

TVA EMPLOYEE CONCERNS  
SPECIAL PROGRAM

REPORT NUMBER: 11100

REPORT TYPE: Subcategory - Construction  
(Final Report)

REVISION NUMBER: 3

TITLE: Hangers/Supports

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REASON FOR REVISION:

Incorporate SRP comments and Line Management responses on Corrective Actions, Executive Summary, minor editorial changes (revision bars omitted for minor changes), and Finalize Report.

Revision 1

Incorporate additional SRP comments and finalize report.

Revision 2

Incorporate TAS and additional SRP comments, Line Management response, and finalize report.

Revision 3

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Preface, Glossary, and List of Acronyms  
for ECTG Subcategory Reports

HISTORY OF REVISION

REV NUMBER	PAGES REVISED	REASON FOR CURRENT REVISION
3	i	To clarify that one or more attachments will help the reader find where a particular concern is evaluated

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Preface

This subcategory report is one of a series of reports prepared for the Employee Concerns Special Program (ECSP) of the Tennessee Valley Authority (TVA). The ECSP and the organization which carried out the program, the Employee Concerns Task Group (ECTG), were established by TVA's Manager of Nuclear Power to evaluate and report on those Office of Nuclear Power (ONP) employee concerns filed before February 1, 1986. Concerns filed after that date are handled by the ongoing ONP Employee Concerns Program (ECP).

The ECSP addressed over 5800 employee concerns. Each of the concerns was a formal, written description of a circumstance or circumstances that an employee thought was unsafe, unjust, inefficient, or inappropriate. The mission of the Employee Concerns Special Program was to thoroughly investigate all issues presented in the concerns and to report the results of those investigations in a form accessible to ONP employees, the NRC, and the general public. The results of these investigations are communicated by four levels of ECSP reports: element, subcategory, category, and final.

Element reports, the lowest reporting level, will be published only for those concerns directly affecting the restart of Sequoyah Nuclear Plant's reactor unit 2. An element consists of one or more closely related issues. An issue is a potential problem identified by ECTG during the evaluation process as having been raised in one or more concerns. For efficient handling, what appeared to be similar concerns were grouped into elements early in the program, but issue definitions emerged from the evaluation process itself. Consequently, some elements did include only one issue, but often the ECTG evaluation found more than one issue per element.

Subcategory reports summarize the evaluation of a number of elements. However, the subcategory report does more than collect element level evaluations. The subcategory level overview of element findings leads to an integration of information that cannot take place at the element level. This integration of information reveals the extent to which problems overlap more than one element and will therefore require corrective action for underlying causes not fully apparent at the element level.

To make the subcategory reports easier to understand, three items have been placed at the front of each report: a preface, a glossary of the terminology unique to ECSP reports, and a list of acronyms.

Additionally, at the end of each subcategory report will be a Subcategory Summary Table that includes the concern numbers; identifies other subcategories that share a concern; designates nuclear safety-related, safety significant, or non-safety related concerns; designates generic applicability; and briefly states each concern.

Either the Subcategory Summary Table or another attachment or a combination of the two will enable the reader to find the report section or sections in which the issue raised by the concern is evaluated.



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The subcategories are themselves summarized in a series of eight category reports. Each category report reviews the major findings and collective significance of the subcategory reports in one of the following areas:

- management and personnel relations
- industrial safety
- construction
- material control
- operations
- quality assurance/quality control
- welding
- engineering

A separate report on employee concerns dealing with specific contentions of intimidation, harassment, and wrongdoing will be released by the TVA Office of the Inspector General.

Just as the subcategory reports integrate the information collected at the element level, the category reports integrate the information assembled in all the subcategory reports within the category, addressing particularly the underlying causes of those problems that run across more than one subcategory.

A final report will integrate and assess the information collected by all of the lower level reports prepared for the ECSP, including the Inspector General's report.

For more detail on the methods by which ECTG employee concerns were evaluated and reported, consult the Tennessee Valley Authority Employee Concerns Task Group Program Manual. The Manual spells out the program's objectives, scope, organization, and responsibilities. It also specifies the procedures that were followed in the investigation, reporting, and closeout of the issues raised by employee concerns.



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ECSP GLOSSARY OF REPORT TERMS\*

classification of evaluated issues the evaluation of an issue leads to one of the following determinations:

Class A: Issue cannot be verified as factual

Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)

Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken

Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation

Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

collective significance an analysis which determines the importance and consequences of the findings in a particular ECSP report by putting those findings in the proper perspective.

concern (see "employee concern")

corrective action steps taken to fix specific deficiencies or discrepancies revealed by a negative finding and, when necessary, to correct causes in order to prevent recurrence.

criterion (plural: criteria) a basis for defining a performance, behavior, or quality which ONP imposes on itself (see also "requirement").

element or element report an optional level of ECSP report, below the subcategory level, that deals with one or more issues.

employee concern a formal, written description of a circumstance or circumstances that an employee thinks unsafe, unjust, inefficient or inappropriate; usually documented on a K-form or a form equivalent to the K-form.

