



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

Report Nos.: 50-390/93-78 and 50-391/93-78

Licensee: Tennessee Valley Authority  
6N 38A Lookout Place  
1101 Market Street  
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: October 25 - November 19, 1993

Team Leader: *R. D. Gibbs*  
R. D. Gibbs, Project Engineer

12/15/93  
Date Signed

Inspectors: J. H. Greene, NRC Contractor  
K. W. Van Dyne, NRC Contractor

Approved by: *P. E. Fredrickson*  
P. E. Fredrickson, Section Chief  
Division of Reactor Projects

12/15/93  
Date Signed

### SUMMARY

#### Scope:

This special, announced inspection was conducted to review the QA records and the QA record plans for the HVAC Supports and Cable Tray Supports hardware elements of the Additional Systematic Records Review (ASRR) portion of the QA Records Corrective Action Program (CAP).

#### Results:

In the areas inspected no violations or deviations were identified. The inspection team concluded that the QA record plans for HVAC Supports and Cable Tray Supports were technically sound. Only minor administrative problems were found in the plans, which were immediately corrected by TVA. TVA was able to retrieve all records requested by the team. The records sampled provided adequate documentation of the installation of the hardware; only minor problems were observed in the records. These problems were corrected during the inspection. Corrective actions for problems identified by ASRR were found to be adequate.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*M. Alexander, Concerns Resolution Staff Site Representative
- \*J. Burruss, ASRR Staff
- \*A. Capozzi, Sr. Project Manager, Completion Assurance
- \*J. Christensen, Manager, Construction Quality Assurance
- \*J. Cox, Radiation/Chemistry Manager
- \*T. Dean, Licensing Engineer
- \*W. Delk, Reactor Engineer
- \*W. Elliott, Engineering and Modifications Manager
- \*M. Fecht, Manager, Operations Quality Assurance
- \*J. Flanigan, Radiation Control Program Manager
- \*D. Herrin, Licensing Engineer
- \*R. Johnson, Nuclear Engineering Manager (Acting)
- \*N. Kazanas, Vice President, Completion Assurance
- \*R. Lewis, QA Records Project Manager
- \*D. Malone, Quality Engineering Manager
- \*R. Mays, Licensing Engineer
- \*D. Moody, Plant Manager
- \*W. Museler, Site Vice President
- \*P. Pace, Compliance/Licensing Manager
- \*L. Peterson, ASRR Project Manager
- \*T. Raley, TVA Consultant
- \*L. Strickland, Nuclear Training Manager
- \*S. Tanner, Modifications Special Projects Manager
- \*D. Voeller, Chemistry Manager

Other licensee employees contacted included engineers and administrative personnel.

#### NRC Resident Inspectors

- G. Walton, Senior Resident Inspector, Construction
- K. Van Doorn, Senior Resident Inspector, Operations
- G. Humphrey, Resident Inspector
- J. Lara, Resident Inspector
- \*K. Ivey, Resident Inspector
- M. Glasman, Resident Inspector

#### Other NRC Employees

- \*W. Bearden, Reactor Inspector, RII
- \*A. Boland, Radiation Specialist, RII
- \*D. Forbes, Radiation Specialist, RII
- \*E. Girard, Team Leader, RII
- \*C. Julian, Engineering Branch Chief, RII

\*G. Kuzo, Senior Radiation Specialist, RII  
\*N. Merriweather, Reactor Inspector, RII  
\*W. Rankin, Chief, Facilities Radiation Protection Section, RII

NRC Contractors

\*B. Smith  
\*K. Van Dyne  
\*J. Greene

\*Attended exit interview

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

2. Background

The QA Records CAP was developed by TVA to address an adverse trend in CAQs, which indicated that records at Watts Bar (1) were not retrievable in a timely manner, (2) were maintained in improper storage, and (3) had quality problems (e.g., were incomplete, technically or administratively deficient). Initially the CAP was directed at corrective actions for known records problems which were identified on CAQs. During later versions of the CAP, the ASRR was added to the CAP, which provided for a systematic evaluation of all Watts Bar records in accordance with ANSI N45.2.9. The ASRR includes several different types of records reviews: the records quality review assesses the retrievability and quality of all of the ANSI types of records, the records hardware review compares the records to the installed hardware, and the records technical content review compares the design output to the hardware and records.

In 1985/1986 TVA began a recovery process to ensure that Watts Bar was adequately constructed (i.e., plant hardware was acceptable). This recovery process has been and continues to be accomplished by various CAPs and SPs, as well as corrective actions to nonconformance reports, resolution of employee concerns, corrective actions for CDRs, etc. During each of these corrective actions, records have been developed which document the completion of corrective actions. These records are being used by TVA to supplement the original construction records, or, in some cases, serve as a substitute for the original construction records. These corrective actions are termed by TVA as "alternate technical basis" and the records developed by these efforts are termed "alternate records".

As a result of the findings by the ASRR and in an effort to properly document the construction records licensing basis for Watts Bar, TVA has developed a series of QA record plans, which describe in detail the records which are applicable to each type of system, structure, or component. These record plans make use of the extensive CAPs and serve as a "road map" to define which records provide the licensing basis, i.e. original construction records in combination with alternate records. TVA has developed thirty nine (39) of these record plans. The

NRC plans to review these record plans and the associated plant records to verify technical adequacy of Watts Bar records for licensing. This inspection of HVAC Supports and Cable Tray Supports involved the review of the individual record plans, record retrievability, the technical adequacy of the records, and a sampling of the corrective actions for ASRR identified records problems.

3. Inspection Scope (TI 2512/28)

a. Record Plan Review

Part of this inspection was conducted to review the QA Record Plans for HVAC Supports (Revision 2, dated June 2, 1993), and Cable Tray Supports (Revision 2, dated August 16, 1993). These plans included a matrix of approximately fifteen to twenty attributes which are critical to the proper installation of these items in the plant. For each of these attributes the plans listed the TVA record type, the original inspection process procedures, and the alternate records which were applicable (if any). In addition, the plans indicated which process procedures were applicable based upon the period of time when the item was installed or modified. Each attribute listed on the record plans included a highlighted area, which indicated the licensing records basis for each attribute (i.e., old construction records or alternate basis records).

