UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-259/95-41, 50-260/95-41, and 50-296/95-41

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260 and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry Nuclear Power Station Units 1, 2, and 3

Inspection Conducted: July 10-14, July 24-28, and August 7-11, 1995

Inspectors: _____ 9/8/95
William P. Kleinsorge PE — Date Signed
Reactor Inspector

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Joseph F. Lenahan — Date Signed
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Approved by: _____ 9/11/95
Jerome J. Blake, Chief — Date Signed
Materials and Process Section
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SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of: 1C Emergency Diesel Generator (EDG) Turbocharger failure; Flow Accelerated Corrosion (FAC): IE Bulletin 83-07 Apparently Fraudulent Products Sold By Ray Miller Inc.; IE Bulletin 88-05 Nonconforming Materials Supplied By Piping Supplies Inc and West Jersey Manufacturing Company; platform structural steel design calculations; modifications to structural steel platforms; structural steel design issues; and licensee actions on previous inspection findings.

Results:

The inspectors concluded that the most likely scenario for the turbocharger failure was gear tooth bending fatigue resulting from fatigue cracks initiated by intergranular attack and grinding or quench cracks, the result of poor manufacturing practices. An Inspector Followup Item was opened to evaluate the results of the licensee's vendor visits and to evaluate the examination of 1A EDG turbocharger scheduled before or during the 1A EDG's next biannual inspection, currently scheduled for June 1996.

Structural steel modifications have been completed in accordance with design requirements. Structural steel design issues have been resolved and are acceptable for Unit 3 restart.

An Inspector Followup Item was identified for the evaluation of minor deficiencies in structural steel design calculations.

The licensee's actions relating to IE Bulletin Nos 83-07 and 88-05 were appropriate and the bulletins are considered closed.

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

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*T. Abney, Unit 3 Recovery Manager
*I. Beltz, 89-10 Manager
C. Carpenter, Welding Engineering
*T. Chandler, Electrical Engineer
⊠J. Cory, Acting Plant Manager
*C. Crane, Assistant Plant Manager
*H. Crisler, Site Engineer
#R. Cutsinger, Chief Civil Engineer, Corporate Engineering
*J. Davenport, Licensing Engineer
*B. Endsley, Maintenance Engineer
*C. Galuska, Site Engineer
#J. Glass, Acting Lead Civil Engineer
K. Groome, Design Engineering
*D. Gurber, Maintenance Training Engineer
*S. Hicmens, Technical Support I&C and Electrical Manager
D. Housley, Regulatory Compliance
J. Hughes, Civil Engineer, Corporate Engineering
*J. Johnson, Site Quality Manager
*D. Linsey, I&C Principal Engineer
#⊠R. Machon, Site Vice President
*J. Maddox, Maintenance/Modifications Manager
L. Madison, Unit 3 Civil Engineer Supervisor
#*J. McCarthy, Lead Mechanical Nuclear Engineer
T. Mingus, Erosion/Corrosion
R. Phillips, Corporate Engineering
*G. Pierce, Technical Support Manager
*B. Pratt, Corporate Maintenance
#*G. Preston, Browns Ferry Nuclear Plant Manager
⊠S. Rudge, Site Support Manager
#*⊠P. Salas, Licensing Manager
*T. Shriver, Manager NA&L
*L. Turner, Technical Support System Engineer
#*⊠S. Wetzel, Acting Compliance Manager
#*⊠H. Williams, Engineering and Material Manager

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

Other Organizations

D. Beguin, Project Manager, Bechtel
*W. Peabody, Vice President, Atwater
E. Thomas, Senior Structural Engineer, Bechtel

NRC Resident Inspectors

#L. Wert, Senior Resident Inspector
#*⊠R. Musser, Resident Inspector
⊠J, Munday, Resident Inspector

⊠Attended exit interview July 14, 1995
*Attended exit interview July 28, 1995
#Attended exit interview August 11, 1995

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. 1C Emergency Diesel Generator (EDG) Turbocharger Failure

As reported in Licensee Event Report (LER) 50-260/95001, dated February 22, 1995, the turbocharger, on the 1C EDG, failed at the completion of the Monthly Operability Test. At 8:05 PM February 16, 1995, the 1C EDG was declared inoperable.

The turbochargers were originally manufactured by Electromotive Division (EMD) of General Motors, and were subsequently rebuilt by MKW Power Systems Inc. (MKW). During the time period from November 1985 to December 1986, the licensee replaced the original turbochargers on the site's eight EDGs with high capacity rebuilt turbochargers.

This is the third failure experienced by the licensee on EMD turbochargers. The first failure (original turbocharger) occurred in October 1984 and was attributed to cumulative damage to the bearings caused by rapid starts and inadequate lubrication. The second failure (high capacity turbocharger) occurred in 1992 and was attributed to planetary bearing failure leading to loss of bearing concentricity resulting in improper meshing of, and subsequent failure of, gear teeth. The failure analysis was conducted by EMD. The EMD report stated that the root cause of the bearing failure was impossible to determine, but could have been caused by improper lubrication. The licensee, being dissatisfied with the EMD failure analysis performed after the second failure, decided to conduct the failure analysis, of the third failure, in-house.

The licensee's metallurgical failure analysis report (MFAR), documented in Metallurgical Evaluation of The 1C Diesel Generator Turbocharger, dated March 23, 1995, concludes that "...fatigue is the most probable case of the 1C diesel generator turbocharger gear train failure."

To evaluate the actions taken by the licensee and to evaluate the cause of the turbocharger failure, the inspectors reviewed documents, interviewed licensee personnel and conducted a walkdown inspection of several EDGs.

The licensee's metallurgical failure analysis consisted of visual observations, fractography using a scanning electron microscope at magnifications to 2000X, metallographic evaluation, hardness testing including a transverse survey, and chemical analysis. The licensee conducted all the appropriate tests, examinations and analyses. The MFAR drew no conclusion as to the adequacy of the gear material for its intended application. It should be noted that the licensee, in March 1995, requested information from MKW relating to material specifications, hardness requirements, case depth, and inspection and Nondestructive Examination (NDE) practices for the turbocharger gears. To date the information is not forthcoming. Without the requested information, it is not possible to determine whether the failed gears were manufactured consistent with the manufacturer's design criteria (correct material, heat treatment, NDE etc).

The MFAR identified evidence of cracks in the highly stressed root radius and tooth faces on the sun gear as well as the planetary gears. These cracks are indicative of improper quenching or grinding practices during the manufacture of the gears. Cracks of this type significantly reduce the fatigue strength.

The MFAR identified evidence of high cycle fatigue in both the sun gear and the planetary gears.

