2.3.1 Contact Between Dissimilar Metals (continued)

paint, in lieu of the stainless steel shim, as an acceptable alternative. The second part of the perceived problem involved the wearing through or hand rubbing off of the paint when it was used. This part was determined as not being factual. Field investigations performed by NSRS, QTC, and a SQN Quality Assurance (QA) group failed to find any occurrences of the paint being worn through or being able to be rubbed off by hand. Also, the NSRS report stated that the inorganic zinc paint will display a polished or bare metal look when rubbed and that it can only be removed by a solvent or a wire brush.

Two side issues were found during the investigation of this element at SQN. The first one was the application of a cosmetic black paint over the inorganic zinc paint. SQN procedure SQA-160 was revised to allow this application case to occur. The second one involved SQN procedure TI-70 referring to a section in SQA-45 that did not exist. This issue has not been corrected.

2.3.2 Design Output

Four main issues were identified as possible problems with design output information. They are summarized as follows:

A. The first issue was factual, but a condition adverse to quality did not exist. The A-size hanger drawing did not match the analysis isometric drawing. This mismatch affected the location of individual pipe hangers. When a mismatch occurred between the two drawings, DNC submitted a Field Change Request (FCR) to DNE to make the two drawings agree. DNE either approved the location as shown on the FCR or specified a location within DNC's location tolerance of the A-size location.

B. The second issue was factual, but a condition adverse to quality did not exist. DNE failed to provide DNC with correct bolt tightening requirements for unistrut clamp bolts. NCR WBN CEB 8501 was written for this issue, and a sampling program was instituted to torque test unistrut clamp bolts. Approximately 40 percent of the sample failed the required torque test; but, DNE qualified all installations by testing the worst-case failures to their respective actual design loads. Also, DNE has provided DNC with additional clarification on bolt tightening requirements.

2.3.2 Design Output (continued)

Since this evaluation was performed, a separate evaluation has been performed for ECTG Engineering Subcategory Report 22800. This evaluation determined discrepancies with DNE's portion of NCR WBNCEB 8501 such that additional corrective actions were required.

C. The third issue was on two different examples or perceived problems dealing with DNE issuing or providing inadequately designed supports. The first dealt with specific supports containing three separate numbers and was not factual. Upon a field investigation of the area in question, a single support structure was found with three different pipe being supported. This type of support is known as a multiple or gang hanger and is commonly used in the nuclear industry.

The second was factual, and dealt with conduit typical support drawing 47A056-85. DNE initiated Significant Condition Report (SCR) WBN CEB 8520 to correct the typical drawing because of some incorrect design assumptions. The unit 1 supports were revised in accordance with Engineering Change Notice (ECN) 5885, and all rework was completed by Workplan (WP) E-5885-1. The unit 2 supports were being revised and reworked by the Electrical Engineering Unit (EEU) with help from DNE onsite. DNE has taken the appropriate steps to correct the problem.

D. The last issue dealt with the authorization given by DNE for DNC to field fabricate replacement components or parts for vendor (Bergen Patterson [BP]) components or parts. WBN DNC field fabricated replacement parts using notes 49, 54, and 102 of the 47A050 series hanger drawing general notes. These fabrications were made using details shown in various BP catalogs so that the replacement parts would match the original BP part as closely as possible. DNE, on the other hand, never anticipated DNC's usage of the notes and did not perform the necessary calculations to qualify the fabrications, except for threaded rods. Currently, all field fabrication of replacement parts similar to BP parts is performed only after approval by DNE. This issue was factual for past field fabrications only. Corrective action for these fabrications is still in progress at this time.

2.3.2 Design Output (continued)

Also, the field fabrication of replacements for vendor parts was determined to be generically applicable to SQN because of the similarity of the 47A050 notes at WBN and SQN. No specific notes referring to field fabrications were found resulting in this issue not being factual at SQN.

2.3.3 Methods Used During Installation

Six main issues were identified as possible problems in this element. The first two discussed have generic applications at all four TVA nuclear plants while the other three are site-specific. They are summarized as follows:

A. The first issue was that all pipe hangers did not have the ends of the tube steel closed or capped. When this condition occurs on vertical tube steel members installed outdoors, water can collect inside the open tube steel causing the steel to rust during warm months or to crack during the freeze-thaw cycles of the cold months of the year.

Both WBN and BLN identified the issue by established TVA procedures before the employee concern was voiced. BLN corrected all installations and provided criteria for future installations in order to complete and close site-generated NCR 3992. WBN, on the other hand, provided criteria for installations after May 21, 1984, but failed to correct installations before May 21, 1984. WBN's capping criteria was by the addition of a note to the 47A050 series hanger drawing general notes (FCR MH-3426).

SQN did not identify the issue such that no criteria or requirements for capping tube steel existed. Several examples were found during a site walkdown by the SQN Generic Concern Task Force (GCTF) and the issue needs corrective action to be taken.

At BFN, the issue did not exist since tube steel was not used on any original outdoor installations. However, to prevent the problem from occurring, the DNE approved drawing will specify cap plates with specific details on the tube steel when required.

2.3.3 Methods Used During Installation (continued)

The issue of open ended vertical tube steel members was factual for installations at WBN and SQN. Corrective actions were required to be performed to prevent structural failures of outdoor vertical tube steel members. BFN did not have the problem, therefore the concern was not factual. BLN had the problem and corrected it such that the issue was factual and was corrected before this evaluation.

B. The second issue was that mechanical shock arrestors (snubbers) were not handled properly, adjusted, and installed in accordance with the manufacturer's recommended practices. Several examples in which snubbers appeared to be deficient to the CI were the lack of waterproof coverings, storing or transporting them uncompressed, and not holding the snubbers in a vertical position when adjusting the snubber paddles. All four of TVA's nuclear plants use snubbers to prevent seismic, earthquake, and shock forces from causing damaging motions in piping and related systems installed in the plants. These devices are very delicate and can be damaged by being dropped, stepped on, sandblasted and/or painted, stored and carried incorrectly, exposed to weather, etc. All four plants were determined to have problems with snubbers; but, all the plants had some form of inspection program to verify the operability of each one either during initial installation or during plant outages. Also, upper-tier document G-43 did not provide any installation or inspection requirements for the installation of snubbers such that the inadequacies in the site procedures occurred.

The problem was factual for all four plants, and corrective action is required for each one.

One side issue was identified during the evaluation on the handling of snubbers at BLN. This issue involved the removal of tack welds holding preassembled pipe hangers together. These removals were performed after the pipe hangers had been discarded and the members were then reused in new installations. A Work Release (WR) was not issued to allow the welds to be removed and the base metal was not inspected for possible damage.

2.3.3 Methods Used During Installation (continued)

Site procedure BNP-QCP-10.12 was being revised to detail steps to be used for future use of tack weld pipe hangers previously preassembled in the fab shop. Also, the preassembly of the pipe hangers in the fab shop has been discontinued.

C. The third issue was that hanger/support documentation was insufficient when issued or revised. Specific concerns identified five areas where insufficient documentation occurred.

1. The first area on instrumentation supports being installed and documented without variances was factual, and corrective actions were initiated before the ECTG evaluation. NCR W-334-P identified this deficiency and accepted past installations. The NCR will remain open until all instrument lines have been reworked and documented.

2. The second area which identified poor quality variance sketches was factual. DNE onsite requested, by informal memorandum, that all site engineering units provide better quality sketches. The EEU has committed, by informal memorandum, to train employees on preparing better quality sketches.

