UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of	)	
CAROLINA POWER AND LIGHT COMPANY AND	)	
NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket No. 50-400 OL
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	)	

NRC STAFF TESTIMONY OF PAUL R. BEMIS,
GEORGE A. HALLSTROM, AND JEROME J. BLAKE ON
EDDLEMAN CONTENTION NUMBER 41, PIPE HANGER WELDS

Q1. State your names, positions and business address.

A1. Paul R. Bemis, Section Chief, Projects Section 1C

Jerome J. Blake, Section Chief, Materials and Processes Section

George A. Hallstrom, Reactor Inspector, Materials and Processes Section

Our business address is:

U. S. Nuclear Regulatory Commission

101 Marietta St. N. W.

Atlanta, GA 30323

Q2. Mr. Bemis, would you state your professional qualifications?

A2. My professional qualifications are set forth in my testimony on Joint Intervenors' Contention Number 1, Management Qualification.

Q3. Mr. Blake, would you describe your position and professional qualifications?

A3. My primary assignment as a Section Chief is to coordinate and oversee engineering inspections and technical evaluations in the areas of welding, metallurgical engineering, nondestructive examination, failure analyses, mechanical engineering and design, and Inservice Inspection and Testing of Reactor Plant systems and components.

Before I was selected as a Section Chief in August 1982, I had been an engineering inspector in Region II since January 1975. As an engineering inspector, I participated in or conducted routine and reactive inspections involving welding, metallurgical engineering, inservice inspection, and nondestructive examination activities at operating nuclear power plants and construction sites throughout Region II.

Prior to my employment with the Nuclear Regulatory Commission, I was employed by the Department of Defense (DOD) as a metallurgist and welding engineer at naval shipyards involved with construction, repair, and overhaul of combatant ships. My major assignments with DOD were as follows:

May 1973 - December 1974: Supervisor of the non-nuclear welding engineer section at Pearl Harbor Naval Shipyard. Responsible for welding engineering repair activities involving all parts of naval ships except the nuclear power plant.

September 1971 - May 1973: Project engineer in the nuclear welding engineering section at Charleston Naval Shipyard. Responsible for welding engineering activities associated with repair and overhaul of naval nuclear power plants.

November 1963 - September 1971: Metallurgist and welding engineer at Mare Island Naval Shipyard, Vallejo, California - Various responsibilities in the metallurgical and welding engineer fields.

I graduated from the Montana School of Mines (now called Montana College of Mineral Science and Technology) at Butte, Montana, in June 1963, with a Bachelor of Science degree in Metallurgical Engineering. During my career, I have completed a number of training courses related to my work. With the Navy, I completed courses in Corrosion, Photo Elastic Stress Analysis, Welding, Health Physics, and Basic Supervision. Since joining the NRC, I have completed courses in Nondestructive Examination, Welding Technology, Concrete Technology, PWR Fundamentals, BWR Fundamentals, and Supervising Human Resources.

Q4. Mr. Hallstrom, would you state your professional qualifications?

A4. I graduated from Mississippi State University in 1966 with Bachelor of Science Degree in Nuclear Engineering. I am a Vice-Chairman of the American Welding Society A5 Committee on Filler Metal and Chairman of the American Welding Society A5M Subcommittee on Filler Metals for Flux-Cored Arc Welding.

In 1984, I accepted a position as a Reactor Inspector with the U. S. Nuclear Regulatory Commission. My duties have primarily involved inspections related to fabrication, inspection and testing of nuclear components and systems with particular attention directed to welding and nondestructive examinations. As a specialist, I provide assistance to other members of NRC staff concerning conditions arising during construction, inservice inspection, or operation of nuclear facilities which require a knowledge of welding and/or destructive examination.

From 1981 to mid-1983, I was employed as a senior manufacturing welding engineer in the Chattanooga, Tennessee facilities of Combustion Engineering, Incorporated. My employment at Combustion Engineering was interrupted by a brief tour of duty with the Tennessee Valley Authority.

My major responsibilities at Combustion Engineering included functioning as the assigned contract welding engineer in the fabrication of nuclear navy reactor vessels and ASME code nuclear and non-nuclear components. Necessary areas of expertise included

qualification of welders and procedures; nondestructive examination; materials purchasing; heat-treating, cleaning and forming to the applicable codes and standards. Additional responsibilities included evaluation of the metallurgical aspects of welding and other thermal treatments.

My major responsibilities at Tennessee Valley Authority were on-site provision of welding and welding-related expertise in major modifications of boiling water reactors and related assemblies including surveillance of welding and nondestructive examinations.

From 1974 to 1981, I was employed as a welding engineer and technical secretary in the Miami, Florida headquarters of the American Welding Society. My major responsibilities included technical clarification of welding standards and specifications to domestic and foreign inquirers, technical input and administrative support to committees responsible for welding codes and standards, and other coordination duties associated with codes and standards of the International Institute of Welding, International Standards Organization, Amercian National Standards Associated, American Society of Mechanical Engineers, and other technical societies. Additional responsibilities included acting as a national level representative of the American Welding Society.

From 1971 to 1974, I functioned as owner and manager of Ocean Jewels of Miami, Florida. The business was licensed to warehouse and wholesale marine tropical animals.

From 1967 to 1971, I was employed as a Consulting Engineer in the Orlando, Florida, and Denver, Colorado offices of R. W. Beck and Associates. My major responsibilities included computer programming and other technical evaluations for publicly-owned electric utility clients.

From 1966 to 1967, I was employed as an Aerospace Engineer in the Propulsion Research and Development Laboratory of the National Aeronautics and Space Administration in Huntsville, Alabama.

Q5. Mr. Bemis, what responsibilities have you had or do you presently have relative to the Shearon Harris Nuclear Power Plant?

A5. I presently have the direct responsibility for the inspection and enforcement program at the Harris plant. The resident inspectors at the plant report directly to me and I coordinate, review, and concur in all inspections and correspondence relating to CP&L.

Q6. What is the purpose of this testimony?

A6. The purpose of this testimony is to address, on behalf of NRC staff, Eddleman Contention 41 which states:

"Applicants' QA/QC program fails to assure that safety-related equipment is properly inspected (e.g., the "OK tagging" of defective pipe hanger welds at SHNPP)."

As admitted by the Atomic Safety and Licensing Board on page 50 in its Memorandum and Order dated September 22, 1982, this contention was limited to whether there exists pipe hanger welds that have been improperly inspected and approved.

Q7. Mr. Bemis, how does the NRC generally assure itself that welds or any other components subject to inspection are properly inspected?

A7. The NRC generally assures itself that proper licensee inspection is being performed in the following way:

° The NRC, as part of its inspection program, will perform actual inspections of completed welds and compare its findings to the licensee's findings; if differences occur, violations may be written. If violations are written, the licensee is required to make a determination of the root cause, and provide a corrective action to address the total scope of the problem and prevent recurrence. Then the NRC would inspect that corrective action for adequacy.

° NRC resident inspectors and Regional specialty inspectors observe CP&L welding inspectors in the performance of their jobs to insure they are inspecting according to requirements.

- NRC inspectors, as part of the routine inspection program, perform audits of both licensee welding inspectors and welder qualifications.

- NRC inspectors perform inspection of the QA/QC program on welding inspection and review procedures used to insure adequate acceptance criteria.

- NRC reviews welding procedures to insure adequacy of the acceptance criteria.

Q8. Has the Shearon Harris QA/QC program been reviewed and approved by NRC?

A8. The Construction Quality Assurance (QA) Program was initially approved by NRC when the construction permit was issued. Changes to the QA Program have been routinely inspected during all phases of construction activity. These inspections confirmed that changes to the QA Program had not been degrading to program commitments. Since March 1983, changes in the QA Program description have been formally submitted by the licensee and accepted by the NRC as required by 10 CFR 50.55(f).

Q9. Has the NRC inspected pipe hanger welds and the implementation of the QA/QC program with respect to those pipe hanger welds?

A9. Yes, the NRC has and will continue to perform inspections in the area of pipe hanger welds and QA/QC inspection of those welds. To date the following inspection reports have been issued.

79-23	80-15	82-18
79-26	80-22	83-25
80-03	81-19	83-20
80-09	82-01	83-22
80-13	82-03	83-26
		83-37
		84-19

Q10. Have deficiencies in that program's application to pipe hanger welds been identified?

A10. Yes. The following deficiencies were identified:

	Inspection Report Number	Discrepancy
1)	80-22-01	"Failure to correctly translate and implement Codes of Standards for special procedures." Lack of training of welders and inspectors in interpretation of welding symbols. Personnel not able to correct ID required welds on pipe hangers. Corrective action required 100% reinspection of pipe hanger welds previously made. Additional training of affected personnel. Design documents were reviewed and changed to reflect design requirements.
2)	80-15-01	(Welding Undercut) Fabrication and contractor undercut on pipe hanger 1-CT-H-7 and Berger Patterson trunnion dwgs. 1-CT-11-1 and 1-CT-5-1.
3)	82-01-03	Failure to follow procedures/instructions for visual examination of welds and reporting of discrepancies (PH-#CC-H-469). Failure of inspector to identify and inspect all welds.

