TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 10700

REPORT TYPE: Subcategory - Construction
(Final Report)

REVISION NUMBER: 3

TITLE: Instrument Tubing

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REASON FOR REVISION:

Revised to incorporate Corrective Action Plans, Executive Summary SRP comments, and finalize report	Revision 1
Revised to incorporate SRP comments and refinalize report	Revision 2
Revised to incorporate TAS comments and refinalize report	Revision 3

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*SRP Secretary's signature denotes SRP concurrences are in files.

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Preface

This subcategory report is one of a series of reports done 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. The subcategory report does more than collect element level evaluations, however. 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 (terms formed from the first letters of a series of words).

Additionally, at the end of each subcategory report the reader will find at least two attachments. The first is a Subcategory Summary Table that includes the following information: the concern number, a brief statement of the concern, and a designation of nuclear safety-related concerns. The second attachment is a listing of the concerns included in each issue evaluated in the subcategory.

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 done 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 Procedure 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 close-out of the issues raised by the over employee concerns.

ECSP SUBCATEGORY REPORT GLOSSARY OF TERMS*

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

Class A: Issue can not 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: Issue itself does not identify a problem, but as a result of the evaluation another problem was discovered for which corrective action was initiated or is needed

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.

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
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of 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)

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
ERT	Employee Response Team or Emergency Response Team
FCR	Field Change Request
FSAR	Final Safety Analysis Report
FY	Fiscal Year
GET	General Employee Training
HVAC	Heating, Ventilating, Air Conditioning
II	Installation Instruction
INPO	Institute of Nuclear Power Operations
IRN	Inspection Rejection Notice

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
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
QAPP	Quality Assurance Program Plan
QC	Quality Control
QCI	Quality Control Instruction

QCP	Quality Control Procedure
QTC	Quality Technology Company
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
TVA	Tennessee Valley Authority
UT	Ultrasonic Testing
VT	Visual Testing
WBECSP	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

Instrument Tubing

Report Number: 10700

Issue Assessment

This subcategory report addresses twelve concerns associated with tubing bending equipment, configuration of Radiation Monitoring System tubing bends, tubing materials, cleanliness of stainless tubing assemblies, venting of tubing assemblies before hydrostatic testing, routing of panel drain tubing and instrumentation line installation practices. The bending issues were associated with the qualification, periodic inspection and segregation of tubing benders and the perceived problem that defective copper tubing materials were being used at WBN. The cleanliness issue was associated with two employee's perceptions that stainless steel tubing was being contaminated by bending machines which were coated with rust, dirt or grease as a result of being stored in an environment with no cleanliness control. One concern was voiced as a suggestion to use teflon tape as an alternative thread sealant on tubing connections. The venting issue involved an employee's perception that venting practices at WBN possibly adversely affected system hydrostatic tests results. The routing issue pertained to the routing scheme chosen for panel drains in the Unit One Reactor Building raceway at WBN. The installation issue surfaced when employees voiced concerns about the amount of rework caused by the installation of tubing systems in areas with pre-existing interferences and the installation of incorrect tubing sizes.

Major Findings

Review of each site's tubing bending and installation controlling procedures diagnosed weaknesses in the storage and segregation controls in effect before the issue evaluations. Inadequacies were apparent in each site's bending equipment qualification and maintenance methods. WBN completed a sampling program designed to qualify the installed configurations of all unit one tubing bends in all of the powerhouse buildings. The unit one sampling program results were expanded to accept all of the unit two tubing bends installed before the current controlling procedures became effective. The TVA fabricated benders used to bend 1" Ø o.d. and 1 1/2" Ø o.d. Radiation Monitoring System had been repaired and requalified to make acceptable bends before the issue evaluation.

Evaluation of the perceived problem with "defective" copper tubing revealed that hard copper tubing (non-bending quality) was being supplied by vendors. Review of the Bills of Materials for each site showed that the procurement specifications were worded in such a way that hard copper could be supplied by vendors and still be in compliance with contract specifications.

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Evaluation of the cleanliness issues revealed that bending equipment storage facilities were inadequate at WBN. As a result of the WBN-DNC concern evaluation, QCP 3.13-5 was revised to include control and storage requirements for bending equipment. Cleanliness requirements for bending equipment were also addressed in the procedure revision to preclude stainless steel tubing contamination. Tubing for critical systems is cleaned before system transfer.

A sample review of the hydrostatic test documentation proved that venting requirements for tubing assemblies were an integral part of each test package. Field observations revealed that high point vents were properly installed or that venting could be performed through the process piping associated with each tubing assembly. The routing issue evaluation showed that panel drains were incorrectly field routed into a floor drain system that was designed to be a closed loop system to retain water inside the unit one cranewall. The closed loop breach was documented by NCR 5899. The drain lines were rerouted to open floor drains as designed.

