U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF SPECIAL PROJECTS

NRC Inspection Report: 50-445/88-21
50-446/88-18

Permits: CPPR-126
CPPR-127

Dockets: 50-445
50-446

Category: A2

Construction Permit
Expiration Dates:
Unit 1: August 1, 1988
Unit 2: Extension request
submitted.

Applicant: TU Electric
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 & 2

Inspection At: Comanche Peak Site, Glen Rose, Texas

Inspection Conducted: March 2 through April 5, 1988

Inspector: for H. H. Livermore 4-15-88
M. F. Runyan, Resident Inspector, Civil Structural (paragraphs 2.b(1), 2.b(2), 2.b(3), 2.b(6), 2.b(7), 3, and 4)
Date

Consultant: W. Richins, Parameter (paragraphs 2.a, 2.b(4), 2.b(5), and 4)

Reviewed by: H. H. Livermore 4-15-88
H. H. Livermore, Lead Senior Inspector
Date

Inspection Summary:

Inspection Conducted: March 2 through April 5, 1988 (Report 50-445/88-21; 50-446/88-18)

Areas Inspected: Unannounced, resident safety inspection of applicant actions on Comanche Peak Response Team (CPRT) Issue-Specific Action Plans (ISAPs), Post Construction Hardware Validation Program (PCHVP), and general plant tours.

Results: Within the areas inspected, weaknesses were identified in the interface between the CPRT and the Design Adequacy Program (DAP) (paragraph 2.b[2]), the definition of inspection attributes (paragraph 2.b[5]), and the Quality Control (QC) documentation of PCHVP activities (paragraph 3). No specific strengths were identified. No violations or deviations were identified.

DETAILS

1. Persons Contacted

D. A. Balatincz, Field Coordinator, Bisco
C. Beasley, Senior Engineer, Evaluation and Research Corporation (ERC)
E. J. Brabazon, Engineering Manager, CPRT, Stone and Webster Engineering Company
G. S. Braun, TENARA (TERA)
*W. G. Counsil, Executive Vice President, TU Electric
N. D. Hammett, Engineering Assurance, Brown & Root (B&R)
*T. L. Heatherly, Licensing Engineer, TU Electric
C. R. Hooton, Civil Engineering Manager, TU Electric
R. M. Kissinger, Civil Engineering, TU Electric
J. J. McNally, Engineer, SWEC
J. C. Miller, TERA
*J. W. Muffett, Manager of Civil Engineering, TU Electric
R. K. Munshi, Engineer, SWEC
*L. D. Nace, Vice President, Engineering & Construction, TU Electric
*A. B. Scott, Vice President, Nuclear Operations, TU Electric
*M. R. Steelman, CPRT, TU Electric
C. W. Stirzl, Engineer, Westinghouse
*J. F. Streeter, Director, QA, TU Electric
J. A. Sullivan, Engineer, SWEC
J. P. Tableriou, Senior Engineer, SWEC
T. Vears, Engineer, SWEC

The NRC inspectors also interviewed other applicant employees during this inspection period.

*Denotes personnel present at the April 5, 1988, exit meeting.

2. Applicant Action on CPRT Issue-Specific Action Plans

The following Comanche Peak Response Team (CPRT) ISAP activities were inspected during this report period:

a. Improper Shortening of Anchor Bolts in Steam Generator Upper Lateral Supports (ISAP V.b) (48055)

The following activities for ISAP V.b were reviewed by the NRC inspector during this report period:

Rework of Unit 1 for Acceptable Thread Engagement (NRC Reference 05.b.01.00) and Inspection of Unit 2 for Acceptable Thread Engagement (NRC Reference 05.b.02.00)

The NRC inspector reviewed Westinghouse files TBX 954/13C (Unit 1) and TCX 954/13C (Unit 2), "Steam Generator Upper

Lateral Beam/Bolt Inspection." These files contain: (1) documentation of the results of field inspections of bolt holes and threads in the steam generator upper lateral supports for all compartments in both Units 1 and 2, (2) calculations and computer models regarding the bolted connections of the upper lateral support beams to the embedded plates, and (3) tabulations of required connection parameters. Each connection was modeled using the nonlinear finite element Westinghouse (W) computer program WESPLAT and external loading values provided by Gibbs and Hill. The external loading values and the computer program WESTPLAT were not part of this NRC review. Loading combinations were specified in the Comanche Peak FSAR, Section 3.4.3.

