



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

Report Nos.: 50-424/86-11 and 50-425/86-06

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: February 24-28, 1986

Inspector:

J. J. Blake
for E. H. Girard

4/14/86
Date Signed

Approved by:

J. J. Blake
J. J. Blake, Section Chief
Engineering Branch
Division of Reactor Safety

4/14/86
Date Signed

SUMMARY

Scope: This special announced inspection involved 41 inspector-hours on site in the areas of licensee action on previous enforcement matters identified in inspection of Readiness Review Module 4, review of construction deficiency reports, and inspector followup items identified in inspection of Readiness Review Module 4.

Results: Three violations and one deviation were identified - (1) Violation - Inadequate measures to assure correction of design criteria documents, paragraph 3.e. (2) Violation - Failure to promptly identify undersize welds, paragraph 3.j. (3) Violation - Removal of temporary pipe supports, paragraph 3.k. (4) Deviation - Failure to inspect supports, paragraph 5.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *M. H. Googe, Project Construction Manager
- *R. E. Folker, Project Quality Assurance (QA) Engineer
- E. D. Groover, QA Site Manager, Construction
- R. W. McManus, Readiness Review (RR) Discipline Manager, Construction

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

Other Organizations

- *W. C. Ramsey, Southern Company Services (SCS), RR Project Manager
- *G. R. Trudeau, Bechtel Power Corporation (BPC), RR Special Assistant
- R. D. Andrews, BPC RR Team Member
- *C. R. Myer, BPC, RR Mechanical Design Team Leader
- R. C. Somerfeld, BPC, RR Mechanical Construction Team Leader
- J. Steele, Pullman Power Products (PPP) Quality Assurance Manager - Unit 1
- W. M. Wright, SCS, RR Discipline Manager (Design)
- R. A. Keidel, Bechtel National Incorporated (BNI), Manager - Material and Quality Services (M and QS)
- K. W. Caruso, BNI, M and QS Lead Welding Engineer
- D. L. Carlson, BNI, M and QS Coordinator

NRC Resident Inspectors

- *J. Rogge, Senior Resident Inspector (Operations)
- R. Schepens, Resident Inspector

Other NRC Personnel

- M. A. Miller, Vogtle Licensing Project Manager
- H. L. Brammer, Reviewer (Pipe Break Criteria)
- F. J. Witt, Reviewer (Post Accident Sampling System)

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on February 28, 1986, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings listed below except for the deviation. No dissenting comments were received from the

licensee. Subsequently, in a telephone call on March 19, 1986, the inspector informed the licensee of the below listed deviation.

- a. Violation 424/86-11-01, 425/86-06-01, Inadequate measures to assure correction of design criteria documents, paragraph 3.e.
- b. Violation 424/86-11-02, 425/86-06-02, Failure to promptly identify undersize welds, paragraph 3.j.
- c. Violation 424/86-11-03, Removal of temporary pipe supports, paragraph 3.k.
- d. Deviation 424/86-11-04, 425/86-06-04, Failure to inspect supports, paragraph 5.

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

3. Licensee Action on Previous Enforcement Matters

- References:
- (a) Letter dated February 7, 1986, from D. O. Foster (Georgia Power Company) to J. N. Grace (NRC Region II) responding to unresolved and inspector followup items described in NRC Inspection Report 424/85-35.
 - (b) Letter dated April 26, 1984, from D. O. Foster (Georgia Power Company) to H. R. Denton (NRC) providing technical information to justify a request for approval of alternate pipe break criteria.
 - (c) Letter dated June 28, 1984, from T. M. Novak (NRC Division of Licensing) to D. O. Foster (Georgia Power Company) providing an evaluation and acceptance of alternate pipe break criteria.
 - (d) Telecopy dated January 22, 1986 from T. Bennet (Bechtel LA) to C. Meyer (Readiness Review Design Team Leader) stating that the Vogtle design contains no moderate energy Class 1 lines.

- a. (Closed) Unresolved Item (424/85-35-01): Assurance of Adequate Readiness Review Coverage of Module 4.

The concern expressed in this item was that the extent of activities and commitments that should be covered by Module 4 was unclear and, as consequence, important activities and commitments might be totally omitted from the Readiness Review 12 activities and/or commitments were identified which the inspectors stated they believed should be verified as adequately addressed.

In Reference (a) the licensee responded to the concern expressed in this item, describing the review coverage intended for Module 4. In addition, they briefly described where and how the Readiness Review addressed the 12 activities/commitments that the NRC inspectors had identified for specific verification of adequate coverage.

The NRC inspector examined this unresolved item during the current inspection through review of the licensee's response and through discussions with responsible licensee and NRC personnel who had completed or evaluated the Readiness Review activities (Module reviews, Independent Design Review, or reviews of Appendices) that the licensee indicated would cover the 12 activities/commitments. The inspector found that evaluation of many of the reviews that the licensee indicated would cover the 12 commitments/activities had, as yet, not been undertaken by the NRC. Examples included Modules 16 and 20; Appendices C, F and J, and the Independent Design Review. The inspector selected 3 of 12 commitments/activities which he found had been examined by NRC personnel and examined the adequacy of their coverage. The commitments/activities considered by the inspector were as follows:

<u>Number (from Report 85-35)</u>	<u>Subject</u>
(4)	Welding Procedure and Welder Qualifications
(8)	Document Control
(11)	Piping Material Controls and Equipment Maintenance (Construction Maintenance)

Based on his examination of the above, the inspector noted only one apparently minor area which did not appear to be covered in the Readiness Review. That area was the development of equipment maintenance requirements. Performance of equipment maintenance was covered in the review and the inspector considers that any serious deficiencies in development of equipment maintenance requirements should have been detected in the review. (Note: Equipment maintenance as addressed here is not maintenance for plant operation, but maintenance prior to operation.)