3. The third area on cable tray support changes being made without FCRs was factual, and corrective actions were initiated before the ECTG evaluation. NCR 5737 was generated in 1984 and required a walk down sample program of cable tray support installations by a task force. All deficiencies were dispositioned either to use "as-is", drawing revision required, or rework of the installation.

   An evaluation of NCR 5737 revealed that release 5737 R1-01 for unit 1 and common areas displayed a high deficiency rate for the 2700 supports reviewed. Based on this deficiency rate, the accuracy of the supports not walked down was also questionable.

2.3.3 Methods Used During Installation (continued)

4. The fourth area on substitution of different typical supports was factual. Some duct supports were installed and documented to a different typical than that shown on the DNE approved drawing. The WBN Engineering Procedure (EP)-43.14 specified that the support was installed to typical drawings along with the ductwork drawings. Upon completion of work, DNC "as-constructed" the ductwork drawings, and DNE incorporated this information onto the approved drawings. Discrepancies that occurred could be attributed to the failure to properly transfer the "as-constructed" typical support number to the design drawing. The evaluation by QTC identified two additional discrepancies which DNC corrected in September 1986. DNC issued NCR 6357 to walk down the area where the two discrepancies occurred. Generic implications of this problem were addressed by SCR 6357-S. An additional walk down was performed as a part of this evaluation, and two additional discrepancies were found which required corrective actions.

5. The fifth area on DNE failing to enforce inspection criteria for non-safety, non-seismic supports was factual. DNE did not enforce inspection criteria, rather DNE supplied the requirements to be used through construction specifications. DNC was responsible for the enforcement of inspection criteria for those supports contained in the WBN QA program. Non-safety, non-seismic supports did not fall within the WBN QA program and therefore did not have any inspection requirements. However, the installation section of TVA General Construction Specification G-32 contained specific requirements for the installation of all concrete bolt anchors, QA and non-QA. Deviations from the requirements required DNE approval, and no mechanism was found to exist to obtain DNE approval for deviations for most non-QA supports. This situation caused WBN DNC to be concerned that non-QA support installations were not checked to G-32 requirements.

2.3.3 Methods Used During Installation (continued)

Non-safety, non-seismic supports are such that if one fails it does not affect the safe operation of the plant. Therefore, the concern was factual as written and did not present a condition adverse to quality.

D. The fourth issue was on unnecessary scrapping of material. This concern was factual and not a problem since scrapping of material was a necessary action when DNE specified the hanger to be reworked. Material Control Subcategory 40300, Installation, as well as Management and Personnel Subcategory 71100 address the material scrapping program.

E. The fifth issue was on inadequate installation practices. Specific concerns identified 12 areas where inadequate installation practices were perceived to have occurred. The 12 areas are summarized as follows:

1. The first area questioning lug placement on pipe was factual and not a problem. Two general construction specifications and the applicable inspection procedure annotated the tolerances allowed for lug clearances to the pipe support. These tolerances would allow lugs to be installed in a manner that appeared to be improper.

2. The second area on pipes riding on lugs going through penetrations or sleeves not being corrected was factual. This was a commonly used type of support at WBN. A Residual Heat Removal (RHR) sleeve hanger with five sets of lugs installed on the pipe was the only problem found. The DNE approved drawings specified American Society of Testing and Materials (ASTM) lug material to be welded on American Society of Mechanical Engineers (ASME) pipe. NCR 6634 and SCR 6634-S were generated requiring a sample of the material heat welded to the pipe to be tested. A sample specimen could not be found. Therefore, NCR 6907/SCR-6907-S were issued for further evaluation by DNE.

3. The third area involving cable tray hangers/supports being installed in violation of procedures was too vague to perform a meaningful evaluation and was therefore not factual. The concern cited I-beams being installed with holes burned through instead of being drilled. This could not have happened since I-beams were not utilized in cable tray hangers/ supports. |R3

2.3.3 Methods Used During Installation (continued)

4. The fourth area about craftsmen performing installation activities to unapproved FCRs or variances was factual, but not a problem. WBN site procedures allowed installation activities to be performed until a hanger had been completely installed before obtaining formal approval of the FCR or variance by DNE. This practice was discontinued in April 1986 by memorandum from the Manager of Engineering Design. |R3

5. The fifth area questioning the adequacy of the supports on the main steam bypass line was not factual. This concern could not be addressed because there was no main steam bypass line.

6. The sixth area on conduit being supported by wire hangers was factual, but not a problem. This was an acceptable practice for temporarily supporting conduit during construction stages.

7. The seventh area questioning the lack of readability of hanger identification tag plates because of paint and insulation was factual, but not a problem. This was not an unusual occurrence at WBN and was of no consequence since the support could be identified by the analysis isometrics, field generated isometrics, and the physical piping drawings.

8. The eighth area on the usage of outdated drawings during the installation of hangers/supports was not factual. This concern was based on a visual observation made during the installation of pipe hanger 2-63-459. TVA had initially accepted the drawing in October 1977 from Engineering Design Services (EDS) but had revised it twice since that time. The pipe hanger was installed and documented to the latest revision of the drawing (October, 1985).

9. The ninth area questioning the traceability of instrumentation support documentation from the Fabrication Operation Sheet (FOS) to the Installation Operation Sheet (IOS) was factual, and corrective actions were initiated before the ECTG evaluation.

2.3.3 Methods Used During Installation (continued)

An investigation of documentation and procedures revealed that traceability between the two was nonexistent. NCR W-334-P on the instrumentation program accepted past discrepancies of the program even though the documentation problems on installed items still existed. This program has been changed such that traceability now exists between FOS documentation and IOS documentation.

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

10. The tenth area addressing problems with 115 installed snubbers in SQN unit 2 was factual, and corrective actions were initiated before the ECTG evaluation. The problem involved pipe supports with snubbers installed in accordance with the 47A053 series typical support drawings. When deviations to the typical drawing occurred, a variance to the typical drawing was initiated depicting the required changes and approved by DNE. Some of these variances were lost, and obvious deviations were not easily identified in the field. An as-built program was established with 128 supports in each unit involved. All of the as-built information has been sent to DNE and approval is required before the restart of SQN.

11. The eleventh area about stainless steel lines not being supported was factual. The lines were reattached to pipe hanger 47A435-1-13 by Maintenance Request (MR) A-533890.

12. The twelfth area included two concerns that as expressed were ambiguous and could not be investigated or evaluated. No further action was taken.

F. The sixth issue dealt with the interpretation and application of the 47A050 series hanger drawing general notes. The statement that the 47A050 notes were over-riding supplements to the majority of the pipe support drawings was factual and not a problem. Drawing 47A050-1 contained a note that stated that the hanger drawing general notes were supplements to a long list of hanger

2.3.3 Methods Used During Installation (continued)

drawings. Also, quality control supervisors over-riding an inspector' inspection was factual and not a problem. When the supervisor signed the documentation, he/she took full responsibility for the installation.

During the evaluation of this issue, one deficient inspection document was found. The thread engagement documentation for pipe hanger 1-68-356 was found to be in violation of WBN-QCP-1.42-2. No DNE approval had been obtained for three concrete anchors not inspected after the one anchor inspected failed the inspection. The pipe hanger needs to be reworked or DNE acceptance of the deficiency obtained.