The connection at each end of the steam generator upper lateral supports consists of eighteen 2 1/2 inch, A540 B23, Class 4 bolts, an embedded 3 inch thick plate with blind threaded holes, and a shim between the beam and the plate. The connection was analyzed by W as a friction connection. Required preload, thread engagement, and bolt length were calculated for each bolt based primarily on connection geometry, allowable bolt tension, thread conditions in the plate, and compression forces required to maintain a friction connection. Bolt elongation was specified based on the required bolt preload and predicted relaxation.

The NRC inspector reviewed the methodology, load combinations, assumptions, and models used in the above W files. Numerical calculations for the following bolts were spot checked for arithmetic accuracy:

Unit 1	Unit 2
1E12	1E12
2W15	1W6
4W1	4E3
4W15	4E15

The W files TBX 954/13C and TCX 954/13C were found to be consistent with the Comanche Peak FSAR and to support the connection parameters specified.

The NRC inspector previously witnessed the W inspection of 13 bolt holes in Unit 1 (NRC Report 50-445/86-03; 50-446/86-02). Remaining NRC activities include inspection of the bolt installation process.

No violations or deviations were identified.

b. Quality of Construction (ISAP VII.c)

ISAP VII.c was initiated by TU Electric to provide assurance that unidentified concerns related to the quality of construction of the hardware would be identified, evaluated, and resolved. This ISAP was a self-initiated program developed independent of issues raised by external sources. Populations of homogeneous QC-accepted safety-related construction work products were randomly sampled. Reinspections and/or documentation reviews were performed for the sampled hardware. The results were collectively evaluated with conclusions and recommendations presented for each population in the appendices to the Results Report for ISAP VII.c.

The following activities for ISAP VII.c were reviewed by the NRC inspector during this report period.

(1) Pipe Whip Restraints (NRC Reference Item 07.c.17.00) (50090)

The NRC inspector reviewed the Results Report for ISAP VII.c, Appendix 29, "Pipe Whip Restraints." This population consists of all safety-related moment restraints, pipe whip restraints, and restraint support structures in large and small bore piping systems. Field inspections of pipe whip restraints are documented in NRC Inspection Reports 50-445/86-26, 50-446/86-22; 50-445/85-14, 50-446/85-11; and 50-445/85-18, 50-446/85-15.

The NRC inspector reviewed documentation in the CPRT working files that support CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilation of CPRT inspection procedures; and (4) justification for the root causes, generic implications, recommendations, and conclusions detailed in the Results Report. Specific questions were addressed to the responsible CPRT engineer.

Calculations were reviewed for (1) a pipe whip restraint, which was designed to share the load with another pipe whip restraint, but which would carry most of the load due to deviations of the gaps between the pipe and the two restraints; and (2) a generic calculation of the increased load on a pipe whip restraint when the distance from the pipe elbow

(where the pipe had been postulated to break) to the restraint was 10 percent longer than the design specified. For calculation (1) above, the CPRT engineer successfully answered the NRC inspector's questions concerning the validity of the calculation. For calculation (2) above, the NRC inspector questioned why the generic calculation (generated as a bounding analysis for the uninspected portion of the population) considered only a deviation in the pipe elbow to restraint distance (along the length of the pipe) and not also an accompanying deviation in the gap between the pipe and the restraint (a radial dimension). Both of these types of deviations had been observed in the inspected portion of the population and they would have a synergistic effect in increasing the force on the whip restraint. The CPRT engineer stated that the PCHVP FVM inspection effort and accompanying hardware changes would restore all gaps between pipes and whip restraints to within design specifications. This activity will be inspected by NRC. The NRC inspector considered this commitment to be adequate justification for deleting pipe to restraint gap deviations from the generic calculation. Other questions concerning these calculations were satisfactorily resolved and no issues were identified. Previous NRC inspection of safety significance evaluations (SSEs) is documented in NRC Inspection Report 50-445/87-04, 50-446/87-04.

The identified corrective actions were consistent with the Results Report details and will be inspected by NRC during future inspections. The Results Report conclusion that, following satisfactory implementation of the identified corrective actions, pipe whip restraints are installed in conformance with design appeared consistent with the details of the report and supporting working files noted above.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(2) <u>Containment Liners and Stainless Steel Tank liners (NRC Reference Item 07.c.22.00) (55150)</u>

The NRC inspector reviewed the Results Report for ISAP VII.c, Appendix 23, "Containment Liners and Stainless Steel Tank Liners." This population consists of plate contour and seam weld installation for the containment liner and liners installed

inside the refueling water storage, condensate storage, and reactor make-up water storage tanks. Previous NRC field inspections of this construction work category are documented in NRC Inspection Reports 50-445/86-31, 50-446/86-25; 50-445/85-18, 50-446/85-15; 50-445/85-16, 50-446/85-13; 50-445/85-14, 50-446/85-11; and 50-445/85-13, 50-446/85-09.