The inspection team conducted a review of the technical adequacy of the records licensing basis for each attribute. For attributes where the original construction records were the licensing basis, (i.e., original procedures were referenced) the team reviewed the referenced procedures to determine what records were required. This information was used in the detailed records review which is discussed in paragraphs 4.c and 5.c of this report. For attributes where an "alternate technical basis" or alternate records were used, the team reviewed the referenced alternate technical basis to verify that the alternate basis adequately addressed (and took corrective action for) the attribute being reviewed. The team also determined what records were generated by this alternate basis, and used this information in the detailed records review which is discussed in paragraph 4.c and 5.c of this report.

b. Retrievability

The TVA data bases and drawings related to HVAC supports and cable tray supports at Watts Bar were used to select a sample of specific areas for review during this inspection. From this data a sample of items was selected to determine if TVA was able to retrieve the construction records. The listing of items selected, and a generic listing of the types of records provided by TVA is included in Attachment A to this inspection report. The records for these items were selected completely independent of records

reviewed by TVA during performance of the ASRR, in order to compare the results of this inspection to the deficiencies identified by ASRR. The records for the items listed in Attachment A were reviewed to verify that TVA was able to retrieve the records. In addition, TVA was requested to retrieve supplementary records such as welder/inspector qualification records, NDE records, receipt inspection reports, etc. The inspection team verified that these records could also be retrieved, and reviewed these records for technical adequacy (see paragraphs 4.c and 5.c below and Attachment B).

c. Records Review

The inspection team selected a smaller subset of the retrieved records (from paragraph 3.b) for a more detailed technical review. These records were reviewed against the design output documents (drawings, design changes, workplans, etc.) and the installation of materials in the plant (including a plant walkdown), to determine if the records and installation agreed with the design. The records were also reviewed to verify whether or not the records properly documented the technical attributes of the installed equipment. In addition, supplementary records such as welder/inspector qualification records, NDE records, receipt inspection reports, etc. were requested from TVA and were reviewed by the inspection team. The record plans for HVAC supports and cable tray supports were used in this review to determine if installation had been properly documented. For attributes where the plan specified that the original construction records were the licensing basis, this consisted of a review of the applicable inspection procedures and verification that the appropriate records required by procedure had been completed during the performance of the original work. For attributes where the plan specified an alternate record as the licensing basis, this consisted of a review of the alternate basis to determine if the attribute was bounded by the alternate records.

d. ASRR Deficiencies and Corrective Actions

The ASRR performed several general types of records and hardware reviews which are discussed in detail in the QA Records CAP. The deficiencies identified by these reviews were documented and resolved in several different ways. Record quality review deficiencies were documented (as RRSSs) on WBSCA910227, the workplan reviews were documented (as SPERs) on WBPER910463, and the hardware review and technical content review deficiencies were documented and resolved in most cases on the evaluation checklists used to perform the review.

The inspection team requested TVA to provide a copy of all deficiencies found by the above ASRR reviews within the HVAC supports and cable tray supports hardware elements. The team reviewed a sample of these deficiencies within each of the

hardware elements to determine what types of problems had been found by TVA, and to determine the adequacy of corrective actions for these items. Specific information regarding this review is included in paragraphs 4.d and 5.d of this report.

4. HVAC Supports - Inspection Results (TI 2512/28)

a. Record Plan Review

Review of the HVAC Support record plan resulted in the following observations (records and procedures discussed are further detailed in Attachment A):

- Review of the record plan indicated that TVA relies almost entirely on implementation of the HVAC CAP to establish the licensing basis record for HVAC ducts and supports. The CAP specified the development and implementation of a critical case evaluation methodology for acceptance of safety-related HVAC ducts and supports. Because of discrepancies contained in the design output documents and because they lacked information regarding specific hardware accessories, such as grills and dampers, the critical case evaluations were based on information obtained by walkthroughs and walkdowns.
- The remarks column of the record plan provided a specific reference to procedures TI 2010, Rev. 2, Engineering Walkthrough for HVAC Ducts and Duct Supports, and TI 2012, Rev. 2, Heating, Ventilation, and Air Conditioning Duct and Duct Support Critical Case Walkdowns, as the CAP walkthrough and walkdown procedures which serve as the primary QA records. The inspection team identified that WD-002, Rev. 1, HVAC Duct and Duct Support Critical Case Walkdowns, was used to collect walkdown data for critical case supports in the main control room and WD-026, Rev. 0, Category I(L) HVAC Ducting and Supports Walkthrough, was used to document engineering walkthroughs in the auxiliary building for category I(L) HVAC duct supports. These procedures were not shown on the record plan. During the inspection period TVA added a note to the record plan to include these WD procedures as primary QA records. The inspection team agreed with this enhancement to the record plan.

b. Retrievability

For the HVAC ducts and supports under review, construction installation records or alternate records were generally retrievable. For attributes regarding support material such as type/grade per drawing and concrete expansion anchors such as bolt material, embedded length, pull test, bolt tightness, and thread engagement, installation records were not retrievable for all HVAC supports and ducts reviewed by the inspection team. Specifically, QCP-1.14, Inspection and Testing of Bolt Anchors Set in Hardened

Concrete and Control of Attachments to Embedded Features, and QCP-1.42-2, Bolt and Gap Inspection for Bolt Anchor Assemblies, were not retrievable for nine applicable HVAC supports.

According to the record plan, QCP-1.14, when retrievable, provides the primary QA record for the embedded length and pull test attributes. QCP-1.42-2, when retrievable, provides the primary QA record for the bolt tightness, thread engagement, and bolt material attributes.

Review of the record plan indicated that when QCP-1.14 is not retrievable the embedded length attribute is verifiable through the alternate records, WBRD 50-390/81-14, WBRD 50-391/81-13, Final 10 CFR 50.55(e) Report for Improperly Installed Support Anchors and NRC Bulletin 79-02 Final Report Rev. 2, Pipe Support Base Plate Designs Using Concrete Expansion Anchors. The pull test attribute is verifiable through the resolution of alternate records, CATDs 11300-WBN-03 and 05, and NCRs W-519-P, 6674, and 3747R.

Review of the record plan indicates that when QCP-1.42-2 is not retrievable the bolt tightness attribute is verifiable through alternate record calculation CSG-93-CA01, which provides the resolution of CATD 11300-NPS-02. The thread engagement attribute is verifiable through the alternate record, WBRD 50-390/81-14, WBRD 50-391/81-13, Final 10 CFR 50.55(e) Report for Improperly Installed Support Anchors and NRC Bulletin 79-02 Final Report Rev. 2, Pipe Support Base Plate Designs Using Concrete Expansion Anchors.

