

4.3 Methods Used During Installations

4.3.1 Generic

Discussion

Two concerns (IN-86-116-001 and IN-85-288-001) at WBN were determined as being potentially generic to the other TVA nuclear plants. These concerns identified perceived problems with (1) the failure to cap open-ended vertical tube steel members, and (2) the mishandling of mechanical shock arrestors (snubber).

A. Capping open-ended vertical tube steel members

• Watts Bar

During the evaluation of concern IN-86-116-001 at WBN, interviews with responsible personnel and a review of the 47A050 notes revealed that before May 21, 1984, a requirement for capping open-ended vertical tube steel members did not exist. FCR MH-3426 was written in May 1984 to add the following note to the 47A050 series hanger drawing general notes: "Structural tubing (outdoors [all] or indoors [on floors or foundations]) installed after May 21, 1984, with an open end in the vertical direction that could allow water and/or trash to collect, must be capped with a 1/4-inch plate and seal welded all around. Other structural tubing may be capped and seal welded at the discretion of construction. Vent holes should be used as required, 1/4-inch maximum." Interviews with personnel involved with the issue of cap plates revealed that all installations before May 21, 1984, were determined to be acceptable as installed and installations after this date were to conform to the above note.

Subsequent to this note being incorporated into the general notes it was discovered that some tube steel at the Intake Pumping Station (IPS) had cracked because of water collecting in the tube steel and freezing. According to various involved personnel, this condition made it necessary to walkdown all installations that were exposed to atmospheric conditions and correct any damage and/or add cap plates as required. Interviews with responsible personnel and a review of the NCR log failed to produce any documentation for this tube steel damage and the ensuing walkdown.

4.3.1 Generic (continued)

A field evaluation of the IPS and outside areas adjacent to the Auxiliary Building revealed 29 vertical tube steel members that could collect water (most of the tubes had water standing in them) and were exposed to atmospheric conditions.

Cap plates did not help in the load carrying capacity of the installed supports at WBN but were placed on installed tube steel sections as a housekeeping measure. The absence of these cap plates on outdoor installations did create a condition adverse to quality.

- Sequoyah

The SQN GCTF performed the initial evaluation of this concern for SQN. The SQN GCTF report revealed that requirements did not exist for adding cap plates for open-ended vertical tube steel members used outdoors. The additional WBN ECTG evaluation included a thorough review of the 47A050 notes and discussions with the responsible modifications personnel. A field evaluation of the outside areas around the IPS exhibited several cases of open-ended vertical tube steel members that were not capped and contained water.

- Browns Ferry

The WBN ECTG performed the evaluation of this concern for BFN. The evaluation found that the capping of open-ended vertical tube steel members was not a problem. This determination was based on the fact that no tube steel sections were utilized in outside areas during initial construction activities. The specific uses of tube steel sections were discussed with a DNE support designer. This discussion revealed that very few supports were installed outdoors, that there were no drawing note requirements for capping tube steel, and if caps would be required the DNE-approved drawing would show them.

4.3.1 Generic (continued)

• Bellefonte

The WBN ECTG performed the evaluation of this concern for BLN. The evaluation revealed that BLN had a problem with open-ended vertical tube steel members that became damaged due to water collecting in the tube steel. BLN NCR 3992 was issued (February 26, 1985) identifying the problem on some previously installed pipe supports. DNE dispositioned the NCR by revising the 3GA0059-00 series drawings to require cap plates on all supports constructed of tube steel, located outside the buildings, which could collect water. The affected hangers identified on the NCR were reworked to fix the cracked members. Rework of the affected pipe hangers had been completed, and DNE approved drawing 3GA0059-00-30 had been revised to add a note, note 10, requiring cap plates on all open-ended vertical tube steel members installed outdoors.

A further review of other possible uses of open-ended tube steel members was performed. Instrumentation, conduit, cable tray, and duct support drawings were reviewed for possible problems. For instrumentation supports shown on drawing series 4BA0570, note 27 on 4BA0570-X2-2A, required tube steel to be capped. Also, all instrumentation supports on the 4BA0895 drawing series that needed to be capped had a specific detail on the drawing. For conduit and cable tray supports, capping details were shown on the DNE approved drawings when open-ended vertical tube steel members were required. Drawings 4BA0892-X2-105 through 4BA0892-X2-113 for conduit supports did not use open-ended tube steel members. Drawing series 4RA0560 and 4BA0892 detailed the caps when required, and note 41 on drawing 4BB0892-X2-2 allowed three different methods for installing the cap plates. For duct supports shown on drawing series 4RW0475, capping requirements were shown for outside installations.

Drawing series 8KW0208 did not show hangers requiring cap plates. These findings were based on a thorough drawing review of hangers/supports and field walkdowns of affected areas around BLN.

4.3.1 Generic (continued)

Conclusion

The perceived problem stated in concern IN-86-116-001 was factual for WBN, SQN, and BLN. It was not factual for BFN.

WBN identified the problem in May 1984, and established requirements for future installations that would eliminate the problem. However, WBN did not correct any past installations as verified by a field walkdown. (CATD 11103-WBN-01)

Not all vertical tube steel sections installed in outside areas at SQN were capped. During the evaluation, no damage to existing vertical tube steel sections was found. However, water was standing in all of them. Based on past occurrences at BLN and WBN, this water could freeze and cause structural damage. (CATD 11103-SQN-03)

BFN did not have a problem since tube steel was not used during initial construction, and whenever this type of installation was required on a DNE-approved drawing, the responsible designer would show a cap plate detail.

BLN had a problem before February, 1985, but through normal site procedures, NCRs, corrected all past installations and provided requirements for all future installations.

B. Mishandling of Snubbers

The issue on the mishandling of snubbers revolves around perceived problems the CI believed had occurred at WBN. These perceived problems were based on recommended practices Pacific Scientific Company (PSCo) included in PSCo Document 141. The recommended practices dealt with handling and storage, adjusting or re-aligning, and protection of snubbers. The CI also believed that snubbers installed outdoors should have waterproof covering.

4.3.1 Generic (continued)

All four of TVA's nuclear plants have used hydraulic and mechanical snubbers. The mechanical snubbers used were manufactured by PSCo. PSCo Document Number 141 provided recommendations on the handling and protection of snubbers to help reduce any unnecessary damage from occurring. These recommendations were as follows:

1. At no time shall installed snubbers be used as steps or handholds.
2. When arc welding, do not attach ground to snubber or any part of the snubber which would cause arcing current to pass thru it.
3. If sand blasting is to be performed on adjacent parts such as unfinished pipe or structure, snubber, and bearings in attaching parts must be masked for protection.
4. Do not sand blast snubbers. Snubbers are prefinished with acceptable corrosion protection.
5. Use care to align snubbers as closely as possible to avoid forces tending to rotate the pipe clamps or induce bending.
6. To avoid driving the spherical bearing free or damaging bearings, use care in inserting pins. Pins should be snug but not tight. Light tapping with a fiber mallet is allowable.

PSCo also specified a recommended procedure to adjust the cylinder end plug when the original orientation of the snubber could not be installed. The general sequence is as follow:

1. Snubber sizes PSA-1/4, -1/2, -1, -3, and -10:
 - Place snubber in a vertical position on a table, sitting on the arrestor housing.

4.3.1 Generic (continued)

- While keeping a slight downward hand pressure on the top end to avoid any linear movement, use retaining ring pliers to free retaining ring. Slowly turn end plug by hand only to the desired position while continuing to keep the slight downward pressure (do not use a wrench or other mechanical device for this operation). Replace the retaining ring while maintaining the slight downward hand pressure. These steps are for sizes PSA-1/4 and -1/2 only.
- Loosen, but do not entirely free, the retaining ring. Rotate the tubular member upon which the scale is printed until the desired position is obtained. Allow the retaining ring to expand into place. These steps are for sizes PSA-1, -3, and -10 only.
- Expand and contract the snubber slowly through one full stroke to determine if the realignment damaged any internal components.