The MFAR identified evidence of intergranular attack (IGA) in both the sun gear and the planetary gears which is also indicative of improper quenching or grinding practices during the manufacture of the gears.

In the inspectors' opinion and reinforced by the literature[1], the most likely scenario for the turbocharger failure is gear tooth bending fatigue resulting from fatigue cracks initiated by IGA and grinding or quench cracks, the result of poor manufacturing practices.

Discussions with the licensee indicated that the vendor's QA program, at the time that the licensee's turbochargers were rebuilt, was such that records attesting to material chemical composition, heat treatment, and NDE and inspection methods and results, are retrievable only from the numbers stamped on the gears themselves. Those numbers, on the 1C turbocharger sun and planetary gears, were obliterated during the turbocharger failure. In addition the identifying numbers on the remaining turbochargers are only visible upon disassembly of the

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[1] ANSI/AGMA110.04 1980, National Standard-Nomenclature of Gear Tooth Failure Modes

AWS Metals Handbook, Ninth Edition, Volume 11, Failure Analysis and Prevention

L. E. Alban, Systematic Analysis of Gear Failures, American Society of Metals, 1985

turbochargers, which voids the vendor's warranty. Therefore it is not possible to determine whether any other turbochargers contain gears of the same material heat or heat treatment batch.

Licensee Problem Evaluation Report (PER) No. BFPER 950065, Revision 1, dated March 14, 1995, indicates that the 1A turbocharger will be disassembled and inspected for any signs of degradation, during the A EDG biannual inspection in June 1996, and if the schedule permits, the turbocharger may be examined during the Unit 2 Cycle 8 refueling outage in March 1996. LER 50-260/95001, Revision 1, dated May 3, 1995, states "TVA plans to remove the EDG turbocharger before or during its next biannual inspection, currently scheduled for June 1996, and inspect it for any degradation which could potentially cause the turbocharger to fail." LER 50-260/95001 indicated that the above is not "a Regulatory Commitment."

The licensee provided the following reasons for waiting until the biannual inspection to remove the 1A turbocharger for examination:

- 1300 starts with only two failures - Reliability for turbochargers is 99.84 percent.

- Turbocharger failures are not common industry failures.

- Approximately 156 hours of additional EDG unavailability are required verses replacement at the biannual inspection, (i.e. increased plant risk since A EDG is required during the first 10 minutes of LOP-LOCA.)

- Both failures of the high capacity turbochargers have happened when the engine was being shutdown. This indicates that the engine would start and load if the same failure occurred again.

The inspectors concur with the first three reasons above, but not the fourth reason. The licensee verbally contends that the largest load on the turbocharger sun and planetary gear teeth, occurs at the moment of re-engagement of turbocharger during the power-down cycle, and this is the approximate cause of the failure. Therefore the failure will occur on the power down-cycle after the EDG as performed its primary safety function. The inspectors are of the opinion that the failure is as likely on the power-up cycle as the power-down cycle, for the following reasons:

- The same side of the gear teeth are loaded during the power-up cycle as the power-down cycle, with the exception of the momentary re-engagement load discussed above.

- The metallography/fractography supports failure by high cycle fatigue. Each rotation of the sun gear represents three fatigue cycles of a single tooth. Each rotation of the planetary gear represents two fatigue cycles of a single tooth. During each power-up and power-down cycle, the sun gear experiences

approximately 6000 fatigue cycles, the planetary gears experience approximately 7800 fatigue cycles, and the same gears experience approximately one to three re-engagement impact cycles. For the 157 power-up/down cycles, experienced by the 1C turbocharger prior to failure, the sun gear saw approximately 9.5×10^5 fatigue cycles and the planetary gears saw approximately 12.2×10^5 fatigue cycles. During the same the 157 power-up/down cycles the sun and planetary gears likely saw less than 500 re-engagement impact cycles.

- There was no metallographic evidence to support failure by impact.

To date, the number of power-up/down cycles on the installed turbochargers at Browns Ferry vary from 2 for 1C (failed after 157 cycles and recently replaced) to 177 for 1A. The majority have experienced approximately 160 power-up/down cycles. The licensee is planing a visit to both MKW and EMD to gather information relating to materials, manufacturing processes and inspection practices.

An Inspector Followup Item (IFI) **50-260/95-41-01: "EDG 1A Turbocharger Inspection"** is opened to evaluate the results of the licensee's vendor visits and to evaluate the examination of 1A EDG turbocharger scheduled before or during the 1A EDG's next biannual inspection, currently scheduled for June 1996.

Within areas examined, deviations or violations were not identified.

3. Flow Accelerated Corrosion (FAC) Unit 3 (49001)

During the extended outage, the licensee implemented a FAC inspection program which implements the CHECMATE® (Chexal Horowitz Erosion/Corrosion Methodology for Analyzing Two-phase Environment) EPRI (Electric Power Research Institute) computer code, industry experience, and previous inspection data as predictive tools for determining and prioritizing inspection locations. Previous to the extended outage, the licensee used engineering judgement to select components for examination. The inspector conducted interviews with licensee personnel and reviewed records as indicated below to evaluate the FAC Program.

Observations/Findings

During the extended outage, the licensee intended to examine 283 locations in their FAC program. The licensee expanded the sample by 99 locations for a total sample size, this outage, of 382 locations. There are approximately 1570 inspection locations identified in the Browns Ferry FAC Program. These examinations necessitated the replacement of five components. Replacements were made prior to the components reaching their minimum wall thickness.

Procedures Examined

ID	Rev	Title/Subject
3-TI-140 12/12/94	0	Pipe Wall Degradation Monitoring Program for Dual Phase Fluid Systems
NIM-004 2/28/94	2	Erosion Corrosion

The inspector reviewed the Wall Thickness Engineering Evaluations made during the Unit 3 Extended Outage for the below listed components.

Wall Thickness Engineering Evaluations Examined

Inspection Point Identification	Component Type	System	Disposition
3EX11-14T Branch	12" Pipe X 0.375"	Extraction Steam	Replaced
TBSB2-9-1P	1" Sc 80 Pipe	Main Steam Bypass Valve leak-off Line	Replaced
TBSB2-9-2P	1" Sc 80 Pipe	Main Steam Bypass Valve leak-off Line	Replaced
TBSB2-HER-2P	2-1/2" Sc 40 Elbow	Main Steam Bypass Valve leak-off Line Header	Replaced
3-73-629	2" Sc 160 Pipe	HPCI/RCIC Steam Trap Drain	Replaced

The inspectors examined welder qualification certification documentation, Quality Control (QC) inspector qualification certification and visual acuity documentation, and welding filler material certified material test reports (CMTRs) for the welders, QC inspectors, and materials employed to install the fittings listed above. The documents were examined for compliance with licensee procedures.