	Inspection Report Number	Discrepancy
4)	82-03-01	"Uncertified welding inspectors." 1. A welding inspector was permitting an inspector trainee to perform inspection and the inspector was signing inspection records when the trainee had performed the inspection. 2. Inspector was completing records using the initials of other persons. 3. Approving inspection points that were rejected and by using the initials of other inspectors.
5)	82-03-02	Uncertified welding inspectors - non-qualified inspector conducting visual acceptance inspections on pipe hangers.
6)	83-25-02	Pipe support installation and inspection discrepancies." 1. Hanger SW-H-456 - was not welded per dwg. 2. Clearances not maintained. 3. Nonauthorized material substitution. 4. Inspector had failed to document the above discrepancies.

Q11. What actions has the licensee taken to correct those deficiencies?

A11. CP&L applied various corrective actions to remedy each violation over the years but the root cause was never adequately addressed. Therefore, deficiencies continued to be identified by both NRC and

CP&L when welds were reinspected. Finally in July of 1983 CP&L took decisive action. They shut down the weld inspection program completely until December 1983, to evaluate and develop a comprehensive, in-depth inspection program which exceeded regulatory requirements and industry standards and which would result in a better weld program. Work and inspection procedures were revised, inspection and craft personnel received additional training, additional licensee inspection personnel were added, and senior management reinforced their commitment to inspection and supervisory personnel for quality work, and meticulous compliance with procedures and regulations. Attached as Exhibit 1 is a copy of the Weld Inspection Criteria CAR-2165 A-003 which NRC has reviewed for acceptability as documented infra.

Q12. What actions have/will the NRC staff take to assure itself the identified deficiencies will not result in defective welds being approved?

A12. The NRC staff will assure itself the identified deficiencies will not result in defective welds being approved through the implementation of the NRC Construction Inspection Program which is to determine that the Shearon Harris nuclear facility is being constructed in accordance with applicable regulations and commitments made by the applicant. This objective is achieved by the observation of work in progress, and by examination of management controls including

quality assurance and quality control manuals, work procedures, records and documents. Work in progress is inspected for quality workmanship, conformance to control procedures, and conformance to codes. Records are examined to verify that purchased materials and equipment met quality standards and that quality control inspections are performed throughout construction.

Inspections are/will be conducted in accordance with the NRC construction inspection program procedures 50090 - Safety-Related Pipe Support and Restraints Systems and TI 2515/29 - Inspection Requirements for IEB 79-14 which are attached. These include selective examinations of procedures and representative records, interviews with craftsmen and site personnel, and in-depth observations by the inspectors within this construction area. The inspections consist of observations of work in progress and noting where work is interrupted for identified inspection hold points as directed by engineering inspections.

At the present time, this area is receiving increased attention by CP&L and the greatest work activity on site is occurring in this area. Due to the increased work activity, NRC will, as part of it routine program, increase its inspection effort and due to previous problems will increase emphasis in this area until we are confident the corrective action is adequate.

Q13. Are the changes made by the licensee to the program to respond to deficiencies adequate?

A13. The CP&L revised inspection program has shown marked improvement. This has been evidenced by the licensee's QA/QC findings. Total weld inspection points from January 1984 through April 1984 was 985. Of the points inspected only 17 (less than 2%) were found by QC to be unacceptable for various reasons. Unacceptable does not necessarily mean that the weld would create a safety problem. CP&L has applied a standard, AWS D1.1, which is strict and has conservatism built in. Many welds that are found unacceptable could possibly be accepted after engineering evaluation, but CP&L decides in most cases to rework the weld rather than wait for an engineering evaluation. After QC identifies a problem, rework is performed and QC reinspects. After QC reinspection, QA surveillance performs an audit as part of their routine program. QA surveillance audits performed in February, March, and April 1984, took a sample size of 158 welds (out of 851 total for those three months) and only identified one weld to be unacceptable. This is less than 1% of the sample. It should be noted that the deficiency found occurred after the QC inspection which gives NRC confidence that the entire CP&L program is working. If NRC inspection effort during the following months bears out these same findings, we would have continued confidence in CP&L's program.

Q14. Does CP&L have a procedure for visual inspection criteria for pipe hanger welds which is intended to meet the American Welding Society D1.1 Structural Welding Code Standard?

A14. Yes. CP&L Weld Inspection Criteria CAR-2165-A-003 is the procedure which provides visual acceptance criteria for fillet and partial penetration in weld structural weldments designed to meet AWS D.1.1 requirements. The procedure provides allowable clarification from a strict interpretation of AWS D1.1 requirements.

Q15. Mr. Hallstrom, did you conduct a review of the CAR-2165-A-003 procedure for conformance with the applicable AWS standard?

A15. Yes.

Q16. Did you participate in developing that AWS standard?

A16. Yes.

Q17. Is your review of the Applicant's procedure documented anywhere?

A17. The review is documented in the attached Inspection report no. 50-400/84-19 under paragraph 8. visual examination. That report is attached as Exhibit 2.

Q18. That report concludes that no violations or deviations are present, but document an unresolved item on the adequacy of the visual inspection procedures. Will you explain what that means?

A18. An unresolved item is a matter about which more information is required to determine whether it is acceptable or may involve violations or deviations. The review identified several areas of the criteria which require clarification and/or additional supporting justification. The matter was identified as unresolved pending NRC review of the licensee's response to the questions raised. The NRC review is discussed below.

Q19. You identify areas of concern in the visual inspection procedure. Are these significant defects in the overall visual inspection program for pipe hanger welds?

A19. No. The identification of these concerns does not necessarily indicate significant defects in the overall visual inspection program for pipe hanger welds. They do indicate need for careful application of adequate criteria to the welds involved. While the stated concerns could be significant when applied to an individual weld, the effect varies considerably between the concerns involved. For example there is greater concern regarding crack propagation due to acceptance of incomplete fusion then that for thickness reduction due to craters acceptable in butt welds.

Q20. Does the licensee's response resolve the concerns raised in Inspection Report 50-400/84-19 as regards to pipe hanger welds?

A20. On August 2, 1984, there was a phone call between Region II personnel and CP&L personnel to discuss the licensee's response to NRC concerns. In addition, the licensee had sent to NRC a revised procedure which addressed the concerns. The licensee's response to the concerns raised in the Inspection Report 50-400/84-19 resolves those concerns, since the scope of the procedure was revised to limit the application of CAR 2165-A-003 only to fillet and partial penetration welds which were not going to receive any other nondestructive examination. This revision, therefore, reduced the scope to a narrow spectrum of welds.

In summary, the concerns do not apply to the fillet and partial penetration welds which would be the ones used on pipe hangers and to which the licensee has limited the application of the procedure. The NRC will perform field verification of the licensee's response in a future inspection.

Q21. Is the Staff satisfied that Weld Criterion CAR 2165-A-003 provides an acceptable program for QA/QC inspection for pipe hanger welds

A21. Yes. This provides an acceptable program for QA/QC inspection for pipe hanger welds. Region II will verity the application and implementation of this procedure by implementing the inspection program as outlined in this testimony.

Q22. Mr. Bemis, what is the Staff's conclusion as to Eddleman 41?

A22. In the past there have been numerous deficiencies identified by both NRC and licensee inspectors. Even though the licensee has performed previous 100% inspection programs after deficiencies were identified, deficiencies continued. The licensee's decisive action where they shut down their inspection program in July 1983 and their willingness to keep the program shut down until the root cause of the program's deficiencies were identified and corrected, evidence management commitment to a program which exceeds requirements. NRC will continue to aggressively monitor and inspect CP&L's program. If their present program continues to identify and correct even the minor deficiencies, Region II will fully support CP&L's program for this safety related work. It is the Staff's view, at the present time, that the Applicants' QA/QC program is adequate to assure that pipe hanger welds are properly inspected.

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FOR INFORMATION ONLY

WELD INSPECTION CRITERIA

APPROVED FOR CONSTRUCTION
CE-14470 OF 10/3/83

DOCUMENT CONTROL
RECEIVED
JUL 11 1984
SHEARON HARRIS N. P. P.

REV	DATE	BY	APPROVED
5	4/19/84		PAGES REVISED - ALL
4	1/16/84		
3	10/17/83		
2	10/4/83		
1	10/3/83		

Edward S Kornuchi

EBASCO SERVICES INCORPORATED DIV. PROJ ENG DATE Oct 3 1983	APPROVED	CAROLINA POWER & LIGHT CO. SHEARON HARRIS NPP WELD INSPECTION CRITERIA	CAR-2165 A-003

EXHIBIT 1

1.0 SCOPE

The intent of this design document is to provide the CP&L QA program with acceptance criteria that satisfies the design requirements and thereby allowing clarification from strict code interpretation during receipt inspection, reinspection, and field welding inspection. This criteria is applicable to both primary (first inspection, uncoated) and secondary inspections (receipt inspection included with quality release or reinspection, coated) for structural weldments designed to AWS D1.1 requirements. Secondary inspections may be performed through coatings. Primary inspections shall not be performed through coatings unless allowed by the engineer. Any item not specifically covered in this criteria shall refer back to AWS D1.1.