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evaluator(s) the individual(s) assigned the responsibility to assess a specific grouping of employee concerns.

findings includes both statements of fact and the judgments made about those facts during the evaluation process; negative findings require corrective action.

issue a potential problem, as interpreted by the ECTG during the evaluation process, raised in one or more concerns.

K-form (see "employee concern")

requirement a standard of performance, behavior, or quality on which an evaluation judgment or decision may be based.

root cause the underlying reason for a problem.

\*Terms essential to the program but which require detailed definition have been defined in the ECTG Procedure Manual (e.g., generic, specific, nuclear safety-related, unreviewed safety-significant question).

Acronyms

AI	Administrative Instruction
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BFN	Browns Ferry Nuclear Plant
BLN	Bellefonte Nuclear Plant
CAQ	Condition Adverse to Quality
CAR	Corrective Action Report
CATD	Corrective Action Tracking Document
CCTS	Corporate Commitment Tracking System
CEG-H	Category Evaluation Group Head
CFR	Code of Federal Regulations
CI	Concerned Individual
CMTR	Certified Material Test Report
COC	Certificate of Conformance/Compliance
DCR	Design Change Request
DNC	Division of Nuclear Construction (see also NU CON)



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DNE	Division of Nuclear Engineering
DNQA	Division of Nuclear Quality Assurance
DNT	Division of Nuclear Training
DOE	Department of Energy
DPO	Division Personnel Officer
DR	Discrepancy Report or Deviation Report
ECN	Engineering Change Notice
ECP	Employee Concerns Program
ECP-SR	Employee Concerns Program-Site Representative
ECSP	Employee Concerns Special Program
ECTG	Employee Concerns Task Group
EEOC	Equal Employment Opportunity Commission
EQ	Environmental Qualification
EMRT	Emergency Medical Response Team
EN DES	Engineering Design
ERT	Employee Response Team or Emergency Response Team
FCR	Field Change Request
FSAR	Final Safety Analysis Report
FY	Fiscal Year
GET	General Employee Training
HCI	Hazard Control Instruction
HVAC	Heating, Ventilating, Air Conditioning
II	Installation Instruction
INPO	Institute of Nuclear Power Operations
IRN	Inspection Rejection Notice

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L/R	Labor Relations Staff
M&AI	Modifications and Additions Instruction
MI	Maintenance Instruction
MSPB	Merit Systems Protection Board
MT	Magnetic Particle Testing
NCR	Nonconforming Condition Report
NDE	Nondestructive Examination
NPP	Nuclear Performance Plan
NPS	Non-plant Specific or Nuclear Procedures System
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSB	Nuclear Services Branch
NSRS	Nuclear Safety Review Staff
NU CON	Division of Nuclear Construction (obsolete abbreviation, see DNC)
NUMARC	Nuclear Utility Management and Resources Committee
OSHA	Occupational Safety and Health Administration (or Act)
ONP	Office of Nuclear Power
OWCP	Office of Workers Compensation Program
PHR	Personal History Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QAP	Quality Assurance Procedures
QC	Quality Control
QCI	Quality Control Instruction

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QCP	Quality Control Procedure
QTC	Quality Technology Company
RIF	Reduction in Force
RT	Radiographic Testing
SQN	Sequoyah Nuclear Plant
SI	Surveillance Instruction
SOP	Standard Operating Procedure
SRP	Senior Review Panel
SWEC	Stone and Webster Engineering Corporation
TAS	Technical Assistance Staff
T&L	Trades and Labor
TVA	Tennessee Valley Authority
TVILC	Tennessee Valley Trades and Labor Council
UT	Ultrasonic Testing
VT	Visual Testing
WBECSF	Watts Bar Employee Concern Special Program
WBN	Watts Bar Nuclear Plant
WR	Work Request or Work Rules
WP	Workplans



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## EXECUTIVE SUMMARY

Hangers/Supports

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### Summary of Issues

This subcategory addresses six issues accounting for forty-six employee concerns. Of these six issues, each contained one or more safety-related concerns such that all the issues were considered safety-related. These issues addressed contact between dissimilar metals, design output, methods used during installation, post installation conditions, use of specifications, and hanger inspection documentation.

### Major Findings

The findings of this subcategory identified specific deficiencies that appeared to be isolated occurrences. However, when the findings were grouped together, the hanger/support engineering program exposed six important issues. Some of the findings were generic to all four nuclear sites. These were:

- Design output for hangers/supports displayed a number of deficiencies. The findings included drawings that specified inconsistent support locations, procedures with incorrect bolt tightening requirements, poorly designed conduit typical supports, and no design control over field fabricated replacements for vendor supplied parts. This indicates the lack of an adequate DNE review program.
- Vertical tube steel sections installed in hangers/supports in outdoor areas without cap plates were found to be a problem. These installations could trap water and other debris and could become damaged during environmental changes. The requirement for these cap plates should have been covered by installation specifications, but no requirements existed. BLN identified the problem and corrected all installations. WBN identified the problem, generated a FCR for all future installations, but did not correct past installations. SQN did not identify the problem such that no installations had been corrected. Once the problem was found at one site, design feed back should have resulted in complete corrective actions at all nuclear sites.