2.3.4 Post Installation Conditions

Six main issues were pointed out as possible problems, in this element. They are summarized as follows:

A. The first issue on loose or missing bolts in supports was not factual. No examples were found. Broken or missing torque stripe was factual since many examples were found. Two samplings were performed on walkdowns with 22 cases of broken torque stripe being found out of the 1,232 bolt installations reviewed. The 19 cases found during Nuclear Services Branch's (NSB) walkdown were retorqued and documented to site procedures after NCR 6194 was issued. A review of the hanger drawing general notes and two general construction specifications revealed no specific requirements for the use of torque stripe on bolted connections. Its use was a WBN site-imposed requirement to aid in the identification of unauthorized work on hangers which had been completed and documented and was not a condition adverse to quality.

B. The second issue was on the unauthorized removal of supports. Supports on two systems at WBN were perceived to have been removed as addressed in two employee concerns. The concern on unauthorized removal of system 32 supports was factual since three NCRs had been issued on unauthorized removal. The removals on system 68 were authorized by six MRs such that this concern was not factual.

2.3.4 Post Installation Conditions (continued)

C. The third issue dealt with concerns on excessive hanger rework. This was unavoidable in many cases since DNE was required to reanalyze supports to satisfy new design criteria. The issue was therefore not factual.

D. The fourth issue addressed inadequate support inspections. Two specific supports were identified as being installed improperly. Both were examined and found to be installed properly such that the issue was not factual.

E. The fifth issue addressed a perceived problem on installed tube steel members with deficient wall thicknesses. These members were installed as duct supports at BLN. The issue was found to be factual since several NCRs had been written requiring thicknesses of tube steel members installed and in the warehouse yard to be checked. Some were found not to meet the thickness tolerance allowed by ASTM A500. This reduction was found to be caused by impurities, slag pockets, and sandblasting operations. DNE was reviewing the problem and would provide any necessary corrective actions.

F. The sixth issue involved a possible problem of welding stiffner plates onto embedded plates used for cable tray supports at BLN. Visual examination of a specific case revealed that concrete around the edge of the embedded plates had spalled. This spalling was evidently produced by the heat from welding the stiffner plates onto the embedded plates. However, an ultrasonic examination of the plates failed to reveal any damage to the embedded concrete anchors such that the issue was not factual.

2.3.5 Use of Specifications

The perceived problems in this issue involved the availability of the 47A050 series hanger drawing general notes and the training given to craft personnel on these notes. Availability and training of the notes in the past was very limited. Presently, each craft needing the notes can obtain controlled copies as needed, 24 sets have been issued, and formal training has been conducted. This perceived problem was factual and corrected before this evaluation. No condition adverse to quality existed.

2.3.6 Hanger Inspection Documentation

Since this evaluation addressed more than one perceived problem the perceived problems and findings are as follows:

1. Perceived Problem

Engineering evaluations were not performed properly on pipe and conduit supports, nor was the hardware always examined.

Finding

Engineering evaluations were done in accordance with site procedures. There was not a requirement to examine hardware. Therefore this was not a problem.

2. Perceived Problem

Cases of missing documentation were evaluated away. Where 10 percent of the documentation was not found, inspections/test 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, additional tests were then performed to achieve the 10 percent minimum. This was done in accordance with the policy statement in SOP-551 or a similar statement in a memorandum, similar evaluations were used for welds. The acceptability of these evaluations needs to be reviewed by DNE.

2.4 Summary of Collective Significance

The subcategory findings of the major issues were confined to specific areas of the hanger/support program because of the manner in which the concerns were expressed. The entire program was not at issue. Most of the areas in the major issues indicated that the perceived problems should not have been a cause of concern to the CI. The findings indicated that the existing procedures utilized in the hanger/support program were generally adequate. These findings brought to light the fact that some of the CIs did not know or understand all of TVAs procedures, specifications, or other output documents used in the hanger/support program.

2.4 Summary of Collective Significance (continued)

Three of the major issues did display some deficiencies that when grouped together signified possible programmatic weaknesses. These weaknesses were in the DNE review program of design output documents, in DNE feedback of deficient areas, and in the communication channels between DNE and DNC. In most of these cases corrective actions had already been initiated by the use of existing TVA procedures or programs.

Each major issue was classified as safety-related issues even though some nonsafety-related subissues were included. Upon completion of all the identified corrective actions, conditions adverse to plant safety will not exist.

2.5 Summary of Causes

The causes were determined on an issue-by-issue basis and were as follows:

A. The misconception that the use of carbo zinc 11 paint instead of a stainless steel shim as the separation between stainless steel pipe and carbon steel supports at SQN and WBN indicated a lack of knowledge or understanding of TVA specifications, procedures, and documents by the CI. Also, the question on the wearing through or hand rubbing off of the paint displayed a lack of knowledge of the paint's properties. The two side issues were caused by managements failure to recognize procedure discrepancies.

B. The problems addressed in the design output issue for WBN were caused by inadequate DNE output documents or criteria and a lack of knowledge of TVA procedures by the CI.

C. The subissues reviewed in the methods used during installations issue were caused by several factors as follows:

- Inadequate DNE output resulted in uncapped tube steel members being installed outdoors, in vendor documents and information not being included in upper-tier documents for use at all four sites, and in inappropriate material being used for pipe lugs at WBN.

2.5 Summary of Causes (continued)

- Failure to follow procedures by DNC personnel resulted in instrument supports being installed without variances, cable tray supports being modified without FCRs, and material not being properly upgraded at WBN.

- Employee carelessness or error was determined to have caused several of the problems associated with hangers/supports at SQN and WBN. Such problems as poor quality variances, stainless steel lines not being supported, and duct typical support numbers being incorrectly incorporated on the ductwork drawings resulted from employee carelessness or error.

- Lack of knowledge or understanding of TVA procedures, specifications, and documents was found to have caused the CI to voice the perceived problems at WBN in this issue. Perceived problems about improper lug placement, installing hangers with unapproved FCRs and variances, conduit being temporarily supported with wire, note drawings being over-riding supplements to other hanger drawings, and hanger identification tag plates being unreadable because of paint and insulation were cases that indicated the CIs lack of knowledge and understanding.

- WBN DNC site management's failure to recognize procedural inadequacies caused instrumentation support documentation to be insufficient and G-32 installation requirements for concrete anchors set in hardened concrete to be indeterminate in non-QA structures.

- Other subissues were evaluated but were such that no cause could be determined or the subissue was also being addressed by another ECTG report from which a cause will be determined. Examples of these subissues were cable tray supports with holes burned in the "I-beam" members, the adequacy of the main steam bypass line supports, and unnecessary scraping of support material.

2.5 Summary of Causes (continued)

D. Several causes were determined during the evaluation of the subissues at WBN contained in the post installation conditions issue.

- DNE pipe hanger reanalysis resulted in the rework of many hangers/supports.
- Failure to properly apply torque stripe material, other construction activities in adjacent areas or unauthorized work being performed caused the missing or damaged torque stripe problems.
- Failure to follow site procedures or lack of knowledge of the procedures led to the unauthorized removal of some supports. Also, a lack of knowledge of some site procedures led the CI to believe some support removals were unauthorized.
- Spalling concrete around an embedded plate lead the CI to believe the adequacy of the embedded plate was questionable.
- A combination of causes were identified in the subissue on tube steel members with deficient wall thicknesses. They were long term storage periods without protective paint; sandblasting operations to remove rust, mill scale, and slag pockets; and the manufacturer using a portion of the allowable thickness tolerance. Also, insufficient quality control inspections allowed the deficient members to be installed and documented.
- The remaining subissues addressed within this issue were such that no cause was determined.