This criteria covers joints which provide framing for components, such as cable tray, HVAC, conduit supports, instrument racks, ducting air control dampers, doors, hatch covers, pipe supports, etc. This is to include any item welded to AWS D1.1 standards. R5

This criteria is applicable to any weld joint where these imperfections are to be visually inspected per AWS D1.1. R

As per AWS D1.1, welds with acceptable defects in combination shall be acceptable. R5

Based on the QA programs for acceptance prior to vendor release (or acceptance of field welds), any defects not identified during primary inspection and subsequently covered by coatings are not considered significant.

Visual inspection of welds shall be in accordance with AWS D1.1 except as modified below:

All visual inspection shall be performed at an eye-to examination surface distance of no more than 24 inches, the inspector position within an angular region of 30° to 90° of the examination surface by personnel possessing 20/20 visual acuity. Visual aids which do not enchance 1X capability, such as mirrors, may be used. Visual inspection shall be used unless otherwise noted on design documents. R5

2.0 ACCEPTABILITY CRITERIA

2.1 Oversize Fillet Welds

Either or both fillet weld legs may exceed design size. Welds may be longer than specified. Continuous welds may be used in lieu of intermittent welds.

2.2 Undersize Fillet Welds

The leg of 1/4" and larger fillet welds may be 1/16" less than the required weld size for a continuous span of 2", provided there is no less than a 6" separation between each undersize increment. For welds less than 8" long, a continuous undersize span of 25% of the total weld run length will also apply. All 1/16" undersize increments less than 1/2" in length will be acceptable. For intermittent welds, 1/16" less than the required size will be accepted provided the undersize condition is no more than 40% of the weld length. R5

The leg of 3/16" fillet welds may be 1/32" less than the required size according to the above provisions or 1/16" less for 10% of the length. R5

It is to be understood that the thickness of coatings on secondary inspections are not considered detrimental and the weld size criteria shall not be adjusted. Any unique application of coatings (excessive thickness, putty) shall be brought to the attention of QA management for resolution. R5

2.3 Porosity

Pores between 1/16" and 1/8" diameter shall be acceptable when separated by a minimum of one inch. Isolated pores less than 1/16"

diameter shall be disregarded. Clustered porosity including all sizes to 0.030" contained within up to a 3/8" diameter circle shall be acceptable. Linear, in-line pores shall be considered as clustered porosity. It is to be understood that porosity not visible through coatings on secondary inspection are not considered significant. R5

2.4 Weld Profile

Fillet and butt weld convexity can be accepted without limit.

2.5 Craters

Welds may have underfilled craters provided underfill depth does not exceed 1/16" and the crater has a smooth contour blending gradually with the adjacent weld and base metal with no evidence of cracking.

2.6 Undercut

Steels 5/16" or thicker which were produced to a maximum specified tensile strength of 60,000 psi may contain weld undercut up to 1/16" in depth for a continuous span of 2" provided its surface width is no less than 0.100" and there is no less than a 6" separation between each undercut increment. Weld R5

runs less than 8" long may contain a continuous undercut span of 25% of the total weld length. All undercut less than 1/2" in length will be accepted provided the above width limit is adhered to. Undercut up to 1/32" depth is acceptable in all steels and all thicknesses.

2.7 Cracks

Cracks are unacceptable. It is to be understood that secondary inspections are intended to identify cracks that result from shipping damage or stress relief and, if relevant, would appear through the coating. R5

2.8 Arc Strikes

Arc strikes in high-strength, low-alloy steels (minimum specified tensile strength greater than 60,000 psi), shall be removed by grinding. The ground area shall be visually inspected to assure complete removal of the arc strikes.

For other steels, having specified tensile strength of 60,000 psi or less, arc strikes shall be visually examined and accepted if no cracking is evident. If cracking is evident, the repair shall conform with Section 3.10 of AWS D1.1. Arc strike regions in these lower strength steels shall not require power brushing or grinding before visual examination. It is to be understood that cracks in arc strikes not visible through coatings on secondary inspections are not considered significant. R5

2.9 Fusion

Lack of fusion which does not exceed 1/4" in length when measured transverse or along the weld and each increment separated by 6" is acceptable. For welds between 1" and 6" in length, 1/4" maximum lack of fusion is acceptable. For welds less than 1", lack of fusion is not acceptable. R5

Criteria for lack of fusion in transverse direction is applicable only in start/stop location.

Criteria for lack of fusion shall apply to overlap also. It is to be understood that lack of fusion not visible through coatings on secondary inspections is not considered significant. Any unique application of coatings (excessive thickness, putty) shall be brought to the attention of QA management for resolution. R5

file

JUL 24 1984

Carolina Power and Light Company
ATTN: Mr. E. E. Utley
Executive Vice President
Power Supply and Engineering
and Construction
411 Fayetteville Street
Raleigh, NC 27602

Gentlemen:

SUBJECT: REPORT NO. 50-400/84-19

On July 10-13, 1984, NRC inspected activities authorized by NRC Construction Permit No. CPPR-158 for your Harris facility. At the conclusion of the inspection, the findings were discussed with those members of your staff identified in the enclosed inspection report.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Within the scope of the inspection, no violations or deviations were identified.

Your attention is invited to unresolved items identified in the inspection report. These matters will be pursued during future inspections.

In accordance with 10 CFR 2.790(a), a copy of this letter and enclosure will be placed in the NRC Public Document Room unless you notify this office by telephone within 10 days of the date of this letter and submit written application to withhold information contained therein within 30 days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1).

Should you have any questions concerning this letter, please contact us.

Sincerely,

/S/

David M. Verrelli, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Enclosure:
Inspection Report No. 50-400/84-19

cc w/encl: (See page 2)

EXHIBIT 2

cc w/encl:
R. A. Watson, Vice President
Harris Nuclear Project
R. M. Parsons, Project General Manager

bcc w/encl:
NRC Resident Inspector
Document Control Desk
State of North Carolina

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

Report No.: 50-400/84-19

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

Docket No.: 50-400

License No.: CPPR-158

Facility Name: Harris Unit 1

Inspection Dates: July 10-13, 1984

Inspection at Harris site near Raleigh, North Carolina

Inspector: W. P. Kleinsorge — July 20, 1984 (Date Signed)

Accompanying Personnel: G. A. Hallstrom

Approved by: J. J. Blake, Section Chief, Engineering Branch, Division of Reactor Safety — 7/20/84 (Date Signed)

SUMMARY

Scope: This routine unannounced inspection involved 66 inspector-hours on site in the areas of licensee action on previous enforcement matters, construction progress, reactor coolant pressure boundary piping, safety-related piping, visual examination (57050B), safety-related components, inspector followup items, and IE Bulletins (IEBs).

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. M. Parsons, Project General Manager
*P. Foscolo, Assistant Project General Manager
*N. J. Chiangi, Manager QA/QC Harris Plant
*G. L. Forehand, Director of QA/QC
*D. A. McGaw, Superintendent, QA
*R. Hanford, Resident Engineer - Met/Welding
C. H. Griffin, Senior Engineer Met/Weld
*D. C. Whitehead, QA Supervisor
*J. F. Nevill, Principal Engineer

Other licensee employees contacted included construction craftsmen, technicians, and office personnel.

Other Organization

L. M. Petrick, Chief Materials Engineer - Ebasco Services Inc.

NRC Resident Inspectors

*G. F. Maxwell
R. L. Prevatte

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on July 13, 1984, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee.

(Open) Unresolved Item 400/84-19-01 "Adequacy of AWS D1.1 Visual Inspection Procedure" - paragraph 8.

(Open) Inspector Followup Item 400/84-19-02 "Unavailable NDE Reports" - paragraph 6.b.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item 50-400/84-02-03: "QA Involvement in Pipe Support Reinspection."

This item concerned QA involvement, with the pipe support installation and inspection program, which did not appear to be commensurate with problems reported in that area. The licensee, on February 17, 1984, started weekly surveillances of QA and CI inspections relative to hanger

inspection activities; these surveillances included reinspection of hangers. The inspector reviewed the majority of the surveillance reports generated. This matter is considered closed.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve noncompliance or deviations. New unresolved items identified during this inspection are discussed in paragraph 8.

5. Independent Inspection Effort

Construction Progress

The inspector conducted a general inspection of the reactor power block to observe construction progress and construction activities such as welding, material handling and control, housekeeping and storage.

Within the areas examined no violations or deviations were identified.

6. Reactor Coolant Pressure Boundary Piping

The inspector observed work activities and reviewed records for non-welding and welding work activities for reactor coolant pressure boundary (RCPB) piping. The applicable code for the installation of RCPB piping is the ASME B&PV Code, Section III, Subsection NB, 1974 Edition through the winter 1976 addenda.

a. Observation of Non-Welding Activities (49054B)

Observation of specific work activities was conducted to determine conformance, where applicable, with the following: inspection and/or work procedures, record keeping, installation specifications or plans, specified materials, specified NDE, calibration and use of proper test equipment and qualified inspection and NDE personnel.

