



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

Report Nos.: 50-390/90-16 and 50-391/90-16

Licensee: Tennessee Valley Authority  
 6N38 A Lookout Place  
 Chattanooga, TN, 37402-2801

Docket Nos.: 50-390 and 50-391

License Nos.: CPPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection Conducted: June 11 thru 15, 1990

Inspector:	<u>Ronald W. Newsome</u> R. W. Newsome	<u>6-20-90</u> Date Signed
Approved by:	<u>J. J. Blake</u> J. J. Blake, Chief Materials and Processes Section Engineering Branch Division of Reactor Safety	<u>6/20/90</u> Date Signed

SUMMARY

Scope:

This routine, unannounced inspection was conducted on site in the area of recent and historical construction nondestructive examination (NDE). This NRC inspection included a review of current NDE procedures; observations of in progress visual (VT) and liquid penetrant (PT) examinations; independent verification of NDE examinations; reviews of current NDE personnel qualifications; reviews of historical and current NDE equipment calibration and material certification documentation; and, a review of current and historical completed NDE examination data. Also, licensee response to previously opened items were addressed.

Results:

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

All areas indicated adequate control of activities associated with construction NDE. Observations of current NDE examinations indicated that these examinations were being conducted by qualified personnel using adequate procedures. Reviews of completed examination records indicated that these records are being retained and are legible and accurate.

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## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*S. Boney, Welding Engineer
- \*R. Briggs, Principal Materials Engineer
- \*T. Dean, Nuclear Licensing Engineer
- \*R. Gridley, Member Watts Bar Program Team
- \*L. Peterson, Manager, Quality Control (QC)
- \*H. Simpson, Manager, Special Projects
- \*J. Yarborough, Supervisor, Welding and QC

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

#### NRC Resident Inspectors

- \*M. Branch, Senior Resident Inspector, Operations
- S. Burris, Senior Resident Inspector, Operations
- G. Walton, Senior Resident Inspector, Construction
- G. Humphrey, Resident Inspector

\*Attended exit interview

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

### 2. Construction Nondestructive Examination

The NRC inspector reviewed current and historical NDE documents and records and observed current NDE examination activities, as indicated below, to determine whether these examinations were conducted in accordance with applicable procedures, regulatory requirements, and licensee commitments.

#### a. Visual Examination (VT) Procedure Review/Work Observation/Record Review, Units 1 and 2 (57050)

- (1) The inspector reviewed the VT procedures, listed below, to determine whether they contained sufficient instructions to assure that the following parameters were specified and controlled within the limits permitted by the applicable code, standard, or any other specification requirement: method - direct visual, remote visual or translucent visual; application - hydrostatic testing, fabrication procedure, visual examination

of welds, leak testing, etc.; how visual examination is to be performed; type of surface condition available; method or implement used for surface preparation, if any; whether direct or remote viewing is used; sequence of performing examination, when applicable; data to be tabulated, if any; acceptance criteria is specified and consistent with the applicable code or controlling specification; and, report form completion.

N-VT-3 (R-11)            Visual Examination Of Weld Ends, Fit-Ups,  
with TCR 90-06            And Dimensional Examination Of Weld Joints  
& TCR 90-25

N-VT-6 (R-4)            Visual Examination Of Structural Welds Using  
The Criteria Of NCIG-01

- (2) The inspector observed 2 in-process pipe weld VT examinations. These observations were made to: determine whether the applicable drawing, instructions or travelers clearly specify the procedure to be used and that a copy of the procedure is available in the area where the work is being performed; identify for record review the personnel performing the examination and ascertain whether they are qualified to perform the assigned task; determine whether the required tools and examination aids (as specified in the examination procedure) are available at the work location; determine whether the specific areas, locations, and extent of examination are clearly defined; determine whether the test attributes are as specified in the applicable test procedure; ascertain whether the defects are evaluated in accordance with the procedure requirements, correct acceptance criteria is used, and the inspection results are reported in a prescribed manner.

The NRC inspector conducted independent VT examinations on both of the items previously observed being examined by TVA personnel. These examinations were conducted in order to evaluate the adequacy of the examination procedure being used and to assess the validity of the information being reported by the examiners.