Review of the DNE issued installation criteria for instrument tubing proved the issue concerning separation violations existing in WBN's Unit Two South Valve Room to be factual. The installation specification, N3E-885, requires a field evaluation by DNE to determine final acceptability of tubing installations before system transfer to ONP. It was concluded that the noted interferences existed, the interferences were known during installation and the installation program requires evaluation at a later date. As stated in the foreward of the subject construction specification, "failure to meet these requirements does not necessarily mean that pipe rupture requirements are violated." The issue was determined to be factual but no corrective action is required at this time.

The BLN evaluation for the installation issue proved to be not technically factual. Rework of tubing was encountered, but was traced to criteria changes issued by DNE.

Collective Significance

All sites' bending equipment controlling procedures and copper tubing procurement specifications were deemed to be inadequate. As a result of the ECTG evaluation for the issues addressed by this subcategory report the following program revisions are being implemented and standardized: Controls for qualification of bending equipment, segregation and storage of bending equipment, detection methods for damaged bending equipment and procurement specifications for copper tubing.

The concerns addressed within the bending equipment/material issue pertaining to copper tubing and the existing copper tubing installations were deemed to be not safety-related. The concerns for the other identified issues had either been addressed before the concerns were evaluated or were considered to not be problems requiring immediate corrective action. R2

INSTRUMENT TUBING SUBCATEGORY 10700

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Bending Equipment and Material - 5 concerns for damaged copper tubing & damaged 1" Ø and 1 1/2" Ø stainless steel tubing.	X		(1) Each of the four nuclear sites experienced procurement problems in which receipt of "bending quality" tubing had not been ensured by the wording of the procurement specifications issued by DNE. (2) WBN-QCP-3.13-5 requires clarification for the qualifying processes of bending operations. (3) WBN-QCP 3.11-2 does not address the ovality exemption for 1/2" Ø and smaller tubing as shown in G-29 PS 4.M.2.1. (4) TVA fabricated benders for 1" Ø and 1 1/2" Ø radiation monitoring system damaged tubing during bending operations. Deficiencies were noted on NCR 6276 and NCR 6275. (5) The control program for storage and use of bending equipment was deficient at all four sites. (6) Benders to be used exclusively for stainless steel tubing were not segregated at any of the four	(1) The procurement specification at each site fails to require bending quality tubing. (2,3) Site implementing procedure is not consistent with the design output controlling process specification. (4) Damage attributed to lack of storage controls. (5) No procedural controls. (6) Site implemen-	(1) Revise procurement specification to include "Bending Quality" requirement for all future contracts and Bills of Material. (2) Clarify WBN-QCP-3.13-5 for bending operation process qualifications. (3) Revise WBN-QCP-3.11-2 to exempt 1/2" Ø and smaller tubing from ovality restrictions per GCS G-29. (4) Benders were repaired and requalified. A sampling program qualified all installed bends. (5) Revise procedure to implement use and storage controls. (6) Establish procedural segregation controls for stainless steel benders. (7) Establish con-	(1) Wording of existing procurement specifications implies that hard copper tubing is bending quality. (2&3) Site implemented procedures failed to incorporate design output guidelines. (4,5&6) Evidence that controls are needed to maintain equipment integrity. (7) Employee awareness programs were not utilized to caution employees about the problems associated with bending difficulties encountered with hard copper tubing. (8) Consistent QA requirements and implementation are essential. (9) Practice is not consistent with established QA program at other sites.	Common bending problems were shared by all sites utilizing hard copper tubing. Employee awareness could have minimized impact of tubing bending problems All sites' controlling procedures were deficient in controls necessary for use and storage of bending equipment & qualification of bending processes.

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
nding Equipment nd Material (cont)			sites. (7) Concerns attributing tubing damaged during bending operations to "bad" material or benders was caused by the use of hard copper tubing which is not considered (by ASTM specifications) to be bending quality. (8) BLN's procedure BNP-QCP-4.3 does not establish a clear distinction between essential (safety related) and nonessential (nonsafety related) tubing installation criteria. (9) IEU personnel at BLN inspect seismic category (IL) supports. This practice is not consistent with the established QA program at other sites and is questionable regarding it adequacy. (10) "Imperial" hand held benders are qualified to make acceptable tubing bends when the proper material is selected.	ted procedure not consistent with process specification. (7) Procurement specification and site procedure controls for segregation were inadequate. (8) Program deficiency. (9) Program deficiency. (10) Bending problems attributed to equipment were caused by hard copper tubing.	trols for storage, segregation, and issuance of hard and bending quality tubing. (8) Revise scope of BNP-QCP 4.3 to establish a clear distinction between essential and nonessential tubing and support installation and inspection criteria. (9) Evaluate adequacy of engineering inspection and documentation of seismic category (IL) supports. (10) Increase employee awareness of problems encountered when bending hard copper tubing.	The lack of second party verification renders past installations questionable. (10) Employee awareness is lacking.	