The NRC inspector reviewed documentation in the CPRT working files that supports CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilation of CPRT inspection procedures; and (4) justification for the root causes, generic implications, recommendations, and conclusions detailed in the Results Report. Specific questions regarding this information were directed to the responsible CPRT engineer. The NRC inspector reviewed several technical calculations for localized liner contour variations and for weld seam offset deviations. The assumptions, methods, and computations of these calculations appeared to be correct. Previous NRC inspection of SSEs is documented in NRC Inspection Report 50-445/87-04, 50-446/87-04.

The identified corrective actions were consistent with the Results Report details and will be inspected during future NRC inspections. However, a weakness was identified in that the issue of microbiological induced corrosion (MIC), which was not included in the identified corrective actions, was possibly dismissed without being satisfactorily resolved. Microbiological corrosion occurs in the presence of stored water and certain contaminants, including living organisms. CPRT did not consider MIC to be attributable to tank fabrication or erection activities. Therefore, the CPRT identified MIC as a potentially significant design-related issue and referred it to the Design Adequacy Program (DAP). This referral ended CPRT's responsibility for this issue. From what little documentation the applicant could find, the NRC inspector determined that DAP dismissed the MIC issue without substantive analysis. The applicant is still determining the chronology of events surrounding this case. The Project has pursued this matter subsequent to the

dissolution of DAP. Also of interest is the broader issue of the interface between the CPRT and DAP and the possibility that other CPRT referrals have been similarly handled. The NRC will track this matter as an open item (445/8821-O-01, 446/8818-O-01).

Microbiological induced corrosion has also been observed in the Service Water piping and has been documented by the applicant within SDAR-CP-86-07, "Service Water System Leakage." Developments from this issue will be considered in the disposition of the open item identified above.

The Results Report concluded that if the recommended corrective action is implemented, the hardware in this construction work category will be adequately installed to perform its safety-related function. The NRC inspector determined that (assuming successful resolution of the above open item) the conclusion was consistent with the details of the report and supporting working files.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(3) Equipment Supports (NRC Reference Item 07.c.23.00) (48055)

The NRC inspector reviewed the Results Report for ISAP VII.c, Appendix 30, "Equipment Supports." This population consists of all safety-related supports for electrical, mechanical, and heating and ventilating equipment. Questions resulting from this review were satisfactorily answered by the responsible CPRT engineer and by reference to specific SSEs. Previous NRC field inspections of equipment supports are documented in NRC Inspection Reports 50-445/86-31, 50-446/86-25; and 50-445/86-22, 50-446/86-20. The NRC inspector reviewed documentation in the CPRT working files that support CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilation of CPRT inspection procedures; and (4) justification for the root causes, generic implications, recommendations, and conclusions detailed in the Results Report.

Previous NRC inspection of SSEs is documented in NRC Inspection Report 50-445/87-04, 50-446/87-04.

The Results Report conclusion that equipment supports are adequately installed in conformance with design appeared consistent with the details of the report and supporting working files noted above. The only corrective action identified by CPRT was a Type 3 (optional) recommendation for the applicant to search and review documentation for non-ASME safety-related equipment supports in light of the fact that much of this documentation was found to be missing in the original review. Any applicant action on this recommendation will be reviewed by NRC and tracked on the CPRT commitment report matrix.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(4) Structural Steel (NRC Reference Item 07.c.25.00) (48055)

The NRC inspector reviewed the Results Report and supporting CPRT working files for ISAP VII.c, Appendix 19, "Structural Steel." Questions resulting from this review were satisfactorily answered in discussions with the responsible CPRT engineer and/or by reference to specific SSEs. Previous field inspections and documentation reviews were performed and documented in NRC Inspection Reports 50-445/85-14, 50-446/85-11; 50-445/85-16, 50-446/85-13; 50-445/85-18, 50-446/85-15; 50-445/86-07, 50-446/86-05; 50-445/86-31, 50-446/86-25. The NRC inspector reviewed documentation in the CPRT working files that support CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilation of CPRT inspection procedures; and (4) justification for the root causes, generic implications, recommendations, and conclusions detailed in the Results Report. NRC inspection of SSEs was performed and documented in NRC Inspection Report 50-445/87-04, 50-446/87-04.