These re-examinations generally agreed with the results reported by the visual examiners.

- (3) The inspector reviewed personnel qualification documentation for 3 VT examiners. These personnel qualifications were reviewed in the following areas: employer's name; person certified; activity qualified to perform; current period of certification; and, annual visual acuity, color vision examination, and periodic recertification.
- (4) Records of 32 completed visual examinations, 16 recent and 6 historical, were selected and reviewed to ascertain whether:

the method(s), technique, and extent of the examination complied with the applicable NDE procedures; findings were properly recorded and evaluated by qualified personnel; programmatic deviations were recorded as required; and, calibrated instruments used, if any, were designated and in calibration at time of use.

All of the examination reports reviewed appeared to contain the required examination information including disposition of deficiencies, if any.

b. Liquid Penetrant (PT) Examination Procedure Review/Work Observation/Record Review, Units 1 and 2 (57060)

- (1) The inspector reviewed PT procedure N-PT-9 Revision 1, Liquid Penetrant Examination Of ASME And ANSI Code Components And Welds, to ascertain whether it had been reviewed and approved in accordance with the licensee's established QA procedures. The procedure was also reviewed for technical adequacy and conformance with ASME, Section V, Article 6, and other licensee commitments/requirements in the following areas: specified method; penetrant material identification; penetrant materials analyzed for sulfur; penetrant materials analyzed for total halogens; surface temperature; acceptable pre-examination surface conditioning; method used for pre-examination surface cleaning; surface drying time prior to penetrant application; method of penetrant application; penetrant dwell time; method used for excess penetrant removal; surface drying prior to developer application, if applicable; type of developer; examination technique; evaluation techniques; and, procedure requalification.
- (2) The inspector observed the in-process PT examinations of 2 Accumulator #3 Sample Line circumferential pipe welds. These observations were compared with the applicable procedure and the ASME B&PV Code in the following areas: specified method, penetrant materials identified; penetrant materials analyzed for halogens and sulfur; acceptable pre-examination surface; surface temperature; surface drying time prior to penetrant application; method of penetrant application; penetrant dwell time; method used for excess penetrant removal; surface drying prior to developing, if applicable; type of developer; examination technique; evaluation technique; and, reporting of examination results.

The inspector re-evaluated both of these welds following the PT examiners evaluation of the welds but prior to the developer being removed from the weld surfaces. These re-evaluations were conducted in order to determine if the evaluations performed by the PT examiners were in accordance with the applicable procedure acceptance criteria and to determine if the

examination results were being reported as required. The re-evaluations conducted by the NRC inspector indicated that the proper evaluation was made by the PT examiners and that the examination results were being reported as required.

- (3) The inspector's review of the below listed liquid penetrant materials certification records indicated that the sulfur and halogen content of the material was within acceptable content limits.

<u>Materials</u>	<u>Batch Number</u>
Liquid Penetrant	78B032, 14F1, 6F090
Cleaner/Remover	86A029, 524J4
Developer	83J016, 82D013, 430H6

- (4) The inspector reviewed personnel qualification documentation for 5 PT examiners. These personnel qualifications were reviewed in the following areas: employer's name; person certified; activity qualified to perform; current period of certification; and, annual visual acuity, color vision examination, and periodic recertification.
- (5) Records of 22 completed PT examinations, 16 current and 6 historical, were selected and reviewed to ascertain whether: the method(s), technique, and extent of the examination complied with the applicable NDE procedures; findings were properly recorded and evaluated by qualified personnel; programmatic deviations were recorded as required; personnel, and NDE penetrant materials were designated.

All of the examination reports reviewed appeared to contain the required examination information including disposition of indications, if any.

c. Magnetic Particle Examination (MT) Procedure Review/Record Review, Units 1 and 2 (57070)

- (1) The inspector reviewed MT procedure N-MT-6 Revision 2, with TCR 90-18 and PCR 89-25, Magnetic Particle Examination Of ASME And ANSI Code Components And Welds, to ascertain whether it had been reviewed and approved in accordance with the licensee's established QA procedures. The procedure was reviewed for technical adequacy and for conformance with the ASME Code Section V, Article 7, and other licensee commitments and/or requirements in the following areas: examination methods; contrast of dry powder particle color with background; surface temperature; suspension medium and surface temperature requirement for wet particles; viewing conditions; examination overlap and directions; pole or prod spacing; current or lifting power (yoke); and, acceptance criteria.