The following piping "runs" were inspected for compliance with installation specifications or plans:

Weld No.		Drawing
From	To	
FW 456	FW 464, FW 468, & FW 460	1-RC-149
FW 341	FW 344	1-RC-130
FW 339	FW 340 & FW 344	1-RC-129

b. Review of Non-welding Quality Records (49056B)

The inspector selected various reactor coolant pressure boundary piping components (e.g., pipe, fittings and welded-in components) for review of pertinent records to determine conformance with procurement, storage and installation specifications and QA/QC site procedures.

Records of the following items were selected for review to ascertain whether they (records) were in conformance with applicable requirements relative to the following areas: material test reports/certifications; vendor supplied NDE reports; NSSS quality releases; site receipt inspection; storage; installation; vendor nonconformance reports.

Item	Heat/Control No.	System
3" sched 160 Pipe	04840	Reactor Coolant
3" sched 160 Tee	04488/11278-7	Reactor Coolant
3" x 2" sched 160 Conc Swg. fitting	659AN/32482-1	Reactor Coolant
3" sched 160 pipe	04840/72079-7	Reactor Coolant
3" sched 160 pipe	M2760/61179-1	Reactor Coolant
3" sched 160-90° ell	JMJK/52080-20	Reactor Coolant
3" sched 160-90° ell	JMJK/12479-11	Reactor Coolant
3" sched 160-90° ell	JMJK/52180-9	Reactor Coolant
3" sched 160-90° ell	RW750180/92779-1	Reactor Coolant
6" sched 160-90° ell	E0324/5581-18	Reactor Coolant
6"x6"x3" sched 160 Reducing Tee	E0324/5581-1	Reactor Coolant
6"x6"x3" sched 160 Reducing Tee	E0277/5481-2	Reactor Coolant
6"x3" concentric Reducer	E0218/5481-1	Reactor Coolant
6" sched 160 pipe	M2786/120980-8	Reactor Coolant
6" sched 160 pipe	M2945/120980-4	Reactor Coolant
6" sched 160-90° ell	JKJD/5880-5	Reactor Coolant
6" sched 160-90° ell	JKJD/5880-6	Reactor Coolant
6" x 3/4" sched 160 weld-o-let	370AN	Reactor Coolant
6" sched 160 pipe	M2945/120980-12	Reactor Coolant
6" sched 160 pipe	M2813/121080-6	Reactor Coolant
6" sched 160-90° ell	E0324/5581-17	Reactor Coolant
6" sched 160-90° ell	E0324/5581-20	Reactor Coolant
6" sched 160-90° ell	E0324/5581-1	Reactor Coolant
2" - 6000# socket weld coupling	27BAN	Reactor Coolant
2" sched 160 pipe	07118	Reactor Coolant
2" sched 160 pipe	05682	Reactor Coolant
2" sched 160-90° ell	JNYM	Reactor Coolant

Spool Pieces

1-RC-129-1	Reactor Coolant
1-RC-149-3	Reactor Coolant
1-RC-149-2	Reactor Coolant
1-RC-149-1	Reactor Coolant
1-RC-130-1	Reactor Coolant
1-RC-130-2	Reactor Coolant

With regard to the examination above, the inspector was unable to review the following final acceptance NDE Reports:

Method	Weld Joint ID
RT & PT	1-CS-414-FW-3074
PT	1-RC-149-FW-459
RT	1-RC-149-FW-467
PT	1-RC-129-FW-339
RT	1-RC-129-FW-340

The licensee indicated the above reports would be made available for a future inspection. This matter will be identified as inspector followup item 400/84-19-02: "Unavailable NDE Reports."

c. Welding Activities

(1) Visual Inspection of Welds (55175B)

The inspector visually examined completed welds as described below to determine whether applicable code and procedure requirements were being met.

(a) The below listed welds were examined relative to the following: location, length, size and shape; weld surface finish and appearance, transitions between different wall thickness; weld reinforcement--height and appearance; joint configurations on permanent attachments and structural supports; removal of temporary attachment, arc strikes and weld spatter; finish-grinding or machining of weld surface, surface finish and absence of wall thinning; surface defects, cracks, laps, lack of penetration, lack of fusion, porosity, slag, oxide film and undercut exceeding prescribed limits.

Weld Joint
1-RC-149-FW-457
1-RC-149-FW-458
1-RC-149-FW-463
1-RC-149-FW-464
1-RC-149-FW-467
1-RC-149-FW-468
1-RC-149-FW-460
1-RC-149-FW-459
1-RC-130-FW-341
1-RC-130-FW-342
1-RC-130-FW-343
1-RC-130-FW-344
1-RC-129-FW-339
1-RC-129-FW-340

(b) Quality records for the above welds were examined relative to the following: records covering visual and dimensional inspections indicate that the specified inspections were completed; the records reflect adequate weld quality; history records are adequate.

(2) Welding Procedure Specifications (55171B)

The following Welding Procedure Specifications (WPS) were selected for review and comparison with the ASME Code:

WPS	Process*	PQR
8BU1O, Rev. 1	GTAW	101
8B2, Rev. 13	GTAW	6, 6A, & 6B

*GTAW-Gas Tungsten Arc Welding

The above WPSs and their supporting Procedure Qualification Records (PQRs) were reviewed to ascertain whether essential, supplementary and/or nonessential variables including thermal treatment were consistent with code requirements; whether the WPSs were properly qualified and their supporting PQRs were accurate and retrievable; whether all required mechanical tests had been performed and the results met the minimum requirements; whether the PQRs had been reviewed and certified by appropriate personnel and; whether any revisions and/or changes to nonessential variables were noted. WPSs are qualified in accordance with ASME Section IX, the latest edition and addenda at the time of qualification.

(3) Special Welding Activities (55178)

The inspector examined special welding activities including weld repair as described below to determine whether applicable code and procedure requirements were being met.

Records of the following special application welds were examined relative to the following: welding procedure used; welding procedure includes all pertinent requirements; welding procedure qualification; welder performance qualification; ANI witnesses performance qualification; base and filler material as specified; base material repairs documents; NDE performed, and records complete.

Incore Instrumentation Tube Welds

PC No.
CQL-50-A-9
CQL-36-B-8
CQL-40-B-10
CQL-44-C-12

Control Rod Drive Seal Welds

Field Weld No.
FW-36
FW-55
FW-60

Within the areas examined, no violations or deviations were noted.

7. Safety-Related Piping

The inspector observed welding activities for safety-related piping as described below to determine whether applicable code and procedures requirements were being met. The applicable code for safety-related piping is the ASME B&PV Code, Section III, Subsections NC and ND, 1974 edition with addenda through winter 1976. Non nuclear safety-related high energy piping identified seismic category 1 is fabricated to ANSI B31.1 (73S73) and post weld heat treated when required to ANSI B31.1 (77W77). The inspector observed in-process welding activities of field welds as described below to determine whether applicable code and procedure requirements were being met.

Weld Heat Treatment (55186B)

Stress Relief

The inspector examined the cumulative stress-relief records for selected pipe welds listed below to determine whether the total time at temperature did not exceed that permitted by applicable code requirements based on the welding procedure qualification record:

Weld No.	System
1-MS-72-FW-295	Main Steam
1-FW-135-FW-497	Feedwater

Within the areas examined, no violations or deviations were identified.

8. Visual Examination (57050B)

Procedure Review

The inspector reviewed CP&L procedure CAR-2165-A-003, Rev. 5, to ascertain whether it has been reviewed and approved in accordance with the licensee's established QA procedures. The above procedure was reviewed for technical adequacy and conformance with AWS D1.1, Structural Welding Code, and other licensee commitments/requirements in the following areas: specified method; specified application; type of surface condition; method of surface preparation; whether direct or remote viewing is used; special illumination, instruments, or equipment required; sequence of examination; acceptance criteria; and reports to be completed.

With regard to the above the inspector noted the following:

a. Lack of clear definition of weld type and material applicability to assure no misuse of criteria

b. Lack of spacing control for short duration (less than ¼") acceptable undersize welds

c. Lack of supporting justification of criteria based on longitudinal versus transverse shear

d. Lack of assurance against base metal thickness reduction for craters acceptable on butt welds

e. Lack of limit for undercut depth and spacing for short duration (less than ¼") undercut imperfections

f. Lack of assurance that all materials applicable to these criteria have suitable notch toughness to prevent brittle fracture because of increased notch size (undercut)

g. Lack of supporting justification for assurance against crack propagation due to acceptance of lack of fusion

h. Lack of clarification of the acceptability of lack of fusion in butt welds

i. Lack of assurance that residue remaining after an arc strike on 60 KSI or less strength materials will be removed prior to visual inspection

j. Lack of supporting justification of the impact of acceptance of combined worst-case discontinuities

The inspector indicated that pending NRC review of the licensee's resolution to the above items this matter will be identified as unresolved item 400/84-19-01: "Adequacy of AWS D1.1 Visual Inspection Procedures."

Within the areas examined no violations or deviations were identified.