The inspector's examination of this item found that both licensee Readiness Review and NRC personnel are sensitive to the potential for omissions of significant matters from the review and that any serious omission is likely to be detected and resolved. Therefore, the inspector considers that it is not necessary to have this matter separately identified for separate evaluation. The unresolved item is considered closed.

- b. (Open) Unresolved Item (424/85-35-03): Design Control of Intermediate Pipe Breaks.

The concern expressed in identification of this item was that it appeared that the licensee had not implemented a particular design commitment they made in obtaining NRC acceptance of changes to design criteria for postulation of intermediate pipe breaks. As understood by the inspectors, this design commitment was a provision to assure that welded attachments lay at least five pipe diameters from any postulated pipe break locations that would be eliminated in accordance with the revised criteria.

The licensee's response to this unresolved item, provided in Reference (a), contended that the commitment questioned by the inspectors had not been a commitment. They indicated that the NRC acceptance of their proposed change to criteria for postulation of arbitrary intermediate pipe breaks was based instead on their compliance with ASME Section III, Subsections NC/ND-3645, generalized requirements that the design appropriately consider the effects of local welded attachments.

During the NRC inspection described by this report the NRC inspector discussed and reviewed the licensee's Reference (a) response with the Module 4 Readiness Review Mechanical Design Team Leader. In addition, the inspector reviewed the licensee's Reference (b) submittal that contained the apparent commitments related to the proposed change in criteria for postulation of intermediate pipe breaks and reviewed the Reference (c) NRC evaluation and acceptance letter. Subsequently, the inspector asked the NRC Vogtle licensing project manager to contact the cognizant NRC review personnel to determine the validity of the licensee's contention that acceptance had been based on their compliance with NC/ND-3645 rather than on a specific commitment that welded attachments would not be closer than five piping diameters to postulated break locations. The NRC Project Manager informed the inspector that the NRC reviewer stated that the licensee's response in Reference (a) was incorrect. The licensee's statements in their Reference (b) letter, including a statement indicating that welded attachment would be at least five pipe diameters from postulated pipe break locations, were considered commitments and served, in part, as the basis for NRC acceptance of alternate criteria for postulation of intermediate pipe breaks. This was confirmed to Region II in writing. The inspector informed the licensee of the response obtained from the NRC reviewer and stated that the criteria that had been and was being used for postulation of intermediate pipe breaks should be provided for review in a subsequent NRC inspection.

The licensee informed the inspector on March 18, 1986, that they plan to contact NRC licensing personnel to resolve this item. Region II will verify the licensee's prompt attention to this matter. The item will remain open pending Region II's review of the licensee's actions in resolving this item.

- c. (Closed) Unresolved Item (424/85-35-04): Design Control of Moderate Energy Class 1 Piping.

This unresolved item identified NRC inspector's concerns that the licensee's design criteria documents did not contain or reference a FSAR described commitment giving criteria for postulation of through-wall leakage cracks in moderate energy Class 1 piping. The Module 4 Readiness Review report listed the FSAR commitment as being implemented in Design Criteria (DC) 1018. However, the inspectors determined that the criteria were not in the DC-1018 document. Although the licensee initially stated that they did have moderate energy Class 1 piping to which the commitment criteria would apply. They have since stated, in Reference (a), that they determined they have no moderate energy Class 1 piping. They also acknowledged that the subject commitment criteria should have been in DC-1018 and stated that the DC was revised to include the criteria.

In the current inspection the NRC inspector verified the licensee's internal communication, Reference (d), from their engineering organization stating that they had no moderate energy Class 1 piping. The matter is considered closed.

- d. (Closed) Unresolved Item (424/85-35-05): Implementation of ANSI N45.2.11.

This unresolved item was identified to expressed NRC inspector's concerns that the licensee's Module 4 Readiness Review had not clearly identified ANSI N45.2.11 as a commitment and it was not clear that their design program adequately implemented this ANSI standard.

In the current inspection the inspector reviewed the licensee's response to this item as described in Reference (a) and discussed the matter with the Module 4 Readiness Review Design Team Leader. The response indicated that ANSI N45.2.11 had not been identified as a commitment because the statements in the FSAR regarding its use were general and the standard was applicable to other modules as well as Module 4.

The inspector noted that general requirements to comply with ASME Section III had been identified and addressed in Module 4 as commitment 880, indicating an apparent inconsistency in the licensee's determination of commitments. However, based on his discussions with the Mechanical Design Team Leader, his examination of checklists and his further examination of the ANSI N45.2.11 requirements, the inspector is

satisfied that implementation of ANSI N45.2.11 was being adequately addressed.

This item is considered closed.

- e. (Closed) Unresolved Item (424/85-35-06): Adequacy of Preparation and Revision of Design Criteria.

This item identified NRC inspector's concerns that the licensee's Design Criteria documents contained errors and omissions indicating a possible generic problem with the process of review and revision of these documents. DC errors and omissions had been discovered by Readiness Review personnel, as described in their findings 4-66, 4-67 and 4-75. In addition, the licensee had previously identified problems with DCs not being updated in their INPO Construction Project Self - Initiated Evaluation (Finding DC.3-10) completed in 1983. Further, the inspectors discovered four apparent omissions and errors in DCs 1018, 2702 and 1204 which had not been identified or corrected.

- (1) A failure to incorporate revised intermediate pipe break criteria and controls in DC-1018 (partially identified by the Readiness Review Team (RRT) in Readiness Review Finding 4-75). This specifically involves a failure to include the commitment that was made in the licensee's April 26, 1984, letter (Reference (b)) in requesting approval of alternate criteria for selection of intermediate pipe breaks. Not included was a commitment that arbitrary intermediate pipe break locations eliminated thru use of the revised criteria be no closer to supports than five pipe diameters.
- (2) A failure to include criteria for postulation of through-wall leakage cracks in moderate energy Class 1 piping in DC-1018.
- (3) A failure to revise DC-2702 to reflect changed criteria for the location of Residual Heat Removal (RHR) and Containment Spray (CS) system containment sump post-accident sampling system lines.
- (4) A failure to revise DC-1204, Section 6.0.2, to reduce the requirement for containment isolation valves in the lines from the RHR sumps from two to one.