The inspection team reviewed the above alternate records and concluded that the subject HVAC support and duct attributes are adequately addressed. For presentation purposes, however, the inspection team observed that the concrete expansion anchor attributes bolt tightness and pull test should include the alternate records WBRD 50-390/81-14, WBRD 50-391/81-13, Final 10 CFR 50.55(e) Report for Improperly Installed Support Anchors and NRC Bulletin 79-02 Final Report Rev. 2, Pipe Support Base Plate Designs Using Concrete Expansion Anchors. This observation was based on the following discussion. The final 10 CFR 50.55(e) report identified deficiencies regarding installations that use surface-mounted plates and self-drilling expansion anchors for conduit, cable tray, and HVAC duct supports. These deficiencies included anchors that were cut short, had insufficient thread engagement, were not set to the proper depth, and/or were installed without proper pull test documentation. Because these deficiencies were similar to those discussed in IEB 79-02 regarding safety-related pipe supports, TVA implemented a "79-02 type" sample program to fully bound and evaluate the extent of condition. This sample program used inspection and proof testing to verify the adequacy of anchor installation. As a result, the final 10 CFR 50.55(e) report and NRC Bulletin 79-02 Final Report,

Rev. 2 provide alternate records for "installation-type" anchor bolt attributes. During the inspection period TVA added a note to the record plan which identified the NRC Bulletin 79-02 assessment as producing primary records coverage for all "installation-type" anchor attributes (bolt tightness, pull test, embedded length, and thread engagement). The inspection team agreed with this enhancement to the record plan.

c. Records Review

From the 15 HVAC supports listed in Attachment A, a sample of six were chosen for a detailed review of hardware and records. These six supports and specific records reviewed are listed in Attachment B. In addition, because the record plan includes HVAC ducts, a sample of three HVAC duct segments was also selected for review. These three duct segments and specific records reviewed are also listed in Attachment B. Specific observations resulting from this review are detailed below:

1030-DW920-02H-0023:

- Walkdown of this support indicated a potential clearance interface problem with an ERCW piping support. The inspection team observed that the clearance between vertical I-Beams on the subject HVAC support and an ERCW support was approximately 1/4". This item was referred to TVA for resolution. TVA stated that this specific configuration was not judged to be a significant interaction as defined by the Integrated Interaction Program (IIP) Screening and Acceptance Criteria, EQE Engineering Report No. 50052-CR-001. This judgement was based on the screening criteria contained in section 3.1 of the EQE report. Specifically, TVA determined that, based on the rigidity of the two members in the vertical direction and because of their significant mass and stiffness, the potential clearance interface problem observed by the inspection team exhibited low damage vulnerability as discussed in section 3.1.2.3 of the EQE report. The inspection team agreed with TVA's assessment of this condition.

1030-DW915-15H-1405:

- Walkdown of this support identified that attachment to the concrete wall was accomplished by tube steel welded to an embedded plate instead of a bolted base plate as indicated on typical support No. 81. Review of calculation WCG-1-1246 indicated that this condition was fully bounded by the critical case evaluation performed on support 1030-DW915-15H-1408.

0030-DW920-06H-1536:

- Walkdown of this support identified that it was attached to in-place structural steel platform (6 x 6 tube steel) which supports HVAC cooler 0-PMCL-30-192-A. Review of the HVAC CAP critical case analysis design calculation WCG-1-1260 for this support did not indicate evaluation of the affect of the support loads on the structural steel platform. Further investigation revealed the following: This support had been reconfigured and attached to the platform via support variance sheet MA 055-25-5 in 1982. Civil Engineering acceptance of this attachment was documented in a 1983 "squad check." In 1992, HVAC CAP critical case analysis design calculation WCG-1-1260 indicated transmission of higher loads to the platform than those approved by the squad check. As a result, TVA should have performed an acceptability review of the platform's qualification regarding this support. However, no evidence exists which would support such a review. Subsequently, TVA committed to perform an analysis of the effect of support 0030-DW920-06H-1536 on the structural steel platform. The loading of this specific platform will be reviewed in greater detail during the structural steel records inspection, which will be completed in January 1994.

0030-DW910-04H-2894:

- Walkdown of this support identified the following: 1) A gap of 1/8" was observed between the baseplate and the concrete. This was subsequently determined to be acceptable based on review of General Engineering Spec. G-32, which provides a maximum allowable gap of 3/16" for this type of installation. 2) The TI-2010 Appendix D walkthrough data sheet indicated that one of two support baseplates was both, anchor bolted to concrete and welded on two sides to an embedded plate. The inspection team confirmed that while the baseplate was anchor bolted to the concrete, it was welded on only one side to the embedded plate. Subsequently, the inspection team determined that this discrepancy was insignificant based on TVA's critical case analysis: The primary purpose of the walkthrough data sheet was to document the as-built condition of the support for consideration in selection for critical case analysis. Specific information regarding the weld length or size, for example, was not important at this point in the critical case selection methodology. The important consideration for this support was that it consisted of a mixed anchorage. As a result, this support was selected as potential candidate for critical case analysis. However, design calculation WCG-1-650 identifies support 0030-DW910-04H-2955 as a more conservative selection for critical case analysis, because it consists of only one vertical leg and must, therefore,

carry twice the load of 0030-DW910-04H-2894, which has two supporting legs. Design calculation WCG-1-650 documents the adequacy of 0030-DW910-04H-2955 by GTSTRUDL analysis thereby bounding 0030-DW910-04H-2894 as well.

0031-DW930-02H-0816:

- Walkdown of this support identified that square spacers were welded to the baseplate to serve as washers for the anchor bolts. This was subsequently determined to be acceptable based on a review of the mechanical hanger general notes, Drawing 47A050-1 R1, which provides for the installation of washers over baseplate bolt holes, which may have been enlarged in excess of the 1/8" overbore tolerance.

d. ASRR Deficiencies and Corrective Actions

RRSS 94:

- This RRSS documented two examples of NAs which were not initialed and dated on final inspection records concerning HVAC supports. In both cases, the final inspection test cards were signed by the inspector. These two examples, identified as items 3 and 4 by RRSS 94, were determined to be invalid since no procedural requirements regarding NAs existed at the time the record was completed.

The inspection team concluded that this disposition was appropriate for the identified deficiencies.

RRSS 121:

- This RRSS reported that a design calculation for support 30-DW920-42H-3015 could not be retrieved. Subsequently, the calculation was retrieved by personnel possessing knowledge regarding the calculation of interest as well as technical and system specific knowledge. Accordingly, this deficiency was dispositioned as invalid.