Welding Filler Material CMTRs Examined

Type	Size	Heat/Lot No.
ER 70S-3	3/32"	J6629
ER 70S-3	1/8"	J6629
ER 70S-3	1/8"	T23929
E 7018	3/32"	T30468
E 7018	1/8"	233800

Welder's Qualification Certification Documentation Examined

LWC, DLR, JLK, RLH, and WNH

QC Inspector Certification and Documentation Examined

GWH RT-II, ARM VT-II, RWF VT-III

The welds were made by properly qualified and certified welders, using appropriate welding materials in accordance with properly qualified welding procedure specifications.

The current FAC program, based on EPRI's CHECWORKS®, was first implemented during this extended outage. The program shows great potential for maintaining high energy carbon steel piping systems within acceptable wall thickness limits. The erosion-corrosion program is acceptable for restart of Unit 3.

Within the areas examined, violations or deviations were not identified.

4. IE Bulletin 83-07 Apparently Fraudulent Products Sold By Ray Miller Inc.

IEB 83-07 addresses apparently fraudulent products sold by Ray Miller Inc. To evaluate the licensee's actions related to IEB 83-07, the inspectors interviewed licensee personnel, reviewed selected records, and the licensee's response dated March 22, 1984. The inspectors determined that the licensee conducted an appropriate survey to identify Ray Miller material at Browns Ferry. No material was identified. IEB 83-07 is considered closed.

5. IE Bulletin 88-05 Nonconforming Materials Supplied By Piping Supplies Inc and West Jersey Manufacturing Company

IEB 88-05 addressed the alleged falsification of Certified Material Test Reports by two suppliers of piping, flanges and fittings. To evaluate the licensee's actions related to IEB 88-05, the inspectors interviewed

licensee personnel, reviewed selected records, and the licensee's response dated August 25, 1988. Observations from those reviews were compared with NUREG-1402, Closeout of NRC Bulletin 88-05: Nonconforming Materials Supplied By Piping Supplies Inc and West Jersey Manufacturing Company. The inspectors determined that the licensee's actions were consistent with both IEB 88-05 and NUREG 1402. IEB 88-05 is considered closed.

6.0 Review of Unit 3 Structural Steel Design Issues (37550)

6.1 Flange Development of Cover Plates.

A Bechtel QA management audit of design calculations conducted March 23-25, 1994 identified a concern regarding cover plate development lengths in calculation number CD-Q3303-920114, Design of Subframes Attached to the Drywell Platform EL.584.

The calculation for the drywell subframes, CD-Q3303-920114, did not address the location of the theoretical cut-off point of the cover plates required by stress. During the additional investigation to evaluate 14 existing subframes in calculations CD-Q3303-920114 and 920115, 12 subframes required modification, of which three involved cover plate modifications. The frames modified by cover plates are shown on DCA's W17538-071, 085, and 386.

The problem violated TVA Design Criteria BFN-50-C-7100, Section 1.5b, and American Institute of Steel Construction (AISC), 8th Edition, Section 1.10.4, which requires that cover plates to reinforce members shall be extended beyond the theoretical cut-off point and the extended portion shall be attached to the beams by adequate fillet welds. The extended portion is called development length which will develop the full strength at the cut off point for the calculated stress.

The licensee issued Problem Evaluation Report (PER) BFPER 940097 to document and disposition this problem on May 5, 1994. Corrective action included review of all the platforms and structures which were qualified for Unit 3 Restart and to review the Unit 3 Core Spray Platform for operability concerns since this platform is required for the Unit 2 Operations. The cover plate design for the modification of the Unit 3 core spray platform was found acceptable. Evaluation of the Unit 2 drywell platform steel for the cover plate issue is discussed in NRC Inspection Report number 50-259,260,296/95-15.

A training session was held for Bechtel design engineers to discuss the code requirements for the design of cover plates and the application to the Browns Ferry specific design. All civil design change notices (DCNs) issued for Unit 3 which included cover plate additions to existing structures were also reviewed to determine if additional modifications were required.

During the review of various DCNs as part of the corrective action for this PER, other design deficiencies were discovered concerning stress transfer from one element to the other for maintaining continuity. The other problems identified involved using various structural shapes (WT, tube steel, plates, built-up sections) for reinforcing existing steel beams. In many cases, these reinforcing elements were discontinued abruptly, or were interrupted due to physical constraints. The problems not addressed in calculations included the discontinuity of cover plates, cover plates switching between top and bottom flanges, side plates switching sides, cover plates switching from flanges to side plates, etc. Therefore, BFPER 940097 was revised on July 7, 1994 and reissued as Revision 1 to disposition the additional problems.

The corrective action included review of all Unit 3 civil DCNs which utilize cover plates or any other reinforcing elements to resist calculated stresses. Additional modifications were issued to correct any discontinuity problems.

The licensee also issued Calculation number CD-Q0303-950105, Guidelines for Evaluation of Miscellaneous Steel - Transfer of Stress Along Modified Cross-Sections, to document the design criteria for modifying structral steel using cover plates. The inspectors reviewed this calculation and concurred with the licensee's design criteria for stress transfer.

An additional training session was held for Bechtel design engineers to address the problems found in the design calculations involving use of ineffective composite sections in the calculations to qualify the beams or structures. The calculations did not check the continuity of the added reinforcements such as cover plates, side plates, T-section, tube steel, etc. This training session also discussed weld failures in the different types of reinforcements with stiffeners.

To resolve the above problems the license reviewed the GT STRUDL analysis by neglecting ineffective sections, such as T-Section, used in modifications and checked the stresses at local discontinuities in the calculations. No generic bounding calculations were generated to envelop or write-off the deficiencies. Engineering judgement was not used to replace or shorten the required calculations. Specific issues associated with BFPER 940097 are discussed in the paragraphs below.

6.2 DCN W17538

DCN W17538 was originally issued to provide modifications, including horizontal rigidity bracing, to the Drywell Platform at EL 584 and suspended frames (called subframes) for revised seismic analysis, revised piping loads due to the 79-14 analysis, revised CRD framing loads, and resolution of construction discrepancies found during various licensee inspections.

The support steel for the drywell platform at EL 584 consists of 24-inch-deep, wide-flange beams (called radial beams) radiating from the sacrificial shield wall to the drywell shell. These radial support beams are welded to columns at the sacrificial shield wall on the inner end of the beam, and supported by beam seats welded to the drywell shell on the outer end of the beam. Tangential beams frame between the radial beams at about 90 degree angles.