2. Snubber sizes PSA-35 and -100:

- With assembly cradled on a bench remove the screws and indicator tube. Extend sufficiently to expose part of the telescoping tube.
- While the telescoping tube is restrained from rotating, loosen the left hand threaded nut (ring). (Nut has been torqued to 150 +/-20 foot/pounds). Rotate the end cap to the desired position.
- Re-torque the left hand threaded nut to 150 +/- 20 foot/pounds.
- Replace the indicator tube and screws.
- Extend and retract the arrestor through full stroke to assure that no internal damage occurred during adjustment.

4.3.1 Generic (continued)

PSCo does not provide any recommendations to cover snubbers with waterproof covers, but PSCo does market and sell a protective boot for snubbers installed outdoors.

These recommendations will be used as a basis in the evaluation of snubbers at all four nuclear sites.

• Watts Bar

The WBN ECTG performed the evaluation of this concern for WBN. The evaluation included reviewing the NSRS Investigation Report I-85-713-WBN for concern IN-85-288-001 and the line responses to the report's recommendations. The responses revealed that improper handling of snubbers has been a problem at WBN and no specific procedure existed covering snubbers. To combat this problem a QCI has been scheduled to be issued delineating the requirements for handling and installing snubbers. An interview with the responsible initiator of the QCI verified that it was being prepared and would provide all the necessary requirements.

Snubbers are verified to operate properly at the time of inspection as indicated in WBN-QCP-4.23-5; therefore, the fact that they were not handled, stored, protected, etc. properly before inspection would not cause a problem with those snubbers previously installed because they would be corrected before plant operation. | R3 |

• Sequoyah

The SQN GCTF performed the initial evaluation of this concern for SQN. The GCTF evaluation was handled using the same methodology stated in section 3.1. The findings of the GCTF report concluded that a problem existed with snubbers being stored outdoors during the construction phase. However, the initial testing performed according to SQN Inspection Instruction A-3, periodic surveillance testing performed according to SQN SI-162.2, and removal and reinstallation inspections performed according to SQN MI-6.13A for snubber installations would have detected any damage. Although the GCTF evaluation appeared to be adequate, further evaluation revealed it was not adequate with respect to the other requirements specified by PSCo.

4.3.1 Generic (continued)

Interviews with knowledgeable Mechanical Maintenance and Mechanical Modification engineers revealed that the PSCo recommendations on snubber handling, storage, and protection were not included in any procedures or instructions. A review of the applicable procedures and instructions (SQN II A-3, SQN SI-162.2, and SQN MI-6.13A) verified these interviews; but, SQN SI-162.2 and SQN MI-6.13A did contain requirements for snubber adjustment or re-alignment. These requirements matched the PSCo recommendations, specified above, except for the vertical position recommendation. This should not cause a problem since the snubber was cycled (expanded and contracted) after the re-alignment process for the sole purpose of detecting possible damage.

• Browns Ferry

The WBN ECTG performed the evaluation of this concern for BFN. The evaluation concluded that during initial construction no procedures existed governing the handling of snubbers. This was acceptable since mechanical snubbers were not used before 1985. Currently site procedures Modifications/Additions Instruction (MAI)-23, MMI-59A, and MMI-59D specify all requirements for mechanical snubbers. MAI-23 specified the requirements for all hangers/supports for piping systems in category I structures. Section 2.1 required the cognizant engineer to provide adequate instructions on vendor component parts in the work control documents and specified that snubbers shall not be used as steps or to support other construction loads. MMI-59A specified a program to control the handling of mechanical snubbers but did not address PSA-35 and -100 snubbers. MMI-59D provided the requirements for the 10-percent functional testing of snubbers during plant outages. Also, SI-4.6.H-1 stated that quality control inspections were to be performed on each snubber when originally installed or reworked.

MMI-59A and -59D did not include any of the PSCo requirements, and MAI-23 addressed only the requirement on not using snubbers as steps or handholds. Damage to installed snubbers could occur during outages or other times when rework or other installation activities take place around them.

4.3.1 Generic (continued)

• Bellefonte

The WBN ECTG performed the evaluation of this concern at BLN. The evaluation concluded a problem had existed with the methods used for snubber handling, but that part of the problem had been corrected. Site procedure BNP-QCP-6.24 provided specific requirements for handling and storage of snubbers. These requirements match those specified by the snubber manufacturer PSCo. However, these requirements were not in force before November 1984, the issue date of snubber inspection procedure BNP-QCP-6.24. Also, the housekeeping procedure BNP-QCP-6.17 added snubber protection requirements in section 6.1.2.9.2 in February 1986.

The problem of ineffective snubber protection was also identified by the Institute of Nuclear Power Operations (INPO) in 1985. INPO Finding CC.3-1 stated that installed snubbers were not adequately protected. BLN line management's response was to remove all snubbers not required to be installed and return them to the warehouse for storage. Those snubbers not removed were to be protected with wooden boxes built around them. A review of the BLN Hanger Tracking Program indicated that 71 snubbers were not removed. Two of them had been documented to BNP-QCP-6.17 before the issuance of BNP-QCP-6.24. The remaining 69 were documented to BNP-QCP-6.24 but some had not been reinspected. This was acceptable since the requirements of BNP-QCP-6.17 before the issuance of BNP-QCP-6.24 were the same as the requirements in BNP-QCP-6.24, except for the recording of the snubber serial number. An informal walkdown of several snubber installations was performed, and some installations were found not to be protected or were not fully enclosed by the protective wooden boxes.

• Generic

DNE specified snubbers to be installed by approved hanger drawings. The upper tier document for these installations was TVA General Construction Specification G-43. G-43, section 1.3, defined a snubber as a component standard support and, section 2.8.1.2, specified the general installation tolerance for snubbers. No other references were made to snubbers in G-43. Also, the PSCo catalog has not been readily

4.3.1 Generic (continued)

available at each site; but as copies became available, some of the PSCo recommendations were incorporated into site procedures and instructions.

Conclusion

The perceived problem stated in concern IN-85-288-001 was factual for all four TVA nuclear plants.

WBN had a problem on snubber handling and will correct the problem by issuing a QCI to provide the requirements. The snubbers previously installed should be adequate since they were verified to operate properly during finalization and documentation by a certified inspector. (CATD 11103-WBN-02).

During the construction phase at SQN, there were some problems dealing with the storage and handling of snubbers. However, the initial testing according to SQN Inspection Instruction A-3, as well as periodic surveillance testing performed according to SQN SI-162.2, would have detected damage resulting from bad construction practices. Currently, there are no plant procedures or instructions that fully provide all necessary requirements for handling snubbers at SQN. (CATD 11103-SQN-01)

BFN did not have problems with snubbers before 1985 since mechanical snubbers were not used. Several procedures have been issued since mechanical snubbers started being installed; however, these procedures did not address PSA-35 and -100 snubbers. Also, the requirements specified by PSCo were not included in MMI-59A and -59D, and MAI-23 did not contain all of the PSCo requirements. (CATD 11103-BFN-01)

BLN had a problem with snubber handling; but, corrective actions had taken place to eliminate most installations that could have future problems. These corrective actions were based on finding identified by INPO in 1985. The 71 remaining installations need further review to ensure proper protection from future problems. (CATD 11103-BLN-02)

4.3.1 Generic (continued)

Mechanical shock arrestor (snubber) criteria was not included in upper tier document TVA General Construction Specification G-43, and PSCo catalog has not always been available to the plant sites. These two situations have been causes for all four plant sites to have discrepancies with snubbers. Since some of the problems were similar at all four sites and the upper tier document did not adequately address snubbers, a corporate review and resolution to snubber criteria is needed. (CATD 11103-NPS-01)

4.3.2 Site-Specific - WBN

Discussion

A. The evaluation of the perceived problem concerning the insufficient issue and revision of hanger/support documentation covered five areas: (1) the issue of support variances for deviations from typical support sketches, (2) the quality of the sketches documenting the variances, (3) the issue of FCRs to document changes to cable tray supports, (4) the substitution of different typical supports, and (5) DNE's failure to enforce inspection criteria for non-safety, non-seismic supports.

