (IEB)

a. (Closed) IE Bulletin No. 79-07 (305/79007-BB): "Seismic Stress Analysis of Safety-Related Piping," April 14, 1979. The NRC inspector reviewed the WPS letter to Region III, "IE Bulletin No. 79-07," April 25, 1979, and had no adverse comments. As a result of investigations conducted by Fluor and Westinghouse, it was determined that applicable piping analysis computer programs did not use the algebraic summation method for the seismic loads in either the horizontal or the vertical direction.

b. (Open) IE Bulletin No. 79-14 (305/79014-BB; 305/79014-1B; 305/79014-2B; 305/79014-3B): "Seismic Analysis for As-Built Safety-Related Piping Systems," July 2, 1979; Revision 1, July 18, 1979; Supplement 1, August 15, 1979; and Supplement 2, September 7, 1979. See Paragraphs 4-5 for details.

4. IEB No. 79-14 Piping As-Built Walkdown Measurement

a. Review of Correspondence and Procedures

The as-built walkdowns for piping configurations and clearances were conducted by the WPS staff between 1979 and 1983. The NRC inspector reviewed the following correspondence and inspection procedures pertaining to IEB No. 79-14:

- WPS letter to Region III, "Seismic Analyses for As-Built Safety-Related Piping Systems," August 9, 1979.
- WPS letter to Region III, same subject, September 17, 1979.
- WPS letter to Region III, same subject, November 2, 1979.
- WPS letter to Region III, "Reportable Occurrence LER 79-028/03X-Z," April 9, 1980.
- Plant Test Procedure, No. PTP 55-1, "As-Built Piping Verification," April 12, 1983.
- "Bulletin No. 79-14 Inspection," February 12, 1980.
- "Hanger Design Verification," June 14, 1980.

The NRC inspector had the following comments:

- There were no requirements established for personnel indoctrination and training. The piping as-built walkdowns were conducted by two WPS corporate personnel with some help from one Fluor engineer. The hanger design inspections were performed by craftsmen with unknown qualifications. The deficiencies identified during this NRC inspection indicated that personnel qualification and training were both questionable and deficient. The lack of personnel training was also evident during the recent piping reinspections conducted in December 1986. The angular orientation of the AFPTSS and SI systems (refer to Paragraph 4.b.(1)(b)) were reverified in the field. The site inspection personnel measured the piping angles relative to the adjacent pipe direction in lieu of the plant XYZ directional coordinates. Both the Fluor piping analytical model and the IEB No. 79-14 as-built isometric drawing were based on the

plant XYZ directional coordinates. The accumulation of tolerance deviations rendered the re-measurement data useless without mathematical adjustments and reverification of data at specific locations.

- Piping routing changes and support location deviations less than 2 pipe outside diameters (OD) on the seismic isometric drawings required no documentation. The acceptance of such a large deviation tolerance was not justified with an engineering evaluation.

- There was no tolerance given for angular measurements.

- There was a lack of procedural requirements to specifically identify visually estimated pipe measurements.

- There was a lack of tolerance justification to confirm that visually estimated dimensions are within acceptable accuracies.

- There was no acceptance criteria for design verification of as-built hanger configurations.

The lack of an indoctrination and training program for personnel conducting the IEB No. 79-14 walkdowns is a violation of 10 CFR 50, Appendix B, Criterion II. (305/87002-01)

The lack of acceptable inspection procedures to perform the IEB No. 79-14 walkdowns is a violation of 10 CFR 50, Appendix B, Criterion V. (305/87002-02A)

b. Procedure Implementation

(1) Piping Configuration Inspection

(a) Review of Service Water System

The NRC inspector reviewed and verified the Fluor as-built Drawing No. 237127A-M-1043, "Service Water System (Part IV)," Revision A, October 13, 1983 with the Fluor piping stress Report No. KEW-233-IX and X, "Service Water System," April 7, 1980, and recent WPS reinspection records. The following comments were made:

1. The horizontal snubber and vertical rigid restraint No. SW-H-401 were installed at the first elbow from the Component Cooling Heat Exchanger (CCHE) IB, however it was modeled on the horizontal pipe run in the analysis.

2. The floor penetration below CCHE IB, No. SW-H402, Node No. 1290, was modeled as a rigid "Z" direction restraint in the analysis, however, no gap clearances were measured.