With regard to the above DC errors and omissions, the licensee responded respectively:

- (1) DC-1018 (Pipe Break Criteria - Interdiscipline) did not include the provision that there be a five pipe diameter distance between postulated breaks and pipe supports because this was not a commitment. NRC acceptance required no changes other than those addressed by finding 4-75.

- (2) DC-1018 did not include provisions for postulating cracks in moderate energy Class 1 lines because there are no lines in that category.
- (3) DC-2702 (Post Accident Sampling System) is nonsafety-related. Drawings and actual installation correctly reflect the intended design. The design indicated in DC-2702 is a former design that was revised. DC-2702 was not updated to reflect the correct design due to an oversight.
- (4) DC-1204 (Safety Injection System), Section 4.0.0.1 reflects the correct design, which was incorporated in a past revision. DC-1204, Section 6.0.2, was not corrected due to an oversight.

In the current inspection, the NRC inspector reviewed the above licensee explanations and agrees with all except (1). The basis for his disagreement with the licensee's response is that a cognizant NRC reviewer indicated that statements in the licensee's April 26, 1984, letter (with regard to the distance of postulated breaks from supports) were considered commitments. The inspector finds that the licensee has not maintained his Design Criteria documents (documents used to provide the primary bases for the licensee's design) up-to-date and correct. The licensee had been aware of and taken actions to correct and assure proper updating in response to their Self-Initiated Evaluating Finding (DC.3-10) and their later Readiness Review Findings (4-66, -67 and -75). However, their corrective action measures apparently did not assure that the Design Criteria were up-to-date and correct as indicated by the inspectors discovery of the errors and omission described in (1), (3) and (4) above. This is considered a violation of 10 CFR 50, Appendix B, Criterion XVI, which requires that the licensee establish measures which assure prompt correction of conditions adverse to quality, such as the errors and omissions noted in the DCs. This violation is identified 424/86-11-01, 425/86-06-01, Inadequate Measures to Assure Correction of Design Criteria Documents.

- f. (Open) Unresolved Item (424/85-35-09): Adequacy of Drawing and DCN Reviews.

This unresolved item identified NRC inspector's concerns that the licensee's Readiness Review of drawings and drawing change notices (DCNs) was unsatisfactory in that, for the examples of review performance examined by the inspectors, the following evidence of unsatisfactory review was noted:

- (1) For the licensee's drawing reviews the checklists used had few items verified and the verifications performed did not appear to be significant or thorough.

- (2) For the DCN reviews the inspectors found that, in one of four they examined, the Readiness Review reviewer failed to note a significant discrepancy between the DCN and the applicable DC even though the reviewer indicated a specific verification that the DCN change was in accordance with the DC.

During the current inspection the NRC inspector addressed this item through review of the licensee's Reference (a) response, discussions with the Module 4 Readiness Review Mechanical Design Team Leader and other involved personnel, and examination of additional checklists.

The licensee's general response for this unresolved item and for Unresolved Items 85-35-11 and -12 below (which also involve Readiness Review checklists) was that:

- (1) The checklists were developed for application to several design areas and inherently included items that were not applicable to all of the areas.
- (2) The checklist items were not intended as absolute check requirements, but rather as guidance to be used by experienced reviewers.

NOTE: The licensee concluded that their checklists adequately served this purpose.

- (3) The reviewers did not always clearly describe the reasoning behind their checks and acceptances of checklist items making it difficult to verify the exact check performed.

NOTE: The licensee stated that their personnel have been given additional training to assure they better document their performance in subsequent modules.

In addition to the above, the licensee provided a specific response to the NRC findings in Unresolved Item 85-35-09 giving a logical explanation of how the checklists were performed. However, it was still not clear to the inspector that the actual review performed had been thorough or accurate due, particularly, to the lack of reviewer documentation of his efforts and to the reviewer's failure to note that a drawing change he reviewed was not in accordance with the DC (DC-2702), a check the review specifically verified on the checklist. The licensee's response to the latter discrepancy was that DC-2702 is not safety-related. The inspector found this explanation inadequate as the DC-2702 system is clearly important to safety, the concern was for its interface with the safety-related RHR system, and the reviewer specifically recorded DC-2702 as having been verified in his notation on the involved checklist.

The Mechanical Design Team Leader commented to the inspector that many of the drawing and DCN reviews that the inspector had not examined, had been more complete and well documented than those which the inspector had previously examined. The inspector verified that this was the cause through examination of the following auxiliary feedwater system (AFW) checklists:

Drawing Checklists (Module 4, Figure 6.1-2) for:

- Piping and Instrumentation Diagrams (P and ID)
1X4DB161-1, Revision 13
- P and ID 1X4DB161-2, Revision 12

DCN Checklists (Module 4, Figure 6.1-3) for:

- P and ID 1X4DB161-1, Revision 13, DCNs 1 thru 38
- P and ID 1X4DB161-2, Revision 13, DCNs 1 thru 32

The inspector noted, however, that the important check for compliance with the DC specified on each of these checklists lacked the detail to provide evidence of a thorough review.

The licensee stated they would further verify the adequacy of the reviews they had performed by re-reviewing several drawings and DCNs and documenting the re-review in detail for further NRC evaluation. Pending NRC evaluation of this re-review the unresolved item will remain open.

- g. (Open) Unresolved Item (424/85-35-11): Inadequate Review of Procurement Specifications.

This item addressed NRC inspector's concern that the licensee's review of procurement specifications in their Module 4 Readiness Review had been inadequate and that the specifications might contain significant unidentified deficiencies. This concern was based on the inspectors' findings in examining the licensee's Module 4 review of Specification X4AH04 (shop Fabricated Atmospheric Tanks...) which had been performed by a licensee reviewer using their checklist 6.1-7. The inspectors had found that a number of checklist items for the specification example appeared not to have been performed satisfactorily and that the specification contained the following apparent deficiencies which had not been detected in the review.