1. Instrumentation supports were identified as not having variances issued as required by QCI-1.28 by concern IN-85-445-X17. NCR W-334-P was generated to document discrepancies found with instrument lines and supports. The corrective action implemented by this NCR accepted the configuration of previously installed instrumentation supports.

The NCR will remain open until all instrument lines are reworked and documented.

2. Sketches, generated by site engineering groups, contained insufficient information and were of poor quality was pointed out in concern IN-85-967-001.

4.3.2 Site-Specific - WBN (continued)

A review of support variances and an interview with the DNE site supervisor revealed that the EEU was deficient in the content and clarity of their variances. DNE site issued an informal memorandum to the Construction Engineering Organization (CEO) addressing this concern. The EEU has committed, by informal memorandum, to conduct training sessions covering the quality of the variances issued by them.

3. Concern WI-86-009-001 was voiced addressing the fact that cable tray supports had been modified in the field without the issuance of an FCR as required by QCI-1.13. NCR 5737 was written in 1984 documenting the fact that not all cable tray supports were installed in accordance with the latest revision of the DNE drawings. In response to this NCR a "Cable Tray Support Task Force" was established to evaluate the problems with cable tray supports. This task force did a detailed walk down sampling of the following areas:

- a. Auxiliary Building, Elevations 692, 713, 737, 757, and 772.
- b. Reactor Building 1, Inside Containment.
- c. Intake Pumping Station.
- d. Diesel Generator Building.

A controlled sample of the following areas was checked:

- a. Reactor Building 1, Annulus.
- b. The Additional Equipment Building 1.
- c. Auxiliary Building, Elevation 782.
- d. The Control Building.

4.3.2 Site-Specific - WBN (continued)

All deficiencies identified by this NCR were dispositioned in one of three ways: (1) use as-is, (2) drawings revised to match feature, or (3) rework. An analysis of NCR 5737 revealed that out of the 2700 supports sampled 93 supports had missing members or were never documented and that 61 supports had dimensional or configuration problems (see memorandum WBN 840924 101). These discrepancies exceeded the standard five percent error rate used by TVA in sampling program analysis. The unit 1 and common portions of NCR 5737 were closed on release 5737 E1-01 with the high error rate such that the accuracy of the cable tray support drawings for supports not sampled became questionable.

4. During QTC's investigation of concern IN-85-469-002, it was discovered that two duct supports were installed according to a different typical than that referenced on the drawings. As a result, concern IN-85-469-X04 was generated.

A review of Sequoyah and Watts Bar Nuclear Projects (SWP)-Engineering Procedure (EP)-43.14, which was superseded by Watts Bar Project (WBP)-EP-43.14, revealed that Category I (L) duct was supported by the field using the 47A055 typical support drawing series and the 47W900 series ductwork drawings. The 47W900 series drawings were "as-configured" by DNC and issued to DNE for incorporation. Therefore, the final drawing depicting the installed typical support was not issued until after the supports were installed and inspected.

The above described procedure utilization precluded unauthorized/undocumented substitution of material and support type.

The examples stated in concern IN-85-469-X04 were addressed by NCR 6357, revision 1, and the generic implications were addressed by walking down the duct supports in the area of the concern (Reference SCR 6357-S). Discrepancies were not identified during this walk down. An additional walk down was performed as a part of this evaluation consisting of examining 20 randomly selected supports. Out of these 20 supports, 2 were installed according to a different typical sketch than that shown on the

4.3.2 Site-Specific - WBN (continued)

design drawings. However, a review of the subject supports inspection documentation revealed that the inspection documents matched the "as-installed" configuration, as was the case of the examples given in the concern.

Based on the above facts, these discrepancies could be attributed to the failure to properly transfer the "as-constructed" typical support number to the design drawings.

5. Concern IN-85-104-001 questioned the fact that the management of DNE did not enforce inspection criteria for non-safety, non-seismic (non-QA) supports. DNE was not responsible for the enforcement of inspection criteria, rather DNE provided requirements to be used during the inspection process through general construction specifications. WBN DNC was responsible for the enforcement of the inspection criteria for all support installations within the scope of the WBN QA program or in non-QA structures as called for on a DNE approved drawing.

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After reviewing the general construction specifications that apply to the installation of supports, the existence of inspection requirements for non-safety, non-seismic supports was not found. However, specific installation requirements for concrete bolt anchors were found. General Construction Specification G-32, for bolt anchor installations, contained specific installation requirements for all installations, QA and non-QA. Deviations from those requirements required DNE approval. Obtaining the DNE approval for QA installations and some non-QA installations was covered by site procedures since these installations were shown on specific drawings. However, most non-QA installations were shown on typical drawings, 30W615, and were installed on field routed lines. No mechanism existed for WBN DNC to obtain DNE approval for deviations from the G-32 requirements.

4.3.2 Site-Specific - WBN (continued)

The WBN DNC line management's response to the concern was also reviewed. This response stated that engineering personnel inspected non-QA pipe supports, except for welds, using the QA inspection procedures as a guideline. The non-QA supports were certified as being installed "as-designed" in accordance with WBN-QCI-1.25. The welding inspections were performed by the welder and his foreman, subject to surveillance inspections by the Welding Quality Control Unit (WQC), and integral welds were inspected by a WQC inspector.

Although the failure of a non-safety, non-seismic support would not cause a condition adverse to plant safety, WBN DNC was concerned about non-QA support installations not being in compliance with the G-32 installation requirements.

- B. The concern on unnecessary scrapping of supports was addressed by the PMO response to employee concern IN-85-821-009. This response described the economic aspects, as well as the practical aspects, of scrapping supports. Scrapping of supports was a necessary action during construction, and periodic checks were made of the scrap yard to ensure reusable material was retrieved. However, this process was questionable and is being addressed in detail in Material Control Subcategory 40300 and Management and Personnel Subcategory 71101.
- C. Several concerns were expressed dealing with various aspects of general installation of hangers/supports. The following items were evaluated:
 - 1. Concern IN-85-109-001 stated that improper lug placement may result in uneven structural support for pipes. General Construction Specifications G-43 and N3C-912 and site procedure QCP-4.23-8 specified the proper lug clearances including tolerances to provide uniform load distribution. These lug clearances were verified by Hanger Quality Control (HQC).
 - 2. Concern IN-85-490-004 stated that some pipes riding on lugs going through penetrations may not have been corrected. Lugs were used as a means of support at penetrations throughout the plant. The RHR penetrations connecting the containment sump to the RHR sump valve room had five sets of lugs

4.3.2 Site-Specific - WBN (continued)

installed on the pipe inside the penetrations. NCR 5962 was written to document some configuration discrepancies between the installed lugs and the design drawings and was incorporated into the DNE drawing by ECN 5557. In addition to the configuration problems, the subject lugs were cut from ASTM-A167 material and installed on ASME section III, class 2 pipe. NCR 6634 and SCR 6634-S were written addressing the installation of ASTM material in ASME Code Systems for unit 2.

NCR 6907 and SCR 6907-S were generated by the Code Data Unit to identify the fact that the disposition of NCR 6634/SCR 6634-S could not be satisfied since an acceptable sample of the installed heat of material (Heat 31590) could not be found. DNE was to evaluate the installations.