- (2) The inspector reviewed documentation indicating that a 10 pound lift test had been performed on magnetic particle alternating current (AC) yoke 467199. This yoke was identified as having been used during examinations in the completed examination reports reviewed below. The certification record for the lift test plate that was used to conduct the test, E03700, was reviewed to confirm the weight of the test plate.
- (3) A review of the magnetic particle material certification record for batch number 78L008 indicated the particles met the applicable specifications requirements.
- (4) The inspector reviewed personnel qualification documentation for 2 MT examiners. These personnel qualifications were reviewed in the following areas: employer's name; person certified; activity qualified to perform; current period of certification; and, annual visual acuity, color vision examination, and periodic recertification.
- (5) Records of 4 completed recent MT examinations were selected and reviewed to ascertain whether: the method(s), technique, and extent of the examination complied with applicable NDE procedures; findings were properly recorded and evaluated by qualified personnel; programmatic deviations were recorded as required; personnel, instruments, and MT materials were designated.

During the review of these reports, minor discrepancies were noted in three of the reports and positive verification that a lift test is being conducted on the AC yokes prior to performing an MT examination, which is a requirement of the MT procedure, could not be established because the MT report form does not have a blank space for recording that a lift test was performed when an AC yoke is used. The inspector was able to determine that in all probability a lift test was being performed on the yokes prior to use based on the check out records of the lift test plates. In each case checked, the records indicated that a lift test plate was checked out on the same date as the date of the MT examination. Discussions with the licensee has resulted in a revision to the MT inspection report form which includes a blank space for recording when a lift test is performed. The revised form was issued to the examiners in the field during this inspection along with instructions for properly recording examination data and associated information on the form.

d. Ultrasonic Examination (UT) Procedure Review, Units 1 and 2 (57080)

The inspector reviewed the UT procedures, listed below, to ascertain whether they had been reviewed and approved in accordance with the licensee's established QA procedures. The procedures were also reviewed for technical adequacy and conformance with the ASME B&PV

Code, Section V, Article 5 and other licensee commitments and/or requirements in the following areas: type of apparatus used; extent of coverage of weldment; calibration requirements; search units; beam angles; DAC curves; reference level for monitoring discontinuities; method for demonstrating penetration; limits for evaluating and recording indications; recording significant indications; and, acceptance limits.

N-UT-18 (R-7)            Ultrasonic Examination Of Piping Welds  
with TCR's 90-01  
and 90-05

N-UT-30 (R-0)            Manual Ultrasonic Sizing Of Planar Flaws

e. Radiographic Examination (RT) Procedure Review/Record Review, Units 1 and 2 (57090)

- (1) The inspector reviewed RT procedure N-RT-1 Revision 9, Radiography Examination Of Nuclear Power Plant Components, to determine whether it contained sufficient information to assure that the following parameters were specified and controlled within the limits permitted by the applicable code, or any other specification requirement: type of material to be radiographed; material and weld surface condition requirements; type of radiation source, effective focal spot or effective source size; film brand or type; number of films in cassette; minimum source to film distance; type and thickness of intensifying screens and filters; quality of radiographs; film density and contrast for single and composite viewing; use of densitometers for assuring compliance with film density requirements; system of radiograph identification; use of location markers; methods of reducing and testing for back-scatter; selection of penetrameters including penetrameter placement; number of penetrameters; shims under penetrameters; radiographic technique for double wall viewing; and, evaluation and disposition of radiographs.
- (2) The inspector evaluated 46 radiographic films for portions of 13 pipe welds, 7 recent and 6 historical, that had been radiographed during the construction of Unit 1. These evaluations were conducted in order to determine if the radiographic quality was in accordance with the applicable procedure and ASME Code requirements and to specifically verify the following: penetrameter type, size, and placement; penetrameter sensitivity; film density and density variation; film identification; film quality; weld coverage; and, disposition of the welds radiographed.
- (3) The inspector confirmed the calibration status for Densitometer 565276 and Density Film Table P/N 29002671 to ascertain whether the documentation was retrievable, complete, and accurate.