- (1) The specification failed to incorporate (fully) a requirement to comply with Regulatory Guide 1.44 commitments.
- (2) The specification failed to require compliance with ANSI N45.2.11.
- (3) Radiation levels specified for some tanks did not include units.

The inspectors examined this unresolved item through a review of the licensee's Reference (a) response, discussions with the Module 4 Readiness Review Mechanical Design Team Leader and other responsible Readiness Review management, and examination of revision of the subject specification to verify information described in Reference (a) response.

The licensee's general response with regard to the adequacy of the reviews they had performed with their checklist is described in f. above. With regard to the specific review addressed by this unresolved item, they responded (in Reference (a) and as supplemented by discussions) as follows:

- (1) ANSI N45.2.11 does not apply significantly to the items covered by the specification, as ASME Section III requirements are prescribed and serve in place of the ANSI document requirements.
- (2) The only requirement from Regulatory Guide 1.44 not addressed in the specification was a requirement to aid in assuring that the welding procedures used did not result in sensitization. This assurance was obtained through a requirement that the manufacturer submit his welding procedures for review and approval. Our review of the submitted procedure verifies their adequacy.

NOTE: The NRC inspector reviewed the welding procedures submitted by one of the manufacturers and verified its apparent acceptability. These were the procedures for the valve encapsulation vessels covered by the specification.

- (3) The omission of the radiation level units is an error that occurred in revision of the specification. It is not safety significant, as proper radiation levels, including units, are given in the Appendix EA attachment to the specification. The omission was not detected by the reviewer because it was not an item he checked.

NOTE: The inspector verified that the radiation level units had been given in the previous specification revision and that the current Attachment EA had the correct units.

The inspector considered that the licensee's explanation showed that the subject specification was satisfactory. However, the inspector considers that review performance that the licensee documented for this checklist lacks sufficient recorded detail for him to conclude that the review was adequate.

As with item 85-35-09, the licensee stated they would further demonstrate the adequacy of their original review by reperforming several of the specification reviews and documenting the reviews in detail. Pending NRC evaluation of the reperformed reviews, this item will remain open.

- h. (Open) Unresolved Item (424/85-35-12): Inadequate Review of Vendor Drawings.

This item addresses NRC inspector's concern that the licensee's review of vendor drawings for Readiness Review Module 4 had been unsatisfactory and that the drawings might contain deficiencies. This concern was based on the inspector's findings in their examination of the licensee's Module 4 review of vendor drawing 1X4AH04-23-13 (i.e., Revision 13), which had been performed by a licensee reviewer using their checklist 6.1-8. The NRC inspectors found that it appeared that few significant checklist items had been performed and the reviewer failed to note that certain important drawing details (e.g., weld sizes) were illegible.

In the current inspection the inspector reviewed the licensee's Reference (a) response to the item, discussed the item with the Readiness Review Mechanical Design Team Leader and QA personnel, and reviewed additional vendor drawing submittals (AFW Pump drawings and Revisions 11 and 12 of the encapsulation vessel drawing). The licensee's general response with regard to reviews which they performed with checklists, such as the review of vendor drawings, is described in f. above. With regard to the drawing illegibility addressed by the unresolved item, they responded as follows:

Suppliers are required to submit drawings of good microfilm quality. Revision 13 of the subject drawing was accepted with portions illegible because the portion revised was legible and Revision 12 had been determined to have acceptable microfilm quality. Revision 11 of the drawing had been returned to the vendor because of poor microfilm quality.

In addition to the above, the licensee provided explanation as to how the review checklist had been used, noting in several instances that the reviewer had simply elected not to perform certain checklist items and that he instead chose to verify other data, (but did not document the checks on the checklist).

The NRC inspector verified that the licensee did have a legible copy of drawing 1X4AH04. The Revision 11 that had been rejected by the licensee for unsatisfactory microfilm quality was reasonably legible while the copy of Revision 12 shown to the inspector, (that was accepted by the licensee) was found partly illegible. Based on his examination of other vendor drawings (the AFW pump drawings) and on discussions with licensee QA personnel who had checked additional vendor drawings in response to Unresolved Item 85-35-12, the inspector was satisfied that the drawing illegibility he had found appeared to be isolated and of no safety significance.

With regard to the explanation of checklist use provided by the licensee the inspector informed the licensee that the reviews were supported by such limited documentation that he could not make a conclusive determination as to their adequacy. The licensee stated that they would further verify the adequacy of the reviews they had performed by re-reviewing several vendor drawings and documenting the re-reviews in detail. They indicated that they would notify the NRC when the re-reviews had been completed and they would be available for NRC evaluation. Pending NRC evaluation of the re-reviews this item will remain open.

- i. (Open) Unresolved Item (424/85-35-13): Inadequate Resolution of Readiness Review Design Verification Findings.

This item expressed NRC inspectors' concern that the licensee had not adequately obtained correction for deficiencies their Readiness Review Team (RRT) had identified in their Module 4 Readiness Review Design Verification Findings. The inspectors had examined the licensee's resolution of two of the RRT findings identified and the inspectors' observations were as follows:

(1) Finding 4-75

This finding was that a calculation failed to postulate intermediate pipe breaks in accordance with DC-1018. The licensee's internal project response to the finding, which was accepted by the Readiness Review Team (RRT), was that:

- ° the calculation was acceptable as it had been performed to a NRC approved change in the criteria described in DC-1018
- ° due to misplacement of a change notice, DC-1018 had not been revised, it was corrected in response to Finding 4-75
- ° actions had been taken to prevent recurrence of unincorporated DC changes

The inspectors determined that the licensee's RRT failed to recognize that there had been conditions upon NRC approval of the change that were not included in the correction of DC-1018. The licensee's failure to recognize these conditions, which were commitments made in obtaining NRC acceptance, is addressed in Unresolved Item 85-35-03 in b. above.