9. Safety-Related Components

a. Procedure Review (50071B)

The inspector reviewed Westinghouse Document AE435P/47P8203-1 Rev. 1, "NSSS Component Receiving and Storage Guidelines" and CP&L Procedures; WP-132 Rev. 2, "Installation of Coil Stack Assemblies, Rod Position Indicators, Seismic Sleeve Assemblies, Thermal Sleeve Guides, and Dummy Can Assemblies"; and WP-127 Rev. 1, "Installing the Pressure Vessel/Latch Assemblies, Head Adapter Plugs, and Instrument Ports," to determine whether specific activities associated with safety-related components are controlled and performed according to NRC requirements and licensee commitments in the below listed areas: installation, testing, and inspection activities meet applicable specifications and established procedures; post-inspection cleaning, preservation, and inspection requirements have been established before need; record keeping requirements are established and clearly indicate those responsible for record generation, and that provisions exist for their review by appropriate management personnel.

b. Work Observation (50073B)

The inspector conducted independent evaluation of storage conditions for the reactor head assembly in accordance with procedures listed above to determine whether activities were in conformance to the procedures involved in the following listed areas: storage environment and protection of components; implementation of special storage and maintenance requirements (cleanliness); and performance of licensee/contractor surveillance and documentation.

Within the areas inspected no violations or deviations were identified.

10. Inspector Followup Items

a. (Closed) IFI 400/83-24-07: "Undercut Criteria for Structural Welds."

This item concerns suitability of undercut acceptance criteria limiting undercut to .01" deep when transverse to the direction of primary stress. This matter is expanded in unresolved item 400/84-19-01; therefore, this inspector followup item is closed.

b. (Closed) IFI 400/84-13-01: "Unavailable Liquid Penetrant Record."

The licensee made the missing record available. The inspector has no further questions in this matter.

c. (Closed) IFI/84-09-02: "Cumulative PWHT Records."

This matter concerned unavailable PWHT records. The licensee made the PWHT records available. The inspector has no further questions in this matter.

d. (Closed) 400/83-03-03: "Evaluation of the Effectiveness of PT on Previously Painted Surface."

This matter concerned the effectiveness of liquid penetrant examination on previously painted surfaces. The licensee performed mock-up testing to demonstrate the effectiveness of cleaning and subsequent liquid penetrant examination of a test block with known defects. The inspector has no further questions in this matter.

11. IE Bulletins (IEBs)

(Closed) IEB 400, 401/80-BU-21: Valve Yokes Supplied by Malcolm Foundry Company, Inc.

CP&L responded to the Bulletin on January 5, 1981, reporting affected valves and stating that "any valve parts having properties not in accordance with ASTM material specification will be replaced by Anchor Darling." NRC Inspection Report 50-400(-401)/82-19 of July 8, 1982, contains the statement that "replacement of hand wheels manufactured by Malcolm Foundry was deemed unnecessary by the licensee." The inspector discussed the above with the licensee who indicated that the valves in question were determined to be passive, and therefore the valve hand wheels were considered non safety-related. The licensee stated that they would amend their January 5, 1981 response to reflect the actual status of the bulletin subject by September 1, 1984.

TI 2515/29
Issue Date: 9/14/79

INSPECTION REQUIREMENTS FOR IEB 79-14

I. OBJECTIVE

The objective of this temporary instruction is to provide guidance for IE inspection and review of licensees' actions and written responses to IE Bulletin 79-14 including Revision 1 to Page 2 of the Bulletin. Bulletin 79-14 requests that licensees assure that seismic analyses of safety-related piping systems accurately reflect the as-built configuration of the plant.

II. BACKGROUND

Recently, two issues were identified which are related to the validity of seismic analyses. These are the analytical technique for combining seismic loads and the validity of input information for seismic analyses. IE Bulletins 79-07 (combining seismic loads), 79-02 (as-built condition of pipe supports) and 79-04 (actual valve weights) address these issues.

As a result of issuing IE Bulletin 79-07 and show cause orders to four licensees, the concern regarding the technique for combining seismic loads was essentially resolved. IE Bulletin 79-02 and 79-04, however, have led to discovery of some failures to conform to design documents which are outside the scope of these bulletins and could have an adverse effect on the validity of the seismic analyses. Based on this fact, IE and NRR concluded that it is necessary to request licensees to verify that other seismic analysis input information is correct by comparison of this input with the physical facility as constructed. IE Bulletin 79-14 was issued for this purpose. The bulletin request that licensees establish an ad hoc inspection program scheduled so that the required inspections are completed within 120 days. Further, the bulletin requires that licensees resolve specific nonconformances by either making changes to the system such that it conforms to design or by correcting the seismic analysis to demonstrate conformance of the as-built system to design criteria. It also requires that licensees take action to correct administrative problems which could allow this problem to recur.

III. BULLETIN REQUIREMENTS

To comply with the requests in IE Bulletin 79-14, it will be necessary for licensees to do the following:

1. Identify Inspection Elements

The licensee must himself or through his contractors or consultants: (a) identify the piping system parameters which were input into the seismic analyses, (b) identify specifically the design documents from which values of the parameters were obtained for the seismic analyses

and (c) establish acceptance criteria which as-built values of these parameters must meet. System parameters which are important include piping system geometry; locations and orientations of anchor points and restraints; masses; locations of centers of gravity; sizes and cross sections of piping, supports and restraints; restraint clearances; and material properties. To competently comply with Item 1 in the Bulletin the licensee must assure that the persons identifying these inspection elements are sufficiently conversant with the seismic analysis documents to identify all significant inputs and their sources. Inspection elements must be identified for those safety-related piping systems addressed in the bulletin. The licensee must then report to the regional office in accordance with Item 1 of the Bulletin.

For older plants for which seismic design criteria did not exist at the time the plants were licensed, licensees are expected to inspect safety-related piping 2-1/2 inches in diameter and greater for conformance to design requirements. For these plants, licensees should identify inspection elements and acceptance criteria for the parameters identified above and report to the regional office in accordance with Item 1 of the Bulletin.

2. Inspect Part of the Accessible Piping

For each system selected by the licensee in accordance with Item 2 of the Bulletin, the licensee is expected to verify by physical inspection, to the extent practicable, that the inspection elements meet the acceptance criteria. In performing these inspections, the licensee is expected to use measuring techniques of sufficient accuracy to demonstrate that acceptance criteria are met. Where inspection elements important to the seismic analysis cannot be viewed because of thermal insulation or location of the piping, the licensee is expected to remove thermal insulation or provide access. Where physical inspection is not practicable, e.g., for valve weights and materials of construction, the license is expected to verify conformance by inspection of quality assurance records. If a nonconformance is found, the licensee is expected in accordance with Item 4 of the Bulletin to perform an evaluation of the significance of the nonconformance as rapidly as possible to determine whether or not the operability of the system might be jeopardized during a safe shutdown earthquake as defined in the Regulations. This evaluation is expected to be done in two phases involving an initial engineering judgment (within 2 days), followed by an analytical engineering evaluation (within 30 days). Where either phase of the evaluation shows that system operability is in jeopardy, the licensee is expected to meet the applicable technical specification action statement and complete the inspections required by Items 2 and 3 of the Bulletin as soon as possible. The licensee must report the results of these inspections in accordance with the requirements for content and schedule as given in Items 2 and 3 of the Bulletin.

3. Inspect Remaining Piping

The licensee is expected to inspect, as in Item 2 above, the remaining safety-related piping systems which were seismically analyzed and to report the results in accordance with the requirements for content and schedule as given in Item 3 of the Bulletin.

4A. Evaluate Nonconformances

With regard to Item 4A of the Bulletin, the licensee is expected to include in the initial engineering judgment his justification for continued reactor operation. For the analytical engineering evaluation, the licensee is expected to perform the evaluation by using the same analytical technique used in the seismic analysis or by an alternate, less complex technique provided that the licensee can show that it is conservative.

If either part of the evaluation shows that the system may not perform its intended function during a design basis earthquake, the licensee must promptly comply with applicable action statements and reporting requirements in the Technical Specifications.

4B. Submit Nonconformance Evaluations

The licensee is expected to submit evaluations of all nonconformances and, where the licensee concludes that the seismic analysis may not be conservative, submit schedules for reanalysis in accordance with Item 4B of the Bulletin or correct the nonconformances.

4C. Correct Nonconformances

If the licensee elects to correct nonconformances, the licensee is expected to submit schedules and work descriptions in accordance with Item 4C of the Bulletin.

4D. Improve Quality Assurance

If nonconformances are identified, the licensee is expected to evaluate and improve quality assurance procedures to assure that future modifications are handled efficiently. In accordance with Item 4D of the Bulletin, the licensee is expected to revise design documents and seismic analyses in a timely manner.

IV. REQUIREMENTS FOR IE INSPECTION

Evaluation of licensees' actions will consist of inspections on a sampling basis and reviews of written responses in the field to assure that licensees responded to the Bulletin in a timely and competent manner and reviews at Headquarters to assure that licensees' actions are appropriate. For each site, the inspector will inspect the following:

1. Development of Inspection Elements

Review the organization and the qualifications of the persons who developed the inspection elements. Interview one of those persons if available on site. Inspect some of the documentation of inspection elements and acceptance criteria which was prepared for use by personnel inspecting the piping systems for the licensee. If documentation of the seismic analysis is available at the site, inspect it in conjunction with the documentation of inspection elements to determine that pertinent parameters and values were identified as required by Item 1 of the Bulletin. Also determine, to the extent possible, that acceptance criteria were developed in a rational way.