E. WBN DNC management failed to recognize the need for craftsmen to understand or have availability to procedures or specifications governing hanger/support installations was the cause of the issue on use of specifications.

F. The hanger inspection documentation issue at SQN was caused by SQN site management failing to implement an adequate engineering evaluation program.

2.6 Summary of Corrective Action

The following is a summary of the corrective actions already taken or needed to be taken as a result of the findings of this report. A more specific description of the corrective actions is detailed in section 7.0 of this report.

2.6.1 Contact Between Dissimilar Metals

- Sequoyah

SQN Standard Practice (SQA)-160 was revised to allow the cosmetic coat of black paint to be applied over the inorganic zinc paint and to come into contact with stainless steel items. TI-70 is to be revised to correct the reference errors.

2.6.2 Design Output

- Watts Bar

The unistrut bolt tightening problem was identified by DNE in 1985 by issuing NCR WBN CEB 8501. DNE qualified the worst-case installations, provided bolt tightening requirements, and closed the NCR in July 1985. A separate evaluation performed for ECTG Engineering Subcategory Report 22800 revealed discrepancies with DNEs qualification of the problems. See that report for additional corrective actions.

The erroneous design assumptions used for the design of conduit typical support 47A056-85 was identified by DNE in 1985 by SCR WBN CEB 8520. All the unit 1 support rework was completed, but the unit 2 support work will continue until the supported conduit is transferred to operations. All unit 2 rework will be done by workplan FS293B which will include ECN 5100.

The field fabrication of replacement parts for vendor support parts has been discontinued. All previous fabrications are being reviewed by DNE through SCR WBN CEB 8654 (B410516007 and B410825006). The identification of the fabricated parts and the material and processes used in the field fabrications will be performed by DNE or a vendor authorized by DNE.

2.6.3 Methods Used During Installation

- Watts Bar

The duct support documentation discrepancies found during QTC's investigation were corrected by DNC by NCR 6357/SCR 6357-S (completed in September, 1986). Two discrepancies, duct hangers 0030-DW920-01H-1804 and 1030-DW920-02H-0109, were found during this evaluation and need further evaluation. DNC Modifications performed further evaluations and found two more discrepancies, 1030-DW920-02H-0110 and 0030-DW920-01H-1805. NCR W-580-P was initiated for these four discrepancies. The recommended corrective action required a review of the HVAC hanger location drawings (47W920 series, 47W915-15, 47W930 series, and 17W910 series) for agreement with the inspection documentation by typical support number. Any discrepancies identified shall be documented and resolved according to AI-2.8.3. Missing duct hanger 1030-0W920-02H-0109 to be reinstalled,if required by DNE, and documented according to MAI-16.

The EEU committed, by informal memorandum, to conduct training sessions covering the quality and clarity of variances issued by them.

The loose stainless steel lines were reattached to pipe hanger 47A435-1-13 by MR A-533890.

Open-ended vertical tube steel sections installed outdoors prior to May 21, 1984, were not capped to prevent water from standing inside them and causing structural damage. All installations after that date were to be capped according to FCR MH-3426. The installations before May 21, 1984, are to be reworked in accordance with the disposition of NCR W-570-P. All work activities will be performed in workplan W570P-1. No installations were found without cap plates in unit 2, nontransferred, areas as verified by a walkdown performed for response to QB-86-6.

Criteria for the handling of mechanical shock arrestors (snubbers) is not covered by site procedures. A maintenance instruction (MI) and a DNC site procedure (QCI) are to be initiated and issued covering snubber installation and handling criteria. Modifications is presently performing these activities in accordance with MAI-16, MI-0.4, and instructions specified by the responsible engineers in applicable workplans.

2.6.3 Methods Used During Installation (continued)

The documentation discrepancies with instrumentation supports from initial fabrication until final installation in the field is identified by NCR/SCR W-334-P. A 100 percent walkdown of all unit 1 instrumentation lines is being performed for workplan NW334P-2, as required by NCR W-334-P. All installations are being documented during this walkdown and any incorrect IOS sheets are being updated to agree with the "as-installed" configurations. Any required rework is being performed by Mechanical Maintenance.

The incorrect lug material being installed on the RHR pipe was identified by NCR 6634 and SCR 6634-S. The corrective action required by DNE could not be completed such that NCR 6907 and SCR 6907-S were issued. DNE dispositioned NCR 6907 and SCR 6907-S use-as-is for the incorrect lug material. This was based on ASME Code Section III, subsection NB-4435, which categorized the installed lugs as "locating lugs." Locating lugs may be noncertified material and may be welded directly to the pressure retaining part. No generic review of unit 1 integral attachments is required since the DNC N-5 unit had already performed a 100 percent review and had corrected all material discrepancies not previously identified and corrected. Further review for unit 2 integral attachments was determined as unnecessary since the preponderance of the work had been done for NCR 6634 and the present N-5 program will detect, document, and disposition any other discrepancies in accordance with the established corrective action program.

Deficient concrete anchor thread engagement documentation for pipe hanger 1-68-356 was found during the investigation on the use of the 47A050 series hanger drawing general notes. The pipe hanger will be reworked and documented in accordance with the disposition of NCR W-571-P.

Construction Specification G-32 specifies installation requirements for all anchors in hardened concrete. WBN DNC has utilized these requirements in category I structures (QA), but their utilization in non-category I structures (non-QA) were found to be indeterminate. The installation and verification of anchors in non-QA areas has been done by craftsmen and engineers, knowledgeable to the requirements of G-32, since they also worked in QA structures. DNC is drafting a memorandum requesting DNE to evaluate these installations.

2.6.3 Methods Used During Installation (continued)

The fact that cable tray supports that were modified without DNE approval, by means of FCRs, was identified by DNC by NCR 5737, R1. A walkdown sampling program for all transferred cable tray support configurations, that encompassed over 2700 supports, was completed and closed on release 5737, R1-01. However, the sample program identified a high error rate (93 supports were not documented or had missing members and 615 supports had minor configuration discrepancies) and was not expanded. The nontransferred supports had not been sampled. A CAQR will be issued to perform a 100 percent configuration inspection of all cable tray supports, documented before the issuance of NCR 5737, located in the unit 1 conduit interface room, yard manholes, the unit 2 RB, and the Additional Diesel Generator Building. The results of the original sample for the Diesel Generator Building, Intake Pumping Station, unit 1 Reactor Building (inside containment), and Auxiliary Building (El 692, El 713, El 737, El 757, and El 772) will be verified for compliance with the requirements of NCR 5737. If this verification cannot prove 100 percent compliance, another re-inspection sample will be performed. The results will be inspected and documented to the current cable tray support installation procedures.

- Sequoyah

Open-ended vertical tube steel sections installed outdoors have not been capped to prevent water from standing inside them and causing structural damage. All supports in outside areas, exempting the abandoned ERCW cubicles, will be capped or will have weep holes drilled to allow any collected water to drain. Final details of the implementation will be finalized by site DNE and Modifications.

Criteria for the handling of snubbers is not specifically addressed by any site procedures. Site procedures will be revised to add instruction as follows:

- Instructional statement will be added to HCI-G16 on not using snubbers as steps or handholds. Also, emphasis will be included about using good judgment and considering personnel safety and protection of plant equipment while working around fragile equipment.

2.6.3 Methods Used During Installation (continued)

- Instructions will be added in AI-15 on specific grounding requirements when welding around snubbers.

