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

Report Nos.: 50-424/86-39 and 50-425/86-19

Licensee: Georgia Power Company
P. O. Box 4545
Atlanta, GA 30302

Docket Nos.: 50-424 and 50-425 License Nos.: CPPR-108 and CPPR-109

Facility Name: Vogtle 1 and 2

Inspection Conducted: May 5-9 and June 23, 1986

Inspector: George Hallstrom 7/8/86
G. A. Hallstrom Date Signed

Approved by: J. J. Blake 7/15/86
J. J. Blake, Section Chief Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This special announced inspection was conducted on site in the areas of licensee action on previous enforcement matters (Units 1 and 2), housekeeping (Units 1 and 2), material control (Units 1 and 2), and safety-related piping (Unit 2)

Results: Two violations were identified - Failure to provide accurate information on elimination of intermediate pipe breaks and associated whip restraints; and Failure to follow procedures for control of welding consumables.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. H. Pinson, Vice President, Construction
*D. O. Foster, Vice President and Project Support Manager
*P. D. Rice, Vice President, Engineering
*C. W. Hayes, Project Quality Assurance (QA) Manager
*E. D. Groover, QA Site Manager, Construction
*C. E. Belflower, QA Site Manager, Operations
*G. A. McCarley, Project Compliance Coordinator
*B. C. Harbin, Manager of Quality Control (QC), Construction
*N. Lankford, QC Support Supervisor
J. E. Seagraves, RR Discipline Manager (Construction)
*W. C. Gabbard, Regulatory Specialist
*H. P. Walker, Manager, Unit Operations
*G. Bockhold, General Manager, Vogtle Nuclear Operations

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

Other Organizations

*W. C. Ramsey, Southern Company Services (SCS), RR Project Manager
*O. Batum, SCS, Deputy to Vice President of Project Engineering
*D. W. Strohman, Bechtel Power Corporation (BPC), Project QA Engineer
D. Niehoff, BPC, Deputy Engineering Group Supervisor
*M. R. Thaker, BPC, RR Civil-Structural Design Team Leader
*R. C. Sommerfield, BPC, RR Construction Team Leader
R. Malin, BPC, Civil/Structural Engineering Group Supervisor
D. Sewell, BPC, Plant Design/Pipe Support and Stress Engineering Group Supervisor
A. Attor, BPC, Senior Pipe Support and Stress Engineer

NRC Resident Inspectors

*H. Livermore, Senior Resident Inspector (Construction)
*J. Rogge, Senior Resident Inspector (Operations)

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on May 9, 1986, with those persons indicated in paragraph 1 above. The inspector described the areas inspected. No dissenting comments were received from the licensee.

(Open) Violation 424/86-39-01, 425/86-19-01, Failure to provide accurate information for elimination of intermediate pipe breaks and associated whip restraints - paragraph 3.a.(4).

(Open) Inspector Followup Item 424/86-39-02, 425/86-19-02, Field confirmation of distance between welded attachments and the location of intermediate pipe breaks - paragraph 3.a.(5).

(Open) Violation 424/86-39-03, 425/86-19-03, Failure to follow procedures for control of welding consumables - paragraph 6.b.(4)

The licensee did identify as proprietary some of the materials provided to and reviewed by the inspector during this inspection; however, details from those materials are not included in this report.

3. Licensee Action on Previous Enforcement Matters

References:

(a) Letter, dated May 9, 1986, from R. E. Conway (Georgia Power Company (GPC)) to B. J. Youngblood (NRC Office of Nuclear Reactor Regulation (NRR)) regarding Vogtle 1 and 2 Intermediate Pipe Breaks.

(b) Memorandum, dated March 18, 1986, from C. E. Rossi (NRC-NRR) to A. Gibson (NRC Region II) providing an interpretation of acceptance criteria for elimination of intermediate pipe breaks.

(c) Letter, dated February 7, 1986, from D. O. Foster (GPC) to J. N. Grace (NRC Region II) responding to unresolved and inspector followup items described in NRC Inspection Report 424/85-35.

(d) Letter, dated November 11, 1983, from D. O. Foster (GPC) to H. R. Denton (NRC) requesting alternate intermediate pipe break criteria which would allow elimination of 182 previously postulated intermediate pipe breaks and 110 associated pipe whip restraints per unit.

(e) Letter, dated April 26, 1984, from D. O. Foster (GPC) to H. R. Denton (NRC) providing technical information to justify a request for approval of alternate pipe break criteria.

(f) Letter, dated June 26, 1984, from T. M. Novak (NRC Division of Licensing) to D. O. Foster (GPC) providing an evaluation and acceptance of alternate pipe break criteria.

(g) Letter dated April 30, 1986, from F. B. Marsh (BPC) to O. Batum (SCS) providing details on BPC review of conformance to alternate intermediate pipe break criteria.

a. (Closed) Unresolved item (424/85-35-03): Design Control of Intermediate Pipe Breaks

(1) Background Information

This item was originated to identify NRC Region II inspectors' concern that the licensee had not implemented a particular design commitment in the postulation and mitigation of intermediate pipe breaks on high-energy piping. The commitment was part of the licensee's design bases (Reference (e)) in obtaining NRC acceptance (Reference (f)) of deviation of the requirements to postulate arbitrary intermediate pipe breaks from those included within NRC Branch Technical Position MEB 3-1 "Postulated Breakage and Leakage Locations in Fluid System Piping Outside Containment." The licensee's proposal of alternate intermediate break criteria was made to avoid the installation of approximately 110 pipe whip restraints per unit (Reference (d)) which MEB 3-1 would have required for the mitigation of design postulated pipe breaks. The alternate criteria allows elimination of arbitrary intermediate pipe breaks together with associated whip restraints provided:

- Possibility of stress corrosion cracking has been minimized;
- Thermal and vibration induced piping fatigue has been minimized;
- Steam/water effects have been minimized;
- Local bending stresses from welded attachments have been minimized.