3. The distance between the floor penetrations and CCHE IB nozzle connection was not measured.

4. The following discrepancies between the IEB No. 79-14 inspection records (as-built drawings), dated November 1 and 8, 1979, and the site reinspection measurements, dated November 18 and 26, 1986, were noted:

Pipe Diameter	IEB No. 79-14 Measurements	Reinspection Measurements
4"	2'-3 1/4"	2'-0"
4"	4'-4 1/4"	3'-10"
4"	1'-0"	1'-5"
4"	4'-3"	4'-7"
6"*	23'-3"*	11'-10"*
6"*	2'-0"*	13'-5"*
6"	1'-0"	8"
6"	2'-11"	3'-4"
6"	8'-10"°	7'-5"°
6"	1'-0"	1'-6"
6"	1'-0"	8"
6"	2'-1 13/16"	2'-6"
6"	9'-2"°	8'-0"°
16"	1'-2"	3'-6"
16"	12'-0"°	2'-6"°
16"	7'-6"°	14'-0"°
16"	5'-0"°	8'-0"°
16"	13'-0"	14'-2"
16"	26'-2"	26'-0"
16"	20'-9 5/8"	18'-4"
16"	2'-9"	2'-6"

* WPS staff identified these deficiencies, and issued Work Request Form CM 14003, stating "Relocate SW-H252 from 2'-0" from north elbow to 12'-9" from north elbow." This was closed on August 12, 1980. After the work was done, the as-built drawing was not revised to reflect the installed location. Furthermore, the relocation deviation, 13'-5" from the elbow instead of 12'-9", was not documented in a nonconformance report, but was accepted by QC final inspection.

° The discrepancies exceeded the 2 OD tolerance per WPS inspection procedure (±9" for 4" pipe; ±1'-1" for 6" pipe; and ± 2'-8" for 16" pipe).

5. The orientations of the pneumatic operators for Valves SW-1306A and SW-1306B were not marked on the stress isometric drawings.

6. The location plans on the pipe support installation/ inspection detail drawings were not updated to show the as-built locations.

(b) Review of Additional Piping System

Since extensive dimensional discrepancies were identified (Paragraph 4.b(1)(a) 4), the NRC inspector requested additional WPS measurements to be taken for Auxiliary Feedwater Pump Turbine Steam Supply (AFPTSS) and Safety Injection (SI) pump suction and discharge piping systems. Some of the preliminary reinspection data was reviewed by the NRC inspector:

1. Some of the discrepancies of 1" or more measured from AFPTSS steam generator 1A connection

Pipe Diameter	IEB No. 79-14 Measurements	Fluor Analysis	Reinspection Measurements
3"	12'-0"	12'-0"	12'-2 1/8"
3"	26'-1 3/16"	26'-2"	26'-3 3/16"
3"	1'-6"	1'-6"	1'-1 1/2"
3"	5'-8"	5'-6"	6'-3
3"	None	12'-5"	9'-11 5/6"
3"	None	1 3/16"	2'-1/4"
3"	None	12'-0"	10'-1/4"
3"	None	7'-0"	8'-7 3/8"
3"	6'-10"	6'-10"	6'-11"
3"	None	1'-7 1/2"	1'-2 1/2"
3"	None	1'-4 1/2"	1'-9"
3"	8'-2"	9'-9 1/2"	8'-5 1/8"
3"	2'-0"	4 1/2"	1'-9 5/8"
3"	6'-3 11/16"	6'-4"	6'-5"

2. Some of the discrepancies of 1" or more measured from SI pump suction nozzle 1B

Pipe Diameter	IE No. 79-14 Measurements	Fluor Analysis	Reinspection Measurements
6"	1'-0"°	0	1'-5 1/4"°
6"	1'-5"	1'-0"	1'-3 3/16"
6"	4'-0"	4'-0"	3'-10 3/8"
16"	3'-0"	3'-1"	3'-8"
16"	4'-2 5/8"	4'-2 1/2"	4'-0"
16"	4'-0"	4'-0"	4'-2 1/2"
16"	9'-0"	9'-0"	8'-10 1/2"
16"	12'-7"	12'-7"	12'-5 1/2"
16"	2"	0	3 1/2"
12"	*	*	*

* The NRC inspector reviewed four dimensions after the 16 x 12 reducer. No dimensional discrepancies were identified.

° The 1'-5 1/4" (or 1'-0") dimension is from pump body to piping nozzle connection, and should not have been a part of piping inspection and evaluation.