This application resulted because of the piping drawings specifying ASTM material attaching to an ASME system. This particular case was detailed on drawing 47W432-7. Other instances had been identified where this condition existed (e.g., drawings 47W432-4 and 47W435-4). According to the responsible DNE individual this was a design oversight which occurred when the SQN drawings were copied for application at WBN.

Interviews with various Hanger Engineering Unit (HEU) personnel failed to identify any additional conditions that would require correction.

3. Concern IN-85-865-002 stated that, "some cable tray supports/hangers may have been installed in violation of procedure (i.e., holes were burned through on I-beam rather than drilled.)" This concern was too vague to perform a meaningful evaluation. The adequacy of cable tray support installations is also addressed in section 4.3.2.A(3) of this report and in subcategory reports 10400, 11300, 50600, and 80200.

Interviews with the responsible EEU engineers and a review of applicable drawings failed to identify any cable tray supports utilizing an I-beam structural member.

4.3.2 Site-Specific - WBN (continued)

4. "Hanger crews are required to work to unapproved FCRs and Support Variance Sheets (SVS)," was the subject of concern IN-85-903-002. According to QCI-1.13 and 1.28, FCRs and SVSs were not submitted for formal approval until an installable configuration had been achieved. However, based on a DNE management decision, this practice has been discontinued and formal written approval of the field change is now required before installation activities are continued (reference TVA memorandum from W. C. Drotleff, Manager of Engineering Design, to Those listed dated April 4, 1986, B05 860404 003).
5. The concerned individual questioned the adequacy of the supports on the main steam bypass line in concern IN-86-168-004. No main steam bypass line was found during a field walk down of the area identified in the concern. The main steam supports in the general area of the concern were checked and found to be in compliance with the applicable drawings.
6. Concern WI-85-065-001 dealt with conduit being supported by wire hanging from the ceiling. This was investigated by NSRS Report I-85-715-WBN. This method was found to be an acceptable means of temporary support for conduit during the construction process. A field walk down of the Auxiliary and Reactor Buildings failed to identify the above condition.
7. Hanger identification tag plates could not be read because paint and insulation covered up the tags was the subject of concern IN-85-016-002. Field investigations found hanger identification tag plates were covered with protective coating and insulation to the point that the information on the tags could not be read. A review of TVA Topical Report TVA-TR75-1A, paragraph 17.1.8.2 and QAPP-8, paragraph 6.1.2, revealed that traceability could be provided either on the item or on records being traceable to the item. The fact that hanger identification tags were unreadable was of no consequence because there remained three other ways to identify supports. Those were: analysis isometrics, field-generated isometrics, and physical piping drawings. By using one or a combination of the above, any support could be properly identified and located in the field.

4.3.2 Site-Specific - WBN (continued)

8. The concerned individual stated that he saw a drawing dated September 1977 being used to install a snubber in Reactor Building 2. Field evaluation of the location described in concern IN-85-428-002 revealed a 10-inch diameter stainless steel line with two snubbers installed. One of these snubbers (2-63-459) intersected the pipe at an angle of approximately 15 degrees as stated in the concern. Review of this drawing found it to be initially issued by EDS on August 22, 1977, and approved for issue by TVA on October 11, 1977. The TVA approval stamp was located in the top center of the drawing and, without a close look at the drawing, could have been misinterpreted as the current date of the drawing.

However, this support was inspected and accepted by HQC on November 18, 1985, utilizing revision 902 of the drawing (dated October 31, 1985) and FCR H-15993.

9. Concern IN-85-445-003 questioned the traceability that existed when instrumentation supports were documented on Fabrication Operation Sheets (FOS) and Installation Operation Sheets (IOS). Interviews with IEU personnel and reviews of FOS and IOS documentation verified the fact that under this procedure of installing instrument supports traceability from fabrication to installation was virtually nonexistent. NCR W-334-P documented several discrepancies within the instrumentation program. One of the corrective actions of this NCR was to conduct a sample program to determine the suitability for service of installed instrument line supports. Based on this sample, instrument lines and supports were deemed acceptable even though "as-constructed" documentation problems existed (B26 860409 007).

The current procedure being used for instrumentation supports has been revised to require each support to be identified by a unique number and the appropriate typical support sketch. The supports are inspected and documented using this information and therefore rectifies the problem with traceability.

4.3.2 Site-Specific - WBN (continued)

10. Stainless steel lines not supported by straps and running close to a hanger was the perceived problem identified by concern IN-85-465-001. This issue was investigated by NSRS Report I-85-714-WBN. The NSRS Report concluded that the stainless steel lines were to be attached to pipe hanger 47A435-1-13. The lines were reinstalled to pipe hanger 47A435-1-13 by MR A-533890.
 11. Two concerns were expressed that were too ambiguous to allow a meaningful evaluation to be conducted. Concern IN-86-300-004 stated: "Hanger attachment may have been installed in an indeterminate condition" and concern IN-86-029-001 stated: "items not supported in accordance with specifications" were not specific enough to perform an evaluation, and additional information was not found in the expurgated files.
- D. The evaluation of the perceived problems stated in concern IN-85-461-001 was performed by investigating the use of the 47A050 series hanger drawing general notes as over-riding supplements to pipe support drawings and by investigating the acceptance of hanger installations by quality control supervisors after the installation had been turned down by an inspector.

The 47A050 series of notes were intended to be used as a supplement to the drawings. This was stated on drawing 47A050-1. These notes provided tolerances, acceptable installation alternatives, specific installation criteria, and acceptable material substitutions for pipe, electrical and instrumentation hangers/supports.

A quality control supervisor could over-ride an inspector's inspection of a hanger. At that point the supervisor signed the documentation taking full responsibility for the installation.

During the evaluation of this concern, one inspection document was found to be deficient. The concrete anchor bolt thread engagement documentation for pipe hanger 1-68-356 was found to be in violation of WBN-QCP-1.42-2 and WBN-QCI-1.02. One self-drilling concrete anchor was checked for thread engagement and was deficient of the criteria specified in QCP-1.42-2. The other three anchors were required to be checked by QCP-1.42-2 but were not. No DNE concurrence was obtained by QCI-1.02.

4.3.2 Site-Specific - WBN (continued)

Conclusions

Based on the above findings for WBN, the following conclusions were determined.

- A. The perceived problems on the insufficient issue and revision of hanger/support documentation were found to be as described below.
1. Instrument supports being inadequately documented was a factual concern with corrective actions being initiated before the ECTG evaluation. These discrepancies were accepted by NCR W-334-P. (CATD 11103-WBN-03)
 2. The EEU being deficient in the content and clarity of variances was factual. The unit has committed to improve the quality of their variances.
 3. Cable tray supports modified without the issuance of FCRs was factual with corrective actions being initiated before the ECTG evaluation. The problem was resolved by established site procedures when NCR 5737 was written in 1984. The unit 1 and common areas of the NCR were closed by release 5737 R1-01 with a high deficiency rate such that the adequacy of the cable tray supports not reviewed were still questionable. (CATD 11103-WBN-08)
 4. The documentation problems with the duct supports was factual. The "as-configured" typical support numbers found during QIC's investigation were not properly transferred. These discrepancies had been corrected by DNC by NCR 6357/SCR 6357-S (closed in September, 1986); but the discrepancies found during this investigation need further investigation, evaluation, and correction. (CATD 11103-WBN-06)
 5. DNE not enforcing inspection criteria for non-safety, non-seismic supports was a factual statement. DNE provided criteria for DNC to use during the inspection process of supports that fell within the scope of the QA program. However, specific installation requirements were found to exist in G-32 that applied to all concrete anchor bolt

4.3.2 Site-Specific - WBN (continued)

installations. Deviations from these requirements required DNE approval. For QA installations and some non-QA installations, site procedures existed to obtain the DNE approval of the deviations. The majority of the non-QA supports, on the other hand, did not have a mechanism to obtain the required DNE approval. The adequacy of the non-QA installations with respect to the G-32 installation requirements was questionable to WBN DNC.