(2) 5D Criteria

The design commitment of concern was intended to minimize stress from welded attachments. As included in Reference (e), this commitment was to assure that no welded attachments/supports lay within five pipe diameters (5D criteria) from any postulated pipe locations that would be eliminated in accordance with the alternate break criteria. The 5D commitment was included as a partial alternative to the installation of pipe whip restraints. The NRC had accepted 5D criteria at other plants as a reasonable requirement to assure that welded supports would not be located close enough to postulated break points to contribute to the severity of damage that could occur during unanticipated transients when stresses in the involved piping can greatly exceed ASME design Code allowables.

(3) History

Region II inspectors first identified their concern that the licensee had not implemented the 5D criteria during an inspection of the licensee's Readiness Review work in August, 1985. The licensee was questioned regarding the absence of any implementing procedures during the site inspection and again in a telephone call on September 18, 1985. The licensee's initial informal response was that the commitment was only required to be met at the time of the April 26, 1984, submittal (Reference (e)), and that it was not intended to be met for later design iterations; i.e., new break locations due to later changes in the piping installation. The inspectors questioned this interpretation as the written licensee proposal and the NRC acceptance of the proposal did not support this view. The inspectors formally documented their concern to the licensee in NRC Report No. 50-424/85-35 dated December 18, 1985. The licensee formally responded by letter to Region II dated February 7, 1986 (Reference (c)). The licensee contended that the 5D commitment had not been a commitment but that NRC acceptance of minimized stress from welded attachments for the alternate intermediate break criteria was based instead on their compliance with the ASME Section III, Subsections NC/ND-3645, generalized requirements that the design appropriately consider the effects of welded attachments. The inspectors noted that NC/ND-3645 was not adequate to satisfy a major objective of the 5D criteria; i.e., minimizing the contribution of supports to the severity of damage that could occur from unanticipated transients with stresses beyond Code allowables.

As part of a Region II inspection on February 24-28, 1986 (Inspection Report No. 424/86-11), the licensee was again requested to provide technical support for their failure to implement the 5D criteria as a continuing commitment. The licensee again responded that the 5D criteria was not considered a commitment based on their previous discussions which had been held with reviewers from the NRC Office of Nuclear Reactor Regulation (NRR) while obtaining NRC approval to deviate from MEB 3-1. As a followup to inspection 86-11, a formal response from NRR was requested regarding the licensee's statements that the 5D criteria was not a commitment. Formal response from NRR (Reference (b)) clarified that, contrary to the licensee's repeated explanations, the 5D criteria had been considered a commitment and that it had been material to NRC acceptance of the licensee's proposal for alternate intermediate break criteria which deviated from MEB 3-1.

(4) May 4-9, 1986, Region II Inspection

In order to evaluate the extent of the licensee's noncompliance during the current inspection, the inspector informed cognizant licensee personnel on April 29, 1986, that this was an announced inspection and requested that data be gathered for use on inspecting postulated break locations to determine whether the licensee had complied with the 5D criteria when it was originally stated in April, 1984, and to examine their current compliance. In response to this request the licensee performed additional review and informed the inspector at the beginning of this inspection that the 5D criteria was not currently met and had not been met at the time it was originally stated. The licensee provided summary details (Reference (a)) of the six instances identified to date of welded attachments located within five pipe diameters from postulated pipe break locations which had been eliminated in accordance with alternate intermediate break criteria. Four of the intermediate breaks eliminated had been postulated since April 26, 1984. Two of the breaks eliminated had been postulated before April 26, 1984. These were main steam line breaks P-1054-C and P-1055-C. Consequently, associated pipe whip restraints PBR-217 and PBR-218 were eliminated without meeting the 5D criteria. Cognizant licensee personnel indicated they could not determine the reason for the inaccurate statements in their April 26, 1984, submittal regarding pipe breaks P-1054-C and P-1055-C.

The inspector examined internal licensee correspondence dated April 30, 1986 (Reference (g)) which established that the licensee was aware as of July, 1984, of their noncompliance with the April, 1984 commitment. Cognizant licensee personnel offered no explanation as to why the NRC had not been informed of this noncompliance as of the date of this inspection.

The inspector informed the licensee that their inaccurate statements regarding pipe breaks P-1054-C and P-1055-C in their April 26, 1984, submittal appeared to be a material false statement as defined in 10 CFR 2 and as such was a violation of NRC requirements. Therefore, unresolved item 424/85-35-03 would be closed and this matter will be identified as violation 424/86-39-01, 425/86-19-01, Failure to provide accurate information for elimination of intermediate pipe breaks and associated whip restraints. Also, that this violation would be reviewed for escalated enforcement action.

(5) Details of Region II Inspection of 5D Noncompliance

In examining the licensee's findings relative to their noncompliance with the 5D criteria, the inspector completed field examinations and examined background documentation to enable independent verification of the summary data included in Reference (a), attachment 1.