- Mechanical shock arrestors (snubbers) required on DNE drawings were found to have overall programmatic deficiencies. Snubber criteria should have been provided for installation and use by design. The site organizations tried to correct the deficiencies by implementing site procedures to include snubber criteria and requirements, but the site organizations did not include all the vendor recommendations in the site procedures. The site procedures were deficient. There should have been a cooperative effort between site organizations and design to provide an appropriate set of installation and use requirements.

#### Collective Significance of Major Findings

Most of the areas evaluated within this subcategory indicated that the problems perceived by the concerned individuals should not have caused concern. The findings indicated that the existing procedures utilized by the hanger/support program were generally adequate. The handling of these hanger/support problems indicated ineffective design feed back and a failure to establish responsible and responsive actions concerning the problems through cooperative efforts by design and site organizations. The findings did indicate that some of the concerned individuals did not know or understand all of TVA's procedures, specifications or other output documents used in the hanger/support program.

#### Causes of the Major Findings

The causes of the deficiencies were three fold. First, the DNE review program inadequacies were caused by a lack of DNE management control over the entire design program. Design criteria, specifications, calculations, and drawings were not adequately reviewed for accuracy, completeness, and conciseness by DNE management. Secondly, the site organizations communication with DNE management about deficient or missing design criteria, specifications, and drawings was weak. And thirdly, numerous NCRs on unauthorized work; deficient, sloppy, and missing FCRs and variances; and procedure noncompliances showed that DNC did not assure that DNC personnel complied with DNC procedures in many instances.

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#### Corrective Actions of the Major Findings

Corrective actions to prevent reoccurrence of the causes for the major findings will not be required by this subcategory report. The TVA Corporate Nuclear Performance Plan (CNNP) had previously identified the causes and provided corrective actions to preclude their reoccurrence. Further analysis of these causes will be performed in the Construction category and/or ECTG Final reports. This will provide corporate management a basis to place more emphasis on joint efforts being taken by DNE and site organizations to communicate and work out the identified problems.

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The evaluations in this subcategory found that some corrective actions had already been initiated for several of the design output issues. However, three design output issues were found to need corrective actions to be taken and were:

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- Open-ended vertical tube steel sections located in outdoor areas at SQN and WBN that do not have cap plates are being identified and corrected.
- DNE is evaluating the field fabricated replacements for vendor parts, performing all necessary calculations to substantiate these fabrications, and will identify all cases to DNC that require rework or replacement. This process is being tracked by SCR WBN CEB 8654.
- Corporate DNE review and resolution of snubber criteria deficiencies is being performed. A review of upper-tier documents, TVA General Construction Specifications, and Pacific Scientific Document Number 141 is being included. Appropriate criteria on snubbers will be issued to site organizations upon completion of this process.

The evaluation on snubber handling also found that existing site procedures were inadequate with respect to the Pacific Scientific Document Number 141 recommendations. All four sites are reviewing their existing site procedures for specific deficiencies identified in this subcategory.

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NOTE: See Executive Summary Table Number 1 for Issue Evaluation.

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
<u>Contact Between Dissimilar Metals</u>	X		<p>Stainless steel pipe being supported by carbon steel supports was a factual statement but not a problem. The use of inorganic paint, in lieu of a stainless steel shims, was an acceptable alternative per TVA General Construction Specification G-29M.</p> <p>The hand rubbing off or the wearing thru of the inorganic zinc paint was found to be not factual.</p> <p>During the evaluation of this issue two side issues were identified.</p> <p>(1) A coat of a cosmetic black paint had been applied over the inorganic zinc paint.</p> <p>(2) Site procedure SQN-TI-70 referred to a section in SQN-SQA-45 that did not exist.</p>	<p>Lack of knowledge or understanding by the CI of TVA specifications or procedures.</p> <p>The particular black paint was not in a site procedure.</p> <p>Procedure error.</p>	<p>None</p> <p>SQN site procedure SQA-160 was revised to allow the black paint to be applied.</p> <p>SQN site procedure is being revised to reflect the correct reference.</p>	<p>Existing programs and procedures were adequate in the area of this issue.</p> <p>Site management did not recognize the procedure inadequacy.</p> <p>Site management did not recognize the procedure inadequacy.</p>	<p>Existing programs and procedures were adequate in the area of contact between dissimilar metals. However, several minor problems did arise that pointed out a problem with keeping the working procedures up-to-date by site management.</p>

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
<u>Design Output</u>	X		Four subissues were evaluated as follows:				These four issues indicated that
			(1) A-size drawing pipe hanger locations not matching the analysis drawings locations was factual at WBN. No problem existed since DNE maintained control of both drawings.	DNE drawing discrepancies.	None	DNE controlled the locations of the pipe hangers. However, lost time due to rework or FCRs to correct bad installations resulted.	the DNE review program for design criteria requirements was inadequate. More time spent in review would have resulted in less errors being issued or installed.
			(2) DNE providing DNC with incorrect bolt tightening requirements for uninstruct clamp bolt was factual at WBN. DNE nonconformed the problem in early 1985, instituted a sampling program, qualified the worst case conditions found, and provided DNC with new bolt tightening requirements.	Inadequate DNE output.	None.	DNE review of design criteria was inadequate.	
			Since this evaluation was performed, an evaluation for the ECTG Engineering Subcategory Report 22800 determined that the calculations for NCR were deficient and required additional corrective actions.				



ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
<u>Design Output</u> (con't)			(3) DNE providing DNC with inadequately designed supports was factual at WBN. A conduit typical support was nonconformed by DNE because of incorrect design assumptions used. Unit 1 supports were revised by an ECN while the unit 2 supports were being reworked by site DNE and DNC personnel.	Inadequate DNE output.	None - already performed. Unit 1 rework was complete, Unit 2 was in progress.	DNE review of design criteria was inadequate.	
			Pipe hangers supporting more than one pipe was factual but not a problem because of its common usage throughout the nuclear industry.	Lack of knowledge by the CI.	None	Existing program was adequate.	
			(4) Based on the DNE authorization, DNC field fabrication of replacement parts for vendor parts was factual at WBN. DNE did not anticipate or perform supportive calculations for the field fabricated replacement parts. No problem was found at SQN.	Inadequate DNE output.	DNE is evaluating SCR WBN CEB 8654 and DNC will perform all required work as identified by DNE.	DNE review of design criteria was inadequate.	

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Methods Used During Installation	X		Six subissues were evaluated as follows:				
			(1) Vertical tube steel members installed outdoors without caps was factual. WBN identified the problem first in May 1984, and initiated a FCR for all future installations. SQN had not identified the problem. BLN identified the problem with a NCR and corrected all past and future installations. BFN did not have a problem.	DNE did not anticipate environmental effects on the installed members. Lack of coordination of the problem by DNE. WBN failed to recognize the need to correct past installations.	Rework of all deficient installations installed before the FCR is being scheduled at WBN. SQN is adding cap plates or drilling weep holes on all deficient installations. Corrective actions for the lack of communication within DNE is identified in the Construction Category Report.	Upon identification of the problem, DNE did not realize the problem's overall effect and did not perform a generic applicability review. WBN DNC failed to establish a complete corrective action program, SQN did not even identify the problem, and BLN identified the problem and established a complete corrective action program.	DNE and site organizations displayed inadequacies in some of the issues addressed in this main issue. DNE did not recognize that potential problems could occur from inaccurate, incomplete, and vague upper-tier criteria. These inadequacies were the result of poor review program of the criteria and a lack of understanding of the criteria usage. Site organizations helped DNE to continue
			(2) Snubbers not being handled properly, adjusted, and installed in accordance with the manufacturer's recommended practices was factual at all four sites. BFN, BLN, and SQN had procedures that specified some snubber requirements but they were incomplete. WBN did not have site procedures on snubber requirements. However, inspections performed at the time of instal-	DNE did not provide upper-tier criteria and did not control vendor manuals to site organizations for incorporation into site procedures. Also, site organizations did	DNE is establishing the lacking snubber criteria in a construction specification so that a standard criteria will be established at all TVA nuclear sites. WBN is initiating a site procedure to specify proper handling and installation practices of snubbers. SQN and BLN are reviewing and correc-	Programmatic inadequacy in that DNE did not recognize the potential problems that could occur by not specifying upper-tier criteria and providing controlled vendor documents for snubbers. Each site obtained the vendor documents but failed to include all requirements.	

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Methods Used During Installation (con't)			lation or during surveillance inspections proved the operability of each installed snubber. Also, DNE did not have snubber criteria in any upper-tier document and did not control vendor manuals to the site organizations.	not adequately incorporated all of the vendors' recommendations into site procedures.	ting discrepancies in existing site procedures. CAQR BFP 870502 has been generated to identify and correct the deficiencies in BF MMI-57A. No PSCo model PSA-100 snubbers have been installed while 62 PSA-35 snubbers have been installed. The installed PSA-35 snubbers will be sampled to ensure their acceptability		in this mode of operation by not questioning criteria vagueness or incompleteness and by trying to incorporate appropriate criteria, obtained from vendor documents, into site procedures. This only helped the overall program a little bit since not all of the vendor's recommendations were incorporated into site procedures. Also DNC management did not adequately review site personnel work activities such
			(3) Problems with general installation practices were found to be factual. They were as follows:				
			• Instrumentation supports were installed and documented without the required variances at WBN.	DNC failure to follow procedures.	None - NCR W-334-P had already been initiated by DNC.	Site Management did not adequately review the work habits of site personnel as these habits pertain to following site	did not adequately review site personnel work activities such



ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
<u>Methods Used During Installation</u> (con't)			<ul style="list-style-type: none"> <li>The Electrical Engineering Unit was deficient in the content and clarity of support variances at WBN.</li> </ul>	Employee carelessness.	DNE requested EEU to prepare better quality variance sketches and EEU has committed to do so.	procedures and performing these work activities in a careful and concise manner.	that procedural violations and sloppy, incomplete work activities resulted. On the other hand, some issues pointed out the fact that existing site procedures and programs were adequate and functioning as intended. When problems or deficiencies were identified, existing site procedures were utilized to identify and correct these deficiencies, thus enhancing the existing hanger/supports program.
			<ul style="list-style-type: none"> <li>FCRs documenting cable tray supports changes not being generated was found to be factual at WBN. A sample program, instituted by NCR 5737, was used to identify installation deficiencies. Over 2,700 supports were reviewed with 708 of them being deficient (26%). The NCR was closed for unit 1 and common with the high deficiency percentage such that the accuracy of those support not sampled is questionable.</li> </ul>	DNC failure to follow procedures	Site organizations initiated NCR 5737, the installed supports sampled, and the NCR closed with a high deficiency percentage. Further review of the cable tray support program is warranted.	The use of existing site programs (NCR) to identify discrepancies as they were found enhanced the strength of the hanger/support.	
			<ul style="list-style-type: none"> <li>Some substitution of typical supports was found to be factual at WBN. Some duct supports were installed &amp; documented to a different typical than that shown on the DNE drawing. The discrepancies found by QCT were corrected, but additional discrepancy was found by this evaluation.</li> </ul>	Employee error or carelessness.	The discrepancies found need to be investigated and corrected.	None	

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.	
Methods Used During Installation (con't)			* DNE's failure to provide inspection criteria for non-safety, non-seismic supports was factual at WBN. DNE was not responsible, rather DNC was responsible for enforcement of inspection criteria. No formal inspections of non-safety, non-seismic, non-QA, supports are required. However, G-32 requires verification of all concrete anchor installations, but does not specify how non-QA anchors are to be handled. Non-QA anchors at WBN are indeterminate on this verification process.	DNE upper-tier criteria is vague in the manner DNC is to verify non-QA concrete anchor installation.	DNC is to investigate the requirements to show verification of non-QA concrete anchor installations.	DNC was inadequate in the implementation of DNE criteria. DNC failed to question vague DNE requirements for non-QA supports because of a low regard for non-QA structures.		R3
			(4) Unnecessary scrapping of material was found to be a necessary action during the construction phase. This issue is also addressed in subcategory 71101.	Determined in subcategory report 71101.	None by this report.	Determined in subcategory report 71101.		R3
			(5) Inadequate installation practices were found to be partially factual. They were as follows:					

ISSUES	ER	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Methods Used During Installation (con't)			<ul style="list-style-type: none"> <li>Pipe lug placement, installation activities performed with unapproved FCRs and conduit supported by wire were factual but not a problem since procedures were in effect during the time period the problems took place at WBN.</li> <li>Incorrect material used for pipe lugs, traceability of instrumentation (FOS/IOS) and installed snubbers that do not match the DNE drawing were factual, corrective action had already been initiated at WBN &amp; SQN.</li> <li>Stainless steel lines not supported by straps was factual at WBN.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of knowledge by the concerned individual.</li> <li>Inadequate DNE output, DNC failure to follow procedures.</li> <li>Employee error</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>NCR/SCR 6907 to be dispositioned by DNE for the pipe lug problem. NCR/SCR W-334-P to be completed by DNE and DNC.</li> <li>DNE to evaluate the "as built" information on the snubbers provided by DNC.</li> <li>ECN 6237 was initiated to perform an "as-built" program of the installed snubber at SQN.</li> <li>None-the lines were attached to pipe hanger 47A435-1-13 by a MR.</li> </ul>	<ul style="list-style-type: none"> <li>Existing site programs and procedures were adequate.</li> <li>DNE review of design criteria was inadequate and DNC should have questioned DNE when vagueness in the criteria was identified.</li> <li>None</li> </ul>	



ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Methods Used During Installation (con't)			Five concerns were found to be not factual or factual and not a problem at WBN. They were cable tray hangers installed in violation of procedure, adequacy of the main steam by-pass line supports, readability of hanger tag plates, usage of outdated drawing during the hanger installation phase, and hanger attachment installed in an indeterminate manner, or in violation of specifications.	Lack of knowledge by the concerned individual or no cause determined.	None	Existing site programs and procedures were adequate.	
			(6) The use of the 47A050 series hanger drawing general notes as an overriding supplement was factual but not a problem at WBN. Also, a quality control supervisor could override an inspectors inspection.	Lack of knowledge by the concerned individual.	None	Established site programs were acceptable.	
			During the evaluation of six subissues, two side issues were identified.				