A condition adverse to safety did not exist since the failure of a non-QA support would not affect plant operation. Also, any changes to G-32 resulting from DNE's Civil Engineering Branch (CEB) review of this issue will require a review and change to the anchor installation programs at BLN, SQN, and WBN.
(CATD 11103-WBN-07)

- B. Unnecessary scrapping of support material was factual. TVA policies, practices and procedures for scrapping material are addressed by Material Control and Management and Personnel Subcategory Reports.
- C. The perceived problems on the general installation of hangers/supports were found to be as described below.
 - 1. The question about lug placement on pipe was factual, but the mismatch was acceptable since DNE specified lug placement tolerances in the specifications.
 - 2. The concern about the pipes riding on lugs in penetrations or sleeves was factual for some lugs welded to the RHR pipe. Corrective action was required, and DNE is evaluating the problem through NCR 6634, NCR 6907, SCR 6634-S, and SCR 6907-S.
(CATD 11103-WBN-04)
 - 3. A meaningful evaluation could not be performed on the issue of cable tray supports not being built according to specification. The example of cable tray supports with holes burned in the I-beam material used in the supports was not factual since I-beam material was not used in the supports.

4.3.2 Site-Specific - WBN (continued)

4. The concern on supports being installed without approved FCRs or variances was factual, but this practice was acceptable according to site procedures. This practice has been discontinued by memorandum from the Manager of Engineering Design.
5. The question on the adequacy of the main steam bypass line supports was not factual since no main steam bypass line was found.
6. The question on conduit being supported by wire was factual, but this practice was acceptable when used as a temporary practice during construction activities.
7. The concern about the readability of hanger identification tags was factual. The ability to read the hanger identification tag was of little or no consequence since three other methods to identify a hanger were available.
8. The question about using outdated drawings during hanger installation was not factual. The hanger in question was installed and documented to the latest revision of the DNE approved drawing at the time of this evaluation.
9. The concern on traceability of instrumentation support documentation (IOS and FOS) was factual. NCR W-334-P accepted past installations, and the instrumentation support documentation program has been changed to insure that traceability will occur in the future.
10. The concern on stainless steel lines with no straps was factual. This condition was corrected when the lines were reattached to pipe hanger 47A435-1-13 by MR A-533890.
11. Two concerns were not factual because of being ambiguously expressed.

4.3.2 Site-Specific - WBN (continued)

- D. The use of the 47A050 series notes as over-riding supplements to pipe support drawings, and quality control supervisors accepting installations after being failed by an inspector were factual concerns. Both were acceptable. A statement on 47A050-1 allowed the notes to be a supplement to the general notes found on each drawing series, and the supervisor took full responsibility for his/her over-riding inspections.

The deficient documentation for pipe hanger 1-68-356 required corrective action to be taken to correct the deficient anchor inspections. (CATD 11103-WBN-05)

The conclusions from the findings on "Methods Used During Installation" indicate that conditions adverse to quality did not exist for the concerns except for the lug material used on the RHR pipe and the deficient documentation for pipe hanger 1-68-356. Upon the completion of their respective corrective actions (described in section 7.2), these problems will no longer be conditions adverse to quality.

4.3.3 Site-Specific - SQN

Discussion

Concern XX-85-070-007 was expressed addressing 115 snubbers in SQN unit 2 that were not installed in accordance with the design drawings. Discussions with a knowledgeable person in the Modifications Group revealed that the only instance where this might be a problem would be in the 47A053 series typical support drawings which involve snubbers. These drawings were used in both units, and it was often necessary to deviate from the typical configuration to achieve a constructible configuration. When this was done, a support variance was issued by construction and approved by design. Some of these variance sketches had been lost, and the supports were not easily identified in the field. As a result, ECN 6237 was issued requiring all 47A053 typical snubber supports to be "as-built" and evaluated by design. A discussion with the Mechanical Maintenance Unit personnel (responsible for the "as-building" of these supports) revealed that this work was

4.3.3 Site-Specific - SQN (continued)

being done by WP11287, and all drawings have been "as-built" and sent to DNE for their evaluation. A review of ECN 6237 and WP11287 revealed that this condition was identified in September 1984 and involved 128 supports for each unit. This timeframe and quantity of supports closely match that expressed in the concern. The completion of the field work associated with this "as-built" program is required before the restart of SQN.

Conclusion

The concern on the snubbers not being installed in accordance with the DNE drawings was factual. The 47A053 snubber support typicals were not always followed. However, this was documented during the construction phase by support variances. In September 1984 it was determined to be necessary to "as-built" these typicals because of missing documentation (reference ECN 6237). This work is currently in progress, and all snubber rework, as determined by DNE, will be completed before restart. No condition adverse to quality exists. (CATD 11103-SQN-02)

4.3.4 Site-Specific - BLN

Discussion

During the evaluation on handling of snubbers, a possible problem with the reuse of discarded pipe hanger material was identified. The specific area of concern was the possibility of base metal damage occurring during the removal of tack welds used when the pipe hanger was preassembled in the fab shop. The base metal in the removal area was not inspected before the members were used in new installations.

Site procedures BNP-QCP-10.6 allowed temporary fitup welds to be removed without a Work Release (section 6.2.3.3). Also, a Work Release was not required when temporary or permanent fitup welds are made by a certified welder in accordance with the detail weld procedure assigned to the associated weld joint (section 6.2.4.2.4). When the original pipe hanger was to be installed a specific detail weld procedure was assigned for each joint such that installation and removal of fitup tack welds was acceptable. However, when the pipe hanger was discarded, sections 6.2.4.2.4 and 6.2.3.3 were no longer applicable for the tack welded joints. These welds would have to be considered a temporary construction weld and would require a Work Release so that the removal area would be inspected for possible base metal damage (section 6.2.3.1 and BNP-QCP-7.5, section 6.1.3).

4.3.4 Site-Specific - BLN (continued)

During a conversation with the Welding Engineering Unit (WEU) supervisor, the problem was acknowledged and appropriate steps to resolve the problem was indicated. Revision Request (RR)-BNP-1061 to BNP-QCP-10.12 was issued detailing a procedure to be used on all future uses of members reused from discarded pipe hangers. Also, all new pipe hanger fabrications are being banded together instead of being tack welded into a preassembled configuration.

Conclusion

The perceived problem of possible base metal damage not being inspected when the tack welds holding members of discarded pipe hangers were removed was factual. The procedures have been revised specifying steps to be taken for future removals, but past removals need to be evaluated by DNE. (CATD 11103-BLN-02)

4.4 Post Installation Conditions

4.4.1 Generic

Not applicable.

4.4.2 Site-Specific - WBN

Discussion

- A. Field investigations performed by QTC, NSB, and WBN ECTG failed to identify the existence of loose or missing bolts in supports as expressed in concern IN-85-069-001 and IN-86-043-001. However, some bolts were found to have broken torque stripe as expressed in concern IN-85-625-001. NSB's walkdown, initiated by this concern, revealed 19 out of 800 bolts with broken torque stripe. WBN ECTG's investigation revealed 3 out of 432 bolts with broken torque stripe. All bolts were in unistrut clamps, and the bolts were tight.

NCR 6194 was generated to document the 19 bolts found during the NSB walkdown. These bolts were retorqued in accordance with WBN-QCP-4.23-8. A review of the 47A050 series hanger drawing general notes, Construction Specification G-43, and N3C-912 revealed no upper-tier requirements for the application of torque stripe. This was a WBN imposed requirement to aid in identifying

4.4.2 Site-Specific - WBN (continued)

possible unauthorized work on hangers and in identifying hangers which had been finalized. The presence of torque stripe did not enhance the quality of a support. According to WBN-QCI-1.02, a violation of a procedure not affecting quality was not a nonconforming condition. Therefore, missing or broken torque stripe was not a nonconforming condition; but, missing or loose bolts was a nonconforming condition.