The inspector verified that break locations postulated after April 26, 1984, with welded attachments within five pipe diameters were as follows:

Item	Isometric	Stress Calc X4CP	Break Data Point	Support Within 5 pipe diameter
1	1K3-1206-066-01	7001A	26A	V1-1208-066-H006
2	1K3-1314-DB4-03	7063A	800	V1-1314-084-H013
3	1K4-1208-005-02	7092	88	V1-1208-005-H006
4	1K4-1208-005-02	7092	156	V1-1208-005-H001

During the above examination the inspector noted that support location tolerances for the small diameter pipe involved amounted to as much as three pipe diameters. Therefore, the application of a five pipe diameter minimum distance criteria could not be assured without field investigation. Cognizant licensee personnel informed the inspector that the licensee's reviews involved had been based on design stress isometrics and field verification had been conducted only for the six instances identified on Attachment 1. The inspector stressed the need for measurements in the field to enable proper application of the 5D criteria and was informed that modifications to the confirmation program for IEB 79-14 would be considered so as to assure the BPC review of pertinent as-built dimensions from welded attachments to intermediate break locations.

The inspector informed cognizant licensee personnel that the need for further NRC examination of proper application of the criteria including field measurements would be identified as Inspector Followup Item 424/86-39-02, 425/86-19-02, Field confirmation of distance between welded attachments and the location of intermediate pipe breaks.

The inspector also verified that break locations postulated prior to April 26, 1984, with welded attachments within five pipe diameters were as follows:

Item	Referenced Break No.	Isometric	Stress Calc X4CP	Break Data Point	Support Within 5 pipe diameter
5	P-1055-C	1K5-1301-001-01	7073/74	68	V1-1301-008-H052
6	P-1054-C	1K5-1301-001-01	7073/74	75	V1-1301-008-H055

During field inspection of main steam line break locations listed above, the inspector noted that associated pipe whip restraints (PBR-217 and PBR-218) had been partially completed since they were also to function as pipe supports. However, they had been eliminated as whip restraints without meeting the required 5D criteria

and were not presently able to meet this required design function. Cognizant licensee personnel and supporting data verified that the licensee did not intend to complete fabrication of these whip restraints as of the date of this inspection.

(6) NRC/GPC Enforcement Conference

Subsequent to this inspection, Region II reviewed the need for escalated enforcement on this matter. A decision was reached to schedule an enforcement conference with the licensee on this matter. This conference was held in the NRC Region II office, Atlanta, Georgia, on June 23, 1986. Attendees were as follows:

Licensee Attendees:
- R. E. Conway, Vogtle Project Director, Georgia Power Company (GPC)
- P. D. Rice, Vice President, Vogtle Engineering, GPC
- C. W. Hays, Vogtle Project Quality Assurance Manager, GPC
- J. Bailey, Vogtle Project Licensing Manager, Southern Company Services (SCS)
- O. Batum, Deputy to Vogtle, Engineering Vice President, SCS
- F. B. Marsh, Vogtle Project Engineering Manager Bechtel Power Corporation (BPC)
- S. J. Cereghio, Nuclear Group Supervisor, BPC
- W. E. Burns, Nuclear Licensing-Nuclear Operations, GPC
- C. W. Whitney, GPC-Vogtle Legal Counsel

NRC Attendees:
- R. D. Walker, Acting Deputy Regional Administrator
- L. A. Reyes, Acting Director, Division of Reactor Projects (DRP)
- B. W. Jones, Regional Counsel, RII
- V. Panciera, Deputy Director, Division of Reactor Safety (DRS)
- V. L. Brownlee, Chief, Reactor Projects Branch 3, DRP
- A. R. Herdt, Chief, Engineering Branch, DRS
- L. Trocine, Enforcement Specialist, RII
- M. V. Sinkule, Chief, Reactor Projects Section 3C, DRP
- H. H. Livermore, Senior Resident Inspector, Construction, Vogtle
- E. F. Christnot, Vogtle Project Engineer, DRP
- E. H. Girard, Reactor Inspector, DRS
- G. A. Hallstrom, Reactor Inspector, DRS
- S. J. Vias, Reactor Inspector, DRS
- M. Miller, Vogtle Project Manager, Office of Nuclear Reactor Regulation (NRR)

R. L. Balland, Chief, Engineering Branch, PWR-A, NRR
G. Bagchi, Section Leader, Engineering Branch, PWR-A, NRR
E. Holler, Enforcement Specialist, Office of Inspection and Enforcement (IE)

The meeting was convened at 10:00 a.m., on June 23, 1986. The licensee was informed of the Region II decision that this matter was considered a material false statement, but that the questions of severity level and potential civil penalty were not yet decided. GPC Vice President Conway responded that GPC's position has been and continues to be one of complete, open, and honest communication with the NRC but that there had been a QA breakdown on this matter. Vice President Rice then submitted a proposed agenda and summary of points for discussion. This licensee submittal is included as an attachment to this report.

Significant clarifications/amplifications obtained during the licensee's presentation were as follows:

° Arbitrary intermediate pipe break (AIPB) concept

- Mis-communication had occurred between the licensee and NRR regarding the need of 5D criteria to mitigate the severity of potential damage from unanticipated transients.

- The licensee had understood that conformance to NC/ND-3645 would satisfy the need to minimize stress from welded attachments. This view is supported by other existing design features to accomplish defense on depth objectives.