(2) Finding 4-85

This finding was that Project Classes stated on the specification and technical provisions for the RHR isolation valve encapsulation vessel were incorrect. The licensee's internal project response

to this finding (which was accepted by the licensee's RRT) was that, while the incorrect Project Class had been identified on the documents, the specific requirements given in the text assured that the proper requirements were met. To assure that proper Project Classes were indicated on other documents, the response stated that eight specifications were checked and no other discrepancies were found. The inspector questioned the adequacy of the corrective action in the response because the inspectors had identified additional examples of misclassification in a Field Change Request (FCR), calculation, and a specification proposal.

The licensee's response to unresolved item was as follows with regard to the inspectors' observations for the two findings and associated responses:

(1) Finding 4-75

The licensee stated their disagreement with the inspectors' observations for this item referring to their response for Unresolved Item 85-35-03 above.

(2) Finding 4-85

The licensee provided explanations for each of the examples cited by the inspectors.

The NRC inspector reviewed and discussed the licensee's response with the Readiness Review Mechanical Design Team Leader. The inspector agreed with the licensee's explanations for Finding 4-85. The licensee's explanation for Finding 4-75 did not appear correct, as described for the related Unresolved Item 85-35-03 above. Pending resolution of 85-35-03 this item will remain open.

j. (Closed) Unresolved Item (424/85-35-14): Undersized/Overground Welds.

This unresolved item expressed a concern described by an NRC inspector to licensee management personnel in a meeting dated August 30, 1985, that RHR isolation valve encapsulation vessel welds were overground and under size. These welds were on vessel 1-1205-V4-001, drawing 1X4AH04-23-13, and were identified as welds 49 and 50 on the drawing.

In their Reference (a) response to this item the licensee stated:

- (1) The hardware involved was not part of the Module 4 Readiness Review sample.
- (2) The inspection of the welds questioned had not been the responsibility of the project, but instead that of the vendor.
- (3) The weld condition was being addressed on deviation reports (DRs) MD-8721 and 8723.

During the current inspection the NRC inspector examined this item by reviewing the deviation reports that the licensee had prepared following the examination of the subject vessel welds performed in response to this unresolved item. In addition, the inspector also reviewed related information on DRs MD-8725 and 2264. The discrepancies that were described on the four DRs were as follows:

MD-8721 (dated February 1, 1986)

This DR confirmed and documented the undersize condition for vessel 1-1205-V4-001, weld 50, that had been identified by the NRC inspector. In addition, it identified similarly located welds that were undersize on other similar Unit 1 vessels fabricated by the same manufacturer.

MD-8723 (dated February 4, 1986)

This DR confirmed and documented the undersize condition for vessel 1-1205-V4-001, weld 49, that had been identified by the NRC inspector. In addition, it identified similarly located welds that were undersize on other similar Unit 1 vessels fabricated by the same manufacturer.

MD-8725 (dated February 5, 1986)

This DR documented the licensee's identification of undersize conditions on Unit 2 vessels and welds similar to those covered by DRs MD-8721 and MD-8723.

MD-2264 (dated July 20, 1982 and resolved March 19, 1985)

This DR documented the licensee's identification and correction of six unsatisfactory condition related to welding on vessel 1-1205-V4-001. This included the identification and removal of slag pockets in weld 49. The licensee failed to recognize the undersize condition for weld 49 when they inspected it following the removal of slag pockets from the weld.

Based on the above, the inspector finds that the licensee failed to comply with 10 CFR 50, Appendix B, Criterion V requirements that activities affecting quality be accomplished in accordance with documented procedures, instructions, or drawings, in that vessel 1-1205-V4-001 welds 49 and 50 did not comply with size requirements given on drawing 1X4AH04-23-12 and similarly located welds on similar Unit 1 and 2 vessels also did not comply with drawing size requirements, as described in licensee deficiency reports MD-8721, 8723 and 8725. In addition, the licensee also failed to comply with 10 CFR 50, Appendix B, Criterion XVI requirements that measures be established to assure that deficiencies are promptly identified and corrected, in that:

- (1) Although the licensee identified (July 20, 1982) and corrected complete March 19, 1985 six welding related deficiencies on vessel 1-1205-V4-001, including a deficiency on weld 49 (which they visually re-inspected) they failed to detect and correct the undersize weld condition.
- (2) Licensee management was not prompt in identifying the condition in that they did not identify the condition on a deficiency report until February 1986, over five months after it was reported to them by an NRC inspector on August 30, 1985.

The licensee's failure to comply with drawing requirements and their failure to promptly identify the noncompliance with drawing requirements is identified as violation 424/86-11-02, 425/86-06-02, Failure to Promptly Identify Undersize Welds.

- k. (Closed) Unresolved Item (424/85-35-15): Undocumented Piping Supports.

This unresolved item expressed NRC inspector's concern that structural members supporting piping inside vessel 1-1205-V4-001 were not depicted on the drawing and the basis for and controls on the installation of these supports could not be readily determined.

The licensee's Reference (u) response to this item was as follows:

The piping and valve supports questioned by the inspectors are temporary supports for shipping purposes. They are shown on Bechtel approved vendor drawing number B-81-22 Revision 0 (vendor document log number AX4A404-90-1). The drawing includes instructions to remove the supports.

The RHR system has been turned over to Nuclear Operation for pre-operational testing and the work completion checklist identifies the vessel as requiring additional work as documented by work item BC0626 and work order 18513301. The control of work activities during the pre-operational test phase is described in Module 3A which was submitted to the NRC on May 1, 1985 with a revision submitted on July 29, 1985.

During the current inspection the NRC inspector reviewed the licensee's response to the item and questioned licensee personnel as to what specific controls they had to assure that the subject temporary pipe supports were removed at an appropriate time.