The fact that this evaluation, as well as QTC's and NSB's evaluations, did not reveal any loose and/or missing bolts did not preclude that loose and/or missing bolts existed at WBN. A review of the NCR log revealed 11 separate NCRs, written from August 1984 to March 1986, addressing loose and/or missing bolts. This condition has been a problem and continued emphasis should be placed on this subject to prevent recurrence.

- B. Concerns IN-85-250-001 and IN-85-458-004 addressed unauthorized removal of supports in system 32 in January or February 1985 and system 68 in late 1984, respectively. The first of these concerns was investigated by NSRS (reference Report I-85-710-WBN) and the removal was found to be unauthorized. However, this unauthorized work was previously identified on NCRs 6091, 6135, and 6149. The second concern required interviewing the responsible engineer to determine what kind of work was being done on System 68 in late 1984. According to the responsible engineer, several supports were removed by the Office of Nuclear Power in order to provide access for work on some valves during the timeframe. It was unclear who removed the supports and why they were removed. Further investigation into this work and interviews with the responsible engineer revealed that this work was performed from October 20, 1984 to January 21, 1985. All removal and reinstallation of the supports was documented on MR 408957, 489700, 489620, 480176, 480172, and 480171. Because of the lack of any further information, the above work was considered to be the same as that referred to in the concern and was appropriately authorized/documented.

4.4.2 Site-Specific - WBN (continued)

- C. Concerns EX-85-121-001 and IN-85-672-004 relating to excessive amounts of hanger rework were expressed. The one main cause of this was reanalysis by DNE. Reanalysis often increased or decreased the loads on supports, sometimes to the point that supports required reconfiguring or deleting. Reconfigured supports were replaced by the new configuration and deleted supports were simply removed.
- D. Concerns IN-86-200-005 and IN-85-349-001 questioned the adequacy of two installed supports. The first mentioned that a unistrut hanger was pulled away from its embed and the other specified a pipe hanger was not installed properly. Both areas mentioned were reviewed. No unistrut hanger was found pulled away from its embed. The pipe hanger was installed according to its DNE drawing.

Conclusion

- A. Loose and/or missing bolts was not factual; but, missing or damaged torque stripe on the bolts was factual. This was of no consequence, since there was no upper-tier requirements for torque stripe.
- B. The unauthorized removal of supports on system 32 was factual and was corrected by existing site procedures. The unauthorized removal of supports on system 68 was not factual since the removals were authorized by MRs.
- C. Excessive rework of hangers was a factual statement. However, all hanger installations were controlled by DNE and rework was required when specified by them.
- D. The concerns on the unistrut hanger being pulled away from its embed and the pipe support not being installed properly were not factual. No unistrut hanger was found pulled away from an embed, and the pipe hanger was installed according to the drawing.

In all the above cases, conditions adverse to quality did not exist.

4.4.3 Site-Specific - BLN

Discussion

- A. Concern BNP QCP 10.35-6 addressed a perceived problem involving installation of tube steel members with deficient wall thickness. Tube steel 4x4x0.25 used for duct supports was specifically questioned. A review of ASTM A500 revealed that a plus or minus (+) 10 percent mill tolerance was allowed for the wall thickness for tube steel shapes.

NCR 4618 was written for audit deviation BL-A-86-02-D-01 which identified tube steel thickness inspections that were not performed because the tube steel ends were either capped or not accessible because of other interferences. An ultrasonic thickness gauge (D-Meter) was used to check the wall thickness for 182 tube steel members with 0.25-inch and 0.1875-inch thickness. The D-Meter results showed 26 of the 189 tube steel members to have deficient wall thicknesses. Of these, 25 were a 0.25-inch wall thickness and the other was a 0.1875-inch wall thickness. These results identified a problem with the 0.25-inch thick tube steel shapes such that NCR 4658 was issued to sample all 0.25-inch tube steel shapes in the warehouse yard.

The results of NCR 4658, based on a test sample of 30 members, revealed that the average thickness was 0.242-inches. Also, a test for reduction in tube steel wall thickness caused by sandblasting was performed with the average reduction being 0.007-inches. Therefore, the average thickness after sandblasting of the sample members would be 0.235-inches.

NCR 4658 was being reviewed by DNE. The responsible engineer for the NCR indicated the NCR would probably be dispositioned "Use-As-Is" because of the reduction in tube steel thickness being caused by impurities, slag pockets, and sandblasting.

4.4.3 Site-Specific - BLN (continued)

- B. Concern BNP QCP 10.35-14 addressed a perceived problem of embedded plate concrete anchors being damaged during the welding of stiffeners onto the embedded plate's outer face. Visual examination of the embedded plates supporting cable tray supports MK 6WA and MK 6WEA (on drawing 4DW0760-X2-04, revision 10) indicated that the heat produced by welding stiffener plates caused the embedded plates to expand and spall the concrete around the edges. The spalled concrete has been repaired. Also, an ultrasonic examination of the plate was performed by Welding Quality Control, and no damage to the embedded concrete anchors was found.

The evaluation performed for this concern was reviewed with the concerned individuals on February 26, 1986, and they believed that their concerns had been adequately addressed.

Conclusion

Some tube steel members used in duct supports did not meet the wall thickness requirements specified in ASTM A500. 189 members were checked with a D-Meter with 26 failures found. A sampling of all 0.25-inch thick tube steel in the warehouse, along with the results of a wall thickness reduction test caused by sandblasting, resulted in the wall thickness being reduced to an average of 0.235-inches. DNE was in the process of evaluating and dispositioning NCRs 4618 and 4658. (CATD 11104-BLN-01)

The visual damage to the concrete around the edges of the embedded plates apparently led the concerned individuals to question the adequacy of the embedded anchors on the backside of the plates. The ultrasonic examinations performed on the plates verified the adequacy of the anchors such that the concern was not factual. No condition adverse to quality existed. Concrete spalling is also addressed in Construction Subcategory 10200.

4.5 Use of Specifications

4.5.1 Generic

Not applicable.

4.5.2 Site-Specific - WBN

Discussion

Employee concerns EX-85-061-005, IN-85-600-003, and IN-86-118-001 addressed perceived problems about the use of specifications. The specification identified was the 47A050 series hanger drawing general notes with the availability of and training for the craftsman being the perceived problem.

The responsible craft superintendent was interviewed on this matter and gave the following history: Early in the hanger program (1978-80), the craftsmen were not given formal training on specifications and had only limited access to specification notes. As the program continued, it became evident that this was a shortcoming. This shortcoming was corrected by allowing foremen to request controlled copies of the 47A050 notes. Four foremen requested and received copies at that time. According to the current distribution list in the Drawing Distribution Center, there were 24 copies of the 47A050 notes issued to the craft. The steamfitter craft were issued 8 copies, electricians were issued 10 copies, and sheetmetal were issued 6 copies. The present general understanding among craft is, if the need arises for additional sets of these notes, they can be obtained by request of the craft superintendent.

In September 1985, a training class was conducted on the 47A050 notes for foremen and their assistants (dual rates). According to the responsible individual in charge of training, and additional training classes will be conducted as revisions to the notes are made which dictate the need for additional classes.

On January 1, 1981, the hanger program invalidated all previously documented hangers. All of these installations were required to be reworked to the latest revision of the applicable DNE drawing and reinspected to the acceptance criteria in affect at that time.

The review of line management's response to concern IN-86-118-001 showed that they concur with the findings stated above.

4.5.2 Site-Specific - WBN (continued)

Conclusion

Based on the above findings, the concerns of this element were not factual with respect to the current availability of the hanger/support specifications. The fact that these specifications were not readily available to the craft during the period from 1978 to 1980 and that training of the craft to these notes was not conducted was factual. All supports have been reinspected since 1980, because of insufficient inspections and documentation, and corrected as required. Therefore, the quality of the supports was not compromised as a result of the lack of training and availability of specifications in the past. No condition adverse to quality existed.