The Results Report concludes that there is reasonable assurance that the structural steel

hardware will be adequately installed to perform its safety-related function based on: (1) the results of the activities performed and documented in the working files, (2) satisfactory implementation of the recommendations stated in the Results Report, and (3) satisfactory implementation of the recommendations and conclusions stated in Appendix 33, "Concrete Inserts," and the Results Reports for ISAPs VII.a.1, "Material Traceability," and VII.b.4, "Hilti Anchor Bolt Installation." The conclusions stated in the Results Report appeared to be consistent with the details of the report and supporting working files noted above. The identified corrective actions were consistent with the report details and will be inspected by NRC during future inspections.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(5) Fill - Backfill Placement (NRC Reference Item 07.c.26.00) (45055)

The NRC inspector reviewed the Results Report and supporting CPRT working files for ISAP VII.c, Appendix 20, "Fill and Backfill Placement." Previous documentation reviews were performed and reported by the NRC inspector in NRC Inspection Reports 50-445/85-16, 50-446/85-13; 50-445/85-18, 50-446/85-15; and 50-445/86-03, 50-446/86-02. NRC inspection of SSEs was performed and documented in NRC Inspection Report 50-445/87-04, 50-446/87-04.

Fill and backfill placement inspections were performed by: (1) Freese and Nichols for the safe shutdown impoundment (SSI) dam; (2) Brown and Root for site backfill prior to July 12, 1978, with testing services provided by R. W. Hunt Co.; and (3) TU Electric for site backfill subsequent to July 12, 1978. Three populations were prepared and sampled to address the three phases of fill and backfill placement work. Physical reinspections of fill and backfill placements were categorized as not recreatable by CPRT and only documentation reviews were conducted.

Initially, 60 sample items from each of the 3 populations were selected. Additional samples were later added to provide a total of at least 60 inspections of each attribute for the SSI and Brown and Root populations and 45 inspections of

each attribute for the TU Electric population. The TU Electric population had a population size of 101 indicating a required sample size of 60 items (Table 5.1-1 in CPRT Procedure CPP066, Revision 3).

CPRT Memorandum QA/QC-RT8657 requested authorization from the CPRT engineering statistical advisor to use a sample size of 45 for the TU Electric population. This authorization was granted. Further review by the NRC inspector revealed that this was an isolated procedural deviation. The NRC inspector verified that a sample of 45 from a population of 101 items is sufficient to produce the desired 95 percent confidence level that fewer than 5 percent defectives exist in the population. (This is the confidence level used for all CPRT populations.) The NRC inspector's determination was made based on information provided in a Jack R. Benjamin and Associates calculation dated August 15, 1985, "Sample Plans for Finite Populations," which references, "Tables of the Hypergeometric Probability Distribution," Lieberman and Owen, Stanford University Press, 1961. As a result of these facts, an open item was not identified for this incident.

The NRC inspector evaluated the lists of safety-significant attributes used for inspection and discussed in the Results Report. CPRT Procedure CPP-007, Revision 2, Section 4.4, defines a safety-significant attribute to be: "A characteristic of a component or construction activity which, if not in accordance with applicable design documents, codes, and standards, could impair the ability of the component to perform its safety-related function under design loading conditions."

A memorandum was prepared by CPRT listing the source documents for each selected attribute. The attributes were entered on the inspection checklists, attachments 6.1 and 6.2 to QI-057, Revision 7, "Documentation Review of Fill and Backfill Placement." The checklists for documentation review of the SSI dam fill placements contain 13 safety-significant attributes. The checklists for the other two populations contain nine safety-significant attributes.

CPRT issued a memorandum, QA/QC-RT-5826, "Correlation of Results Report and QI Attributes, Fill and Backfill Placement," which combines safety-significant attributes as listed on the QI-057

checklists into a second set of safety-significant attributes used in the Results Report. The safety-significant attributes selected for the Results Report were; (1) inspector's report notations, (2) test results, and (3) inspector certification. CPRT Memorandum QA/QC-RT-5826 combined 11 safety-significant attributes from the QI-057 checklist for the SSI dam into one safety-significant attribute (inspector's report notations) used in the Results Report. Similarly, seven attributes from QI-057 for the two backfill populations were combined into one attribute (also the inspector's report notations) used in the Results Report. CPRT sampled 60 (45 for the TU Electric population) of each of the attributes as defined in the Results Report but did not sample 60 (45 for the TU Electric population) of the attributes listed on QI-057 checklists.