The inspector was referred to and reviewed the following documents:

- Nuclear Plant Maintenance Work Order, Control No. 18513301, Work Item BC-0626

The inspector found that this document only stated, "Secure Encapsulation Vessel 1-1205-V4-001 and perform test 1-1205-10". The document neither provided or referred to any criteria that assured removal of the supports.

- Field Process Sheet for Mark No. V-1-1205-V4-001, dated October 27, 1981, and entitled "Process Sheet for Inspection and Cleaning of Encapsulation Vessels. Also, to Allow Removal of Shipping Braces and Installation of Electrical Penetration by others".

The inspector found that this process sheet had included an instruction for removal of the temporary supports (support braces). The instruction for support removal was not performed, but was accompanied by a modifying note (dated April 22, 1982) that stated the instruction was to be performed after welds were complete. The step was never performed and there was no evidence of it having been transferred to any other document for performance. The field process sheet was considered complete and had received final QA approval. There had been no requirement for a QC inspection to verify the support removal.

In his review of the above and in discussions with licensee personnel, the inspector found no documented criteria that would assure removal of the subject pipe supports. This is considered noncompliance with 10 CFR 50, Appendix B, Criterion V requirements that documented instructions, procedures or drawings be provided and used to assure proper accomplishment of activities affecting quality, such as removal of the supports. This noncompliance is identified as violation 424/86-11-03, Removal of Temporary Pipe Supports.

1. (Closed) Unresolved Item (424/85-35-17): Inadequate Resolution of Readiness Review Findings.

This item expressed NRC inspectors' concern that the licensee had not adequately resolved Readiness Review Module 4 Construction RRT findings. The concern was based on the inspectors' determination that the resolution of finding 4-83 stated in the Module 4 report was incorrect.

In their Reference (a) response the licensee stated that the response provided in the Module 4 report had been based on certain correspondence that was subsequently found incorrect. The response indicated that the determination that the response was incorrect was not completed until after the Module 4 report had been submitted to the NRC. In the current inspection the NRC inspector verified that the

licensee had become aware of the error, as stated in their Reference (a) response. The licensee's resolution of the finding appears adequate, though belated, and the matter is considered closed.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Construction Deficiency Reports (CDRs)

(Open) Item 424, 425 CDR 83-41: Embed Plate Base Metal Failure

- References:
- (a) Letter dated July 11, 1983, from R. E. Conway (Georgia Power Company) to J. P. O'Reilly (NRC Region II) providing on interim report on investigation of an embed plate base metal failure.
 - (b) Letter dated February 15, 1984, from D. O. Foster (Georgia Power Company) to J. P. O'Reilly (NRC Region II) stating that the previously described embed plate base metal failure had been determined not to be reportable in accordance with 10 CFR 50.55(e).
 - (c) Georgia Power Company Nonconformance Report MD-4266, dated April 9, 1983, documenting separation of weld from embed plate that occurred on piping support V1-1901-043-H019.
 - (d) V. H. Wadhvani, Bechtel Group, Incorporated, "Investigation of Weld Failures Between Welded Embed Plates and Steel Support Tubes at the Vogtle Jobsite", June 1983.
 - (e) Letter dated July 5, 1983, from M. Malcolm (Bechtel Power Corporation) to J. A. Bailey (Southern Company Services) describing the status of the investigation of the embed plate base metal failure.
 - (f) Letter dated August 1, 1983, from M. Malcolm (Bechtel Power Corporation) to D. O. Foster (Georgia Power Company) describing the results of a meeting to discuss a field inspection program to be conducted to further investigate the pipe support weld failure (the embed plate failure).
 - (g) Letter dated August 2, 1983, from H. H. Gregory (Georgia Power Company) to M. Malcolm (Bechtel Power Corporation) describing the results of a survey to identify flare bevel welds made to embed and surface mounted plates.

- (h) Letter dated September 12, 1983, from M. Malcolm (Bechtel Power Corporation) to H. H. Gregory (Georgia Power Company) describing the field inspection program to be performed for further investigation of the pipe support failure.
- (i) Letter dated January 19, 1984, from M. Malcolm (Bechtel Power Corporation) to J. A. Bailey (Southern Company Services) describing the completed engineering evaluation of the potential construction deficiency involving the pipe support weld failure.
- (j) "Commentary on Highly Restrained Welded Connections", Reprint, AISC Journal, 61-78, Third Quarter/1973.
- (k) L. F. Porter, "Lamellar Tearing in Plate Steels (A Literature Survey)", United States Steel Corporation Research Laboratory Technical Report, August 29, 1975.
- (l) U.S. Nuclear Regulatory Commission, "Potential for Low Fracture Toughness and Lamellar Tearing on PWR Steam Generator and Reactor Coolant Pump Supports", USNRC Report NUREG-0577 for comment, October 1979. Available for purchase from USNRC Division of Technical Information and Document Control, Washington, DC 20555.
- (m) E. J. Kaufmann, A. W. Pense and R. D. Stout, "An Evaluation of Factors Significant to Lamellar Tearing", Reprint, Welding Research Supplement to the Welding Journal, 43s-49s, March 1981.
- (n) R. D. Stout and A. W. Pense, "Causes and Prevention of Lamellar Tearing", Civil Engineering - ASCE, 74-75, April 1982.
- (o) G. A. Knoroveki, R. D. Kring and G. C. Allen, Sandia National Laboratories, "Fracture Toughness of PWR Components Supports", USNRC Report NUREG/CR-3008, February 1983. Available for purchase from National Technical Information Service, Springfield, VA 22161.
- (p) U.S. Nuclear Regulatory Commission, "Potential for Low Fracture Toughness and Lamellar Tearing in PWR Steam Generator and Reactor Coolant Pump Supports", Rev. 1, October 1983.
- (q) J. L. Grover and R. C. Cipolla, Aptech Engineering Services, Incorporated, "The Significance of Lamellar Tearing in Structural Steels", Electric Power Research Institute Report NP-3570, June 1984.