Inspections covering the area described above will also be conducted within the organizations of three architect engineers. Selection of one architect engineer each by Regions II, III and V will be coordinated with the Vendor Inspection Branch by Technical Programs/Headquarters.

Potential generic problems identified during licensee and architect engineer inspections should be referred to the appropriate regional task group representative as identified in Section VI.

2. Licensees' Inspection of Accessible Piping

Observe in part the physical inspections of accessible piping systems performed by licensees in accordance with Item 2 of the Bulletin. Review licensees' reports to determine that they accurately reflect the work done. Independently inspect a segment of a piping system which the licensee has completed. For that segment, inspect each inspection element to the extent practicable.

3. Licensees' Inspection of Normally Inaccessible Piping

In accordance with Item 3 of the Bulletin, do the work described in Item 2 above.

4A. Nonconformance Evaluations

Where nonconformances are identified, determine that evaluations were initiated as soon as was reasonably possible and have been completed in accordance with Item 4A of the Bulletin and Section III, Items 2 and 4A, above. Assure that action was taken in accordance with action statements in Technical Specifications.

4B. Submittal of Nonconformance Evaluations

Determine that licensees have submitted all completed nonconformance evaluations to NRC per the distribution given in the Bulletin. Also, determine that licensees have submitted schedules as required by Item 4B in the Bulletin where reanalysis is indicated by licensees.

4C. Correction of Nonconformances

Where licensee elect to correct significant nonconformances, determine that schedules and reports required in Item 4C of the Bulletin have been submitted.

4D. Improvement of Quality Assurance

For sites where nonconformances are identified, assure that necessary improvements to quality assurance procedures related to design changes due to modifications or maintenance are completed within 120 days of the date of the Bulletin. Also assure that design documents and seismic analyses are revised as required by Item 4D of the Bulletin and in accordance with Section III, Item 4D above.

V. REPORTING REQUIREMENTS

The results of inspections required by Section IV above, shall be included in the usual inspection report. The regions shall transmit a copy of pertinent portions of inspection reports describing this effort to R. W. Woodruff TP, ROI, IE; and to S. B. Hosford, DOR, NRR.

VI. EVALUATION OF LICENSEES' REPORTS

Reports submitted by licensees in accordance with the requirements of the Bulletin will be evaluated at Headquarters by a task group with the following membership:

C. J. DeBevec,	ROI, IE (for BWRs)
*R. W. Woodruff,	ROI, IE (for PWRs)
J. C. Glynn,	RCI, IE (for construction)
R. A. Feil,	RI, IE (for RI reactors)
L. Modenos,	RII, IE (for RII reactors)
I. T. Yin,	RIII, IE (for RIII reactors)
R. H. Brickley,	RIV, IE (for AEs and RIV reactors)
T. W. Hutson,	RV, IE (for RV reactors)
*R. G. LaGrange,	DOR, NRR (for structural review)
*R. Lobel,	DOR, NRR (for W systems review)
*M. M. Mendonca,	DOR, NRR (for GE systems review)
*S. S. Diab,	DOR, NRR (for CE/B&W systems review)
*S. B. Hosford,	DOR, NRR

This task group will prepare evaluations of the reports submitted for each operating facility.

Reports submitted by each holder of a construction permit will be evaluated, by the task group in conjunction with the licensing review which leads to issuance of the operating license.

An interoffice panel, as indicated above by asterisks, has been identified from the task group to respond to licensees' questions on the intent of the Bulletin and to evaluate licensees' arguments for continued plant operation with safety related equipment or systems which are degraded from the design intent. The panel shall be convassed or convened based upon questions directed from the regional offices. The panel will discourage licensees from bypassing the regional offices since most of the questions raised can be readily answered there. The panel consists of the persons noted by an asterisk above.

VII. EXPIRATION

This TI shall expire on January 4, 1982.

VIII. IE HEADQUARTERS CONTACTS

H. J. Wong, R. W. Woodruff, E. L. Jordan (49-28180)

IX. MODULE TRACKING SYSTEM INPUT (766 DATA)

For module tracking system input, record the actual inspection effort against Module No. 25529B.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
Washington, D.C. 20555

INSPECTION AND ENFORCEMENT MANUAL

DRP

INSPECTION PROCEDURE 50090

SAFETY RELATED PIPE SUPPORT AND RESTRAINT SYSTEMS

PROGRAM APPLICABILITY: 2512

50090-01 INSPECTION OBJECTIVES

011 To determine whether the technical requirements detailed or referenced in the facility Safety Analysis Report (SAR) associated with safety-related pipe supports and restraint systems have been adequately addressed in the construction specifications, drawings, and work procedures.

012 To determine whether quality assurance (QA) plans, instructions, and procedures for safety-related pipe supports and restraints have been established in the facility QA Manual.

013 To determine through direct observation and independent evaluation of work, whether the licensee's work control system is functioning properly and whether the installation of safety-related pipe support and restraints are in compliance with NRC requirements, licensee commitments, and applicable codes.

014 To review samples of safety-related pipe support and restraint system records to determine whether the licensee is adequately preparing, reviewing, and maintaining a system of quality records; whether there is reasonable assurance that the records reflect work accomplishment consistent with NRC requirements and SAR commitments; and whether the records indicate any potentially generic problems, management control inadequacies, or other weaknesses that could have safety significance.

Inspection Schedule

May Be Started	Must Be Started	Must Be Completed
---	Before work is 20% complete.	90 days following completion of work.

EXHIBIT 3

50090-02 INSPECTION REQUIREMENTS

021 Review of QA Implementing Procedures

Review the facility QA Manual and Implementing Procedures to determine whether:

a. Adequate QA uadit procedures have been established for this activity including scope and frequency of audits, audit criteria, reporting requirements, followup action, and resolution of findings by those audited.

b. Provisions have been made to ensure that those engaged in conducting audits are qualified and have been adequately trained. Provisions must ensure that auditors do not have direct responsibility in the areas being audited.

c. Means have been established to verify that technical requirements, including material and component specifications, acceptance criteria and required documentation are specified in design and procurement documents.

d. Means have been established to verify that any significant design and field changes from approved drawings are adequately controlled and processed commensurate with the original design.

e. Provisions have been established to ensure that quality requirements are met (including documentation that quality requirements of materials and components are met before installation or use) and that deviations, nonconformances, and defects are adequately documented and processed through to complete resolution.

f. The licensee has established a program for ensuring that all craft, NDE and inspection personnel associated with the installation of safety-related pipe supports and restraints have been trained, or otherwise qualified to the work procedures involved, with specific attention directed toward those engaged in the installation and testing of concrete expansion anchors.

022 Review of Work Procedures

a. Determine whether procedures and instructions (e.g., drawings, specifications, manufacturers' instructions, etc.) pertaining to safety-related pipe supports/restraints have been reviewed and approved. Make this determination by reviewing an appropriate sample of work procedures. Include in the sample

procedures and instructions that will be used for supports on both large and small bore piping - including instrumentation lines.

b. Determine whether work procedures incorporate the following:

1. controls to ensure that the type and classification of pipe support and restraint systems comply with approved drawings and/or specifications and meet licensee commitments,

2. instruction and precautions to ensure that welding, cutting, forming, heat treating, and machining are performed in a manner that will prevent the impact properties of the material from being degraded below specified values,

3. provisions for ensuring that required preinstallation and in-process inspections are performed at the appropriate time,

4. means to ensure that bolts, nuts, and washers (including lubricant if used) are of the proper type and correctly installed, and where required, bolt preloading (torquing); minimum bolt embedment and thread engagement criteria are imposed.

023 Observation of Work and Work Activities

By direct observation, interviews, and independent evaluation of work performance, work in progress, and completed work, determine whether activities relative to pipe support/restraint systems are being accomplished in accordance with NRC requirements, SAR commitments, and licensee procedures.

a. Personnel Interviews (Installation Practices)

Select appropriate personnel (three or four) engaged in the installation and testing of safety-related supports, snubbers, and shock suppressors and confirm the following:

1. Preinstallation checks are made to ensure hydraulic units are not installed if there is evidence of excessive leakage of hydraulic fluid (possible damage or deterioration of seals) physical damage, or corrosion of polished sliding surfaces,

2. Preinstallation check on variable type supports are performed for obvious damage, rust, or other conditions that may interfere with their proper operation.

3. Any preinstallation field repairs or adjustments to the units are performed in accordance with the manufacturers' instructions and specifications to ensure that proper seal materials, replacement parts and fluids are used, and performance requirements are met.

4. Installation equipment such as torque wrenches and other testing and measuring devices are properly controlled, calibrated, and adjusted at specified periods.

5. Personnel engaged in the installation of safety-related pipe supports and restraints have received adequate training to perform special processes contained in relevant work performance and inspection procedures.

b. Installation Activities

1. Witness portions of the installation activities of ten (10) pipe support systems to verify the following:

(a) The latest issue (revision) of applicable drawings or procedures are available to the installers.

(b) Significant modifications to supports are approved by appropriate personnel before implementation.