The inspection team concluded that this disposition was appropriate for the identified deficiency.

ASRR Technical Content Review 006-087 and Resolution (Ordered Review):

- This ordered review evaluated the technical content of the HVAC records associated with ANSI record types applicable to the installation of HVAC Support 1030-DW920-08H-0100. The review included the following record types:

- \* bill of material
- \* as-constructed and as-designed drawings

- \* support installation operation sheet
- \* support welding inspection
- \* duct inspection
- \* expansion shell anchors measurements/test results

Within these record types, numerous attributes including configuration, weld size and inspection, anchor bolt type/size, support locations, and ductwork acceptance criteria were considered. All aspects of this ordered review were stasured as "acceptable." The inspection team found the ordered review and results to be acceptable.

ASRR Hardware Inspection Results and Resolutions:

- During performance of the ASRR hardware walkdowns a total of 52 HVAC supports were identified as having discrepancies. These discrepancies fell into one or more of five categories: 1) Fabrication dimensions not in accordance with the latest fabrication drawings or approved field change request, 2) Installed location not in accordance with design drawings or field change request, 3) the size, length, and location of all welds did not conform to detail drawings, 4) specified welds were omitted, and 5) unspecified welds were added. These discrepancies were documented on WBP920007. Subsequent review identified that the discrepancies were within the scope of the HVAC CAP and WBN870316SCA. As such, WBP920007 was closed by specifying that the identified discrepancies were to be included in the resolution of WBN870316SCA. The inspection team reviewed WBN870316SCA Rev. 11 to ensure that it enveloped WBP92007 and considers this action adequate to resolve the issue.

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

5. Cable Tray Supports - Inspection Results (TI 2512/28)

a. Record Plan Review

For Cable Tray Supports, TI-2004, Engineering Walkthrough For The Cable Tray Support Critical Case Evaluation, and TI-2022, Walkdown Of Cable Tray Supports, are listed on the record plan as the primary QA records for demonstrating qualification for several attributes. Those attributes are as follows:

- Configuration
  - Support Identification Number
  - Structural Member Size And Shape
  - Dimensions And Geometry
  - Support Member Lengths
  - Baseplate Dimensions And Configuration
  - Spacing For Anchor Bolts

- Location
  - Support Location
- Concrete Anchor Bolts
  - Anchor Size/Location, Type, And Number
- Weld
  - Field Weld Configurations
  - Size And Length Of Weld
  - Location Of Weld

The Cable Tray Support CAP initiated the TI-2004 walkthrough of cable tray and cable tray supports to assess the acceptability of the field installations. The walkthrough collected information on all tray supports. This information was used to develop the critical case supports which were subsequently subjected to a detailed walkdown in accordance with TI-2022. The walkdown information was then used to develop the calculations for the critical case supports. These critical case calculations provide the analytical basis for the design of all cable tray supports. The inspection team reviewed TI-2004 and TI-2022 and concurs that the procedures adequately address those attributes listed above.

For the attribute bolted connections, subattributes thread engagements and tightness, and for attribute concrete anchor bolts, subattribute tightness, MAI-1.9, Damaged, Loose, Or Missing Hardware, was listed on the Record Plan as the primary QA record. The inspection team reviewed MAI-1.9 and concurs that the procedure adequately addresses these attributes but the team also noted that implementation of this procedure is not complete. Further inquiry revealed that CAQR No.WBP890502 will track this activity to completion and will require verification that the work and records are complete. The inspection team concluded that this provided adequate assurance that records will be available to demonstrate qualification of these attributes.

The attribute bolted connections includes tray to tray connections and tray to support connections. However, although WD-24, WBN Cable Tray Walkdown Procedure, was listed as the primary record for this attribute, the inspection team could not verify that the procedure included tray to support hardware in the scope. This issue was presented to TVA for resolution. TVA responded by stating that the walkdowns, which will be performed in accordance with MAI 1.9, will inspect tray hold down bolts for location, number, size, type, and material, as well as for thread engagement. Additionally, TVA noted that engineering has performed an analysis in calculation 50054.01-C-001 to qualify the various cable tray clip configurations. As a result, TVA added MAI 1.9 and calculation 50054.01-C-001 to the record plan as primary documents. The inspection team reviewed those documents and agreed with TVA's action to correct the record plan.

## b. Retrievability

For the cable tray supports under review, construction records were generally retrievable. There were four examples however, where the TI-2004 walkthrough data sheets were included with the cable tray documents provided to the inspection team, but the data sheets documented unauthorized features on the supports. The data sheets indicated that further evaluation was required to resolve the items but no additional information was provided. The inspection team requested additional information from TVA to address these items. In response, TVA provided records which document the resolution of those items as follows:

- Support ID 0-CTSP-287-0036  
Problem: Tube steel not centered on embedded plate  
Resolution: Calculation WCG-ADGB-338-0036 provided the specific analysis for this support configuration.
- Support ID 0-CTSP-290-0527  
Problem: Unauthorized attachment  
Resolution: Calculation WCG-CB-1337-0509 provided the analysis which was bounding for this support configuration.
- Support ID 0-CTSP-292-0347  
Problem: Unauthorized attachments  
Resolution: Calculation WCG-AB-1298-0576 provided the analysis which was bounding for this support configuration.
- Support ID 0-CTSP-299-0226B  
Problem: A 1/2 inch gap exists between hold down clip and cable tray.  
Resolution: Calculation WB-CT-00-04.8 provided engineering justification for a use-as-is disposition.

The inspection team reviewed the records provided and agreed that they adequately resolved these items.

## c. Records Review

From the fifteen cable tray supports listed in Attachment A, a sample of six were chosen for a detailed review of hardware and records. These six supports and specific records reviewed are listed in Attachment B. In addition, because the record plan includes cable tray bolting, a sample of four cable tray sections was also selected for review. Those four tray sections and specific records reviewed are also listed in Attachment B. Specific observations resulting from this review are detailed below:

## General:

- The inspection team observed that in five of the six tray supports inspected, the weld installation and inspection

documentation provided to the inspection team had "N/A" in the blank labeled "Welder ID". The inspection team requested that TVA explain how weld quality could be assured if there were no records available to demonstrate that the welding was performed by qualified welders. TVA responded that the WEP Closure Statement Evaluation Reports (Group ID-I,J,202) and the walkthroughs and evaluations per TI-2004 and TI-2022 are the primary QA records for demonstrating weld qualification. Specifically, for the issue of welder identification, the WEP Group 202 Evaluation Report notes that the American Weld Society D1.1 does not require that permanent weld records be maintained for matching an individual welder to a specific weld. The inspection team reviewed the referenced documents and agreed with TVA's response.