3. The Fluor analysis and the hanger drawing MS-33-2, Revision C, showed a lateral support in contrast to the as-built drawing which showed an axial support.

4. Gap clearance for wall penetration SS-A1 was not measured.

(2) Pipe Support Design Inspection

The NRC inspector reviewed the following IEB No. 79-14 hanger inspection records:

- SW-H409 for a 4" diameter pipe, signed off on March 5, 1981.
- SW-H88 for a 16" diameter pipe, signed off on March 2, 1981.
- SW-H252 for a 6" diameter pipe, no inspection record. Design Change Request No. 921, closed on November 1, 1980, requested hanger location change only. There was no documentation of IEB No. 79-14 hanger design inspection.
- SS-H141 for 3" diameter pipe, QC signed off on July 21, 1973; IEB No. 79-14 inspection signed off on February 17, 1981. The hanger did not conform to the design location, orientation, or auxiliary steel configuration.

Subsequent to the above review and a review of 12 additional hanger QC Records, the NRC inspector stated that some of the hanger design details were so incomplete that no meaningful inspection could be performed. As a followup effort, the NRC inspector reviewed the original hanger inspection procedure used during construction - Phillips, Getschow Company Procedure No. PGHI-K, "Hanger Inspection Procedure," January 24, 1972. The NRC inspector noted that the procedure provided specific requirements in measurement and verification of hanger locations, but had no requirements for the verification of pipe support configuration, orientation, or dimensions.

The lack of an adequate hanger QC inspection program is a violation of 10 CFR 50, Appendix B, Criterion X. (305/87002-03A)

The WPS staff's failure to implement the IEB No. 79-14 inspection procedure is a violation of 10 CFR 50, Appendix B, Criterion V. (305/87002-04)

c. Small Bore Piping Program

(1) Review of Program

During discussions with the WPS staff, the NRC inspector learned that only 93 analytical parts (isometric drawings) were as-built walkdown and evaluated for the IEB No. 79-14 effort. There were 247 small bore (S/B) analytical parts (some nonsafety-related and not within the IEB No. 79-14 scope) that had not been inspected and reviewed.
The S/B piping was field run during construction, and the placement of seismic restraints was by engineering judgment without any approved implementing work procedures. The seismic support locations and design criteria were, according to WPS, contained in the following specifications:

- Pioneer Services and Engineering Company (PSEC) Standard Specification SS-M325 for "Piping, Nuclear Plants," Revision 2-69.
- PSEC SS-M426, "Pipe Support Design, Fabrication and Erection," Revision 1-69.
- PSEC Specific Specification SS-M427, "Pipe Support Design, Fabrication, and Erection," Revision 2-69.

The NRC inspector reviewed the pertinent portions of these specifications and found no acceptable seismic design criteria. Subsequently, WPS stated that computer analyses of the as-built S/B systems were performed by Fluor. The NRC inspector noted that computer analyzed S/B piping and pipe support systems were within the scope the IEB No. 79-14, but were not included in the WPS program. This is a violation of 10 CFR 50, Appendix B, Criterion V. (305/87002-02B)

(2) Review of Fluor Computer Analysis

The NRC inspector reviewed the Fluor piping stress analysis for a small portion of PSEC drawing 237127A-SkM1247-N, "Isometrics of Steam Generator Blowdown Piping and Letdown Piping (CVCS System)," Revision M, October 6, 1975, and identified the following dimensional discrepancies:

Pipe Diameter	Isometric Drawing	Fluor Analysis
2"	1' - 9"	2' - 11"
2"	6' - 4"	5' - 9"

In addition, the following two errors were identified for the input of valve properties:

- One valve was coded in the Fluor analysis as 150 lbs. in contrast to the valve manufacturer data of 50 lbs.

- One flow control valve was input as 150 lbs. in contrast to the valve manufacturer data of 185 lbs. Also, the Fluor analysis model did not consider the center of gravity for the valve which was 22.3 inches above the centerline of the pipe. It was not apparent that any hand calculation was made to reconcile these discrepancies.