Some DCN W17538 modifications included reinforcement elements associated with the cover plates. During the review of DCN W17538 for BFPER940097, Revision 4 to Calculation CD-Q3303-920113, GT Strudl Model Input for NRC 79-14 Program Lower Drywell Floor Framing at EL 584'-9½", was issued on December 22, 1994 to accommodate all the latest changes to incorporate DCNs F27588A and F30774A, as-built conditions, and any outstanding or revised Structural Attachment Load Sheets (SALS). These changes were incorporated and referred to as the Reconciliation III analysis.

The inspector reviewed the drawings (Design Change Authorizations (DCAs)) contained in DCN W17538 and randomly selected eight drawings with the different types of reinforcement elements to check against Calculation CD-Q3303-920113 to ascertain if the drawing incorporates design requirements. The eight drawings were DCA Nos. W17538-053, -054, -056, -059, -061, -063, -068, and -107. The associated calculations were reviewed to check the local stresses due to cut-off, discontinuity, etc. The inspectors noted that small cut-offs or discontinuities for the lateral beams on the reinforcement elements were not considered in the GT Strudl input. Details of the review are discussed below:

6.2.1 DCA No. W17538-053, Rev. 002

The wide flange beam on this DCA was reinforced with a side plate plus two T-Sections welded outside of the side plate. The stem of T-Section was welded to side plate horizontally. The T-Sections were not considered in calculation of beam properties for the reinforcement element in the GT Strudl model. This was conservative. The side plate for the tangential beam was stopped at a lateral beam and switched to the other side of web.

6.2.2 DCA No. W17538-054, Rev. 002

The east-west beam on detail 16 for this drawing DCA was reinforced by a full length side plate on the north side of the beam, by another side plate about half the length on the south side, by a bottom plate, and by two ¾" x 3" stiffener plates under the bottom plate. The half side plate and two ¾" x 3" stiffener plate were not considered when calculating the beam properties. A 6" development length was considered in the bottom plate property calculation. A 12" development length is adequate. The slight difference in consideration of the development length will result in a small but insignificant difference in load distribution. However, neglecting the half side plate and two stiffener plates offsets the slight difference in development length. The overall results of this analysis was conservative.

6.2.3 DCA No. W17538-056, Rev. 002

The beam was modified to add a full length side plate and a bottom plate from the west radial beam at AZ 98°, and 12" past the lateral beam on the east. The computer model neglected the 12" of bottom plate past the lateral beam. The 12" was considered as development length. The required development length is twice the 7" bottom plate width, or 14 inches. The slightly reduced development length considered in the computer model will have an insignificant effect on the member loads.

6.2.4 DCA No. W17538-059, Rev. 001

A C8 channel was added to the bottom flange of the beam in addition to a side plate added as beam reinforcement. A small cut-off in bottom channel was made for a pipe support. A large cut-off in the side plate was also made for a pipe support and a lateral beam connection. Both cut-offs were considered to be 7 inches in the beam property calculation for the computer model. The required cut-off length is 13 inches. The difference of 13" verse 7" will affect the member load distribution slightly, but is negligible. The local stresses in the cut-off area such as shear and normal stresses due to the torsional warping was checked and accepted in calculation CD-Q3303-920129, Rev. 5, dated April 24, 1995.

6.2.5 DCA No. W17538-061, Rev. 001

Four plates were added to the beam. They were a full length bottom plate between the radial beams, a partial length top plate, a full length north side plate between the radial beams, and a partial length west side plate between two lateral beams.

For the beam properties used in the computer model, the partial length west side plate was not considered and a development length of 13½ inches (twice the plate width of 6¾ inches) at each end for the top cover plate were deducted from the total length. Therefore, the beam properties used in the computer model were conservative. This resulted in higher calculated stresses.

6.2.6 DCA No. W17538-063, Rev. 001

Four plates were added to reinforce the beam. They were a side plate on the west side of the beam, another side plate at a distance further out from the web with a overlap of 12 inches, a side plate in each side of web with 12" overlap, and a bottom plate of 8" wide connected to another bottom plate with a full penetration weld at joint.

The overlaps of 12" is twice of side plate depth 6" and meets requirements. The model of GT Strudl was correct and reflected the actual as-built conditions.

6.2.7 DCA Nos. W17538-068, and -208, Rev. 004

The reinforcement elements were one side plate at each side of web with some openings (or cut-off) between the two beams in north-south direction, two top plates and two bottom plates at different locations of beam and six pieces of T-section at different locations of added side plates.

In the GT Strudl analysis, the six pieces of T-section reinforcement elements were not considered in calculation of the beam properties. Conservative composite sections were used in the model such as using one side plate instead of two side plates. The plate development lengths were not considered in the model due to the complexity of the sections. Conservative sections were used. The inspectors considered the model was acceptable without considering the development length due to the complexity and neglecting the T-sections.

6.2.8 DCA No. W17538-069, Rev. 002

Essentially, two side plates were added to the beam in the north-south direction. Around the midpoint of the beam, a lateral beam jointed from west side of the web and a small portion of side plate was cut-off. A top plate 3 feet in length was added, 18" each direction to north and south from center line of the intersection of the lateral beam. The 18 inch overlap between the top plate and side plates is adequate.

6.2.9 DCA No W17538-107, Rev. 001

Side plates were added to each side of the beam at different locations to provide connections for commodity supports or reinforcement for the beam. Small openings were provided at the connection of lateral beams. The inspectors reviewed Calculation CD-Q3303-920118, Rev. 9, and verified the member local stress check for the cut-off openings and the ineffective cover plates were properly evaluated. The stresses met design allowable values.

6.2.10 Conclusions Regarding DCN W17538

Overall, the GT Strudl model used in calculation CD-Q3303-920113 considered the irregular reinforcement elements such as development length, discontinuities, disregarding ineffective T-section, etc. Small openings in side plates were not considered in GT Strudl, but the local stresses at opening areas were checked for the individual calculations. A few cases were found to have insufficient development overlap lengths, or development lengths not considered in the GT strudl model. Disregarding the development lengths in the GT strudl model had an insignificant effect on the member load distributions. The inspectors considered the modifications in DCN W17538, calculation CD-Q3303-920113, and other calculations reviewed to be adequate and acceptable.

6.3 Subframes in Calculation CD-Q3303-920114

DCN F30298 was issued to revise DCN W17538 for the subframe modifications per BFPER 940097 Corrective Actions. A subframe is a smaller frame attached to the beams of the drywell platform at EL 584'-9½".