4.6 Hanger Inspection Documentation

4.6.1 Generic

Not applicable

4.6.2 Site-Specific-SQN

Discussion

The review of NSRS Investigation Reports I-85-695-SQN and I-85-709-SQN, generated by investigations for concerns XX-85-053-001 and XX-85-053-002, revealed that in the subject timeframe construction management revised procedures and instructions to utilize various computer programs as a method of indicating inspection, test, and operating status of plant features.

This allowed engineering evaluations to be performed on inspections completed under previous procedures. These evaluations were based on the guidelines in Standard Operating Procedure (SOP) Number 551.

It was determined by reviewing site procedures for the subject timeframe:

1. In 1977 the SQN procedures and instructions were revised to utilize computer programs as the methods of indicating inspection, test, and operating status of plant features.

4.6.2 Site-Specific-SQN (continued)

2. SNP-CP P-8 required features that had been completed and inspected by previous procedures to be evaluated in terms of current inspection instructions. Where equivalent activities were performed the responsible engineering unit was to provide written justification to indicate satisfactory completion of the requirements. When current requirements differed from those in effect at the time of installation, the feature was to be evaluated to determine its acceptability. Where evidence of satisfactory acceptance could be shown it was to be documented. When insufficient evidence existed the feature in question was to be noted as nonconforming.
3. SNP-SOP-Number 551 addressed engineering evaluations. This procedure was initially issued in 1977 and sited three basic methods of performing engineering evaluations.
 - a. Evaluation and acceptance of existing record - required a written, signed evaluation attachment to record.
 - b. Perform a reinspection and new documentation.
 - c. When a. or b. above would not satisfy the requirements, a NCR would be generated.

Revision 2 of this SOP was issued November 28, 1978. This revision added a policy statement as attachment "F." This policy statement is shown below.

Policy Statement

Structural Welds

Structural welding on miscellaneous steel, protective devices, rupture restraints, and hangers and supports has been inspected and documented through the use of individual inspection records, log entries, notation on the item, and notation on the drawings. These records are not traceable to specific features or weld joints in all cases as required by the present program and in cases where documentation was not prepared, the record has been obliterated by subsequent painting. The program in effect at that time required verification of welding inspection before painting.

4.6.2 Site-Specific-SQN (continued)

In order to assure the required quality, such welds will be identified in lots and representative samples reinspected for fillet size, length and general appearance. The required II-75 inspections can then be satisfied by the methods described in SNP CP No. I-24.

Expansion Anchors

Some anchors are not traceable to a lot. Where this condition exists, areas may be divided into lots, total number of anchors counted, and compared to the records of anchors tested in that area. If the records show 10 percent or more of the total anchors have been tested, this is considered satisfactory. If less than 10 percent of the total was tested, then additional tests should be performed to achieve the 10 percent minimum.

- C. It was found by reviewing the Hanger General Notes and the hanger typical drawings that some supports with bolt anchor installations could have the bolt anchors deleted and be welded. Drawings 47A056-40A, revision 0, 47A056-3, revision 0, and 47A053-150, revision 0 are examples of this type of optional installation.
- D. It was found by reviewing the documentation on engineering evaluations for 20 pipe supports and 20 conduit supports in the subject timeframe, that the following was used:
 - 1. The evaluation was based on past documentation. The past documentation met the requirements at the time of the evaluation. In these cases the past documentation was with the evaluation attachment.
 - 2. The evaluation was based on past documentation. The past documentation that did not meet the requirements at the time of the evaluation but was acceptable and satisfied licensing commitments. In these cases the past documentation was with the evaluation attachment.
 - 3. The evaluation attachment contained a statement that indicated the basis for the evaluation was the policy statement on attachment F of SOP Number 551, or referenced a memorandum that was attached. This memorandum contained a statement similar to the policy statement in the SOP. Past documentation was not always with these evaluations.

4.6.2 Site-Specific-SQN (continued)

- E. It was learned from the interviews that in the subject timeframe a group was formed at SQN that routinely performed engineering evaluations according to the procedures. Some of these evaluations were made for anchor installation as shown in D-3 above. These evaluations were made without visual examination of the hanger and examination of the hardware was not required.

CONCLUSIONS

Since this evaluation addressed more than one perceived problem below is a list of perceived problems and findings.

1. Perceived Problem (Concern XX-85-053-002)

Engineering evaluations were not performed properly on pipe and conduit supports, the hardware was not always examined.

Finding

Engineering evaluations were done in accordance with site procedures. These evaluations were done to verify that the necessary inspections had been performed. This perceived problem was factual but not a problem.

2. Perceived Problem (Concern XX-85-053-001)

Cases of missing documentation were evaluated away. Where 10 percent of the documentation was not found, inspections/ tests were only re-done to the extent necessary to reach 10 percent.

Finding

Evaluations were done for bolt anchor inspections where the anchors were not traceable to a lot based on records showing 10 percent of the anchors in the area being tested. If less than 10 percent of the total was tested, then additional tests were performed to achieve the 10 percent minimum. This was done in accordance with the policy statement in SOP-Number 551 or a similar statement in a memorandum, similar evaluations were used for welds. DNE needs to determine the acceptability of these evaluations. (CATD 11106-SQN-01).

5.0 COLLECTIVE SIGNIFICANCE

5.1 Collective Significance of Each Issue

5.1.1 Contact Between Dissimilar Metals

Based on the fact that the issue was factual but not a problem, the existing programs and procedures were adequate with regards to carbon steel contacting stainless steel with only carbozinc paint as the protective barrier between them. The two side issues were only isolated problems and indicated a weakness by site management in maintaining site procedures up-to-date.

5.1.2 Design Output

The four subissues on design output indicated that the DNE review program of design output documents and criteria was inadequate. For instance, DNE provided incorrect bolt tightening requirements for unistrut clamp bolts to DNC, and DNE allowed DNC to field fabricate replacements for vendor parts without supportive calculations. Both cases occurred at WBN and could have caused the affected systems, supported by the clamps or field fabricated parts, to be inoperable during a seismic event. More time spent in review of output information by DNE would have resulted in less errors being issued for installation purposes. Upon completion of the required corrective actions, conditions adverse to plant safety will not exist.

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5.1.3 Methods Used During Installation

The six subissues contained in this main issue addressed several areas of importance with respect to the DNE and site organizations within TVA's nuclear division. First, DNE did not recognize the potential effects that could have occurred from inaccurate, incomplete, or vague output documents or criteria. Again, the inadequacies resulted from a poor review program and possibly a lack of understanding in the needs of the site organizations. Such problems as capping vertical tube steel members installed outdoors or handling and installation of snubbers arose because of these types of inadequacies by DNE. On the other hand, site organizations did not help DNE with these problems based on the methods utilized in an attempt to correct them. Obtaining vendor catalogs and incorporating only portions of the necessary vendor requirements and initiating FCRs to add cap plates did not correct potentially inadequate installations.

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|R3

5.1.3 Method Used During Installation (continued)

Secondly, DNC management did not adequately review site personnel work activities or compliance to site procedures. Procedural violations, deficient and incomplete work activities resulted. Such problems as support variance content and clarity, cable tray supports being documented without FCRs indicating modifications, duct supports being installed and documented to a different typical than that shown on the DNE drawing, and instrumentation support documentation discrepancies resulted in a poor surveillance program by DNC management. |R3

Thirdly, the existing site programs and procedures were found to be adequate. Several problems had been identified before the concern was voiced with corrective actions initiated. NCRs, SCRs, and ECNs had been initiated to correct such problems as instrumentation support problems, incorrect material installed as pipe lugs, and installed snubbers with lost documentation illustrated the adequacy of the existing procedures. Also, several perceived problems were found to be either factual and not a problem or not factual. These indicated a lack of understanding on the part of the CI to the existing programs or procedures. These programs and procedures, again, were adequate.