- Instructions will be added in MI-10.14 prohibiting the sandblasting of snubbers and requiring that sensitive equipment such as snubbers are to be protected when sandblasting operations are in the area.

The 47A053 typical snubber "as-built" program information has been transmitted by DNC to DNE. DNE is to complete the evaluation of the referenced variances. Those requiring physical work will be completed before restart of each unit. Those requiring documentation only drawing changes will be completed six months after startup. ECN 6237 has been issued and unit 2 work is in progress.

- Browns Ferry

Criteria for the handling of snubbers is not covered by BF Mechanical Maintenance Instruction (MMI)-59A. Also, specific details for Pacific Scientific Company (PSCo) model PSA-35 and -100 snubbers are not contained in BF MMI-59A. CAQR number BFP 870502 has been initiated to identify the deficiencies in BF MMI-59A. BF MMI-59A is to be revised to include criteria for the handling of snubbers and specific criteria for installation of PSCo Model PSA-35 and PSA-100 snubbers. No PSA-100 snubbers had been installed, but 62 PSA-35 snubbers had been installed in all three units. Prior installations will be sampled to ensure the acceptability of the PSA-35 snubbers installed. R3

- Bellefonte

Open-ended vertical tube steel sections installed outdoors were identified as a discrepancy on February 26, 1985. DNC issued NCR 3992, and all previous installations were reworked to install cap plates. Criteria was established for all future installations, and the NCR was closed.

2.6.3 Methods Used During Installation (continued)

Snubbers which were not removed to close INPO finding CC-3.1 need to be reviewed, inspected, and documented in accordance with site procedure BNP-QCP-6.24. BLN did not formally commit to INPO finding CC-3.1 but BLN DNC did take certain actions as a result of the findings. Most snubbers installed in the powerhouse in areas of ongoing construction activities were removed. Those snubbers installed in non-accessible areas or in areas with no ongoing construction activities were not removed. A total of 108 snubbers had not been removed with 70 of them being documented to BNP-QCP-6.24. Also, only 18 of the 108 snubbers were installed on transferred piping systems. To protect these snubbers and to prove future operability, the following will be reviewed or taken:

- Snubbers installed on transferred systems will be left as installed and inspected/functionally tested before restart of the preop testing program.

- Snubbers located in easily accessible areas will be removed.

- Standard Practice BLS4 will be revised to provide adequate snubber protection.

- Snubbers installed in non-accessible areas will be left installed and any completed inspections will be voided.

- At time of transfer from BLN DNC to Nuclear Power, all snubbers to be inspected to BLN-QCP-6.24 and proof of these inspections given to Nuclear Power by BLN DNC.

During the evaluation on handling of snubbers, a perceived problem with the reuse of discarded pipe hanger material was identified. The practice of reusing salvaged structural shapes and baseplates from pipe supports began on September 1, 1986. Upon being informed of possible problems with the method being used, a Revision Request (BNP-1061) to site procedure BNP-QCP-10.12 was issued to control the reuse of structural shapes and baseplates. During the interim period, all baseplates were stored and not reused, and all shapes had the tack welds with adjacent base metal areas removed and discarded. This practice was confirmed in a memorandum from the Steamfitter Superintendent to the Welding Engineering Unit Supervisor on February 8, 1987. Also, the practice of preassembling the pipe hangers in the shop has been disconnected.

- Generic

Upper-tier document TVA General Construction Specification G-43 does not contain criteria for snubbers and does not reference vendor (PSCo) requirements. Also, the PSCo Document Number 141 has not been issued as a controlled document to all four nuclear sites. A specification will be revised or one will be written to address the handling, storage, adjusting, or re-aligning, and protection after installation of snubbers. This specification will then require each nuclear site to revise or create a site specific procedure on snubbers. |R3

2.6.4 Post Installation Conditions

- Watts Bar

The unistrut bolts with missing or broken torque stripe were identified by DNC by NCR 6194. The bolts were retorqued and torque stripe applied in accordance with WBN-QCP-4.23-8. The NCR was closed in March 1985.

The unauthorized removal of system 32 instrumentation hangers were identified and corrected by NCRs 6091, 6135, and 6149. The NCRs were closed in June and July 1985.

- Bellefonte

Tube steel sections with 0.25-inch wall thickness were found to be deficient to the minimum thickness allowed by ASTM A500. DNC issued NCR 4658, performed a sampling program, and transmitted the sampling program results to DNE for evaluation and disposition. Early indications from DNE are that additional sampling data will be required to clarify the extent and exact parameters of the deficiency. Because of an engineering manpower shortage on BLN, final resolution of this issue is on hold and has been entered into TROI for tracking. All corrective actions taken will be documented under the issued NCR.

2.6.5 Use of Specifications

None.

2.6.6 Hanger Inspection Documentation

- Sequoyah

  Engineering evaluations were performed in accordance with the policy statements on attachment F of SQN-SOP Number 551 or a memorandum with a similar statement. DNE to determine if the evaluations performed in accordance with the policy statement or memorandum are acceptable.

3.0 EVALUATION PROCESS

3.1 Evaluation Methodology

The six elements developed from the employee concerns addressing perceived problems on hangers/supports were evaluated using a general approach or methodology. This general approach was:

Reviewed NSRS and QTC investigation reports for any missing specific details or additional concerns requiring further investigations; reviewed NRC and TVA generated NCRs/SCRs; reviewed TVA line management's responses for adequacy; reviewed approved drawings, specifications, procedures, and documents issued by DNE and DNC; and performed field investigations, samplings, and interviews of cognizant personnel. The evaluation strategy pertinent to each issue is discussed in section 3.2 below.

3.2 Evaluation Requirements or Criteria

3.2.1 Contact Between Dissimilar Metals

The evaluation of this element's concerns was performed at WBN and SQN using the general method described in section 3.1. Specific evaluation steps are as follows:

- Watts Bar

  A. Reviewed existing NSRS and QTC Investigation reports I-85-712-WBN and I-85-239-WBN to determine if the concerns had been adequately addressed.

  B. Contacted a DNE individual knowledgeable of paints and protective coatings to obtain an independent view of the findings of the NSRS and QTC reports.

3.2.1 Contact Between Dissimilar Metals (continued)

C. Prepared a sample of carbozinc painted material to determine if the paint could be rubbed shiny by hand.

D. Reviewed TVA General Construction Specification G-29M, revision 9, "Process Specifications for Welding, Heat Treatment, Nondestructive Examination, and Allied Field Fabrication Operations," Process Specification 4.M.1.1, paragraph 3.1.4.2.

- Sequoyah

A. Reviewed QTC report on concern XX-85-038-001, NSRS' recommendations of QTC's report, and line management's response to those recommendations for consistency with WBN.

B. Reviewed WBN ECTG findings on contact between dissimilar metals for applicability to SQN.

C. Reviewed the following procedures/instructions for compliance of line management's response mentioned in step A above.