On June 6, 1983, the licensee notified NRC Region II by telephone of a support failure which they had determined was potentially reportable as a construction deficiency in accordance with the requirements of 10 CFR 50.55(e). In their written report, dated July 11, 1983 (Reference (a)), the licensee informed NRC Region II that the potential deficiency concerned a failure of a support constructed of rectangular tubular steel welded to an embed plate. The support construction had involved welding one flat face of a piece of tubular steel against the embed plate face utilizing flare bevel welds placed along the two rounded edges of the tubular steel that lay adjacent to the tubular steel/embed plate interface. The failure occurred when a craftsman stepped on the support. In a letter dated February 14, 1984 (Reference (b)), the licensee informed Region II that they had completed their investigation of the support failure and had determined that it was not reportable in accordance with 10 CFR 50.55(e).

During the current inspection the NRC inspector examined the licensee's investigation of the support failure through a review of literature on lamellar tearing, a review of the licensee's documentation of their investigations of the failure and discussions with cognizant licensee personnel. The literature and licensee documentation reviewed are listed as references above. Significant information and findings obtained by the inspector in his review and discussions is summarized as follows:

- a. The licensee reported that the failure occurred when an individual stepped on the tubular steel portion of a pipe support fabrication from tubular steel that was welded to an embed plate utilizing flare bevel welds with fillet weld reinforcement.
- b. The licensee indicated that failure occurred in the embed plate base metal. The fracture ran the full length of the welds and pulled out plate base metal about 1/16 inch deep.
- c. The licensee reported that weld size was excessive, greatly exceeding the size specified by the design drawing. The drawing specified unreinforced flare bevel welds to join the tubular steel to the plate (one on each side of the tube). The licensee found that the welds used in practice had been flare bevels plus fillet weld reinforcements of over 1/2 inch. The welds joined 3/8 inch thick (6w x 3d) tubular steel to a inch thick plate.
- d. Based on a metallurgical evaluation of the failure, the licensee concluded that the failure was the result of lamellar tearing caused by the large shrinkage stresses from heavy welding, compounded by embed plate inclusions and ferrite banding close to the plate surface.
- e. Based on his review of the licensee's metallurgical investigation report (Reference (d)) and relevant literature (Reference (j) through (g)) the inspector found that the licensee's conclusions in d. above were amply supported, except that the literature does not support ferrite banding as a factor.

- f. In their July 11, 1983, written report (Reference (a)) on this item the licensee presented a summary of the results from their metallurgical investigation and also described a test which they performed at the site to investigate the failure. This test involved four similarly welded (tubular steel welded to plate) supports which were visually inspected, magnetic particle examined, and load tested to destruction. For the testing, the licensee removed the weld from one tube edge/plate interface on each of the supports and loaded the supports to failure utilizing a hydraulic ram and a wedge. They noted that extensive effort was required for each destructive failure. One of the four samples exhibited magnetic particle indications and it failed by lamellar tearing. Licensee personnel estimated that the force required to produce the destructive failure was well in excess of that required by design.
- g. The licensee's July 11, 1983, letter stated that the following additional investigation would be conducted to verify that lamellar tearing had not occurred elsewhere:
- A field walkdown of supports which utilize weldments of similar size and type will be conducted to confirm that lamellar tearing has not occurred elsewhere. Flare bevel welds with reinforcing fillet welds 3/8" and larger, on plates one inch or thicker will be identified and evaluated based upon a detailed visual inspection program. This inspection will include, as a minimum, samples of weldments made to the embed plates fabricated from heat numbers 7417461 and 7419919. These are the heat numbers respectively of the embed plates to which the subject support and the fourth support tested to destruction were attached. In addition, appropriate samples will be inspected using magnetic particle testing to assure a higher confidence level on the integrity of the existing installation. The 3/8" fillet reinforcement is considered an appropriate threshold for the initial scope of this investigation.
 - The final scope of this investigation will be determined after a detailed assessment has been made of the proposed field walkdown and MT sampling results have been obtained.
- h. In their internal letter of January 19, 1984, (Reference (i)), the licensee described their completed evaluation of the support failure as a potential construction deficiency in accordance with 10 CFR 50.55(e). The investigation that the licensee performed to verify that lamellar tearing had not occurred elsewhere was described in that letter. Significant aspects of the investigation, as determined by the NRC inspector from his review of the letter, were as follows:
- The investigation was conducted through visual and magnetic particle examination of a sample of supports for evidence of lamellar tearing.

- The population of supports from which the sample for examination was limited to previously inspected supports involving flare bevel welds made to embed plates and surface mounted plates. This total population consisted of 447 supports.
- Examination was performed on a sample consisting of 53 supports selected at random on a statistical basis from the stated population.
- The following finding and conclusions were reported:
 - o No lamellar tear indication was identified in the inspection of the samples.
 - o There is a 95% confidence level that at least 95% of the flare bevel welds included in the total population considered will not have any lamellar tear indications.
 - o There is one half of one percent probability of exceeding 1/2 inch overweld in the field. It should be noted that the subject support that failed had 1/2 inch fillet reinforcement which was not called out in the design drawing. It is therefore concluded that significant overwelding is a rare occurrence.
- The evaluation of the field inspection program results have confirmed that the weld failure of the subject support was an isolated event.
- Examples of supports fabricated from plate heat numbers 7417461 and/or 7419919 were not identified and included in the investigation. As noted in g. above, the licensee had informed the NRC that weldments made to embed plates fabricated from those heats would be inspected as a minimum.
- i. The licensee's internal letter of January 19, 1984 (Reference (i)) stated that the conditions that had made the original failed support plate susceptible to lamellar tearing were considered highly unlikely to exist uniformly or repeat within a given heat of plate material.