- BPC design engineers had considered 5D criteria to be non-relevant since conformance to NC/ND-3645 was maintained.

° Chronology

- The BPC review which commenced in June, 1984, was for completeness regarding AIPB requirements and was the first review with supporting documentation. Supporting documentation is unavailable for reviews occurring before the April 26, 1984, submittal.

- The BPC review completed in July, 1984, did establish the lack of conformance to 5D criteria for main steam breaks P-1054-C and P-1055-C. However, this lack of conformance was not reported to the NRC since the 5D criteria was considered non-relevant as reported above.

- Error in Project Proposal

  - The initial review of baseline data was not done in accordance with formally established GPC policies and procedures. The initial review was completed as an engineering study and no formal policies and procedures had existed to control this type of activity similar to those controlling other formal licensee submittals such as 10.55(e) and Part 21 reports.

  - For the 11 cases where welded attachments within 5D of the break point which have been identified through the June, 1986, licensee engineering review, there were 11 cases in the main steam system. Of these, only break P-1054-C is considered by the licensee to require further deliberations regarding its lack of conformance to the 5D criteria.

- Root Cause

  - The licensee agreed that a QA program weakness had existed due to lack of formality in controlling the engineering studies associated with the 5D criteria.

  - The licensee agreed that the materiality of the lack of conformance with the 5D criteria should have been identified in July 1984 when the nonconformances were first identified. The licensee's failure to identify materiality was attributed to the failure to properly interpret the 5D criteria versus NC/ND-3645 conformance. The interpretation failure was attributed to miscommunication with NRR which would have been rectified under formal controlling procedures.

  - The lack of notification to NRC of the inaccuracies in the April 26, 1984, submittal which were discovered on July, 1984, was attributed to the licensee's failure to recognize the materiality of the 5D requirements.

- Corrective Actions

  - The relevant design criteria (DC-1018) has been revised to include the 5D criteria. However, the revised DC-1018 will not be implemented until resolution of the technical issue with NRC. The licensee's objective is to avoid imposing the 5D criteria due to potential rework required.

- The QA audit of similar engineering studies/proposals included a sample of five which were similar to the AIPB studies. These five had not been examined during readiness review activities. No discrepancies were identified.

- The training seminar for project managers who prepare or approve regulatory commitments will be conducted by Vice President Rice.

- The letter to NRC on a proposed AIPB concept to resolve the technical issue is expected to be transmitted during the first week of July, 1986.

The meeting was adjourned at 11:50 a.m., on June 23, 1986.

NRC escalated enforcement activities on this matter is not complete. Therefore no Notice of Violation on this matter is enclosed with this report. Separate correspondence will be issued on the results of NRC deliberations on this matter.

b. (Closed) Unresolved Item (424/86-03-02, 425/86-02-02): Polar Crane Design

This item concerns potentially inadequate design calculations for seismic qualification of the VEGP Polar Crane. Apparent discrepancies were identified during the NRC review of the Seismic design calculation package (BPC lcg AXAL01-46-2) provided by the VEGP Polar Crane Supplier. BPC specification X4AL01, Revision 1, dated December 14, 1978, requires dynamic analyses for eight different loading conditions for both Safe Shutdown Earthquake (SSE) and Operational Basis Earthquake (OBE). Analyses for two of the required loading conditions (trolley in center of span with full load in mid position and trolley at end of span with full load in mid position) were not included. NRC concern was also expressed due to the possibility that the worst case for hook height may not have been included in the load conditions originally specified for analysis.

The technical adequacy of the initial BPC response was questioned on two points as follows:

- The implication that crane girder seismic stresses are essentially unaffected by the lifted load. Stated reasoning is that all Z-component (vertical direction) earthquake stresses are absorbed in the rope; i.e., that these stresses are never transmitted to the Polar Crane Bridge Girder.

- The contention that the up-position of lifted load is the worst case for hook height. The stated basis for this contention is that the natural structural frequency (about 2 hertz) for the load/rope combination in the up position corresponds to the peak acceleration of the vertical seismic response spectra. Further support of an accurate coincidence of the frequencies is necessary since lowering the load could increase the seismic acceleration if the frequencies do not coincide.

Further GPC response on this issue was transmitted by letters, dated April 17, 1986, (Log: GN-864) and May 1, 1986 (Log: GN-892). Engineering justification in response to the above questions was as follows:

- Calculated stresses from model response spectrum (worst-case load) analyses were provided to show that the Y-component (tangential direction) stresses are the major contributor to the Crane girder seismic stresses. The vertical (Z-direction) load contributes primarily to rope stresses and is transferred from the rope to the girder. However, the resultant bending stress is considerably less than the Y-component stresses and, therefore, contributes little to the Crane girder seismic stresses.

- Further support of the up-position of lifted load as the worst case for hook height was provided through a comparison of the natural frequencies of the polar Crane system as obtained through finite element model analysis by the polar crane vendor with additional calculations completed by BPC on April 14, 1986. Additional clarification established that the initial response spectra reviewed represented the response of a single-degree-of-freedom oscillator mounted on the lifted load and not the response of the polar crane structure. The basis for seismic analysis of the polar crane girders is a set of in-structure response spectra developed from a time-history analysis of the building. The set of vertical response spectra show peak responses to lie in the range from 2 to 10 cps. Below 2 cps, the response is a descending ramp. Therefore, as the load is lowered and frequency reduced the crane will experience progressively lower levels of amplification in response.