1. Technical Instruction (TI) 70, revision 5, "Cleaning and Documentation of Plant Equipment"

2. Standard Practices (SQA) 45, revision 21, "Quality Control of Material and Parts and Services"

3. SQA-160, revision 4, "Materials Which May Come in Contact With Reactor Coolant"

D. Interviewed the knowledgeable engineer responsible for revising SQN TI-70.

3.2.2 Design Output

The evaluation of this element's concerns was performed at WBN and SQN using the general method described in section 3.1. Specific evaluation steps are as follows:

3.2.2 Design Output (continued)

- Watts Bar

  A. Reviewed NCR WBN CEB 8501, initiated 1-24-85 and the associated correspondence between TVA and the NRC.

  B. Reviewed SCR WBN CEB 8520, initiated 8-28-85, SCR WBNCEB 8654, initiated 5-5-86, SCR 6557-S, initiated 1-10-86, SCR 6704-S, initiated 3-24-86, NCR 6557, initiated 1-8-86, NCR 6704, initiated 3-7-86, NCR 6737, initiated 3-17-86, and SCR WBN CEB 8569, initiated 11-26-85. | |R3

  C. Reviewed current, as well as historical, 47A050 series hanger drawing general notes with respect to the field fabrication of replacement parts for BP components or parts.

  D. Reviewed Quality Control Instruction (QCI)-1.60, revision 0, "Work Control" and the informal memorandum describing Hanger Engineering's implementation of the QCI.

  E. Field evaluated the specific area described in concern IN-85-293-016.

  F. Interviewed 13 construction engineers, five design engineers, two craftsmen, one inspector, and one former design engineer knowledgeable with the concerns addressed in this element.

- Sequoyah

  A. Reviewed current, as well as historical, 47A050 series hanger drawing general notes to determine if any notes were ever applied that did not clearly define the requirements for field fabricated support components.

  B. Interviewed one engineer and one craftsman knowledgeable with field fabrication of support components.

3.2.3 Methods Used During Installation

The evaluation of this element's concerns was performed at all four TVA nuclear plants using the general method described in section 3.1. Specific evaluation steps are as follows:

- Watts Bar

  A. Reviewed NSRS Investigation reports I-85-174-WBN, I-85-713-WBN, and I-85-715-WBN.

  B. Reviewed Project Management Organization's (PMO) response to concern IN-85-821-009 and IN-85-104-001.

  C. Reviewed NCR W-334-P, initiated 6-12-86, NCR 5737, initiated 7-6-84, NCR 5962, initiated 2-21-85, NCR 6357, initiated 12-[illegible]-85, NCR 6463, initiated 2-10-86, NCR 6634, initiated [illegible]-5-86, NCR 6907, initiated 6-30-86; SCR 6357-S, initiated 12-16-85, SCR 6463-S, initiated 11-19-85, SCR 6634-S, initiated 2-10-86, SCR 6907-S, initiated 7-3-86; 47A050 series hanger drawing general notes; cable tray support drawing series 48W1200; and various memorandums and documents.

  D. Reviewed the following specifications, procedures, and documents:

     1. Construction Specification N3C-912, revision 3, "Support and Installation of Piping Systems in Category I Structures" (WBN only).

     2. Quality Control Procedure (QCP)-4.23-8, revision 7, "Support Final Inspection"

     3. TVA Topical Report TR-75-1A, revision 8, "Quality Assurance Program Description for the Design, Construction and Operation of TVA Nuclear Power Plants", section 17.1.8.2.

     4. Quality Assurance Program Policy (QAPP)-8, revision 3, "Identification and Control of Items"

     5. QCP-1.42-2, revision 5, "Bolt and Gap Inspection for Bolt Anchor Assemblies"

3.2.3 Methods Used During Installation (continued)

6. QCI-1.02, revision 15, "Control of Nonconforming Items"

7. Pacific Scientific (PSCo) Document Number 141, revision 7, "Instruction Manual, Installation and Maintenance of Mechanical Shock Arrestors"

8. General Construction Specification G-32, Revision 11, "Bolt Anchors Set in Hardened Concrete"

9. Standard Operating Procedure HEU-05, Revision 0, "Non-QA Items"

E. Performed field evaluations of the following areas:

1. Legibility of hanger identification tag plates.

2. Out-of-date drawings being used for hanger/support installations.

3. Main steam bypass supports not being installed properly.

4. Duct supports not installed according to the design drawings.

5. Installation of c[illegible] plates on tube steel.

F. Interviewed 14 construc[illegible] engineers, four design engineers, and eight inspection individuals knowledgeable of the programs governing the perceived problems contained in this element.

3.2.3 Methods Used During Installation (continued)

G. Review LCTG Engineering Subcategory Report 22800 for further information about the unistrut clamp bolts identified in concern IN-85-398-001.

- Sequoyah

A. Reviewed the WBN GCTF report for concern IN-85-288-001 and the NSRS report I-85-713-WBN to determine the applicability of the WBN evaluations to SQN and to determine the amount of any additional evaluations required for SQN.

B. Reviewed the 47A050 series drawings to determine if a requirement for adding cap plates to tube steel members existed.

C. Field evaluated outside areas around the plant to determine if any vertical tube steel members have been capped.

D. Reviewed ECN 6237 and WP 11287 to determine the extent of the as-constructed snubber program currently in progress.

E. Interviewed three mechanical maintenance and one engineering individuals knowledgeable of the programs governing the concerns in this element.

F. Reviewed the following instructions to determine if procedures exist for handling snubbers:

1. Surveillance Instruction (SI) 162.1, revision 7, "Snubber Visual Inspection (Hydraulic and Mechanical)"

2. SI-162.2, revision 4, "Snubber Functional Testing (Hydraulic and Mechanical)"

3. Maintenance Instruction (MI) 6.13A, revision 3, "Removal and Reinstallation of Hydraulic and Mechanical Snubbers"

4. Administrative Instruction (AI) 36, revision 9, "Storage, Handling, and Shipping of QA Material"

3.2.3 Methods Used During Installation (continued)

G. Reviewed PSCo Document Number 141, revision 7, "Instruction Manual, Installation and Maintenance of Mechanical Shock Arrestors"

- Browns Ferry

A. Reviewed concerns IN-85-288-001 and IN-86-116-001 and the WBN ECTG report to determine their applicability to BFN.

B. Reviewed the following procedures and documents to determine the requirements for handling snubbers:

1. Mechanical Maintenance Instruction (MMI) 59A, revisions 0 and 1, "Instructions for Removing and Installing Pacific Scientific Mechanical Snubbers and the Torus Dynamic Restraints"

2. MMI-59B, revision 1, "Functional Testing and Corrective Adjustment - Grinnel Hydraulic Shock Arrestors"

3. MMI-59D, revision 0, "Functional Testing of Mechanical Arrestors"

4. Surveillance Inspection (SI) 4.6.H.1, revision 2, "Visual Examination of Hydraulic and Mechanical Snubbers"

5. PSCo Document Number 141, revision 7, "Instruction Manual, Installation and Maintenance of Mechanical Shock Arrestors"

6. SQN Inspection Instruction (II) A-3, Revision 6, "Inspection and Cycling of Shock Suppressors" |R3

C. Performed field evaluations of areas pertaining to the concerns in this element.

D. Interviewed two craftsmen, one design, one mechanical maintenance, and one modification individuals responsible for the installation of snubbers and tube steel supports.

3.2.3 Methods Used During Installation (continued)

- Bellefonte

A. Reviewed concerns IN-85-288-001 and IN-86-116-001 and the WBN ECTG report to determine their applicability to BLN.

B. Reviewed the following procedures and documents to determine the requirements for handling snubbers:

1. BNP QCP-6.17, revision 14, "Seismic Support Installation and Inspection".

2. BNP-QCP-6.24, revision 3, "Installation, Testing, and Inspection of Mechanical Shock Suppressors".

3. BNP-QCP-10.27, revision 10, "Housekeeping".

4. BNP-QCP-10.6, revision 18, "Work Release"

5. BNP-QCP-10.12, revision 10, "Material Issue Control," revision Request BNP-1061.

6. BNP-QCP-7.5, revision 16, "Visual Examinations of Weld Joints"

7. PSCo Document Number 141, revision 7, "Instruction Manual, Installation, and Maintenance of Mechanical Shock Arrestors."