DCN F30298 issued three DCAs, W17538-071, -085, and -386 for modifications All the subframes are attached to the platform at EL 584'-9½". There are a total of 14 subframes. Eight subframes were analyzed in calculation CD-Q3303-920114. The other six subframes were analyzed in calculation CD-Q3303-920115.

The inspector randomly selected two subframe drawings DCA W17538-071, Rev. 005 and DCA W17538-086, Rev. 005 for review. Both subframes were analyzed in calculation CD-Q3303-920114, Rev. 6.

6.3.1 DCA W17538-071, Rev. 005 (Subframe SF-262B)

DCA W17538-071 modified a 8WF17 beam on subframes SF-262B to add two side plates on each side of the beam web. The front side plates were discontinued (or cut out) at two unistrut supports. In this area two 4x4 tube steel sections were welded to each flange. The tube steel and front side plate had a 6" overlap at each end. Pages 87.84.2 to 87.86.1 of Calculation CD-Q3303-920114, Rev. 6, qualified the section (Detail E1-E1) for the two lengths of tube steel. A reduced section modules of Sy=18.56 in^3 (compared to the full section modules of Sy=22.10 in^3) was used to calculate the allowable stresses and to check against the applied stresses. This was conservative. However, the inspector noted an interaction ratio for the applied stress against the allowable stress for Operating Base Earthquake (OBE) case for Member 5 from 0.7L to 0.9L was not checked. This case could possibly be the critical case. The inspectors questioned licensee engineers regarding the check of this member for OBE. Pending further review by NRC, this problem was identified as Inspector Followup Item (IFI) 50-260, 296/95-41-02, Platform Steel Qualification.

6.3.2 DCA W17538-086, Rev. 005 (Subframe SF-351H)

DCAs W17538-086, modified a beam in subframe SF-351H by adding cover plates to each flange. A ¾" side plate plus a 8x6 section of tube steel was also welded to the side plate on the north side of the beam. The cover plates were discontinuous (cut-off) and reinforced with other plates on top of the cover plate or welded to inside of flange.

The GT Strudl analysis was performed for this beam in calculation CD-Q3303-920114, Rev. 0, dated July 23, 1992. The model used the beam properties from the original specified construction detail (a 12 WF27 beam). For subsequent modifications, the calculation was revised to check the changes in stresses acting on the beam, but the GT Strudl model was not revised.

This calculation was revised to Rev. 6, dated April 21, 1995, to consider a new modification and in response to the cover plate problem stated in BFPER 940097. Pages 342.24 to 342.44 were added to discuss the variance and qualified the beam with the various reinforcement elements and cut-off. The drawings for DCAs W17538-086, Rev. 005 and W17538-453, Rev. 000 were attached to the calculation as page 342.43 and 342.44. The development lengths considered in the calculation were four times the tube width and two times the plate width respectively. For plates welded at the ends, the required development length is 1.5 times the plate width. Therefore, the modification, as designed was acceptable.

Calculation CD-Q3303-920114, Rev. 6 qualified this beam with the consideration of development length for plates in the composite section due to the addition of reinforcement elements. The tube steel was welded to a ¾" side plate and ¾" side plate welded to wide flange 12WF27. The stress on this ¾" side plate was not checked in calculation. In response to the inspectors questions, the licensee qualified the ¾ inch side plate by using shear flow theory in Rev. 7 to the calculation issued on August 10, 1995. Since shear flow only may not qualify this plate, the inspector discussed with licensee engineers the need to consider all forces applied to this plate by the tube steel. These included direct forces, shears, bending, torsion, etc. This problem was identified as a second example of IFI 50-260,296/95-41-02, Platform Steel Qualification.

6.4 DCN W17536

DCN W17536 was to provide modifications, including horizontal rigidity bracing to the drywell platform at EL. 563 due to the revised seismic analysis and increased piping loads from the 79-14 analyses. It also provided modifications to the drywell piping whip restraints due to increased piping loads. This DCN was reviewed per BFPER940097 for any cover plate related problems. No modifications were required. Some calculations were revised to clearly document the reinforcement elements in the original design calculations.

The inspector randomly selected three drawings DCAs W17536-023, -030, and -045 and corresponding design calculations for review. These three DCAs had cover plate type beam reinforcement details. The calculation complied with design requirements.

6.4.1 DCA W17536-023, Rev. 002

A side plate was added to each side of a beam. Cut-offs were provided in the north side of the side plate due to the connection of lateral beams. Cover plates were provided on the lowest flange, 10 inches in each direction from the intersection of lateral beams. The 12WF27 beam was adequate to resist axial stresses combined from axial load and bending moments. The side plates were added to resist the torsion.

Therefore, development lengths were not required for the side plates per conclusion in page 57.16 of Calculation CD-Q3303-920144, Rev. 7. The inspectors determined the calculation to be acceptable.

6.4.2 DCA W17536-030, Rev. 000

One partial side plate was added to the 12WF27 beam to resist torsional stresses (see page 56.10 of Calculation CD-Q3303-920153, Rev. 4). Therefore, the development length was not required to be checked.

The interaction ratio for the axial stress reached the margin and the calculation did not check the axial stresses combined from the axial load, bending moments, and normal warping stress due to the torsion beyond end of the side plate. The inspectors questioned licensee engineers why an analysis for the normal stress at end of the side plate was not performed. In response to the inspectors questions, the calculation was revised on July 20, 1995 (Revision 5). The results were acceptable.

6.4.3 DCAs W17536-045, Rev. 000 and W17536-125, Rev. 001

The W6x25 beam shown on Detail A1-A1 of DCA W17536-125 was connected to the side plate of the beam 12WF27 shown on Detail 21 of DCA W17536-045. The inspectors noted that the GT Strudl modelled the lateral W6x25 beam directly to 12WF27. This was acceptable. However, the shear stresses of the 12WF27 beam combined with the direct shear and torsion at location of intersection with W6x25 beam had not been checked in Calculation CD-Q3303-920145, Rev. 4. The licensee revised the calculation on July 20, 1995 to include the check of shear stresses in the above intersection, in response to the inspectors' question. The shear stress was acceptable.

6.5 DCN W17537

DCN W17537 provided modifications to the upper drywell platforms, elevations 604, 616, and 628, including pipe support frames. These modifications were required due to revised 79-14 piping loads and as-built conditions as determined during walkdown inspections. This DCN was reviewed per BFPER940097 for any cover plate related problems. No modifications were required. Some calculations were revised to clarify that the reinforcement elements met the design requirements.

The inspectors randomly selected DCA drawing W17537-018, Rev. 000 for review. Most of modifications on this drawing were addition of a plate to an angle member to reinforce the angle. The original qualification was to add the plate on one side of the angle leg. An alternate method was to add a plate to the angle to form a U shape. The GT Strudl qualified the member with the plate welded to the full length of the angle legs. Therefore, this member was acceptable.