The NRC inspector held meetings on March 14 and March 31, 1988, regarding the above discussion of attribute definition and subsequent grouping. This issue is a weakness in the CPRT Result Report for ISAP VII.c, Appendix 20. The attributes as defined in the QI-057 checklist were not statistically sampled. Instead, they were grouped into a new set of attributes for sampling. The term "Safety-significant attribute" is identically defined for QI-057 (via CPP-007) and for the Results Report. Since a large number of attributes were grouped together for statistical sampling, conclusions for the populations can only be made regarding the three general attributes. This is an open item (445/8821-O-02, 446/8818-O-02) pending response from CPRT.

The Results Report concludes that there is reasonable assurance that the fill and backfill placements will adequately perform their intended safety-related functions. The NRC inspector reviewed documentation in the CPRT working files that supports CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilations of CPRT inspection procedures; and (4) justification for the root cause, generic implications, recommendations, and conclusions detailed in the Results Report.

The conclusions stated in the Results Report appeared to be consistent with the details of the report and supporting working files noted above. No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(6) Concrete Insert Thread Engagement (NRC Reference Item 07.c.34.00) (46055)

The NRC inspector reviewed the Results Report and supporting CPRT working files for ISAP VII.c, Appendix 33, "Concrete Insert Thread Engagement." The attribute of concrete insert thread engagement addresses the engagement length of threaded rods or bolts into Richmond inserts that were utilized in the installation of safety-related equipment and structures for structural steel, pipe whip restraints, large-bore supports, and small bore supports. Proportional sampling was performed from inserts associated with these four construction work categories in order to identify trends which may not be evident in the individual categories. The process of proportional sampling will be reviewed by the NRC inspector as part of the closure of unresolved item 445/8601-U-16, 446/8601-U-05.

Questions resulting from the NRC inspector's review were addressed to the responsible CPRT engineer. One of the issues discussed was whether or not identified instances of partial thread engagement, resulting in reduced load capacity, would be positively documented to prevent a future hardware modification from increasing the load above capacity. This could occur if the design engineer assumed that the bolt was fully threaded and capable of supporting its design load. The NRC inspector was informed that all cases of partial thread engagement would be noted on the design drawing and that any future modification engineer would recognize this condition. The NRC inspector considered this method of accounting for reduced capacity inserts to be acceptable.

The NRC inspector was later informed that following reinspections conducted under the PCHVP, there will not be any known cases of reduced load capacity inserts remaining in the plant. The specification for engagement length of Richmond inserts is twice the bolt diameter plus 1/8 inch. Many engagement lengths were found to be less than this specification. A SWEC experimental study, "Report on Tests

of Richmond Inserts with Partial Bolt/Rod Thread Engagement," 16345/6-CS(B)-17-05, showed that thread engagements equaling twice the bolt diameter minus 1/4 inch could still withstand the entire design capacity. A 100 percent reinspection of Richmond inserts is being conducted under the PCHVP and any instances where thread engagement does not equal or exceed twice the bolt diameter minus 1/4 inch will result in replacement of the bolt. The NRC inspector reviewed the SWEC study referenced above and determined that the PCHVP effort should ensure that the full design capacity of Richmond inserts will be attained.

The NRC inspector reviewed documentation in the CPRT working files that support CPRT activities and conclusions for this population including: (1) population description, homogeneity justification, and sampling methods; (2) matrices used for determining adverse trends and tabulating deviations versus attributes; (3) documentation used as reference for the identification of inspection attributes and the compilation of CPRT inspection procedures; and (4) justification for the root causes, generic implications, recommendations, and conclusions detailed in the Results Report. The Results Report conclusion that, after completion of the identified corrective actions, there is reasonable assurance that hardware for this attribute is adequately installed appeared consistent with the details of the report and supporting working files noted above. The implementation of corrective actions documented in Section 4.0 of the Results Report will be inspected by NRC within the PCHVP and tracked on the CPRT commitment report matrix.

No violations or deviations were identified. This activity is complete and no further NRC inspection is planned for this reference item.