C. Reviewed drawing series 3GA0059-00, 4BA0570-X2, 4BA0895-X2, 4BA0892-X2, 4RA0560-X2, 4BB0892-X2, 4RW0475-X2 and 8KW0208-X2, NCR 3992, initiated 2-26-85, and the hanger tracking computer printout.

D. Performed field walkdowns to evaluate installed features compliance with site procedures.

E. Interviewed seven engineering and one inspection individuals knowledgeable in the areas of snubbers and tube steel support installations.

3.2.4 Post Installation Conditions

The evaluation of this element's concerns was performed at WBN and BLN using the general method described in section 3.1. Specific evaluation steps are as follows:

- Watts Bar

  A. Reviewed the following investigation reports, NRC violations, and responses:

     1. QTC Investigation report IN-85-069-001.

     2. NSRS Investigation report I-85-710-WBN and the PMO's response to the report.

     3. NCR 6194, initiated 7-19-85.

  B. Reviewed the 47A050 series hanger drawing general notes for any torque stripe requirements.

  C. Reviewed the following specifications and procedures:

     1. Construction Specification G-43, revision 8, "Support and Installation of Piping Systems in Category I Structures"

     2. Construction Specification N3C-912, revision 3, "Support and Installation of Piping Systems in Category I Structures," (WBN only)

     3. WBN-QCI-1.02, revision 15, "Control of Nonconforming Items"

  D. Field evaluated the following items:

     1. The configuration of pipe support 2-62A-259.

     2. Loose and missing bolts/damaged torque stripe.

     3. Unistrut hanger pulled away from an embedded plate in Reactor Building 2.

3.2.4 Post Installation Conditions (continued)

E. Interviewed two construction engineers and one nuclear services individuals knowledgeable of the areas addressed by the concerns contained in this element. |R3

- Bellefonte

A. Reviewed concerns BNP QCP 10.35-6 and BNP QCP 10.35-14 for additional details.

B. Reviewed NCR 4618, initiated 11-15-85, and NCR 4658, initiated 12-17-85, for specific details on tube steel wall thickness.

C. Reviewed ASTM A500, last revised in 1982, "Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes"

D. Reviewed line management's response to concern BNP QCP 10.35-14.

E. Performed field evaluations of the embedded plates supporting cable tray supports MK 6WA and MK 6WEA.

F. Interviewed two engineers knowledgeable of the areas addressed by the concerns contained in this element.

3.2.5 Use of Specifications

The evaluation of this element's concerns was performed at WBN only using the general method described in section 3.1. Specific evaluation steps are as follows:

A. Reviewed line management's response to concern IN-86-118-001 to determine the adequacy of the response.

B. Reviewed the current distribution list for the 47A050 hanger drawing general notes to determine the number of copies issued to the different crafts.

C. Interviewed one document control clerk and one craft superintendent about present and past availability and training on the 47A050 notes.

3.2.6 Hanger Inspection Documentation

The evaluation of this element was performed at SQN only using the general method described in section 3.1. Specific evaluation steps are as follows:

A. Reviewed NSRS Investigation Reports I-85-695-SQN and I-85-709-SQN on these subject concerns.

B. Reviewed the following site procedures:

1. TVA SQN Standard Operation Procedure (SOP) Number 551, revision 3, "Review of Past Records"

2. Sequoyah Nuclear Plant (SNP) Construction Procedure Number (CP) P-8, revision 13, "Quality Assurance Records"

3. SNP-CP P-24, revision 1 through 4, "Inspection and Test Status"

C. Reviewed hanger General Notes and hanger typical drawings.

D. Reviewed documentation depicting engineering evaluations of pipe and conduit supports.

E. Interviewed four former construction engineering and two former QC inspectors involved with the engineering evaluations during the subject timeframe.

4.0 FINDINGS

The findings and conclusions pertinent to the issues found in each of the six elements in subcategory Hangers/Supports are discussed by element below.

4.1 Contact Between Dissimilar Metals

4.1.1 Generic

The three employee concerns in this element are site-specific as addressed in the concern descriptions. The similarity of the perceived problems, stainless steel pipe contacting carbon steel support members without the use of stainless steel shims, is potentially generic for WBN and SQN. The discussion of these concerns along with conclusions will be handled in sections 4.1.2 and 4.1.3 below.

4.1.2 Site-Specific - WBN

Discussion

NSRS Investigation Reports I-85-239-WBN and I-85-712-WBN (concerns IN-85-595-005 and EX-85-059-002, respectively) and QTC Investigation Report XX-85-038-001 (for SQN) were written addressing the perceived problem as described in section 4.1.1. The investigations for these concerns pointed to TVA General Construction Specification G-29M which specified several alternatives for the separation of carbon and stainless steel. One of the alternatives was an application of paint (inorganic zinc) which prevented the contamination of stainless steel from the carbon steel. With regard to the wearing through or hand rubbing off of the inorganic zinc paint, the NSRS and QTC Investigation Reports stated that walkdowns of WBN failed to document any occurrences. The reports and information from a cognizant individual in TVA's Architectural Branch indicated that rubbing inorganic zinc paint tended to polish the outer layers of the painted surface. This polishing action only changed the original color of the paint to one that appeared to be similar to bare metal; but, the desired protection still existed.

Furthermore, an informal "in-house" test was performed on a plate that was sand blasted and painted with a standard coat of carbozinc paint. This plate was rubbed by hand with various metal objects over a period of one week. At the end of the week, the plate displayed characteristics as described above. The plate was then placed outside and exposed to atmospheric conditions for a period of one week. Subsequent examinations revealed that no rust had formed. This short-term, informal test further supports the findings of NSRS, QTC, and TVA Architectural Branch.

Conclusion

Based on the consistency of the reports, the information from TVA's Architectural Branch cognizant individual, and the review of TVA General Construction Specification G-29M, the concern of stainless steel shims not being used was factual; but, a condition adverse to quality did not exist since the type of paint, inorganic zinc, used on the carbon steel was an acceptable alternative. However, the wearing through or hand rubbing off of this paint was not found to be factual.

4.1.3 Site-Specific - SQN

Discussion

The findings discussed for WBN were applicable for SQN in that QTC report for concern XX-85-038-001 was used during the investigation at WBN. To further substantiate the validity of the WBN findings for SQN, a walkdown by SQN QA was performed, and no examples of wearing through or hand rubbing off of the inorganic zinc paint were found.

During the QTC evaluation of concern XX-85-038-001, a discrepancy was found that involved the addition of black paint over the inorganic zinc paint. No procedure existed that allowed any paint to be placed over the inorganic zinc. SQA-160 has been revised to allow a cosmetic coat of black paint, C-268 Sherwin Williams, to be placed over the inorganic zinc and to come into contact with the stainless steel pipe. Another discrepancy was found during a review of procedure TI-70, "Cleaning and Decontamination of Plant Equipment." Paragraph 9.1.1 of TI-70, referred to procedure SQA-45, part III, section 1.6, which did not exist. SQN's line management's response was, "SQA-45 has been revised to reference the applicable procedures to be used for cleaning and decontamination of plant equipment." A second review of TI-70 and SQA-45 revealed that SQN's line management's response was not valid. The sections did exist in SQA-160, part III, however.