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Methods Used During Installation (con't)			<p>(1) The removal of tack welds holding pre-assembled pipe hangers that had been discarded without a work release was found at BLN.</p> <p>The work release was required to have the base metal inspected for possible damage before the material could be reused.</p> <p>(2) The concrete anchor thread inspection documentation (WBN-QCP-1.4. 2) was found to be deficient for pipe hanger 1-68-356. The thread engagement for one recessed S.S.D. anchor was deficient and the remaining anchors were not checked and/or DNE approval of the installation was not obtained.</p>	<p>Inadequate or misinterpretation of site procedures.</p> <p>Failure to follow procedures by site personnel</p>	<p>DNC is to review the program with DNE and correct deficiencies.</p> <p>DNC to correct the deficiency by reinspection of the pipe hanger or by obtaining DNE approval of the installation.</p>		
Post Installation Conditions	X		<p>Six subissues were evaluated as follows:</p> <p>(1) Loose or missing bolts in supports were not</p>	No cause was found	None-corrective action initiated and	Existing program was adequate but not	Existing programs or procedures were ade-

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Post Installation Conditions (con't)			found, missing or broken torque stripe was found at WBN. Several cases were found and were corrected by a NCR. No upper tier requirement was found for torque stripe, its use was a site imposed requirement to aid in the identification of unauthorized work on completed hangers.	for loose or missing bolts. Failure to follow site procedures for the torque stripe problem.	completed due to this evaluation.	followed by appropriate personnel.	adequate for the majority of the issues in this main issue. Only a few instances displayed flaws in these programs in which personnel did not follow the procedure or that procedural control was not maintained.
			(2) Unauthorized support removal was found to be factual for system 32 instrumentation supports and to be not actual for system 68 pipe supports at WBN. Three NCRs for unauthorized removals were found on system 32 while six MRs authorizing support removals were found on the system 68 supports.	Failure to follow site procedures for system 32 supports. Lack of understanding of site procedures for system 68 supports.	None - corrective actions initiated previously and are now complete.	Existing programs or procedures were adequate but not followed by site personnel for one issue only.	R3



ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Post Installation Conditions (con't)			(3) Excessive hanger rework was determined to be factual but not a problem at WBN. This was unavoidable since DNE was required to re-analyze supports to satisfy new design criteria.	Reanalysis caused by new criteria by DNE.	None	None	
			(4) Inadequate support inspections were found to be not factual at WBN. The two specific supports identified were found to be installed properly.	No cause determined.	None	Existing site program was adequate.	
			(5) Installed duct supports with deficient wall thickness was determined to be factual at BLN. The tube steel sections used in these supports were found to have a wall thickness below the 10-percent mill tolerance.	Inadequate inspections upon receipt of material and upon installation.	NCR 4658 initiated by DNC. DNE is to evaluate and disposition.	Existing site procedures were adequate but not followed by site personnel.	
			(6) A problem of welding stiffener plates onto embedded plates was found for the specific cases identified at BLN. An ultrasonic examination of the	Spalling of the concrete around the edges of the embedded plate.	None - corrective action was initiated and completed before this evaluation.	Existing site procedures and programs were adequate for welding to the embedded plate but procedural control during the welding	

IR3

IR3

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
ost Installation onditions con't)			plates failed to reveal any damage to the embedded concrete anchors even though some concrete around the plate edges had spalled. This spalling was due to the heat generated by the welding of the stiffeners. The concrete had already been repaired.			process was lacking in that the plate expanded enough to spall the adjacent concrete.	
Use of Specifications	X		The availability of the 47A050 series hanger drawing general notes and the training of craft personnel on these notes in the past was very limited at WBN. However, these deficiencies do not exist today in that each craft can obtain controlled copies of these notes as needed, and formal training has been conducted.	Site management failure to recognize the need for craftsman to understand the specifications governing hanger/support installations.	None - corrective action initiated and completed before this evaluation.	Site management recognized the need for craft personnel to be better informed on hanger/support requirements and criteria.	Site management enhanced the hanger/support program by providing more criteria to craft personnel and training them on this criteria.
Hanger Inspection Documentation	X		Two subissues were evaluated as follows: (1) Engineering evaluations not being performed properly on pipe and conduit supports was	Lack of knowledge by the CI.	None	Existing site program and procedures were adequate.	SQLN site management established a program

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
<u>Hanger Inspection</u> <u>Documentation</u> (con't)			not found to be factual at SQN. These evaluations were per- formed in accordance with site procedures, no requirement to examine the installed hardware existed.				with procedures to perform engineering evaluations that was different from the
			(2) Cases of missing docu- mentation for bolt anchor inspections being evaluated away were determined to be factual at SQN. Evalu- ations had been per- formed for inspections that were not traceable. Evaluations based on records show- ing 10-percent of the anchors in the area being tested. When the 10-percent limit was not met, only enough tests were performed to achieve the 10-percent limit. These evaluations were completed in accordance with a policy statement in site procedure SQN- SOP-551 (Attachment F) or a similar statement in a memorandum.	Failure by site man- agement to implement a program to adequately control engineering evalu- ations.	DNE to evaluate the engineering eval- uations performed in accordance with SQN-SOP-551 Attach- ment F for accept- ability.	Site management did not coordinate with DNE on a site pro- cedure program that differed with upper- tier criteria.	DNEs upper- tier docu- ments. Site management failed to coordinate with DNE on criteria in the accept ability of this program.