During review of the above information prior to this inspection further question was raised regarding conformance with allowable stress criteria specified in FSAR paragraph 9.1.5.2.3.1.B versus stress values stated from the model response spectrum analyses. Additional clarification transmitted with the letter of May 1, 1986, indicated acceptable polar crane component stresses.

During this inspection the inspector examined background data supporting the engineering justification provided within GPC's April 17, 1986, and May 1, 1986 letters. No discrepancies were identified and this item is considered closed.

c. (Open) Unresolved Item (424/86-03-03, 425/86-02-03) High Strength Bolted Connections

This item concerns ASTM A325 and A490 high strength steel bolts installed at plant Vogtle. Discussions with QC inspectors and other cognizant licensee personnel had identified potential overtensioning of bolts on mainplate girder #5 at elevation 240' in the Control Building. The girder was installed in August 1982, and potential overtorquing was observed due to lack of conformance to "turn-of-nut" installation requirements within construction procedure CD-T-16. Bolts in girder #5 were replaced.

However, followup discussions with cognizant licensee personnel had established additional potential for overtensioning due to the following:

- A common philosophy that bolt overtensioning would not present a problem as long as the bolts did not break during installation. A technically supported justification of this philosophy was requested.

- An apparent inability of the QC inspection program (past or present) to identify overtensioning (overtorquing) to near failure limits. QC inspection personnel uniformly stated that CD-T-16 specified only that the minimum required torque be checked; i.e., no check for potential overtorque is required or conducted and QA surveillance of "snug tightening" or application of reference match marks is not required.

- Installation of high strength bolts by craftsmen who had not received training on the "turn-of-nut" method. The turn-of-nut method was initiated on Revision 3, dated July 23, 1982, of CF-T-16. Initial training of construction craftsman was completed on September 8, 1982.

- Statements by cognizant licensee personnel that the minimum time frame during which installation by turn-of-nut method could be suspect and overtorque a potential problem is from July 23 to September 8, 1982.

Further GPC response on this issue was transmitted by letter to Region II dated April 17, 1986, (Log: GN-864) and reviewed by the inspector prior to this inspection. The adequacy of the engineering justification was questioned on several points and discussed with cognizant licensee personnel during this inspection. Further justification was requested on the following apparent inconsistencies, as a minimum.

- The contention that bolt overtension would have been identified by the QC inspection program; i.e., on overtensioned bolt would turn (or break) prior to reaching the minimum torque setting on the calibrated torque wrench. (This contention apparently ignores test data showing significant remaining bolt tension capacity above the ASTM proof load (elastic limit) versus CD-T-16 requirements that test torque wrenches be calibrated below proof load.)

- The contention that the credibility of the GPC bolting program to identify overtensioned bolts is established by GPC audits and audits by others. (This contention apparently ignores the fact that installation methods and QC procedures which were audited are structured to locate and correct undertorqued bolts - overtensioned bolts are not addressed.)

- The contention that design in accordance with the 1969 AISC specification will yield factors of safety of a least 3 and 5, respectively against ultimate tension and shear failures. (This contention apparently ignores the more germain safety factors associated with the shear capacity of a friction connection using tensioned bolts and the tensile capacity of these bolts, i.e., those safety factors actually prevailing in the design.)

- The contention that a direct tension load applied to a previously torque-tightened bolt ultimately approaches the direct tension load characteristic curve for the bolt; i.e., severely overtorqued bolts have a tensile load reserve that will provide additional safety against a failure should additional stress be applied by additional strain. (The test data referenced generally support this conclusion. However, test data limitations apparently ignored included thread length of 9/16" within the grip rather than the more severe 1/8" which would be applicable to the majority of bolts used at plant Vogtle. The 1/8" length provided the significantly more drooping curve. Therefore, the data referenced is not considered to verify the contention of strength recovery to the direct tension characteristic for the majority of bolts used at plant Vogtle.)

- The contention that initial bolt preload has little effect on the ultimate shear strength of the bolt in a connection. (The test data referenced generally support this conclusion. However, test data referenced were from bolts in double sheer with both sheer planes passing through the bolt shank. The test jig was designed to keep the bolt shank in as near to pure shear as possible. No information was offered relative to the more severe situation of single shear through the thread root under grip conditions that could offer prying tension. Therefore, additional assurance is needed that the more severe situation is not applicable to connections at plant Vogtle.)

During this inspection, additional potential for overtensioning was identified due to deviation report CD-1417 issued October 8, 1981, due to high tension values in high strength bolted connections within the turbine building. A total of 484 connections were inspected with 403 connections exhibiting approximately 850 ft. lbs. of torque. Testing of sample bolts on a hydraulic tensioner established the tensile load associated with this torque to be equivalent to the ASTM specified ultimate tensile strength for the 7/8" diameter A325 bolts involved. The bolts were installed with the calibrated impact wrench method (not turn-of-nut method) and those methods together with identical impact wrenches was also used for installation of high strength bolts in the auxiliary building (levels D and C) during the same time frame. Therefore, additional engineering justification was requested regarding any potential long-term adverse affects (stress corrosion cracking, or other failure mechanisms) for high strength bolts preloaded to near ultimate tensile strength values.