6.6 DCN W17767

This DCN was issued to modify and repair the miscellaneous steel platform structures and associated steel frames as required per analysis based on as-built walkdowns, IEB 79-14 piping loads, other loads, and thermal loads. The platforms are located in four corner rooms at EL. 541'-6", EL. 557'-2", EL 555'-1", EL. 561'-10" and in the east and west RHR Heat Exchanger room at EL. 587'-0". Typical modifications included new welds or bolts, concrete anchors, addition of stiffener plates, addition of reinforcing plates to the structural members, etc.

During the review of DCA W17767-003, Rev. 0 and Drawings 3-48E453-2, Rev. 001 for this DCN, the inspectors noticed that a T-section (WT 8x15.5) was used in section k2-k2 for a reinforcement element on a wide flange 10WF21 beam. The inspectors reviewed Calculation CD-Q3303-930573, Rev. 6. The inspectors noted that the licensee did not check this composite section for the full effective area to take the full allowable stress, reduce the allowable stress for the ineffective element, or reduce the ineffective area to develop the full allowable stress per AISC Code requirements. This is a third example of IFI 50-260,296/95-41-02, Platform steel Qualification.

6.7 BFPER950408 and Knee Brace Problems

This PER was written on April 12, 1995 to investigate potential knee brace modeling problems in Unit 3 Calculation CD-Q3303-920120. For DCN W17538, knee brace connections had been used to provide torsional restraint for some radial beams. These connections were modelled in the GT Strudl computer model as fixed ends for vertical moment for the tangential beams (knee braces were not modelled). The behavior of the beam with knee brace may have been different from what had been assumed. The concern was that the actual reactions or loads in knee braces and beam ends could be higher than the output based on the fixed end analyses.

The licensee immediately evaluated this PER for Unit 2 operability concerns. The maximum allowable design stresses used in the drywell platform analysis was 32 ksi. The minimum yield stress (Fy) of the steel used was 36 ksi. The allowable stresses is 43.2 ksi (1.2 Fy) which is stated in paragraph 3.2.1 of TVA Design Criteria BFN-50-C-7301, Operability Criteria for Miscellaneous Steel. Licensee engineers reviewed the Unit 2 Calculation CD-Q2303-894170 and concluded that the as designed structural steel was acceptable for operability.

To resolve this modelling issue, Bechtel and TVA Corporate Engineering performed independent evaluations. The results of the evaluation are summarized in Bechtel "Report on Browns Ferry Unit 3 Drywell Miscellaneous Steel Issues", by E. W. Thomas dated May 4, 1995 and TVA report "Corporate Engineering Activity Report on Plant Reference No. Civil-1-1995."

The Bechtel engineering review consisted of specific Unit 3 calculations and other computer analyses to justify the modeling technique. Bechtel's conclusion was that the modeling technique is conservative. However, conversion of output from fixed end connections to actual loads on the knee braces showed that end shears could become excessively high if the end moment was large with corresponding high axial forces in the beams. A method was developed to convert the fixed end bending loads to simulate a braced connection. Seven connections were re-evaluated. All were found to meet existing design criteria. The inspector randomly selected connections ID 82-98C, 82-98A, 60-82D, and 82-98D and verified that all the connections had been evaluated and met design criteria.

The TVA Corporate Engineering review was based on a 1991 engineering assessment of this approach for the modeling technique. The approach was concluded to be acceptable at the conclusion of the 1991 assessment. The 1991 assessment compared two models and concluded that the modeling radial-to-tangential beam connections as fixed connections rather than modeling the knee brace explicitly as adequate and acceptable based on the analysis methods. TVA Corporate Engineering concurred with finding stated in the Bechtel Report.

Based on the Bechtel and TVA assessment, it was concluded that calculations for the knee brace were acceptable. The PER was invalidated (i.e., cancelled) by the license based on the results of the assessments. The inspectors concluded that the licensee adequately resolved the concern regarding the knee brace problem, and that it was acceptable to invalidate BF PER 950408.

Within the areas inspected, violations or deviations were not identified.

7. Inspection of Modifications to Unit 3 Drywell Structural Steel Platforms (37550)

The inspectors examined modifications completed to the elevation 584 platform steel in the Unit 3 drywell. The licensee's commitments for design and construction of the structural modifications are specified in FSAR Section 12.2, FSAR Appendix C and Volume 3 of the TVA Nuclear Performance Plan. The structural steel platform modifications were inspected against design drawings for configuration, member size, weld size, type and length, connection details, and others requirements, such as addition of cover plates, beam reinforcements (stiffeners), etc.

In addition to the design drawings, the following procedures were utilized by the inspectors as acceptance criteria:

- General Engineering Specification G-89, Requirements for Structural and Miscellaneous Steel, Revision 3, dated April 26, 1994.

- MAI-5.9, Fabrication and Installation of Structural and Miscellaneous Steel, Revision 2, dated June 20, 1994.

- Site Standard Practice (SSP) -7.50, Controlling Welding, Brazing, and Soldering Processes, Revision 4, dated July 11, 1994.

- Specification G-29, Welding Materials and Nondestructive Examination, Section P.S.O.C. 1.2, Revision 2, dated June 5, 1991, Specification for Welding of Structures Fabricated in Accordance with AISC requirements for Buildings and Inspected to the Criteria of NCIG-01.

The inspectors examined the elevation 584 modifications listed in the table below. The modifications were installed under DCNW17538A, and various FDCNs issued against the original DCN package. The modifications were required for correction of errors made during original construction, for changes in design criteria, and/or for increases in the design loads carried by the platform structural steel. The FDCNs were issued because of field conditions, final reconciliation of changes in design loads, and/or cover plate issue identified in BFPER 940097.

TABLE

Elevation 584 Drywell Structural Steel Frame Modifications

Detail Number	Drawing Number *	Description of Modification
Azimuth 30°-60°		
168	207, R1; 240, R2	Cover plate on radial beam
187	227, Rev. 2	Connection
267	306, R0	Connection
279	320, R3	Cover plate
294	324, R1	Connection
Azimuth 9° - 30°		
15	053, R2	Cover plate
66	103, R1	Cover plate
Azimuth 82° - 98°		
27	065, R2, 431, R0	Cover plate
114	156, R2	Radial beam
115	157, R1	Cover plate
135	174, R2	Connection
147	186, R2	Connection
150	189, R1	Connection
151	190, R1	Connection
427	427, R0	Connection
428	428, R0	Connection
429	429, R0	Connection

Azimuth 210°-240°

30	068, R4; 208, R4	Cover plate
204	241, R2	Connection
215	249, R1	Connection
216	250, RL	Connection
225	262, R0	Cover plate
333	113, R1	Radial beam
A-A	071, R5; 386, R4	Subframe cover plate

Azimuth 262°-278°

125	167, R1	Cover plate
126	168, R0	Cover plate
127	169, R0	Connection
128	171, R1	Connection
129	170, R2	Connection

*All drawing numbers listed in table preceded by W17538.