IR3



## 1.0 CHARACTERIZATION OF ISSUES

### 1.1 Introduction

This subcategory report of the Construction Category of the Watts Bar Nuclear Plant (WBN) Employee Concerns Task Group (ECTG) addresses employee concerns in the area of hangers/supports at WBN and/or other Tennessee Valley Authority (TVA) nuclear plants. These concerns address perceived problems with pipe cable tray, duct, electrical, and instrumentation hangers/supports.

Forty-six concerns from four TVA nuclear plants (WBN, Sequoyah Nuclear Plant [SQN], Browns Ferry Nuclear Plant [BFN], and Bellefonte Nuclear Plant [BLN]) are included in subcategory Hangers/Supports. These concerns logically fall into six groups each consisting of employee concerns on identical issues. These groups, hereafter referred to as "elements," are described in greater detail in section 1.2 below.

### 1.2 Description of Issues

#### 1.2.1 Contact Between Dissimilar Metals

Three concerns addressed the subject of contact between dissimilar metals of which two (EX-85-059-002 and IN-85-595-005) were for WBN and one (XX-85-038-001) was for SQN. These concerns focused on a perceived problem with stainless steel pipe contacting carbon steel supports without stainless steel shims separating them. In lieu of shims, the supports were painted. Concern EX-85-059-002 stated that the paint would wear through, and concerns IN-85-595-005 and XX-85-038-001 stated that the paint could be rubbed off by hand.

#### 1.2.2 Design Output

Five concerns addressed the subject of design output of which all were for WBN:

IN-85-052-003	IN-85-398-001	WI-85-091-013
IN-85-293-016	IN-86-019-005	

These concerns focused on perceived problems with A-size drawings not matching the analysis isometrics with respect to the support location, specific hangers having three separate identification numbers, the results of the sampling program initiated because of Division of Nuclear Engineering's (DNE) failure to provide adequate bolt tightening requirements, duct

1.2.2 Design Output (continued)

supports were inadequately designed, and field fabricated component standards or parts could not be distinguished from vendor supplied parts. During the evaluation of concern WI-85-091-013 at WBN, the concern was determined to be potentially generic for SQN. This determination was based on the potential ambiguity of the 47A050 series hanger drawing general notes to authorize field fabrication of support components.

1.2.3 Methods Used During Installation

Twenty-two concerns addressed the subject of the methods used during installation of which one was for SQN and 21 were for WBN as follows:

IN-85-016-002	IN-85-465-001	IN-86-029-001
IN-85-104-001	IN-85-469-X04	IN-86-116-001
IN-85-109-001	IN-85-490-004	IN-86-168-004
IN-85-288-001	IN-85-821-009	IN-86-300-004
IN-85-428-002	IN-85-865-002	WI-85-065-001
IN-85-445-003	IN-85-903-002	WBM-86-009-001
IN-85-445-X17	IN-85-967-001	XX-85-070-007-SQN
IN-85-461-001		

The concerns in this element focused on perceived problems that dealt with installation aspects of hangers/supports. Concerns IN-86-116-001 (ends of tube steel members closed/capped) and IN-85-288-001 (snubbers not handled properly) were determined to have potential generic applications at all four TVA nuclear plants. The remaining concerns, except for XX-85-070-007, fell into four general categories, i.e., insufficient issue and revision of hanger/support documentation, unnecessary scrapping of supports, general installation aspects of hangers/supports, and interpretation/application of the 47A050 series drawings. Concern XX-85-070-007 was site-specific to SQN, and questioned the adequacy of some installed supports containing snubbers.

Three of the employee concerns contained in this element are also being evaluated by another subcategory report. Concern IN-85-288-001 is also addressed in Subcategory Report 40400, Material Control. Concern IN-85-821-009 is also addressed in Subcategory Report 71101, Materials. Concern WBM-86-009-001 is also addressed in Subcategory Report 10400, Embeds.

1.2.4 Post Installation Conditions

Eleven concerns addressed the subject of post installation conditions of which two were for BLN and nine were for WBN as follows:

BNP-QCP 10.35-6	IN-85-250-001	IN-85-672-004
BNP-QCP 10.35-14	IN-85-349-001	IN-86-043-001
EX-85-121-001	IN-85-458-004	IN-86-200-005
IN-85-069-001	IN-85-625-001	

The concerns in this element focused on perceived problems that dealt with hangers/supports after the installation activities were documented. The two BLN concerns addressed problems with duct support tube steel thickness and the method utilized in "beefing-up" embedded plates. The nine WBN concerns fell into four general categories, i.e., loose or missing bolts or inspection torque stripe, unauthorized support removals, excessive hanger rework, and installed support inadequacies.

Employee concern IN-85-672-004 is also addressed in Subcategory Report 22000, Support Design General.

1.2.5 Use of Specifications

Three concerns (EX-85-061-005, IN-85-600-003, and IN-86-118-001) addressed the subject of the use of specifications. These concerns focused on perceived problems due to the lack of availability for and training of craft personnel on hanger/support specifications (specifically the 47A050 series hanger drawing general notes) at WBN.