- During the field inspection of the cable tray supports, the inspection team noted nine examples where the field installation did not match the design drawings. Two of those were later resolved by additional design information provided to the inspection team and are discussed below (unistrut attachments). A third example will be resolved by future walkdowns and is also explained below. Of the six remaining items, two deficiencies had been identified by TVA during the walkthroughs and/or walkdowns and therefore, had been considered in the critical case evaluation process. No further discussion of those two items is contained in this inspection report. However, there were four examples where the deficiencies had not been identified previously. For those four examples, the inspection team examined the bounding case calculations in detail to assure that the bounding conditions were more severe even when considering the deficiencies in the field installations. In each case the inspection team concluded that the field installation was adequately bounded by the bounding calculation. The details are explained in the following inspection result descriptions.

Support No. 0-CTSP-290-0301:

- During the field inspection of this support, the inspection team found four 6 inch unistrut attachments to the vertical tube steel column which were not shown on the design drawing. This observation was identified to TVA for explanation. TVA responded by pointing out that DCN P-03095-A authorizes the attachment of unistrut sections to cable tray supports provided the maximum weight does not exceed 150 pounds. The inspection team reviewed the DCN and concluded that TVA's response was acceptable.

## Support No. 0-CTSP-290-0527:

- The field installation of this support included an 8 inch by 8 inch tube steel vertical column, which had an upper attachment plate (10x10) welded to a structural I-beam. However, the attachment plate was offset from the center of the I-beam flange such that only 3 inches of the plate was in contact with the flange. This resulted in a weld which is only 3 inches along 2 sides and 10 inches along the third side. The inspection team asked TVA to provide documentation to demonstrate that the weld configuration was acceptable. TVA provided calculation WCG-CB-1337-0509, which is the bounding calculation for the support in question. This calculation provides the analysis for the acceptance of support No. 0-CTSP-290-0509. The analyzed support has the upper attachment plate (8x8) welded to a 4 inch by 4 inch tube steel member. The weld is 8 inches on each side of the tube steel resulting in 16 linear inches of weld, a length equal to that on the bounded support. The analyzed support weld was smaller than the weld on the bounded support, 3/16 versus 1/4 inch, and the analyzed support was more heavily loaded than the bounded support, 8 trays versus 5. In summary, the analyzed support had an equivalent weld length, a smaller weld bead and was more heavily loaded. The inspection team concluded that the bounding calculation provided adequate documentation that the weld configuration which was being questioned was acceptable.
- There were also two unistrut attachments on this support that were not shown on the design drawings. However, as described before, they were authorized per DCN P-03095-A.

## Support No. 0-CTSP-292-2729:

- The inspection team found three configuration discrepancies during the field inspection of this support. They were as follows:
  - \* A cable tray support member was mispositioned approximately 5 inches along the length of a 6 foot horizontal frame member. The discrepancy was identified to TVA for resolution. TVA responded by providing calculation WCG-1-1374, Assessment of Remaining Population of Framed Cable Tray Supports in the Aux. Building. A review of this calculation determined that the position of the tray support along the horizontal frame member was not a factor in the worse case selection process. The inspection team found this acceptable since this dimension was insignificant in the analysis with regard to support

failure. The inspection team concluded that the dimensional discrepancy was of no consequence.

- \* The 3 inch by 3 inch tube steel members which support the trays are flush mounted and welded to the upright 5 inch by 5 inch tube steel frame member. The design drawing detail calls for the 3 inch by 3 inch member to pass through the upright member and to be welded on each side of the upright member around the smaller tube steel. The inspection team questioned the adequacy of this alternate configuration. TVA responded by pointing out that in accordance with calculation WCG-1-510, GTSTRUDLE-Weldcheck Limitations and Assumptions, the calculation program used for cable tray support analysis assumed flush mounted (versus through tube connections) because they were considered more critical thus providing more conservative stress values. The inspection team reviewed Calculation WCG-1-510 and agreed with this response.
- \* On one of the tray to support hold down clips, one of the bolts is lacking full thread engagement with the nut by about 3/32 of an inch. TVA pointed out that during the MAI 1.9 walkdown, thread engagement deficiencies will be identified and corrected. The inspection team found this corrective action plan acceptable.
- In addition to the configuration discrepancies noted above, the inspection team found that there was no support identification number visible on the support. TVA explained that the identification number can be determined by using Drawing No. 48W10251-1, Rev. 5, Cable Tray Supports Identification Numbers Below El. 713.0, thus providing an acceptable alternate means of identifying supports. The inspection team reviewed the drawing and agreed with TVA's response.

Support No.0-CTSP-297-1027:

- The inspection team noted that the minimum edge distance required when locating support attachments to embedded plates is 2 inches. The attachments for this support were located such that the edge distances were 1 and 1/2 inches at the top embedded plate and 1 and 3/4 inches at the bottom plate. The inspection team requested TVA to provide documentation demonstrating that this discrepancy has been bounded by the bounding calculation. TVA provided calculation WCG-IPS-212-1009 for review by the inspection team. This calculation originally provided the analysis for a support centered on the embedded plate. However, as a

result of TVA's walkdown per TI-2022, a similar dimensional deficiency was identified on the critical case support. The calculation was then revised to reflect a 1 and 1/2 inch edge distance in the analysis. The inspection team therefore agreed that this calculation provided an adequate bounding analysis for the support in question.

- In addition to the dimensional discrepancy, the inspection team noted that there was no identification number visible on this support. However, TVA was able to identify the support by using Drawing No. 108N10417, Rev. 1, ERCW Intake Pumping Station Cable Tray Supports. The inspection team found this to be an acceptable alternate means of identifying the support.

d. ASRR Deficiencies and Correction Actions

RRSS-93:

- This RRSS documented an example where an individual's certification records pertaining to Rev. 3 of QCP-3.4, Installation, Inspection, and Documentation of Cable Tray Systems, were missing. The resolution referred to CAQR WBP 870036, Rev. 6 for final disposition. The CAQR was dispositioned "use-as-is" based on the following justification. Although no record of training on Rev. 3 of the procedure could be located, the individual had been trained on an earlier revision. The changes made to the procedure in Rev. 3 were minor in nature and would not have affected either the performance or the acceptance criteria of the subject inspection. Additionally, the individual had a degree in Electrical Engineering as well as 17 years field experience. The inspection team reviewed the details and agreed with the justification and disposition of this issue.