No deficiencies were identified during the walkdown inspections. The inspectors concluded that the modifications were implemented in accordance with the design requirements.

Within the areas inspected, violations or deviations were not identified.

8. Followup on Unit 3 Startup Issues

8.1 Lower Drywell Steel Platforms and Miscellaneous Steel

For restart of Unit 2, the NRC staff reviewed and accepted iterim operability criteria for design of the lower drywell structural steel platforms and miscellaneous structural steel platforms and miscellaneous structural steel. The NRC staff defined two post-restart action items for the licensee to address in this area:

- Since the original Browns Ferry FSAR criteria was based on the 1963 AISC code, the licensee was required to address the adequacy of their current design criteria which applies the 1978 AISC code.

- The licensee was required to submit their long term structural steel design criteria to NRC for review to determine if the criteria conforms with FSAR requirements of the licensee's use of the 1978 AISC Code is documented in a Safety Evaluations Reports transmitted as Enclosure 1 in an NRC letter to TVA dated July 13, 1992.

Acceptance of the licensee's long term design criteria is documented in a Safety Evaluation Report transmitted as Enclosures in NRC letters to TVA dated July 13, 1992 and the results of an audit documented in a letter to the licensee dated April 20, 1994.

8.2 Miscellaneous Steel Frames

The program for design evaluation of Unit 3 structural steel platforms was based upon the precedent established for Unit 2. Over 700 modifications to Unit 3 structural steel platforms were identified and implemented as a result of the Unit 3 program. Numerous NRC inspections and design reviews were conducted by the NRC staff to review design calculations, and examine implementation of the modifications. These are documented in paragraph 9.1, below. This program is acceptable for restart of Unit 3.

9. Action on Previous Inspection Findings (92701 92702)

9.1 (Closed) Unresolved Item 296/86-14-03, Overstress of Drywell Beams. This item was identified by the Resident Inspectors as a followup to TVA Nonconformance Report (NCR) BFNCEB8402. This NCR was initiated by the licensee when discrepancies were identified in the original design calculations for the drywell steel platforms in Units 1-3. Further review of this NCR disclosed numerous deficiencies in construction of the drywell platform structural steel. This was reported to NRC as Licensee Event Report 50-260/87002.

The licensee initiated a comprehensive program to resolve the problems with the drywell platform steel. This included a walkdown inspection to complete detailed as-built drawings of the existing steel, updating of seismic response spectra for use in the platform re-analysis, revision of the structural steel design criteria, and identification of the magnitude of all design loads affecting the platform steel. This redesign program was extended to all safety-related structural steel platforms and miscellaneous structural steel in Unit 2. The NRC staff performed numerous reviews of the licensee's structural steel platform re-design effort for Unit 2. These included review of design criteria and response spectra, review of design calculations, and walkdown inspections to examine completed modifications. Unresolved item 260/86-14-03 was closed for Unit 2 in NRC Inspection Report number 50-260/90-08 prior to restart of Unit 2.

The licensee's program for re-evaluation of the Unit 3 structural steel was similar to that completed on Unit 2. The program included walkdowns to prepare as-built drawings, identification of loads acting or the platform steel, and implementation of modification to the platform steel where required. In addition to the inspection of drywell steel calculations and modifications documented in paragraphs 6 and 7, above, inspection of the Unit 3 structural steel redesign effort and modifications were performed by NRC during inspections documented in NRC Inspection Report numbers 50-259,260,296/91-36, 93-201, 94-15, and 95-15. Based on the results of these inspections, Unresolved item 296/86-14-03 is closed. Unresolved item 259-86-14-03 remains open for Unit 1.

9.2 (Closed) Inspection Followup Item 259,260,296/94-29-01, Review of CONAN Concrete Capacity Data

The licensee used the CONAN computer program to calculate the allowable anchor loads for anchors which are located near other anchors at distances less than those specified in TVA specification G-32. The inspectors questioned the methods the CONAN program used to distribute and divide overlapped failure cone areas to adjacent anchors, its relationship to the straight line methods, and it relationship to other methods currently approved by NRC.

During a meeting held in the NRC Region 2 Office on April 6, 1995, the licensee discussed their review of the CONAN program and the results of a peer review teams' review which compared CONAN to methods used by other organization to evaluate closely-spaced anchor. The licensee furnished a copy of a report titled "TVA-Comparison of CONAN with Current Industry Practice. A copy of the report is attached to NRC Inspection Report numbers 50-259,260,296/95-15.

During the current inspection, the inspector reviewed the report and discussed the report with licensee engineers. Based on the review and discussions, the inspector concluded that the CONAN program is compatible with other industry methods used to distribute loads to closely-spaced anchors, and is a technically adequate design method.

9.3 (Closed) Inspection Followup Item 259,260,296/94-29-02, Design Methods to Consider Construction Tolerances for Anchor Locations

During review of calculation numbers CD-Q3002-920720 and 920737, the inspectors noted that a method was used in the calculations to account for anchor bolt location construction tolerances which was not included in Civil Design Standard DS-C1.7.1. The construction tolerances provided movement of three anchors in a four-bolt base plate outward one inch while the remaining anchor is moved inward (toward the center of the plate or the attachment to the plate) one-half inch. This tolerance was specified on Note 22 of TVA drawing number 0-47B435-6, revision 0, General Notes Pipe Supports. The inspectors questioned the theoretical basis for these tolerances.

The licensee revised calculation number CD-Q0000-893696 and 894847 to assess the effect of the installation tolerances. As a result of the licensee's review of the tolerances, a minor error was discovered regarding Note 22 on the drawing. The design calculations applied the tolerance to the radial distance between the attachment and the anchor bolt. The note on the drawing specified the tolerance on two separate orthogonal dimensions. PER number BFPER 941172 was issued to document and dispos'tion this problem.