The inadequate design verification of S/B piping stress analysis is a violation of 10 CFR 50, Appendix B, Criterion III. (305/87002-05A)

(3) Review of S/B Support Design

The NRC inspector selected the following S/B seismic supports from PSEC drawing 237127A-SKM 1169-M, "Isometric - Chemical and Volume Control Piping," Revision M:

No. 23320
No. 25105
No. 25297 (WPS presented No. 56085 to the NRC inspector)

The NRC inspector noted that the S/B hanger design details were incomplete and consequently no meaningful inspection or evaluation could be performed. The lack of an adequate QC inspection program for S/B hangers is a violation of 10 CFR 50, Appendix B, Criterion X. (305/87002-03B)

5. IEB No. 79-14 Piping As-Built Engineering Evaluation

a. Review of Procedure

There has not been any IEB No. 79-14 engineering evaluation procedures issued by Fluor. In conjunction with Paragraph 4.a, there was a lack of engineering justification to permit no inspection documentation and no engineering evaluation for piping installation deviations within two pipe diameters of the design dimension.

The lack of a formal procedure for performing IEB No. 79-14 evaluation is a violation of 10 CFR 50, Appendix B, Criteria V. (305/87002-02C)

The lack of engineering justification to accept apparent excessive design deviations due to inaccurate installation is a violation of 10 CFR 50, Appendix B, Criteria III. (305/87002-05B)

b. Fluor As-Built Evaluation

In conjunction with Paragraph 4.b, the NRC inspector reviewed the Fluor as-built evaluation of the service water system, and had the following comments:

- Since the WPS as-built piping and support measurements were incomplete and erroneous, Fluor's ability to reconcile design deviations was restricted or in some cases impossible.

- Design record for the limit stop restraint SW-H400 was not available for review.

The NRC inspector reviewed the analytical basis for the following valves:

- SW-11-1, a 6" gate valve: The weight and dimensions used in the analysis were verified using the vendor drawing.

- SW-4-1, and SW-4-2, 10" MOVs: There were no vendor drawings for design verification. There were no Fluor calculations for valve and operator weights and center of gravity.

- SW-20-1, and SW-20-2, 10" MOVs: Same evaluation deficiencies as above.

The Fluor inadequate design as-built reconciliation review is considered a violation of 10 CFR 50, Appendix B, Criterion III. (305/87002-05C)

6. Review of Hanger Calculations

Due to the sketchiness of hanger design details (Paragraph 4.b(2)), the NRC inspector questioned the adequacy of the hanger design efforts. The original hanger calculations were made by Grinnell Corporation; but were not kept at the site. The calculations were believed to be based on charts developed by Grinnell. Although Fluor approved all the Grinnell designs, the Fluor engineers did not recall any review/verification/approval methods developed or utilized. The following hanger calculations were requested by the NRC inspector for his review on December 3, 1986, and again on January 8, 1987:

- SW-H409
- SW-H88
- SW-H252
- SS-H141

No calculations except a Grinnell Corporation Pipe Hanger Division, "Hanger Standard," October 1978 was represented to the NRC inspector on January 28, 1987. The Grinnell standard is not adequate for hanger design and was not approved by the licensee for such use.

The lack of hanger design calculation is a violation of 10 CFR 50, Appendix B, Criterion III. (305/87002-05D)

7. Review of WPS QA Audit

At the request of WPS Nuclear Licensing the WPS QA performed an audit on October 8-10, 1979, to verify the accuracy of piping walkdown inspection and measurement conducted by the WPS staff with assistance from Phillips Getschow personnel. The Audit Report No. 79-73, "NRC IE Bulletin No. 79-14 Seismic Analysis for As-Built Safety-Related Piping Systems," October 15, 1979, found discrepancies between as-built and design piping configuration. The audit open item (finding) was resolved and closed in a QA memorandum to file on December 14, 1979.

In view of the many similar discrepancies identified during the NRC inspection, the WPS corrective program was determined to be ineffective. This is a violation of 10 CFR 50, Appendix B, Criterion XVI. (305/87002-06)

8. Exit Interview

The NRC inspector met with licensee representatives (denoted in Paragraph 1.a) at the conclusion of the inspection on January 29, 1987. The inspector summarized the scope and findings of the inspection. The inspector also discussed the likely informational content of inspection report with regard to documents reviewed by the inspector during the inspection. The licensee representatives did not identify any such documents as proprietary.

9. Enforcement Conference

The NRC staff met with licensee representatives (denoted in Paragraph 1.b and 1.c) on February 13, and 26, 1987, to discuss plant system safety issues. The WPS management presented a comprehensive plan and schedule to resolve these issues. The Region III staff was in general concurrence with the WPS presentation. Matters that will be reviewed further included walkdown and evaluation of primary loop piping, the small bore piping evaluation program, and the applicability of Regulatory Guide 1.61.