NOTE: No reference or data was provided in support of this statement.
- k. Significant related data obtained by the inspector from literature on lamellar tearing is as follows:
 - Lamellar tearing is a form of cracking that occurs in planes essentially parallel to the rolled surface of a plate under high thru-thickness (welding induced) loading. It tends to initiate thru cracking or decoherence of elongated inclusions. (Reference (o))

- No relationship has been established between lamellar tearing and banding. (Reference (j))
- The zone of decohesion responsible for lamellar tearing generally extends from the lower part of the weld heat affected zone to 1/4 inch below the plate surface. (Reference (k))
- Most of the time lamellar tearing occurs beneath the plate surface where it is best detected by ultrasonics (Reference (n)). Ultrasonic examination is the most suitable method for detecting lamellar tearing in completed weld joints. (Reference (j))
- Plate material susceptibility to lamellar tearing is strongly dependent on base metal compositions, particularly on sulfur and carbon content. (Reference (g))

NOTE: Based on licensee analysis of the failed embed plate it appears susceptible to lamellar tearing.

- Only one documented inservice failure can be attributed to lamellar tearing and this was not in a nuclear application. (Reference (p))
- Preliminary tests suggest that incipient lamellar tears buried from view do not lower static strength of the joint seriously unless they have propagated sufficiently to be detected by ultrasonic examination. (Reference (m))

In reviewing the licensee's actions on this matter, the NRC inspector found that the licensee's investigation was generally technically sound. However, the inspector noted two factors that the licensee did not appear to adequately consider to assure that they did not have additional supports that exhibited lamellar tearing:

- The licensee did not identify and inspect or test any examples of supports fabricated from the heat of plate that originally failed, such that they might verify that the plate metallurgical characteristics had not resulted in additional examples of lamellar tearing. As described in g. above, the licensee had specifically reported to NRC Region II that additional support examples from the failed heat of plate would be inspected. (The licensee did not subsequently notify, Region II of their decision not to inspect additional examples of the heats of plate that had exhibited lamellar tearing.)
- The preferred method for detection of lamellar tearing is ultrasonic examination. The licensee employed magnetic particle examination (rectified alternating current using prods) in their investigation.

NOTE: The use of ultrasonic examination may not have been practical for the support configurations involved in the investigation but the inspector saw no pending evidence that its use had even been considered. Pending further NRC examination of the licensee's embed plate installation records and evaluation of the examinations performed by the licensee to detect lamellar tearing in their investigation, item 424,425 CDR 83-41 will remain open. The licensee's failure to identify and inspect samples of weldments made to embed plates fabricated from heat numbers 7417461 and 7419919 is considered a deviation from the commitment made in the licensee's letter of July 11, 1983. This deviation is identified 424/86-11-04, 425/86-06-03, Failure to Inspect Supports.

6. Inspector Followup Items (IFIs)

- a. (Closed) IFI (424/85-35-02): Omission of Westinghouse Offsite Activities for the Readiness Review.

This item identified NRC inspector's concerns that the licensee had omitted the offsite activities of the Nuclear Steam Supply System supplier (Westinghouse) from the Readiness Review.

In their response (see paragraph 3 above, Reference (a)) to this IFI, the licensee acknowledged and described their basis for omitting Westinghouse offsite activities from the Readiness Review. The licensee's position on the matter is clear and will be acknowledged in the final NRC report on Module 4. The inspector considers that no further inspection of this item is necessary.

- b. (Closed) IFI (424/85-35-07): Calculation Corrective Actions.

This item was opened by NRC inspectors for followup to assure that corrective actions with regard to minor discrepancies in calculations had received adequate attention.

During the current inspection the NRC inspector examined this item through a review of the licensee's written response (Reference (a) in paragraph 3 above) and discussions with the Module 4 Readiness Review Design Team Leader. The inspector accepted licensee explanations citing the lack of safety significance in the subject calculation discrepancies.

- c. (Closed) IFI (424/85-35-08): Maximum Design Pressure Discrepancy

This IFI was opened to address an apparently minor discrepancy that the inspector's observed in comparing a maximum design pressure given on an isometric drawing with that indicated for the same line on the licensee's Line Designation List.

During the current inspection, the NRC inspector followed up on this item by reviewing the licensee's response to the item (Reference (a) in paragraph 3 above), discussing the item with the Module 4 Readiness Review Mechanical Design Team Leader, and verifying correction of the design pressure entry given on the isometric drawing. The licensee's explanation of the discrepancy indicated that the pressure given on the drawing is not used in stress analysis and had no impact on the system design. This explanation was accepted by the inspector and the matter is considered closed.

- d. (Closed) IFI (424/85-35-10): Review of Construction Specifications and Procedures.

This item expressed minor concerns with regard to review coverage provided by the Module 4 Readiness Review of the construction specification and of construction procedures for receipt, storage, and maintenance. The inspector's who identified this IFI based their concern on the fact that there was no indication of a review of these documents for commitment implementation in the Module 4 Readiness Review report commitment section.

During the current inspection, the NRC inspector examined this item through review of the licensee's written response (see paragraph 3, Reference (a)) and discussions with cognizant Readiness Review personnel. The licensee's response pointed out that the subject construction specification and procedures had been addressed in development of Readiness Review Module 4 report, Section 4 which provides the description of the licensee's program and includes descriptions of procedures for receipt, storage and maintenance. The response also noted with regard to the construction specification that they had identified a significant finding (Finding 4-56) and a Readiness Review Information Request (RIR 4-6) which were evidence of their review. The inspector verified the finding and the description of the procedures for receipt, storage and maintenance given in the Module 4 report and accepts the licensee's explanation. The matter is considered closed.

- e. (Closed) IFI (424/85-35-16): Inconsistency in the use of low carbon stainless steel.

This IFI was opened by the NRC inspectors to follow-up on an apparent inconsistency in the composition of piping materials used in the RHR isolation valve encapsulation vessel. The inconsistency was that all of the pipe was a low carbon stainless steel, while the valve itself was not.

During the current inspection, the NRC inspector followed up on this item by verifying that the material specified for the valve in the design was not low carbon stainless steel. The inspector determined that the materials were as specified by the designer. The matter is considered closed.