(7) <u>AISC Bolting (NRC Reference Item 07.c.35.00) (48055)</u>

The NRC inspector reviewed the Results Report for ISAP VII.c, Appendix 34, "AISC Bolting." The population of AISC (or high-strength) bolting was added to the general ISAP VII.c scope due to similarities of findings in the populations of ISAP VII.c, Appendix 19, "Structural Steel;" ISAP VII.c, Appendix 29, "Pipe Whip Restraints;" and ISAP VII.c., Appendix 30, "Equipment Supports." As such, it provides a combined evaluation of the results of bolting reinspections and documentation

in Appendices 19, 29, and 30 in order to identify trends beyond those identified separately in these three appendices. Questions resulting from the NRC inspector's review of the Results Report and CPRT working file were satisfactorily answered by the responsible CPRT engineer.

The AISC Bolting Results Report stated that additional corrective actions, beyond those identified in Appendices 19, 29, and 30, were not needed; however, corrective action recommendations for missing jam nuts, incorrectly-installed locking devices, and lack of joint tightness, identified in the structural steel and pipe whip restraint populations, were determined to be applicable to the equipment supports population. The Results Report concluded that when corrective actions prescribed by Appendices 19, 29, 30, and 34 are completed, there will be reasonable assurance that hardware joined with bolts will be adequately installed. This conclusion was consistent with the details provided in the report.

This completes the NRC review of this ISAP reference. The completion of identified corrective actions will be verified by NRC within the CPRT Commitment Report matrix.

3. Post Construction Hardware Validation Program (PCHVP)

The following PCHVP activity was observed during this report period.

Concrete Anchorage Richmond Inserts (FVM No. SWEC-FVM090) (46053)

The NRC inspector observed a PCHVP inspection of four bolted Richmond inserts in Unit 1. The applicant QC inspectors who performed the inspections were able to demonstrate that the inserts they were testing were in fact the correct inserts to be tested as shown on Drawings 2323-SI0589-01 R4 and 2323-SI-0581 R3. The inspection included an evaluation of the following attributes: bolt engagement, bolt diameter, bolt material, and tightness of the connection. Bolt engagement was calculated by ultrasonic testing (UT) of the bolt length and a physical measurement of the bolt head to plate distance. Bolt diameter was measured directly. Bolt material was verified by physical markings on the bolts. Bolt tightness was verified by the full effort of one man using a large wrench.
NCR 88-05267, Revision 0, was written to document an indeterminate status of the bolt washers, which are required to be "hardened" as designated by a "star" stamp. The bolts were

not removed from the inserts due to the destructive nature of this activity. The stamps could not be observed on the washers either because they were covered by the nut or because the washers were not hardened. The NRC inspector verified that the inspection was conducted in accordance with NQI-3.09-C003, Revision 5. The bolts were required to have at least a 2 3/4 inch thread engagement. The minimum thread engagement observed was 3 inches.

The NRC inspector reviewed Inspection Report 1-0166564, which documented the above inspection activity, and NCR 88-05267 referenced above. Although, no specific discrepancies were identified, the lack of complete documentation confirming thread engagement was considered a weakness. The procedure requires documentation of the measured total bolt length, but leaves undocumented the bolt head to plate distance, calculated thread engagement, and the acceptance criteria used by the QC inspector (who documents bolt engagement as "sat" or "unsat"). The QC inspector makes the acceptability determination in the field, but the lack of documentation prevents a reviewer from checking the arithmetic or verifying that the correct acceptance criteria had been used. These concerns as well as the potential for a broader issue related to other areas of QC documentation have been raised to the applicant who is reviewing this issue. The NRC will track this matter as an open item (445/8821-O-03; 446/8818-O-03).

No violations or deviations were identified.

4. General Plant Tours (92700)

The NRC inspectors made frequent tours of Unit 1 to observe items such as housekeeping, equipment protection, and in-process work activities. No violations were identified and no items of significance were observed.

5. Open Items

Open items are matters which have been discussed with the applicant, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or applicant or both. Three open items disclosed during the inspection are discussed in paragraphs 2.b(2), 2.b(5), and 3.

6. Exit Meeting (30703)

An exit meeting was conducted April 5, 1988, with the applicant's representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspectors during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection;

however, the applicant arranged a meeting between a Westinghouse employee and the NRC inspector in which the following proprietary files were reviewed: TBX 954/13C (Unit 1) and TCX 954/13C (Unit 2), "Steam Generator Upper Lateral Beam/Bolt Inspection." During the exit meeting, the NRC inspectors summarized the scope and findings of the inspection.