The inspectors reviewed the following calculation which qualified the inspection tolerances and were used as the basis to disposition BFPER 941172:

- Calculation CD-Q2999-95061, Revision 0, Qualification of Anchor Bolts and Baseplate (BFPER 941172)

- Calculation CD-Q3999-950173, Revision 0, Justification of Installation Tolerance BFPER 941172

- Calculation CD-Q0000-893696, Revision 3, Four Bolt Baseplate Design Criteria Addressing Installation Tolerances

Review of the calculations showed that the installation tolerances were conservative. Calculation CD-Q2999-95061 evaluated nine supports and showed that all nine met the design criteria. Calculation CD-Q0000-893696 showed that the configuration for the baseplate with three anchors moved outward one inch and one anchor moved inward one-half inch was either the worst case (maximum anchor loads and maximum baseplate stresses) or within one to two percent of the worst case. The inspectors also reviewed the calculations for 12 heavily loaded pipe supports which had been designed without documented consideration of the effects of anchor bolt installation tolerances. The licensee had revised these calculations to clearly show that long term design criteria were met for the as-built anchor locations.

The licensee revised Note 22 on drawing 0-37B435-6 to reduce the anchor bolt installation tolerances to be consistent with the tolerance considered in the design calculations. The inspectors reviewed Revision 1 of drawing 0-47B435-6 and verified the note had been revised.

The licensee also reviewed Appendix H of Civil Design Standard DS-C1.7.1 to clarify the methodology for evaluation of anchor bolt installation location tolerances. The inspectors reviewed Revision 8 of DS-C1.7.1 and verified the revised Appendix H incorporated the specified installation tolerances. The inspectors noted that Appendix H specifically applies to four bolt base plates. All other types require case by case evaluations to determine acceptable installation tolerances.

9.4 (Closed) Unresolved Item 259,260,296/95-15-02, Failure to Update Design Drawings to Reflect As-Built Conditions

During walkdown inspections documented in NRC Inspection Report number 50-259,260,296/95-15, the inspectors identified some examples of hardware which was not installed in accordance with details shown on the drawings the inspectors were using during the walkdowns. Subsequent to the inspection, the licensee determined that the cause of the discrepancies were drawing errors, and not incorrect installation of the hardware. The inspectors identified this Unresolved item since they were concerned that the errors may have been indicative of a configuration control problem. During the current inspection, the inspectors discussed the causes of the drawing errors with licensee engineers.

During a walkdown inspection, a conduit clamp on junction box support number 3-48B3800-4181 was not installed as shown on the design drawing. The licensee determined that the junction box had been installed in accordance with FDCN F31910. The clamp was erroneously added to the drawing during the drawing rollup process (i.e., final revision of the drawing to incorporate actual as built conditions). The FDCN did not show a conduit clamp on the piece of unistrut located just below the junction box. The licensee issued PER number BFPER 950305 to disposition this problem. Investigation of this problem disclosed that the field installation was correct and the drawing showing the clamp was incorrect. The drawing, number 3-48B3800-4181, Revision 0, was revised to show the as-built condition for the support. The inspector reviewed Revision 1 of the drawing and verified it had been revised to show the actual support configuration. The drawing drafter and checker were counselled to pay closer attention to details. The PER was closed on April 11, 1995.

When inspecting support (frame) number 3-48N1003-450 the inspectors noted that a weld was apparently undersized. Revision 2 of drawing 3-48E1003-4 showed a 5/16 inch all around fillet weld to connect a structural tee section to an embedded plate. The licensee issued PER number BFPER 950300 to investigate and disposition this problem. Review of the design change package showed that the weld in question had been originally a 3/16 inch fillet, as determined by a walkdown inspection prior to redesign of the support. A DCN package was issued to modify this support frame by upgrading the weld on the top flange to a 5/16 inch fillet weld, with no change to the weld on the underside of the flange and the stem of the tee. The original 3/16 inch fillet welds on the underside of the flange and stem of the tee were qualified for the new design loads. The licensee determined that due to a drafting error when incorporating FDCN to reflect the completed modification to the support, an incorrect size weld was shown for these welds. The drawing checker and reviewer were counselled to pay closer attention to detail and the drawing was revised to reflect the actual as-built conditions. The PER was closed on March 28, 1995.

During a walkdown inspection of the drywell structural steel platform steel modifications, an out of date drawing, Revision 5 instead of the current drawing Revision 6, was used. An apparent discrepancy had been identified during the walkdown. However, there was no discrepancy with the as-built structural steel, but instead was the result of using as out-of-date drawing. When the inspector questioned the licensee engineer as to reason why an out of date drawing had been used in the walkdown, he misunderstood the engineer's explanation. The inspector had thought the error may have been caused by failure to update the DCN package index. The actual cause of the problem was that the licensee engineer did not check the drawing against the DCN index to verify that the correct revision level was being used prior to the walkdown. During the current inspection the inspector reviewed the licensee's drawing control program. The inspector also reviewed the results of QA assessments which have examined configuration control. The only significant issue with configuration control identified during the

assessments involved fuse control. A PER was issued to document and disposition the fuse problems. This issue is being reviewed by Region II electrical engineering specialist inspectors.

The inspectors concluded that the issues identified under this unresolved item were isolated examples. The inspectors concluded that the errors do not indicate that the configuration control system is inadequate.

10. Exit Interview

The inspection scope and results were summarized on July 14, July 28, and August 11, 1995, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Open)	Inspector Followup Item:	50-260/95-41-01: "EDG 1A Turbocharger Inspection", paragraph 2.
(Open)	Inspector Followup Items:	50-260,296/95-41-02: "Platform Steel Qualification", paragraph 6.3.1, 6.3.2, and 6.6.

11. Acronyms and Initialisms

AISC	-	American Institute of Steel Construction
Checworks	-	Chexal Horowitz Erosion/Corrosion Methodology for Analyzing Two-phase Environment
CMTR	-	Certified Material Test Report
DCN	-	Design Change Notice
DPR	-	Demonstration power Reactor
EDG	-	Emergency Diesel Generator
EMD	-	Electromotive Division of General Motors
EPRI	-	Electric Power Research Institute
FDCN	-	Field Design Change Notice
FAC	-	Flow Accelerated Corrosion
FSAR	-	Final Safety Analysis Report
HPCI	-	High Pressure Coolant Injection
IE	-	Inspection and Enforcement
IEB	-	Inspection and Enforcement Bulletin
IFI	-	Inspector Followup Item
IGA	-	Intergranular Attack
LER	-	Licensee Event Report
MFAR	-	Metallurgical Failure Analysis
MKW	-	MKW Power Systems Inc.
NCR	-	Nonconformance Report
NDE	-	Nondestructive Examination
NRC	-	Nuclear Regulatory commission
PE	-	Professional Engineer
PER	-	Problem Evaluation Report

QC	-	Quality Control
RCIC	-	Reactor Core Injection Cooling
Sch	-	Schedule
TN	-	Tennessee
TVA	-	Tennessee Valley Authority