RRSS-114 and 121:

- These RRSS's identified examples of documents which were not retrievable by the original reviewers. The records were later retrieved by personnel more familiar with the records and the retrieval system. The inspection team agreed with TVA's closure of these items.

RRSS-115:

- This RRSS identified a procedure violation wherein a welding inspector failed to provide a complete inspection date on an inspection card. The deficiency was dispositioned "acceptable-as-is" since the inspector's signature did signify the acceptability of the work performed. The inspection team found this disposition to be acceptable.

## ASRR Technical Content Review and Resolution (Ordered Review):

- This ordered review evaluated the technical content of the cable tray support records associated with ANSI record types applicable to the installation of support No. O-CTSP-290-916. The review included the following record types:
  - \* As Constructed Drawings
  - \* Calculations
  - \* As Designed Drawings
  - \* Installation and Inspection Documentation
  - \* Weld Inspection Verification

Within those record types, numerous attributes were considered including location, identification, configuration, member sizing, and weld acceptability. All aspects of this ordered review were stasured as "acceptable". The inspection team reviewed all of the checklists, the verification bases and the results. The inspection team found the ordered review and results to be acceptable.

## ASRR Hardware Inspection Results and Resolutions:

- The inspection team reviewed all of the ASRR Hardware Inspection Summary Sheets for the 32 cable tray supports which were inspected. For the 32 tray supports, there were 7 examples of insufficient thread engagement for bolted connections and 23 examples of undersize welds. Other deficiencies existed but were relatively minor in nature. For all of the examples of insufficient thread engagement, work documents had been issued to correct the deficiencies. Additionally, the resolution statements noted that deficiencies of this nature would also be identified and corrected as part of the MAI 1.9 walkdown program. The inspection team agreed with the corrective action plan for those deficiencies. With regard to the undersized weld deficiencies, the resolutions stated that the conditions were judged acceptable by virtue of the Cable Tray Support Corrective Action Plan bounding process. The inspection team learned that the bounding process was the subject of a previous NRC deficiency, Deficiency 92-D 16, from IDI Followup Inspection Report 50-390/93-201, "Failure to Consider As-Built Weld Sizes in the Identification of Critical Case Commodity Supports". The deficiency was resolved when TVA provided evidence demonstrating that the critical case evaluation process did in fact include the evaluation of weld size in the ranking process. The NRC subsequently closed this issue in a letter from NRC to TVA dated June 29, 1993. The inspection team therefore considers the reference to the Cable Tray Support bounding

process as an acceptable resolution to the welding deficiencies.

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

6. Exit Interview

The inspection scope and findings were summarized on November 19, 1993 with those persons indicated in Paragraph 1. The team leader described the areas inspected and discussed in detail the inspection results. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

7. List of Acronyms and Abbreviations

ANSI	American National Standards Institute
ASRR	Additional Systematic Records Review
CAP	Corrective Action Program
CAQR	Conditions Adverse to Quality Report
CATD	Corrective Action Tracking Document
CDR	Construction Deficiency Report
CTSP	Cable Tray Support
DCN	Design Change Notice
DGB	Diesel Generator Building
ERCW	Emergency Raw Cooling Water
HVAC	Heating Ventilation and Air Conditioning
IEB	Engineering Bulletin
IIP	Integrated Interaction Program
MAI	Modifications and Additions Instruction
NCR	Nonconforming Conditions Report
NDE	Nondestructive Examination
NRC	Nuclear Regulatory Commission
QA	Quality Assurance
QCI	Quality Control Instruction
QCP	Quality Control Procedure
RRSS	Record Review Summary Sheet
SPER	Supplemental Problem Evaluation Report
SP	Special Program
SSP	Site Standard Practice
TI	Temporary Instruction
WBNP	Watts Bar Nuclear Plant
WEP	Watts Bar Engineering Procedure

ATTACHMENT A

RECORDS RETRIEVED FROM RIMS FOR THE INSPECTION TEAM

1. HVAC SUPPORTS:

A generic listing of the HVAC ducts and HVAC support records provided by TVA and reviewed by the inspection team was as follows:

NOTE: The material records for HVAC supports and the material attribute on the HVAC support record plan were not reviewed during this inspection, due to the fact that material used to fabricate these supports is not traceable from purchase to the point of installation. The lack of traceability was previously identified and resolved as a part of the action taken on NRC Unresolved Item 50-390,391/92-21-01.

- TI 95.1, Rev. 0, Walkdown Collection of HVAC Sheet Metal Data
- TI 2010, Rev. 2, Engineering Walkthrough for HVAC Ducts and Duct Supports
- TI 2012, Rev. 2, Heating, Ventilation, and Air Conditioning Duct and Duct Support Critical Case Walkdowns
- QCP-1.06, Rev. 24, Receipt Inspection of Safety Related Items
- QCP-1.14, Rev. 21, Inspection and Testing of Bolt Anchors Set in Hardened Concrete and Control of Attachments to Embedded Features
- QCP-1.42-2, Rev. 8, Bolt and Gap Inspection for Bolt Anchor Assemblies
- QCP-4.8, Rev. 10, Inspection and Documentation Requirements for Mechanical Supports
- QCP-4.13, Rev. 6, Nondestructive Examination
- QCP-4.23-4, Rev. 7, Visual Examination of Support Weld Joints
- QCP-4.23-8, Rev. 10, Support Final Inspection
- QCP-4.27, Rev. 9, Inspection and Documentation of Ductwork
- MAI-4.3, Rev. 7, HVAC Duct Systems
- WD-002, Rev. 1, HVAC Duct and Duct Support Critical Case Walkdowns
- WD-026, Rev. 0, Category I(L) HVAC Ducting and Supports Walkthrough Procedure, Unit 1 and Common

Records for the following HVAC duct and HVAC supports were requested by the inspection team and were provided by TVA:

HVAC Supports:

- 0031-DW930-03H-0022
- 1030-DW920-02H-0023
- 0030-DW920-03H-0093
- 0030-DW920-24H-0395
- 0030-DW910-02H-1324
- 1030-DW915-15H-1405
- 0030-DW920-06H-1536
- 1031-DW915-06H-1663

- 0065-DW920-24H-2150
- 0030-DW910-04H-2894
- 0030-DW910-03H-2977
- 1030-DW920-09H-NTAG
- 1065-DW920-10H-2328
- 0031-DW930-02H-0816
- 0031-DW930-02H-0915