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Cleanliness for stainless steel tubing systems and use of teflon tape for threaded connections in instrumentation systems. Issues were WBN specific and were not evaluated at the other sites.	X		WBN DNC evaluation for cleanliness concerns determined inadequate storage facilities increased potential for contamination of stainless steel pipe by unclean bending equipment. Tubing for critical systems is cleaned before system transfer. Controlling procedures were adequate when addressing cleanliness requirements. Division procedure manual (DPM) N73M2 restricts use of teflon tape to a maximum temperature of 300°F & a maximum radiation dose of 10^4 rads.	Inadequate storage facilities	Controlling procedure revised to include control and storage requirements for bending equipment.	None	None
			NCR WBN W-231-P documented curtailment of use of teflon tape at WBN. Improper use of teflon tape on tubing systems reentering reactor coolant system could result in leaks caused by deterioration of the tape which in turn, causes a release of flourine. Flourine in the presence of water produces hydrofluoric acid which contributes to the poten-	No cause assigned. Employee voiced concern only as a suggestion	None required	None	None

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Cleanliness for stainless steel tubing systems and use of teflon tape or threaded connections in instrumentation systems issues were WBN specific and were not evaluated at the other sites. (Continued)	X		tial of general corrosion and stress corrosion cracking of stainless steel. Teflon tape applications restrictions have been issued in the Engineering Requirements spec. No. ER-WBN-EEB-001 for Instrument and Instrument Line Installation & Inspection.				
Venting of Instrument tubing systems. Issue was WBN specific and was not evaluated at any other site.	X		Issue was not substantiated. Venting provisions were included in hydrostatic test packages. Field observations proved that vents were properly installed or that venting could be performed through process pipe.				
Routing of Instrument tubing from panel drains to open floor drains in WBN unit one raceway. WBN specific.	X		Panel drains in question were originally routed to floor drains required to be components of a closed loop drains system designed to prevent water inside the cranewall from getting out into the raceway during a LOCA. Incorrect routing was documented on WBN NCR 5899. Piping was rerouted to correct floor drain system. Closed loop drain system was repaired to maintain closure integrity	Incorrect Routing of Drain Pipes.	Corrective Action Completed before evaluation.	None	None

INSTRUMENT TUBING SUBCATEGORY 10700

Executive Summary Table #1

ISSUES	SR	NS	FINDINGS	CAUSE	CORR ACT.	SIGNIFICANCE	COLLECTIVE SIGN.
Installation of instrument tubing systems - WBN specific.	X		Tubing systems in question in WBN unit 2 south valve room were found to be installed without maintaining seperations required by construction specification N3E-885. Interviews with cognizant system engineer provided evidence that the discrepancies were known during installation operations. One interference was scheduled to be rerouted. The three remaining potential problem areas would be evaluated by DNE's pipe rupture evaluation team before system transfer. Any area identified to require rework would be initiated.	Seperation criteria cannot be met in many cases	None required at this time. Any corrective action will be initiated as a result of DNE's pipe rupture evaluation team recommendations before system transfer.	N3E-885 provided as much flexibility as possible with a full evaluation of installed configurations to be completed before system transfer to address conflict areas.	None
Installation of instrument tubing systems - BLN specific	X		Inspection rejection trend review indicated major rework of tubing systems had occurred. Rework was associated with ECN's 1840 and 2500. Frequent rework caused by installing "wrong size" tubing could not be verified.	None Assigned	None	None	None

1.0 CHARACTERIZATION OF ISSUES

1.1 Introduction

This subcategory report on Instrument Tubing in the Construction Category addresses twelve safety-related concerns. The concerns were specific to Watts Bar Nuclear Plant (WBN), with one exception, and pertain to the adequacy of bending equipment/material, cleanliness, venting, routing, and installation of instrumentation tubing. The concerns were categorized for evaluation into five issues;

Bending Equipment/Material

IN-85-707-002
IN-85-740-002
IN-85-740-003
IN-85-773-002
IN-85-831-001

Cleanliness

WBN-86-052-001
IN-85-447-001
IN-86-289-001

Venting

IN-85-866-002

Routing

IN-85-532-002

Installation

IN-85-858-001
XX-85-086-001 (Specific to Bellefonte Nuclear Plant - BLN)

1.2 Description of Issues

1.2.1 Bending Equipment/Material

Five concerns are addressed in the issue of bending operations and materials used for instrumentation systems and are WBN specific.