- (4) The inspector reviewed personnel qualification documentation for 3 RT examiners. These personnel qualifications were reviewed in the following areas: employer's name; person certified; activity qualified to perform; current period of certification; and, annual visual acuity, color vision examination, and periodic recertification.
- (5) The inspector reviewed the accompanying examination documentation for the 13 radiographed pipe welds noted above. These records were reviewed to ascertain whether: the method(s), technique, and extent of the examination complied with the applicable NDE procedures; findings were properly recorded and evaluated by qualified personnel; programmatic deviations were recorded as required; personnel, instruments, and film were designated; and, results were consistent with acceptance criteria.

### 3. Licensee Action On Previously Opened Items

- a. (Closed) Violation 50-390/86-17-01, Qualification Of Weld Procedure For Thin Gauge Material.

This violation was denied by TVA and supporting arguments were forwarded to the NRC in their Notice of Violation response letter dated March 11, 1987. After reviewing TVA's response letter, NRC agreed with their conclusion that a Violation had not occurred. This determination by the NRC was forwarded to TVA by letter dated June 12, 1987. This matter is closed.

- b. (Closed) UNR 50-390/86-17-04, Identification Of Welds On ISO Drawings.

This item identified a concern with regard to how the licensee was identifying piping welds in the field for the purpose of repair and examination traceability. The licensee's method of identification of welds for these purposes relied on weld identifications found on site-isometric drawings rather than on weld hard stamping to locate and identify piping welds made before August 17, 1987. Several instances of welds being misidentified by construction personnel had been identified during NRC inspections and NRC inspection report 390/87-19 expanded the field weld identification issue to include welds that were incorrectly identified during radiography.

The problem of piping weld identification relating to Radiography and other issues resulted in the licensee having approximately 2,080 welds of the approximately 2,650 Unit 1 and common ASME Section III piping welds, previously interpreted as accepted during construction, independently evaluated again and accepted. The remaining approximately 570 welds required repair or reradiography, either during construction and/or as a result of the independent review



program. These 570 welds were selected for additional evaluation of radiographic identification discrepancies.

Of the 570 welds, approximately 400 welds required repair during initial construction. Of these 400 welds, approximately 300 welds did not require repair and/or additional radiography as a result of the independent reviews. The remaining approximately 270 welds required repair and/or additional radiography as a result of the independent reviews.

As part of the independent review, the NDE Level III matched the repair radiographs (400 welds) to the original radiographs for repaired welds to ensure that the correct area was repaired and that the repair radiograph matched the original weld. No additional discrepancies were identified.

During repair and/or reradiography of the 270 weld population, the new radiographs, verified as corresponding to the correct welds, were compared against the existing radiographs. Two additional discrepancies were identified.

As a result of the two separate evaluations of the ASME Section III piping welds and the additional evaluations of the 270 and 300 weld populations, the licensee has logically demonstrated that all ASME piping welds requiring radiography will comply with the licensing commitments and that further evaluation of misidentified radiographs is not necessary.

During this inspection, the NRC inspector requested historical radiography packages of 6 welds from 3 different safety related piping systems, at random, to verify that at least two independent radiographic film evaluations had been conducted on the welds. All welds had been evaluated at least two times.

In addition, on August 17, 1987, Watts Bar revised procedure WBN-QCI-4.03 to require the permanent marking of weld numbers at the weld location for ASME piping welds fabricated after that date and the NRC inspector has reviewed this procedure, currently identified as WBN-GCI-8.1.04-03, and one additional procedure relating to the identification of welds, AI-9.4.5. These procedures are currently in use and appear to adequately control the weld identification issue.

During this inspection, the NRC inspector conducted in-field, at random, observations of ASME Section III piping welds on welds made before August 1987 and welds made after August 1987 to determine if all welds could be identified by the site isometric drawings for welds made before August 1987 welds and by permanent markings adjacent to welds fabricated after August 1987. The welds selected for this sample involved 4 different piping systems and 37 individual welds. The welds were all identifiable, both by site-isometric drawings and permanent markings for those welds fabricated after

August 1987 and by site-isometric drawings for those welds fabricated before August 1987. No discrepancies were found during this in-field verification.