(c) The use of jacks or rigging to pull piping into position for hanger installation or welding does not exceed cold spring allowances for that particular material, size and length of pipe run.

(d) Clearances exist between the pipe and retraints are as specified on detail drawings.

2. Witness portions of the installation and testing of concrete anchor bolts for ten component support elements (of various type and pipe size) to verify that anchor bolt type, diameter, embedment length, shoulder-to-cone measurements and torque requirements meet installation requirements.

c. Dynamic Pipe Supports

Select a total of ten installed snubbers, shock suppressors or restraints for at least three different load classifications and at various degrees of accessibility (easy or difficult accessibility), and determine by visual examination whether the following conditions meet applicable requirements:

1. Components are free from corrosion or other signs of deterioration.

2. Support plates, extension rods, and connecting joints are not bent, deformed, loose, or otherwise out of specification.

3. Bolts, nuts, washers, locking devices, and fasteners are tight and secure and are of the correct material and size. Where required, bolt tension specification requirements have been met through the use of properly calibrated bolt torquing wrenches and torque multipliers.

4. Bleed holes are open and free from foreign material.

5. Lubricants and sealants are applied as specified and there does not appear to be sign of excessive leakage.

6. Seals are not deteriorated (if visually observable without dismantling).

7. Connecting joints, moving parts, piston shafts, seals, etc., are free from foreign material such as cement, dropped paint, excessive dust and dirt or other material that may obstruct proper operation.

d. Rigid, Constant, and Variable Type Supports

1. Select a total of ten installed spring hanger assemblies of three different load ratings and observe the following:

   (a) Hanger rods for supporting 2-inch pipe are not less than 3/8-inch diameter and for 2-1/2 inch pipe or larger, not less than 1/2-inch diameter.

   (b) Spring hangers are provided with indicators to show the approximate "hot" or "cold" position, as appropriate.

   (c) Spring hangers enclosed in spaces that will be subjected to high ambient temperatures during reactor operation, have suitable service ratings to accommodate the expected operating temperature range.

2. Select a total of ten installed pipe support systems of different sizes (load rating) and at various degrees of accessibility. Determine by visual examination whether the following conditions exist:

   (a) No deformation or forced bending is evident.

   (b) No deterioration or corrosion is evident.

(c) Where pipe clamps are used to support vertical lines, shear lugs are welded to the pipe (if required by installation drawings) to prevent slippage.

(d) Movements of pipe due to vibration, thermal expansion, etc., will most likely not cause contact with other pipes, supports, equipment or components (as best can be determined following installation but before initial operation.)

(e) Sliding or rolling supports are provided with material and/or lubricants suitable for the environment and compatible, sliding contact surfaces.

3. Select at least five small-bore or instrumentation lines that have been designed by a simplified seismic criterion and determine by visual examination whether the following conditions meet applicable requirements:

(a) The functional restraint direction is proper and in accordance with the design drawings.

(b) The gaps between the piping and support appear adequate to allow thermal axial expansion.

(c) The gaps between the piping and support are not excessive for dynamic loads.

e. Component Supports

Select a total of twelve installed component supports including at least three multiple pipe supports, and ascertain by visual examination whether the following conditions exist:

1. Component support elements are located and installed as specified on the drawings.

2. The surface of welds meet applicable Code requirements. Check weld surfaces for grooves, abrupt ridges, valleys, undercuts, cracks, discontinuities, or other detrimental indications that appear to exceed Code limitations.

3. Materials used in the construction of the component supports have been certified by reviewing material test reports or a certificate of compliance.

4. Where special bolting materials are specified check for compliance with specifications including preload (torquing requirements.)

5. Support design clearances are as specified on drawings.

f. As-Built Configuration

1. Select six as-built/final design pipe support structural drawings and compare several selected supports with the actual installation.

Discrepancies observed may result from in-process changes such as those initiated in the field. If in-process changes are involved, determine whether the licensee has properly controlled and documented these changes on a current basis for engineering review, approval, and subsequent incorporation into final as-built drawings.

2. Select a total of six pipe anchor locations on the as-built drawings (piping 2-1/2 inches in diameter and greater). These anchor locations are designed to restrict individual pipe movement in all directions. Visually examine these six anchors and compare them with the drawings to ensure agreement as to their location and function.

024 Review of Records

a. Review licensee/contractor requirements covering the span of records for safety-related piping supports and restraints. Determine the initiation point for those records sampled and, importantly, the effectiveness of those responsible for reviewing the records for accuracy and completeness and ensuring that the recorded information meets documentation requirements. To determine the effectiveness of the licensee/contractor system for documenting work in this area, review the records for three dynamic pipe supports or restraints and three fixed pipe supports in the following areas:

1. Type and classification of pipe support or restraint comply with appropriate drawings and specifications.

2. Location, spacing, and critical clearances meet licensee's specifications and have been verified by QA/QC.

3. The required scope of QA/QC inspections was met.

4. Weld identification/location corresponds to respective weld card, drawing, work order, or other welding documentation.

5. Welding material used corresponds to the material specified in the licensee's procedures

6. Welders were qualified to the welding procedures used and welding procedures were qualified in accordance with Code requirements.

7. The records confirm that for welding activities where attachments are welded directly to the safety-related piping, the welding specifications used are the same orequivalent to the ones used for safety-related pipe welding including preheat, post-weld-heat treatment, and nondestructive examinations.

8. The examination records are complete and meet the NDE procedure requirements.

b. Review the licensee/contractor system for reporting and dispositioning nonconforming materials, parts and components associated with safety-related pipe supports and restraints. Review approximately ten nonconformance/deviation reports to determine whether:

1. The records adequately document current status of nonconformances and deviations.

2. The records are legible, complete and indicate that reports are promptly reviewed by qualified personnel for evaluation and disposition.

3. The records are routinely being processed through established channels for resolution of the immediate problem as well as for generic implications.

4. The records are being properly identified, stored, and can be retrieved in a reasonable time.

5. Nonconformance reports include the status of corrective action or resolution.

6. Resolution of nonconformances appears to be reasonably appropriate, and demonstrates good engineering practice.

c. To determine whether qualified licensee/contractor, craft and inspection personnel are being utilized on those special processes associated with safety-related pipe support and restraint installation work, review a sampling of personnel qualification records (4 - 6, but no more than 10 records total) covering several different disciplines as follows:

1. Determine whether a system of personnel qualification records, meeting stated requirements, exists and is being maintained in current status.

2. Determine if the records are sufficient to reasonably support qualification in terms of certification, experience, proficiency, training, testing, etc., as applicable.

3. Review the action taken by responsible licensee/contractor organizations to independently authenticate the employment, training, and qualification history of newly hired personnel.

d. Review relevant portions of licensee/contractor audit reports concerning the installation of safety-related pipe supports and restraints. Review 2 - 4 reports to determine whether:

1. The required audits have been performed in accordance with schedule and functional areas in established audit plans.

2. Audit findings have been reported in sufficient detail to permit a meaningful assessment by those responsible for corrective action, final disposition, and trending.

3. The licensee/contractor has taken proper followup action on those matters in need of correction.

50090-03 INSPECTION GUIDANCE

031 General Guidance

a. This procedure pertains to all safety-related pipe supports and restraint systems; i.e., reactor coolant pressure boundary piping and all other safety-related piping. Pipe supports include pipe hangers, restraints, supports, shock and sway suppressors, etc. that directly support the pipe. Pipe whip restraints, such as structural steel or concrete barriers, that do not normally contact the pipe are not covered by this procedure. Additionally, it should be noted that some welding inspections are included in this inspection procedure (IP). Assistance to the inspector in this area may be required. This matter should be considered during inspection preparation.

b. Applicable portions of the SAR (3.2, 3.9 and 17.1) should be reviewed to determine licensee commitments relative to construction and inspection requirements before performing this inspection. The inspector should then utilize these SAR sections during the review of the licensee's implementing construction specifications, drawings, work procedures, and QA implementing procedures. Most of this review can be completed during inspection preparation after these procedures have been obtained from the site. The NRC inspector should also review applicable portions of ASME Code, Section III, Division I, Subsection NF, Component Supports.

c. It is recognized that the construction installation work associated with IP-50090 normally is carried out over an extended period of time which will require a series of inspections to fully complete this procedure. Additionally, some licensee contracting arrangements may be such that several different contractors will be involved in the installation work. If this is the case selected parts of this procedure may have to be repeated in order to adequately cover the total effort. Regional evaluations and appropriate adjustments to this procedure are necessary to ensure inspection continuity during the extended period of time involved and to accommodate the various contracting arrangements encountered.

d. Considerable impact on the development and structure of IP-50090 has resulted from a series of problems NRC has encountered in the area of pipe supports and restraints. These problems and concerns are best summarized in several IE Bulletins, Circulars, and Information Notices that have been issued over the years. These documents are listed in the reference section below. Information contained in these issuances should be of prime importance to inspectors during implementation of IP-50090, particularly to help understand the extent and variety of the problems, the details and nature of their occurrence and expected licensee corrective action.

e. Findings from this inspection activity should address each element as being satisfactory, being unresolved and requiring resolution, or being in violation and requiring correction. When significant inadequacies are identified in specifications or procedures indicating weakness within the preparing technical organization, the inspector should so inform cognizant regional supervision. The issue should be addressed at the appropriate level of licensee management.