Additional GPC response was transmitted by letter, dated May 12, 1986 (Log: GN-908) and NRC evaluation is not complete. This item remains open.

d. (Closed) Unresolved Item (425/85-40-02, 425/85-31-02): Assurance of adequate backpurge for welding stainless steel piping

This item concerned the use of adequate backpurge when welding stainless steel piping. During previous examinations of welding activities on stainless steel piping, the inspector noted that oxygen analyzers were not used to assure the 1% minimum oxygen requirement and that welders involved were uncertain as to the required argon flow rates and minimum oxygen required. Further that clarifying information was not included on some of the welding technique sheets provided to the welders involved. During this inspection, the inspector examined revised technique sheets and records of additional welder training and QC surveillance activities which were conducted to assure meeting backpurge requirements. The inspector observed uniform use of oxygen analyzers and adequate backpurge for the welding activities reported in paragraph 6.b.(1). This item is considered closed.

4. Unresolved Items

No unresolved items were identified during this inspection.

5. Independent Inspection Effort

Housekeeping (54834B), Material Identification and Control (42902B), and Material Control (42940B)

The inspector conducted a general inspection of Units 1 and 2 containments, the control building and the reactor auxiliary building to observe activities such as housekeeping, material identification and control; material control, and storage.

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

6. Safety-Related Piping (Unit 2)

The inspector examined welding and nonwelding activities for safety-related piping to determine whether applicable code and procedure requirements were being met. The applicable code for safety-related piping is the ASME Boiler and Pressure Vessel Code, Section III, 1977 Edition with Addenda through W77.

a. Review of Nonwelding Quality Records (49065)

The inspector selected various safety-related 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; Nuclear Steam Service Supply quality release; site receipt inspections; storage; installation; vendor nonconformance reports.

Item	Heat/Control No.	System
3/4" dia. SS angle globe valve	S/N B7459	Safety Injection
3/4" dia. SS SS Gate Valve	S/N H178 ABE	Safety Injection
1" dia sched 160 SS 90° ell	8 8607	Chemical and Volume Control

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

b. Welding Activities

(1) Production Welding (55050)

The inspector observed in-process welding activities of safety injection and chemical volume and control system piping field welds inside of containment as described below to determine whether applicable code and procedure requirements were being met.

The below listed welds are examined in-process to verify work conducted in accordance with traveler, welder identification and location, welding procedures, WPS assignment, welding technique and sequence, materials identity, weld geometry, fit-up; temporary attachments, gas purging, preheat, electrical characteristics, shielding gas, welding equipment condition, interpass temperature, interpass cleaning, process control systems, qualifications of inspection personnel, and weld history records.

ISO	Weld	Size	Status
2K4-1208-015-02 R/1			
	112-W-115	1"	Final Pass
	112-W-109	1"	First Pass
2K4-1204-030-02 R/3			
	034-W-109	2"	Root Pass
	030-W-136	3/4"	Final Pass
	030-W-137	3/4"	Final Pass
	030-W-140	3/4"	Second Pass

The following inspector qualification status records and QA/QC Inspector Qualification/Certification records were reviewed relative to inspection of the weld joints listed above.

Inspector	Type of Certification
PEM-PPP	VT-II
MSG-PPP	VT-II

(2) Welding Procedures

Welding procedure specifications (WPS) applicable to the weld joints listed in paragraph 6.b.(1) were selected for review and comparison with the ASME code as follows:

WPS	Process 1/	Procedure Qualification PQR Reports
29-111/1-8-OB-1 (9/7/83)	GTAW	125,132,133
38-111/1-KI-1 (12/6/85)	GTAW	120,121

General welding standard BWS-111/1 (4/15/85)

1/ 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 mechanical tests had been performed and the results met the minimum requirements; whether the PQRs had been reviewed and certified by appropriate contractor/licensee personnel; and whether essential were noted. WPSs are qualified in accordance with ASME Section IX, the latest edition and addenda at the time of qualification.

(3) Welder Performance Qualification

The inspector reviewed the PPP program for qualification of welders and welding operators for compliance with QA procedures and ASME Code requirements.

The following welder qualification status records and "Records of Performance Qualification Test" were reviewed relative to the weld joints-listed in paragraph 6.b.(1).

Welder Symbol	WPS
FV	29-III/I-8-OB-1
CZ1	38-III/I-8-KI-1

(4) Welding Filler Material Control

The inspector reviewed the PPP program for control of welding materials to determine whether materials were being purchased, accepted, stored and handled in accordance with QA procedures and applicable code requirements. The following specific areas were examined.

- Purchasing, receiving, storing, and distribution and handling procedures; material identification; and inspection of welding material issuing stations.

- Welding material purchasing and receiving records for the following material applicable to current production welding were reviewed for conformance with applicable procedures and code requirements.

Type	Size	Heat, Lot, Batch/No.
ER308L	1/16" X 36"	26245
ER308L	3/32" X 36"	05394
ER308L	1/8" X 36"	P0443
E309L-16	5/32" X 14"	X45602

During the above inspection, the inspector observed apparent documentation deficiencies for E309L electrodes stored in the "doublewide" welding materials distribution center (WMDC). The covering of these electrodes were not marked with heat, lot, or control number and the inspector requested documentation which independently verified that the electrodes involved were from heat X45602 as was indicated on the stationary holding oven door. WMDC personnel informed the inspector that the electrodes involved had been received via GPC bulk materials requisition for on-site vendor use to complete repair of ASME code valves (maintenance work order 12607258) (50.55(e) item 424/425 CDR 85-90). The inspector reviewed requisition No. 221686 (dated April 26, 1986) for conformance to PPP procedure VIII-3 "Control of Welding Consumables" dated February 27, 1985, and GPC procedure MD-T-12" Receipt Inspection and Storage/Issue of Pipe, Pipe Components, and Weld Filler Material" dated June 21, 1985. The inspector observed that requisition No. 221686 did not conform to requirements in that it did not:

- Include "N/A" in the Unit No., Drawing No., Rev., System No., Project Class and Material Class spaces
- Include the authorized signature for the owners welding section supervisor, or his designee in the "approved by" space
- Include an "N/A" in the GPC "QC Inspection" space
- Include the signature of a contractor's Q.C. representative in the "Q.A. Appr. Doc." space
- Include the Purchase Order No.; Item No.; or Heat, Lot, or Control No.