1.2.6 Hanger Inspection Documentation

Concerns XX-85-053-001 and XX-85-053-002 addressed the subject of hanger inspection documentation at SQN. The perceived problems addressed engineering evaluations not being performed properly on pipe and conduit supports. The hardware was not always examined before the evaluation was performed. Cases of missing documentations were evaluated away. Where 10 percent of the documentation was not found, inspection tests were only redone to the extent necessary to reach 10 percent. The timeframe for this was from 1978 to 1980.



## 2.0 SUMMARY

### 2.1 Summary of Issues

The employee concerns dealing with perceived problems on hanger/support installations within this subcategory are grouped into six major topics. These topics or elements are summarized as follows:

#### 2.1.1 Contact Between Dissimilar Metals

Several concerns expressed perceived problems with the contact of dissimilar metals. Stainless steel pipe being supported by carbon steel supports without a stainless steel shim between them was the example pointed out by these concerns. Also, they mentioned that the paint used on the carbon steel, in lieu of the shims, would wear through or could be rubbed off by hand. This concern was identified for WBN and SQN only.

#### 2.1.2 Design Output

Design output on hangers/supports is another area pointed out to have perceived problems by employee concerns. These concerns indicated the design organization failed to provide bolt tightening requirements, provided conflicting information on where to locate pipe hangers, and provided inadequately designed supports. These problem design areas were identified for WBN only.

Another design area problem identified at WBN was the authorization by DNE for Division of Nuclear Construction (DNC) to field fabricate vendor component standards or parts. The field fabricated replacement parts could not be distinguished from the vendor supplied parts. This problem was determined to have generic implications at SQN because of the similarities of the 47A050 series hanger drawing general notes used at both plants.

#### 2.1.3 Methods Used During Installation

The largest group of employee concerns on hangers/supports dealt with perceived problems on methods used during installation. These concerns indicated that hanger/support documentation was insufficient when being issued or revised; hanger/support material was being unnecessarily thrown out; methods or practices used during the installation of

2.1.3 Methods Used During Installation (continued)

hangers/supports was inadequate or deficient; and the 47A050 series hanger drawing general notes were over-riding supplements to the hanger drawings. These perceived problems pertained to installations at WBN or SQN.

Two concerns dealt with perceived problems at WBN that due to their common usage at the other three TVA nuclear plants were deemed to have generic applicability. One perceived problem was on possible structural failure of tube steel members installed in a vertical position outdoors without cap plates. Water would collect inside the tube steel causing cracks during freeze-thaw cycles in the winter and rust during the remainder of the year. The other perceived problem was on handling, storing and carrying, adjusting, and protection of snubbers during installation.

2.1.4 Post Installation Conditions

The second largest group of concerns dealt with perceived problems on installations after they were installed. Unauthorized work resulting in portions of or complete installations being removed, torque stripe material on bolts being damaged or missing, hanger support inspections being incomplete or nonexistent, and damage to existing features caused by hanger/support installations were the subjects of the perceived problems voiced by employees at WBN and BLN.

2.1.5 Use of Specifications

The availability of the 47A050 series hanger drawing general notes and knowing how to use them was the issue of three concerns on the use of hanger/support specifications at WBN. The 47A050 series notes were needed as an aid for the craftsman during the installation of hangers/supports.

2.1.6 Hanger Inspection Documentation

Improperly prepared engineering evaluations for missing conduit and pipe support documentation was the issue of the last area with perceived problems on hanger/supports. The hardware was not always examined before the evaluation was performed, and some evaluations were completed on features with missing documentation. When 10 percent of the documentation was not found for concrete anchor bolt installations, inspection tests were only redone to reach the necessary 10 percent.

## 2.2 Summary of Evaluation Process

The six areas or elements developed from the employee concerns on hangers/supports were investigated as independent entities; but, a similar approach methodology was used for each element. These general steps in performing the evaluations are as follows:

1. The reports from previous investigations performed by the Nuclear Safety Review Staff (NSRS) and the Quality Technology Company (QTC) were reviewed for adequacy and for any additional information that could require further investigations.
2. A review of Nuclear Regulatory Commission (NRC) and TVA discrepancies and/or Nonconforming Condition Reports (NCR) was performed for adequacy determination, for corrective actions to be completed, and for generic applicability to the other TVA plants.
3. TVA line management's responses for steps 1 and 2 were examined for compliance to the corrective actions to be completed and for adequacy of methods used.
4. A review of approved drawings, specifications, procedures, and documents was performed to determine the required criteria for each element.
5. Performed field walkdowns, investigations, and samplings to determine the existence of the perceived problems.
6. Interviewed cognizant and knowledgeable individuals on the perceived problems.

## 2.3 Summary of Findings

The perceived problems within the six elements were investigated individually and found to be either factual or not factual. A synopsis of the findings and conclusions by element are as follows:

### 2.3.1 Contact Between Dissimilar Metals

This issue was factual, but a condition affecting quality did not exist. The perceived problem addressed in this element was two-fold. The first part of the problem involved stainless steel pipe being supported by carbon steel supports without a stainless steel shim between them. TVA General Construction Specification G-29M allows the use of inorganic