5.1.4 Post Installation Conditions

The six subissues evaluated indicated that the existing programs or procedures were adequate for the majority of the problems voiced. Some instances were found that displayed flaws in these programs but did not suggest programmatic problems existed. The problems found had already been identified and corrective actions begun and/or completed. Again, those perceived problems that were factual and not a problem or not factual signified a lack of understanding or knowledge on the part of the CI.

5.1.5 Use of Specifications

During the early stages of the hanger/support program at WBN, the availability of general notes and criteria to craft personnel was limited. However, as the program grew, site management recognized the fact that a better quality product could be produced by craftsmen that were better informed and trained. Availability and training of the notes and criteria was provided such that the overall hanger/support program was enhanced.

5.1.6 Hanger Inspection Documentation

SQN site management established a site program to perform engineering evaluations on installations previously completed. However, the procedure to be used was different from the DNE upper-tier criteria, and the responsible SQN site management did not obtain DNE approval of this procedure.

5.2 Collective Significance of the Subcategory

The subcategory findings of the major issues were limited to specific areas of the hanger/support program and did not attempt to evaluate the entire program. This type of evaluation was based on specific areas or examples identified by the 46 concerns voiced about hangers/supports. Five of the the six major findings displayed areas in which the existing programs and procedures were adequate. Problems or errors had been found and corrected, or were in the process of being corrected, using established procedures. Also, cases where the CI did not know or understand established programs and procedures surfaced. This further substantiates the adequacy of the hanger/support program. |R3 |

Three of the six major issues displayed areas with isolated deficiencies that when grouped together indicated possible programmatic weaknesses. The findings in the area of DNE output pointed out weaknesses in the DNE review program of design output documents. The findings concerning the capping of tube steel supports indicated a weakness in DNE feedback of the deficiency when complete corrective actions did not occur for all nuclear sites. And the findings on missing snubber criteria resulted from a weakness in the communication channels between DNE and site organizations.

No major program deficiencies were revealed through this evaluation. Upon completion of all the identified corrective actions, conditions adverse to plant safety will not exist.

6.0 CAUSES

The following is a summary of the causes for the issues discussed in the findings of this subcategory report.

6.1 Contact Between Dissimilar Metals

6.1.1 Generic

No generic causes were determined.

6.1.2 Site-Specific - WBN

The confusion over the use of inorganic zinc paint in lieu of stainless steel shims between carbon steel supports and stainless steel pipe indicated a lack of knowledge of TVA specifications, procedures, and documents by the CI. This lack of knowledge was based on the amount of information contained in and the lack of a cross-reference between specifications, procedures, and documents. Also, the confusion over the wearing through or hand rubbing off of the paint was attributed to a lack of knowledge of the paint's properties.

6.1.3 Site-Specific - SQN

As discussed in section 6.1.2 above, the cause for the concerns at SQN for this element was the same. Also, the installation of the black cosmetic coat of paint over the inorganic zinc paint and the existing procedural problems found during the evaluation indicated a failure by management and personnel to recognize inadequacies in procedures.

6.2 Design Output

6.2.1 Generic

No generic causes were determined.

6.2.2 Site-Specific - WBN

The problems with the hanger locations, bolt-tightening requirements, and conduit typical support drawings was attributed to inadequate DNE output.

The problem with the method used to identify supports was caused by a lack of knowledge of TVA procedures by the CI.

The field fabrication of replacements for vendor parts by DNC without supportive calculations by DNE was a failure by DNE to understand the ramifications of the usage of notes 49, 54, and 102 of the 47A050 notes by DNC.

6.3 Methods Used During Installations

6.3.1 Generic

Tube steel members required for outdoor installations were not capped because of DNE's failure to realize the environmental effects on the installed members. Also, a lack of communication between the design projects allowed the problem to exist at BLN and SQN after initial identification at WBN in May 1984. Failure to correct past tube steel installations at WBN was a failure by DNC management to fully implement all necessary corrective actions.

The deficient snubber program was attributed to DNE not including criteria in specifications. Also, DNE did not control vendor documents to the sites, and site organizations did not fully include vendor recommendations, when obtained, in site procedures.

6.3.2 Site-Specific - WBN

Several causes are evident from the problems contained in these elements. They are as follows:

1. Failure to follow procedures by DNC engineering personnel caused the instrumentation supports to be installed without variances and cable tray supports to be modified without FCRs.
2. Employee error or carelessness resulted in poor quality support variances being sent to DNE by DNC, duct typical support numbers being incorrectly incorporated on the ductwork drawings, and the stainless steel lines not being properly attached to the pipe support.
3. Lack of knowledge or understanding of specifications, procedures, and documents caused the concerns on improper lug placement, installing hangers with unapproved FCRs and variances, not being able to read hanger identification tag plates due to paint and insulation, misreading the revision and revision date on the issued hanger drawing, the 47A050 notes being over-riding supplements to other hanger drawing, conduit being temporarily supported by wire, and supports being installed in an indeterminate condition or not in accordance with the specifications.

6.3.2 Site-Specific - WBN (continued)

4. Improper review and checking of drawing information by DNE and DNC's failure to properly upgrade material allowed incorrect material to be welded to the RHR pipe.
5. Failure by DNC site management to recognize procedural inadequacies created the problem of insufficient FOS and IOS documentation on instrumentation supports and the scope of G-32 not being followed for the inspection of anchors in hardened concrete in non-QA structures. |R3
6. Causes for unnecessary scrapping of support material is addressed in Subcategory Report 71101, Materials. Other causes on cable tray support installations are addressed in subcategory reports 10400, 11300, 50600, and 80200.
7. No cause could be determined for the concern of the main steam bypass line supports since no main steam bypass line existed, and cable tray supports with holes burned in the "I-beam" members since "I-beam" members were not used. |R3

6.3.3 Site-Specific - SQN

The supports with snubbers not being installed in accordance with the design drawings was caused by employee carelessness or error.

6.4 Post Installation Conditions

6.4.1 Generic

No generic causes were determined.

6.4.2 Site-Specific - WBN

- A. No causes could be determined for loose or missing pipe clamp and duct support bolts since none were found. But the missing or damaged torque stripe could be attributed to one or a combination of the following: failure to properly apply the stripe material, associated construction activities in the adjacent areas, and unauthorized work being performed.

6.4.2 Site-Specific - WBN (continued)

- B. The unauthorized removal of system 32 supports was caused by either a lack of knowledge or failure to follow site procedures. Also, a lack of understanding of site procedures caused the concerned individual to believe that the system 68 hanger removals were unauthorized.
- C. Reanalysis by DNE caused the rework of hangers/supports.
- D. No causes were determined for the unistrut hanger being pulled away from its embed and the pipe hanger not being installed properly as these subissues were not factual.

6.4.3 Site-Specific - BLN

- A. The problem of tube steel with deficient wall thickness being installed as duct supports was a result of a combination of the following: Tube steel manufacturer using the 10-percent tolerance, tube steel being stored for long periods of time without protective paint, and sandblasting operations to remove rust, mill scale, or slag pockets. Also, once the tube steel members were installed, insufficient inspections allowed the suspect tube steel members to be documented as acceptable installations.
- B. The spalling of the concrete around the edges of the embedded plate caused the concern about the adequacy of the embedded concrete anchors on the back of the plate.

6.5 Use of Specification

6.5.1 Generic

No generic causes were determined.

6.5.2 Site-Specific - WBN

The lack of availability and training of the 47A050 series hanger drawing general notes was a failure of management to recognize the need for craftsman to understand the specifications and procedures governing hanger/support installations.