## HVAC Ducts:

- 1-65-RB-D-01
- 0030-AB-D-212A
- 0-030-AB-D-238

## Additional records reviewed:

- WBN HVAC Duct and Duct Support CAP Plan, Rev. 0
- HVAC Duct and Duct Supports Project Plan, Rev. 2
- HVAC Duct and Duct Support Critical Case Evaluations, TP 2 Interim Report, Rev. 2
- SSP-9.A, Rev. 3, Administration of Walkdown Documents
- N3C 942, Rev. 3, Structural Requirements for HVAC Ducts and Duct Supports
- NRC Inspection Report 390/92-201
- NRC Inspection Report 390,391/92-03
- NRC Inspection Report 390,391/92-21
- Design Calculations:
  - 1) 50098.01-C-003, CAT I(L) HVAC Ducting and Supports Walkthrough Data and Screening Evaluation (Auxiliary Building)
  - 2) CSG-93-CA01, Evaluation of the Potential Effects of Overtightening on the Capacity of Self-Drilling Expansion Anchors
  - 3) WCG-2-17, Auxiliary Building Tank and Equipment Supports
  - 4) WCG-1-332, HVAC Duct Material Strengths
  - 5) WCG-1-403, Load Comparison for Typical Supports
  - 6) WCG-1-412, HVAC Control Room Walkthrough Reports
  - 7) WCG-1-650, HVAC Support and Duct Evaluation For HVAC Drawing 17W910-04
  - 8) WCG-1-677, Evaluations of Duct Walkthrough/Walkdown Data
  - 9) WCG-1-1246, Evaluations of Reactor Building Ducts and Supports
  - 10) WCG-1-1260, Evaluation and Modification of Duct and Duct Supports at Auxiliary Building Elevation 737, Category I
- WEP Closure Statement (Groups K, L, and 219)
- WBRD 50-390,391/87-09, Final 10 CFR 50.55(e) Report for Safety Related HVAC Duct Welding
- WBRD 50-390/81-14, WBRD 50-391/81-13, Final 10 CFR 50.55(e) Report for Improperly Installed Support Anchors

- Employee concern subcategory reports 11300-CATD 11300-WBN-02, 03, and 05
- Employee concern subcategory report 40500 p.35
- General Engineering Spec. G-32
- NCR 3409R, Duct Supports With Improper Anchor Documentation
- NRC Bulletin 79-02 Final Report Rev. 2, Pipe Support Base Plate Designs Using Concrete Expansion Anchors

## 2. CABLE TRAY SUPPORTS:

A generic listing of the cable tray and cable tray support records provided by TVA and reviewed by the inspection team was as follows:

NOTE: The material records for cable tray supports and the material attribute on the cable tray support record plan were not reviewed during this inspection, due to the fact that material used to fabricate these supports is not traceable from purchase to the point of installation. The lack of traceability was previously identified and resolved as a part of the action taken on NRC Unresolved Item 50-390,391/92-21-01.

- TI-2004 Rev. 0, Engineering Walkthrough For The Cable Tray And Cable Tray Support Critical Case Evaluation
- TI-2022 Rev. 3, Walkdown Of Cable Tray Supports
- QCP-1.06 Rev. 24, Receipt Inspection Of Safety-Related Items
- WD-19 Rev. 1, WBNP Integrated Interaction Program Walkthrough Procedure
- MAI-1.9 Rev. 0, Damaged, Loose, Or Missing Hardware
- QCP-1.14 Rev. 21, Inspection And Testing Of Anchors Set In Hardened Concrete And Control Of Attachments To Embedded Features, Test No. 1
- QCP-3.4, Rev. 1,3,4,5,6,8,9, and 11, Installation, Inspection, and Documentation of Cable Tray Supports
- Final Report For 10CFR50.55E, Improperly Installed Support Anchors, WBRD-50-390/391/81-13, Dated March 14, 1983.
- NCR 2789R, Final Report For 79-02 Program
- Calculation CSG-93-CA01 Rev. 0, Evaluation Of The Potential Effects Of Overtightening On The Capacity Of Self-Drilling Expansion Anchors
- QCP-1.42-2 Rev. 8, Bolt And Gap Inspection For Bolt Anchor Assemblies, Test No. 2
- Employee Concern Subcategory Report 11300, CATD 11300-NPS, Inadequate Bolt Tightening Criteria
- Employee Concern Subcategory Report 11300, CATD 11300-WBN-05, Incomplete Disposition of NCR 3747R
- Employee Concern Subcategory Report 11300, CATD 11300-WBN-03, Incomplete Disposition of NCR 6674
- WEP Closure Statement Evaluation Reports (Group ID-I,J,202)
- Calculation WCG-1-1375, Bounding Calculation for Support 0-CTSP-292-1543
- Calculation WCG-ADGB-338-0036, Calculation for Support 0-CTSP-287-0036

- Calculation WCG-CB-1337-0509, Bounding Calculation for Support 0-CTSP-290-0527
- CAQR No. WBP 890502, Deficiencies Associated With Loose and Missing Hardware
- CAQR No. WBP 870036SCA Rev. 6, Incomplete Certification Records
- Calculation 50054.01-C-001, Cable Tray Holddown Clip Analysis
- WD-24, WBN Cable Tray Walkdown Procedure
- Calculation WCG-1298-0576, Bounding Calculation For Support 0-CTSP-292-0576
- Calculation WB-CT-00-04.8, Qualification of Cable Tray Supports With Deficiencies Identified During Walkdown

Records for the following cable trays and cable tray supports were requested by the inspection team and were provided by TVA:

Cable Tray Supports:

- 0-CTSP-287-0036
- 0-CTSP-290-0301
- 0-CTSP-290-0527
- 0-CTSP-290-0931
- 0-CTSP-292-0347
- 0-CTSP-292-1543
- 0-CTSP-292-1824
- 0-CTSP-292-2729
- 0-CTSP-296-0211
- 0-CTSP-297-1027
- 0-CTSP-297-1045
- 0-CTSP-299-0226B
- 1-CTSP-293-0028
- 1-CTSP-293-0282A
- 1-CTSP-296-0019B

Cable Trays:

- 3Z296164
- 3A3522
- 4A3526
- 5A3522

ATTACHMENT B

DETAILED LISTING OF RECORDS REVIEWED

1. HVAC SUPPORTS:

HVAC Supports:

1030-DW920-02H-0023:

- TI 2010 Walkthrough Package AB-14
- TI 2012 Walkdown Package AB 14-23
- HVAC Typical No. 93
- QCI-1.11-2 Rev. 3, Weld Inspector Certification

1030-DW915-15H-1405:

- TI 2010 Walkthrough Package RB-36
- HVAC Typical No. 81
- Design Calculation WCG-1-1246

0030-DW920-06H-1536:

- TI 2010 Walkthrough Package AB-26
- TI 2012 Walkdown Package AB 26-1536
- HVAC Typical No. 25
- Design Calculation WCG-1-1260
- Design Calculation WCG-2-17
- QCI-1.11-2 Rev. 3, Weld Inspector Certification
- Support Variance Sheet MA 055-25-5
- Squad Check MA 055-25-5

0065-DW920-24H-2150:

- TI 2010 Walkthrough Package AB-29
- TI 2012 Walkdown Package AB 29-2150
- HVAC Typical No. 211
- DCN M-17876-A
- WP D-1787604
- QCP-1.14, Rev. 9
- QCP-1.42-2, Rev. 3
- QCI-1.11-2 Rev. 3, Weld Inspector Certification

0030-DW910-04H-2894:

- TI 2010 Walkthrough Package DGB-1
- HVAC Typical No. 148
- QCP-1.14 Rev. 13
- QCP-1.42-2 Rev. 4
- TI 2010 Walkthrough Package DGB-1 for 2955
- TI 2012 Walkdown Package DGB-1-2955
- Design Calculation WCG-1-650
- Design Calculation WCG-1-403
- QCI-1.11-2 Rev. 3, Weld Inspector Certification

- 48N1338-6, Rev. C
- Design Calculation WCG-1-1375
- QCP-3.4, Rev. 1, Test 25 Dated 9-7-75
- QCP-3.4, Rev. 1, Test 26 Dated 11-14-75
- Division of Construction Non-Destructive Examination Certification for Employee # 443-76-4153
- TI-2022, Rev. 2, Appendix C and H, Dated 1-11-92
- DCN P-03095-A, Conduit Attachment To Cable Tray Supports

## 0-CTSP-290-0527:

- Construction Drawings
  - 48N10246-2, Rev. 3
  - 48N1337-2, Rev. B
  - 48N1337-1, Rev. F
  - 48N1337-4, Rev. D
  - 48N1337-8, Rev. D
- Design Calculation WCG-CB-1337-0509
- QCP-3.4, Rev. 3, Test 25 Dated 7-21-76
- QCP-3.4, Rev. 3, Test 26 Dated 8-30-76
- Division of Construction Non-Destructive Examination Personnel Certification Summary for Employee # 410-58-7473
- Division of Construction QA Engineering Unit Personnel Certification Record for Employee # 491-58-2041
- TI-2004, Rev. 0, Appendix C2 Dated 11-6-90

## 0-CTSP-292-2729:

- Construction Drawings
  - 48W10251-1, Rev. 5
  - 48W1295-1, Rev. C
  - 48W1295-4, Rev. D
  - 48W1295-5, Rev. C
- Design Calculation WCG-1-1374
- QCP-3.4, Rev. 8, Test 25 Dated 1-21-80
- Division of Construction Non-Destructive Examination Certification Summary for Employee # 411-98-5829
- TI-2004, Rev. 0, Appendix C2 Dated 11-1-90
- Calculation WCG-1-510, GTSTRUDLE-Weldcheck Limitations and Assumptions

## 0-CTSP-297-1027:

- Construction Drawings
  - 108N10417, Rev. 1
  - 38N213, Rev. C
  - 38N212, Rev. 11
- Design Calculation WCG-IPS-212-1009
- QCP-3.4, Rev. 4, Test 25 Dated 6-25-77
- QCP-3.4, Rev. 4, Test 26 Dated 7-7-77
- Division of Construction QA Engineering Unit Personnel Certification Record for Employee # 413-94-0276
- Division of Construction Non-Destructive Examination Personnel Certification Record for Employee # 413-94-0276

- Division of Construction QA Personnel Certification Record for Employee # 416-70-6619
- TI-2004, Rev. 0, Appendix C2 Dated 11-6-90

Cable Trays:

3Z296164:

- Construction Drawings
  - 15W184-1 Rev. J
  - 15W184-6 Rev. B
- General Design Criteria No. WB-DC-20-21.1, Category I Cable Tray Supports

3A3522 4A3526:

- Construction Drawings
  - 35W800-1 Rev. J
  - 35W800-2 Rev. E
  - 35W800-3 Rev. K
- General Design Criteria No. WB-DC-20-21.1, Category I Cable Tray Supports

## 0031-DW930-02H-0816:

- TI 2010 Walkthrough Package CB-5
- HVAC Typical No. 25
- WP C-WBN870316-1
- Design Calculation WCG-1-412

## HVAC Ducts:

## 1-65-RB-D-01:

- QCP 4.27 Rev. 1

## 0030-AB-D-212A:

- QCP 4.27 Rev. 1

## 0-030-AB-D-238:

- QCP 4.27 Rev. 1

## 2. CABLE TRAY SUPPORTS:

## Cable Tray Supports:

## 0-CTSP-296-0211:

- Construction Drawings
  - 108N10410-5, Rev. 1
  - 18N309-7, Rev. 5
  - 18N309-7A, Rev. 0
  - 18N309-6, Rev. D
  - 18N309-1, Rev. F
- Design Calculation WCG-DGB-309-0-0201
- TI-2004, Rev. 0, Appendix C and D, Dated 10-6-89
- QCP-3.4, Rev. 11, Test 25 Dated 1-23-85

## 1-CTSP-293-0028:

- Construction Drawings
  - 48W970-1, Rev. 1
  - 48W970-1, Rev. D
  - 48W970-4, Rev. A
  - 48W970-3, Rev. B
- Design Calculation WCG-SB-970-0028
- QCP-3.4, Rev. 5, Test 25 Dated 6-13-78
- QCP-3.4, Rev. 6, Test 26 Dated 2-19-79
- Division of Construction QA Engineering Unit Personnel Certification Record for Employee # 374-64-1911 and Employee # 403-80-6654
- TI-2004, Rev. 0, Appendix C2, Dated 11-2-90

## 0-CTSP-290-0301:

- Construction Drawings
  - 48N10233-3, Rev. 5
  - 48N1338-1, Rev. E
  - 48N1338-3, Rev. D
  - 48N1338-4, Rev. E