032 Specific Guidance Note: The numbering of the guidance below refers to specific subsections of 02[illegible]ve.

021a&b Audit procedures and/or checklists for pipe supports and restraints systems should provide for checks of each type of system used and should, if possible, include representative samples from all suppliers of components. Audit procedures or criteria should address the qualifications needed by those performing the audits.

021f The inspector should determine specific steps the licensee has taken, or plans to take, to ensure that only qualified personnel are permitted to perform work associated with the installation of safety-related pipe supports and restraints. This effort may tie in with the review of the licensee's audit plans specific to this area of work.

022b2 Most of the welding, cutting and forming operations covered by this procedure pertain to component support structures, support members and brackets, and do not require pre-heat-treatment or post-weld heat treatment. However, those pipe supports, support flanges, or support brackets that are directly welded to safety-related pipe are subject to pre-heat and/or post-heat treatment. Applicable heat treatment procedures are necessary for this type installation. Records of heat treatment (time, temperature) must be generated and reviewed for Code compliance.

023a Interviews must be performed expeditiously so as to minimize the worker's time away from jobs in progress. Only those licensee/contractor employees who can provide first hand knowledge or experience in the area of interest, and appears willing to share the information, should be interviewed.

023b thru 023f Various degrees of accessibility may require the erection of scaffolds or long ladders for the examination of some supports and restraints. The IE inspector should use judgment in regard to this type of assistance from the licensee or contractor. If possible, the IE inspector should schedule inspections so that existing scaffolds, etc., could be used. In the event plant design features cause difficulty selecting certain types of support brackets, saddle supports and multiple pipe supports the inspector may choose the equivalent number of other Component Standard Supports for inspection and/or examination.

023b2 Refer to IE Bulletin No. 79-02 (and revisions), Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts, for additional information.

023e3 The material certificate and identification should meet the requirements of the applicable edition of ASME Code Section III, NCA - 3800

023f The intent is to determine whether pipe support and restraint systems are being installed according to properly approved drawings - either the original design drawings or properly approved revisions; and, if revisions are in process, that these changes are properly handled in accordance with established procedures.

Appropriate standards can be used as a guide in this area. For example, ANSI N45.2.11 requires that where changes to previously verified designs have been made, design verification shall be required for the changes, including

evaluation of the effects of those changes on the overall design. Further, N45.2 states that records which correctly identify the "as-built" condition of items in the nuclear facility shall be maintained and stored for the life of the particular item while it is installed in the nuclear facility. Additionally, 10 CFR 50, Appendix B, Criterion III, states in part, that design and field changes shall be subject to the same design control procedures as the original design.

Numerous changes may be made to these supports during construction that are different from the original (SAR) design. Such changes will result in the accumulation of various types of design change documents and/or marked-up drawings. Since these changes reflect as-built conditions, they should be adequately controlled so they will be readily available for use with affected original design documents during future evaluation on the effect other design changes have on the overall design. Additionally, the as-built process should result in proper and timely updating of the original/master drawings and specifications to incorporate such changes.

The importance of accurate as-built drawings and their use in confirming that safety-related piping systems have been properly installed cannot be overemphasized in view of the problems encountered. Two other NRC Inspection Procedures are relevant to as-built drawings. These are: Review of as-builts, IP-37051B, that requires a review of plant as-built drawings one year before OL issuance, and IP-37930, Design Verification - Fluid Systems, that is intended for application at organizations where engineering and design functions are performed including the licensee, the A/E, the NSSS, vendors, consultants, contractors, etc.

The latter procedure calls for inspections at engineering organizations engaged in design of fluid systems and is aimed-in large part - to ensuring that correct information is available and is used in the course of meeting system design requirements. As-built drawings of installed plant piping systems are necessary input to confirm the final piping analysis for the plant.

024 The inspectors should bear in mind that the NRC's inspection sample covers only a very small portion of the records involved. Thus, substantive errors or departure from requirements identified in NRC's sample, raise the issue of whether the licensee is adequately controlling the process. In this connection, particular attention should be given to reviewing the adequacy of those records dealing with the qualification of personnel and QA audits. Problems noted in these two areas should be viewed as

prime indicators of the licensee's involvement in the work and the effectiveness with which the licensee maintains control over the work in progress.

033 Prevalent Errors/Concerns

This section is included to provide background for inspectors on past problems of a generic nature that have been identified and certain areas that should be more closely scrutinized to give NRC early information on potential problems.

a. Welders not properly qualified to applicable Code and records not properly maintained.

b. Personnel qualification records, including indoctrination, training, examinations, and certifications either not being maintained, invalid, or nonexistent for some employees.

c. Field design work (redesign, modifications) not being processed through appropriate review and approval route.

d. Nonconformance Reports not being processed fully in accordance with established procedures.

e. Personnel assigned to licensee audit function not appropriately trained in the assigned audit areas nor independent from areas audited.

f. Licensees and contractors conduct some audits on schedule but may postpone or omit others entirely. Although audits are carried out to some extent and may be adequately performed, in many instances the audit findings and recommendations are ignored or are filed without appropriate consideration or followup action.

g. Refer to Appendix A of IE Bulletin 79-14 for additional problem areas. Other IE Bulletins, Circulars, and Information Notices listed below in the Reference section of this IP contain additional relevant information about problem areas.

034 Definitions

Dynamic Pipe Supports. A pipe support assembly or restraint with a hydraulic or mechanical control unit designed to prevent unrestrained pipe motion during an earthquake; or vibratory pipe movements brought on by water hammer, steam hammer, pump start/stop, or safety and relief valve actuation. Thermal expansion of piping is not restrained by dynamic supports. (Snubbers, shock suppressors, etc.).

Rigid, Constant, and Variable Type Supports. Pipe support assemblies used for mounting pipes without hydraulic or mechanical control units (hangers, base supports, saddle supports, spring hangers, sliding and rolling supports, etc.).

Component Supports: Metal elements which transmit loads between plant components and the building structure and whose function includes carrying the weight of components or providing them with structural stability.

Component Standard Supports: Pipe support assemblies consisting of one or more units usually referred to as Catalog items and generally mass produced. (Anchors, guides, restraints, rolling or sliding supports, spring hangers, snubbers, sway braces, vibration dampeners, clamps, etc.)

035 References

SAR, Chapters 1, 3, 5, 10, 14, and 17, including pertinent Codes and Standards referenced in these chapters.

Regulatory Guide 1.28, QA Program Requirements

Regulatory Guide 1.31, Control of SS Welding

Regulatory Guide 1.50, Control of Preheat Temperature

Regulatory Guide 1.58, Qualification of Inspection, Examination and Testing Personnel

Regulatory Guide 1.64, Quality Assurance Requirements for the Design of Nuclear Power Plants

Regulatory Guide 1.71, Welder Qualification for Areas of Limited Accessibility.

Regulatory Guide 1.88, Collection, Storage, and Maintenance of Nuclear Power Plant QA Records

Regulatory Guide 1.144, Auditing of Quality Assurance Programs for Nuclear Power Plants, September 1980, Rev. 1

Regulatory Guide (Draft 2/81) - Qualification and Acceptance Tests for Snubbers Used in Systems Important to Safety

ASME B&PV Code, Section III, Division 1, Subsection NF, Component Supports

AWS D1.1, Structural Welding Code

IE Bulletin 73-03 (and revision), Defective Hydraulic Shock Suppressors and Restraints

IE Bulletin 73-04 (and revision), Defective Bergen-Paterson Hydraulic Shock Absorbers

IE Bulletin 73-07, Failure of Structural or Seismic Support Bolts on Class 1 Components

IE Bulletin 74-03, Failure of Structural or Seismic Support Bolts on Class 1 Components

IE Bulletin 75-05, Operability of Hydraulic Shock and Sway Suppressors

IE Bulletin 78-10 Bergen-Patterson Hydraulic Shock Suppressors Accumulator Spring Coils.

IE Bulletin 79-02 (and revisions), Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts.

IE Bulletin 79-07, Seismic Stress Analysis of Safety-Related Piping

IE Bulletin 79-14 (and revisions), Seismic Analysis for As-Built Safety-Related Piping Systems

IE Bulletin 81-01 (and revision), Surveillance of Mechanical Snubbers.

IE Circular 76-05, Hydraulic Shock and Sway Suppressors

IE Circular 76-07, Damaged Components of Bergen-Paterson Hydraulic Test Stand

IE Circular 79-25 (and supplement), Shock Arrestor Strut Assembly

IE Circular 81-05, Self Aligning Rod End Bushing for Pipe Supports

IE Information Notice, 79-01, Bergen-Paterson Hydraulic Shock and Sway Arrestors Reported Failures

IE Information Notice, 79-10, Nonconforming Pipe Support Struts.

IE Information Notice, 79-28, Overloading of Structural Elements Due to Pipe Support Loads.

IE Information Notice, 82-12, Surveillance of Hydraulic Snubbers.

END