Based on the in-field verifications, film package reviews, and documentation reviews stated above, this item is considered closed.

- c. (Closed) UNR 50-390/86-17-05, Ultrasonic Practical Exam.

This item was addressed and closed in NRC Region II inspection report 390/88-02.

- d. (Closed) UNR 50-390/86-17-12, Evaluation Of Multiple Weld Repairs On Stainless Steel Piping.

This item was addressed and closed in NRC Region II inspection report 390/88-02.

- e. (Closed) UNR 50-390/88-04-01, Code Compliance Of Hydrostatically Examined Welds.

During an NRC inspection of hydrostatic test packages, a field weld, FW-15, was identified as not being accessible for visual inspection during the system hydrostatic test. The weld was contained in a pipe support box anchor that was filled with grout. The ASME Code requires welds that are to be pressure tested after installation to be left uninsulated and exposed for examination for leakage during the pressure testing of the piping.

The licensee recognized that the weld was inaccessible for visual examination either during the hydrostatic test or shortly thereafter and issued a nonconformance report, identified as NCR 5490. A letter accompanying the NCR, issued by the Project Manager of Watts Bar Design Project states:

"This test procedure is not in accordance with the ASME Code hydrotest and this weld must be specifically excluded on the N-5 Data Report. This NCR was upgraded to significant solely to inform the NRC of the exception to the ASME Code and thereby to clear the acceptability."

It appeared that the licensee was not fully aware of the proper procedure for NRC notification and the licensee was advised that the upgrading of an NCR did not constitute NRC notification and approval. Appropriate NRC notification is accomplished by a formal submittal to the NRC.

As part of the corrective action for the proper NRC notification, a memorandum, dated June 30, 1989, was issued which indicates that the practice of upgrading NCR's to "significant" solely for the purpose

of notifying the NRC of the recommended disposition when minor discrepancies are discovered, is not an acceptable practice.

The licensee has conducted a search to determine if any other cases exist where an exception to the ASME Code was obtained improperly by upgrading NCRs to significant. Corrective actions identified as a result of this review have not yet been completed, including additional hydrostatic tests.

The inaccessible weld, FW-15, on weld map 450-21, sheet 1-45, located in the Emergency Raw Cooling Water supply line to Reactor Coolant Pump Motor cooler #4 was made accessible by removal of the box anchor and grout covering the weld. A hydrostatic test was performed on this weld during May 1990 and the required visual examination was accomplished during that test. This weld is now in compliance with the ASME Code.

The NRC inspector has reviewed the above documentation supporting the actions taken by the licensee and considers this matter closed.

- f. (Closed) Violation 50-391/84-01-01, Failure To Follow Procedures For Hanger Inspection.

This item identified two hangers with deviations from the documented requirements, which were identified during an NRC inspection in January 1984, after having been accepted by the licensee's QC inspectors. Following the identification of the discrepancies, the licensee issued NCR 5307, which required rework in accordance with design drawings and/or vendor catalogs, and redocumentation in accordance with applicable controlling procedures. In addition, QC inspectors were retrained and reinstructed on the acceptance criteria for hanger examinations.

The NRC inspector conducted a review of the rework documentation associated with these hangers and conducted an in-field verification of the acceptability of the two hangers. The hangers appeared to meet the applicable acceptance criteria.

Based on the documentation reviews and in-field verifications conducted, this item is considered closed.

#### 4. Exit Interview

The inspection scope and results were summarized on June 15, 1990, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

## 5. Acronyms and Initialisms

AC	-	Alternating Current
ASME	-	American Society of Mechanical Engineers
B&PV	-	Boiler and Pressure Vessel
DAC	-	Distance Amplitude Correction
MT	-	Magnetic Particle
NDE	-	Nondestructive Examination
NRC	-	Nuclear Regulatory Commission
PCR	-	Procedure Change Request
PT	-	Liquid Penetrant
QA	-	Quality Assurance
QC	-	Quality Control
R	-	Revision
RT	-	Radiographic
TCR	-	Temporary Change Request
TVA	-	Tennessee Valley Authority
UT	-	Ultrasonic
VT	-	Visual