The inspector informed cognizant licensee personnel that the above deficiencies were considered a lack of conformance to 10 CFR 50 Appendix B, Criterion V, and would be identified as Violation 424/86-39-03, 425/86-19-03, Failure to Follow Procedures for Control of Welding Consumables.

7. Previously Identified Inspector Followup Items

a. (Closed) Inspector Followup Item (424,425/85-14-01): Clarification of Liquid Penetrant Inspection Procedure

This item concerned required minimum light intensity at the inspection site under PPP procedure IX-PT-1-W77. Cognizant licensee personnel informed the inspector that all PPP NDE Technicians were aware of the illumination/lighting requirements to perform penetrant examination to ASME Section V requirements. Further, that all technicians were supplied flashlights to aid in inspections. Followup discussion with NDE technicians confirmed that flashlights are universally used for penetrant inspections in the field. This item is considered closed.

b. (Closed) Inspector Followup Item (424/85-40-01, 425/85-39-01): Assurance of Necessary Minimum Clearances for Installed Piping

This item concerned need for assurance of minimum clearances between installed piping and Unit 1 containment pipe racks.

There appeared to be potential for contact between the 12" X 12" X 6" Reducing Tee in Reactor Coolant Line 1K4-1201-036-01 and the top of column 8 in Rack R0001. The inspector reviewed revisions to PPP Procedure 1 X 3 which require a general minimum separation of 1" in the direction of the obstruction from installed piping. The inspector also observed completed modifications to the top of column 8 in Rack R0001 to obtain adequate separation from Line 1K4-1201-036-01. The inspector also completed random inspection on Unit 1 containment and no potential clearances less than 1" were identified. This item is considered closed.

ATTACHMENT

NRC ENFORCEMENT CONFERENCE
JUNE 23, 1986

AGENDA

. INTRODUCTION	R. E. CONWAY
. BACKGROUND - AIPB Concept - Chronology	P. D. RICE
. DISCUSSION OF PROBLEM - Evaluation - Error in Project Proposal - Root Cause	P. D. RICE
. CORRECTIVE ACTIONS	P. D. RICE
. CONCLUSIONS	P. D. RICE
. CLOSING REMARKS	R. E. CONWAY

R. E. CONWAY - Senior Vice President and Project Director

P. D. RICE - Vice President Project Engineering

ARBITRARY INTERMEDIATE PIPE BREAK (AIPB) CONCEPT

- DEFENSE IN-DEPTH CONCEPT FOR EVENTS UNANTICIPATED IN DESIGN
- POSTULATION OF BREAK POINTS IN HIGH-ENERGY PIPING SYSTEMS WHEN ACTUAL STRESSES ARE BELOW ALLOWABLE STRESSES
- NRC AND INDUSTRY AGREEMENT IN PRINCIPLE THAT EXISTING DESIGN FEATURES AND CONSERVATISMS ACCOMPLISH THE DEFENSE IN-DEPTH OBJECTIVES
- COORDINATED INDUSTRY AND NRC EFFORTS HAVE JUSTIFIED THE ELIMINATION OF THIS REQUIREMENT FOR A NUMBER OF PLANTS

CHRONOLOGY

Nov '83	GPC letter to NRC proposing elimination of Arbitrary Intermediate Pipe Breaks (AIPB)
Mar '84	GPC meeting with NRC on November, 1983 letter
Apr '84	GPC letter providing additional justification for November, 1983 letter and responding to March, 1984 meeting
Jun '84	BPC commenced review of AIPB for completeness in anticipation of NRC approval of GPC proposals and in preparation for FSAR change
Jun '84	NRC letter approved deviation from Standard Review Plan to use alternative AIPB Criteria
Jul '84	BPC completed review started in June, 1984
Aug '84	FSAR changed to incorporate June, 1984 NRC approved changes

ARBITRARY INTERMEDIATE PIPE BREAKS

EXCERPTS FROM APRIL 24, 1984, GPC LETTER TO NRC

ATTACHMENT A, TECHNICAL JUSTIFICATION FOR ELIMINATION OF ARBITRARY INTERMEDIATE BREAKS, STATES:

"2. WELDED ATTACHMENTS ARE NOT LOCATED IN CLOSE PROXIMITY TO THE BREAKS TO BE ELIMINATED. CONSEQUENTLY, LOCAL BENDING STRESSES RESULTING FROM THESE ATTACHMENTS WILL NOT SIGNIFICANTLY AFFECT THE STRESS LEVELS AT THE BREAK LOCATIONS (REFER TO ATTACHMENT E)."