Conclusion

As in the conclusion for WBN, the nonusage of stainless steel shims was factual; but, a condition adverse to quality did not exist since the type of paint, inorganic zinc, used on the carbon steel was an acceptable alternative. Again, the wearing through or hand rubbing off of the inorganic zinc paint was not found to be factual. The practice of applying a cosmetic coat of black paint over the inorganic paint became acceptable after SQA-160 was revised to allow its usage in contact with stainless steel items.

NOTE: The discrepancy found by QTC involving the incorrect procedure referenced in TI-70 still exists and needs correcting.

4.2 Adequacy of Design Output

4.2.1 Generic

Employee concern WI-85-091-013 was determined to be potentially generic for WBN and SQN due to the similarity of the 47A050 series hanger drawing general notes. The discussion of this concern along with conclusions will be handled in sections 4.2.2.D and 4.2.3 below.

4.2.2 Site-Specific - WBN

Discussion

A. The problem of A-size hanger drawings not matching their corresponding analysis isometrics existed at WBN from the beginning of the hanger program as expressed in concern IN-85-052-003. In June 1981, the program plan for CEB Report 81-30 was developed to resolve all support off-location problems for rigorously analyzed piping identified at that time. Those supports installed after that time were to be installed using the A-size drawings and inspected in accordance with the analysis isometric. If a problem was identified by inspection personnel with regard to location, then the isometric was to be revised by an FCR to the A-size location or an acceptable location within DNC's allowable tolerances. This procedure is still in effect today. However, interviews with design personnel revealed that the isometric cannot be revised in all cases. When this occurred the support had to be reworked.

It was often necessary for design to move a support within the tolerances provided to achieve a constructable configuration. When this was done, the location of the constructable configuration was reflected on the A-size drawing. Other instances where the drawings do not match the isometrics do occur. This can be attributed to reanalysis, human error, or the combination of the two. In the past the craft were only issued the A-size drawings, and the analysis isometrics were available at various locations for review purposes only. In the future, according to WBN-QCI-1.60, the workplans issued to the craft will contain both the A-sized drawings and the analysis isometrics. This enabled the craft to use both drawings during installation.

4.2.2 Site-Specific - WBN (continued)

B. Concern IN-85-398-001 identified a perceived problem with the random sampling program performed on unistrut clamp bolts for NCR WBN CEB 8501. The perceived problems were that corrective action had not been taken for the clamps installed in unit 1 or for the clamps not sampled in unit 2. Actually, all installed unistrut clamp bolts were qualified as-installed, and bolt tightening requirements have been implemented. These actions were the result of DNE reviewing, evaluating, and completing the NCR with no field rework being required in July 1985.

The fact that 40 percent of this sample failed a 4 foot-pound torque test is true. However, the test of these bolts was not limited to torquing the bolts. The worst cases of these failures were load tested and found to be satisfactory with respect to the actual design loads. This sample program was set up to cover both units 1 and 2. Therefore, this sampling program was successful in qualifying the subject unistrut clamp bolts for both units. The other corrective actions of NCR WBN CEB 8501 provided additional clarification on bolt tightening requirements as required.

Since this evaluation was performed, the ECTG Engineering group has performed an evaluation on this issue and found discrepancies in the calculations used by DNE for NCR WBN CEB 8501. Subcategory Report 22800 addressed the issue and required additional corrective actions.

C. Two concerns, IN-85-293-016 and IN-86-019-005, expressed perceived problems with specific design output items. The first of these dealt with specific supports that had three separate numbers. A field investigation of the general area described in the concern revealed that these supports were multiple or gang hangers (hangers supporting more than one pipe). Therefore, it was necessary for the supports to have separate numbers because each pipe represented a different support. This method of supporting pipe was commonplace in the nuclear industry and was documented by design.

4.2.2 Site-Specific - WBN (continued)

The second concern dealt with conduit typical support drawing 47A056-85. This particular typical support was identified as nonconforming because of some erroneous design assumptions (SCR WBN CEB 8520). Those supports in unit 1 utilizing this typical were revised accord'ng to ECN 5885 and reworked according to WP E-5885-1. This work has been completed. Those supports in unit 2 (utilizing this typical) were being revised and reworked by the EEU, with assistance from site DNE. The SCR was closed in November 1985, with the unit 2 support work continuing until transfer to operations.

D. Concern WI-85-091-013 identified a problem with TVA field fabricating replacements for vendor, Bergen-Patterson (BP), supplied hanger components or parts. These replacement parts were field fabricated using details shown in several BP catalogs, and in some cases, the BP part number was stamped on the field fabricated parts. The intention was to make the replacement part an exact duplicate of the BP part. These parts were even stored in the same bins until installation. Therefore, there is now no way to identify who was the fabricator of a particular part.

These field fabrications were considered acceptable by WBN DNC because of notes 49, 54, and 102 of the 47A050 notes. According to the responsible DNE personnel, the extent of Construction's application of these notes was never anticipated. Therefore, there were no calculations backing up these fabricated parts, except for threaded rods (reference NCR 6557 and SCR 6557-S). DNE review and evaluation of these past fabrications was initiated by SCR WBN CEB 8654, and all field fabrication of hanger parts is now being done in accordance with DNE approved drawings.

Conclusion

A. The fact that the A-size drawing location plans did not always match the locations specified on the analysis isometrics was factual as stated by employee concern IN-85-052-003. However, DNE either approved the DNC submitted FCRs or specified the required rework to qualify the pipe hangers. A condition adverse to quality did not exist since DNE had the final approval on the location of the pipe hangers.

4.2.2 Site-Specific - WBN (continued)

B. The unistrut clamp bolt issue expressed in concern IN-85-398-001 was factual with respect to the information on the sample program. However, the portion on no corrective actions being taken was not factual. DNE qualified all unit 1 and 2 installations by analysis and calculations by NCR WBN CEB 8501. However, ECTG Engineering Subcategory Report 22800 found discrepancies with DNE's calculations for NCR WBN CEB 8501. These deficiencies required additional corrective actions to be performed by DNE.

C. The concern on multiple or gang hangers with more than one identifier number was not factual since each identifier annotated a different support required by design. The concern about the conduit typical support type 47A056-85 being installed incorrectly because of inadequate design output was factual. The affected unit 1 supports have been reworked and completed while the unit 2 supports were still being worked. (CATD 11102-WBN-01) These conclusions did not indicate conditions adverse to quality existed.

D. The concern on WBN DNC fabricating replacement parts for BP hanger parts was factual. In addition, DNE did not anticipate DNC's application of the 47A050 notes authorizing these fabrications and did not perform any calculations to qualify them. Corrective action for these fabrications is being controlled by SCR WBN CEB 8654. (CATD 11102-WBN-02)

4.2.3 Site-Specific - SQN

Discussion

As stated in section 4.2.1, field fabrication of replacements for BP parts was determined to be generically applicable to SQN. The review of the 47A050 notes at SQN did not reveal any notes addressing field fabrication of hanger components. Also, discussions with personnel involved with hanger fabrication during construction revealed that hanger components were not fabricated in the field. |R3

Conclusion

The similarity of the 47A0050 notes mentioned in section 4.2.1 above did not exist, and field fabrication of hanger components did not take place. This issue was not factual for SQN.