ATTACHMENT E, PROVISIONS FOR MINIMIZING LOCAL STRESSES FROM WELDED ATTACHMENTS, STATES:

"WE HAVE REVIEWED ALL ARBITRARY INTERMEDIATE BREAK LOCATIONS TO BE ELIMINATED AND HAVE DETERMINED THAT IN NO CASES ARE WELDED ATTACHMENTS CLOSER THAN FIVE PIPING DIAMETERS FROM POSTULATED BREAK LOCATIONS. AT THIS DISTANCE, LOCAL BENDING STRESSES INDUCED BY THE ATTACHMENT WILL NOT AFFECT THE STRESSES AT THE POSTULATED BREAK POINT. TO ENSURE THAT THIS IS THE CASE, THE LOCAL STRESSES HAVE BEEN DETERMINED AND ADDED TO THE PRIMARY STRESS REPORT."

CHRONOLOGY, CONT'D

APR '85	GPC LETTER REQUESTING ELIMINATION OF AIPB IN MAIN FEEDWATER SYSTEM
JUN '85	NRC LETTER APPROVED APRIL, 1985 GPC MAIN FEEDWATER SYSTEM PROPOSAL
MAR '85	READINESS REVIEW IDENTIFIED LACK OF UPDATE OF DESIGN CRITERIA IN REGARD TO ELIMINATION OF AIPB CRITERIA
DEC '85/ APR '86	NRC INSPECTIONS IDENTIFIED PROBLEMS IN IMPLEMENTATION OF ALTERNATIVE AIPB CRITERIA
APR '86	GPC REVIEW OF CURRENT HIGH STRESS POINTS TO DETERMINE THOSE POINTS WITHIN 5D OF A WELDED ATTACHMENT
MAY '86	GPC LETTER TO NRC DOCUMENTING APRIL, 1986 REVIEW AND DEFINING FURTHER ACTIONS
MAY '86	GPC REVIEW OF HIGH STRESS POINTS AS PROMISED IN MAY, 1986 LETTER
JUN '86	GPC AND NRC MEETING TO DISCUSS RESULTS OF MAY, 1986 REVIEW AND TO DEFINE FURTHER ACTIONS
	ACTIONS CONTINUE TO ADDRESS TECHNICAL ISSUES. GPC PREPARING RESPONSE TO NRC ON QUESTIONS AND ACTIONS DEFINED IN JUNE 1986 MEETING

DISCUSSION OF PROBLEM

- Evaluation

- Error in Project Proposal

- Root Cause

EVALUATION OF PROBLEM

- Conducted Review for Applicable Documentation

- Interviewed Personnel Involved

- Performed Rereview of Arbitrary Intermediate Pipe Break (AIPB) Locations Based on March, 1984 Design Documents and Criteria

ERROR IN PROJECT PROPOSAL

- Baseline Data (November 1983 GPC Letter)
  - 576 Total Pipe Break Locations
  - 182 Arbitrary Intermediate Pipe Breaks (AIPB)
  - 233 Total Pipe Whip Restraints
  - 110 Pipe Whip Restraints for AIPB

- Error (June 1986 Engineering Review)
  - 18 Cases Where Welded Attachments Were Within 5D of Break Point
    - 11 Cases in Main Steam System
    - 3 Cases in Main Feedwater System
    - 2 Cases in Chemical and Volume Control System
    - 1 Case in Steam Generator Wet Lay-Up System
    - 1 Case in Auxiliary Feedwater System

ROOT CAUSE

QA Program Weakness

- Lack of formality in documenting the scope, criteria, detailed results, and supervisory reviews associated with the 5D review

Timeliness of Identification

- Failure to incorporate proposed 5D provision into Engineering Design Criteria
- QA audits based primarily on commitments incorporated into Project Design Documents

CORRECTIVE ACTIONS

- Review Project and NRC Correspondence Related to Elimination of Arbitrary Intermediate Pipe Break (AIPB) for any Similar Issues
- QA Audited Selected Past Engineering/Licensing Correspondence to NRC for Similar Problems
- QA Audit Procedures Strengthened to Examine for Proper Incorporation of Commitments made in NRC Correspondence
- Design Criteria Revised to Reflect Current Approved Status (Implementation on hold pending resolution of technical issue with NRC)
- Action Initiated to Strengthen Project Procedures for Off-Normal Engineering Reviews
- Project Policy Procedures which Control Correspondence to NRC Revised to Strengthen Personnel Accountability for Accuracy
- Training Presentation Developed and Scheduled for Engineering Personnel to Include Engineering Procedure Changes and Sensitivity
- Training Seminar Defined for Project Managers Who Prepare or Approve Regulatory Correspondence
- Letter to NRC in Preparation on Proposed AIPB Concept

VOGTLE MANAGEMENT PHILOSOPHY

- Readiness Review
- Continued Emphasis on Project Policy Training
- Quality Concern Program
- Anti-Drug Program
- Senior Corporate Involvement (Project Management Board, Quality Assurance Committee and Readiness Review Board)
- Numerous Technical Assessments (3 INPO Construction Assessments, Self-Initiated Evaluation and Design Control Review)
- Continuing Enhancements to Project Management Organization
- Openness in Dealings with NRC

CONCLUSIONS

- Weakness in QA Program for Off-Normal Reviews - Lack of formality in documenting the scope, criteria, detailed results, and supervisory reviews associated with the 5D review

- Continuing Dialogue Between GPC and NRC is Expected to Satisfactorily Resolve Technical Issue

- GPC has and will continue to deal with all issues in an open and factual manner.