1.2.1 Bending Equipment/Material (continued)

The WBN issues are associated with the damage of copper tubing and 1"ϕ o.d. and 1-1/2"ϕ o.d. stainless steel tubing. The damage was attributed to defective bending machines and/or the material used. Specifically, the perceived problems were that "Imperial" brand hand held benders break, deform, and/or crack copper tubing during bending operations. This could have been the result of defective bending machines or defective copper material. Hand-made benders for 14" and 20" radius bends of 1"ϕ o.d. and 1-1/2"ϕ o.d. stainless steel tubing for the Radiation Monitoring System damaged the tubing.

1.2.2 Cleanliness

Two concerned employees perceived that stainless steel tubing was being contaminated by bending machines which were coated with rust, dirt, or grease as a result of the pipe and/or tubing benders being stored in a leaky shack. One concern was voiced as a suggestion to use teflon tape on pipe fittings instead of pipe dope (lock-tite).

1.2.3 Venting

One issue was evaluated concerning the venting methods used for instrumentation systems during hydrostatic testing. The concerned individual perceived that improper venting methods adversely affected hydrotest results.

1.2.4 Routing

One issue was evaluated relating to the incorrect routing of instrument panel drain lines in the WBN Reactor Building. The employee perceived that a problem existed in the routing of instrument panel drain lines. The lines were routed to a "closed" system, but are now routed to "open" floor drains. The "closed" system identified by the employee was a radiologically separate drainage system designed for leakage detection.

1.2.5 Installation

One concern pertaining to instrumentation line installation identified an interference existing between an instrumentation line and a 36-inch pipe in the WBN Unit 2 South Valve Room. The concerned employee indicated that the interference was known to exist during installation, but the decision was made to complete the installation and reroute the instrumentation line later if necessary.

1.2.5 Installation (continued)

One BLN employee perceived a problem existed with "a lot of tubing rework", resulting from the frequent installation of the wrong size tubing which was possibly caused by inadequate installation control methods. This report addresses the technical aspect of the issue. The Employee Concerns Task Group Management and Personnel Section will address the portion of the concern dealing with inadequate control methods (see Subcategory Report Number MP71700).

2.0 SUMMARY

2.1 Summary of Issues

The issues evaluated in this report involve concerns pertaining to instrumentation tubing material, tube bending, the quantity of instrumentation tubing requiring rework, the cleanliness of stainless steel instrumentation pipe, the adequacy of venting instrumentation tubing before testing and it's effect on test results, the routing of instrument panel drain lines in the Reactor Building, the possibility of an interference between an instrumentation line and a process pipe in the Valve Room, and the use of teflon tape as a thread sealant.

2.2 Summary of the Evaluation Process

The concern evaluations were based on applicable criteria and requirements established after a review of standards, Division of Nuclear Engineering (DNE) specifications (upper-tier), and applicable site procedures. Discussions were held with site personnel directly involved in the work pertaining to the concerns. In some instances, field observations were made to determine the as-built configuration of features. Nonconforming Reports (NCRs) were reviewed in detail to establish the history of problems in the concerns areas, as well as for any actions currently being taken to resolve problems. Documentation records were reviewed for adequacy, as were applicable work controlling documents and drawings. Quality Technology Company (QTC) files were reviewed and additional information was requested from them to determine if specific items of concern could be identified as required.

2.2 Summary of the Evaluation Process (continued)

After the criteria was established, and all available historical information was obtained, the investigation was conducted to determine if the problem the employee reported was a valid concern. If the reported situation was substantiated, the concern was concluded to be factual, whether or not a problem existed. If the situation the employee reported could not be found, the concern was determined to be not factual. The Findings Section (4.0) will report if the situation presented a problem area. The Corrective Action Section (7.0) will summarize if corrective action is needed in addition to any actions already taken by the responsible organization(s).

2.3 Summary of Findings

Of the five issues investigated, the issue of Bending Equipment/Material was deemed potentially generic to all active nuclear plant sites. Evaluation at the sites concluded an implementation problem existed for the adequate control of tubing bending equipment. The review of the design output procedures applicable to the use of bending equipment determined those procedures to be in compliance with the applicable codes and standards. In summary, the issues addressing Bending Equipment/ Material are factual and require corrective action as a result of ECTG investigations. The review also determined each site has experienced procurement problems in which "bending quality" copper tubing for instrumentation had not been ensured by the DNE contracts. ASTM B75 H-80 ("Nonbending Quality") material was supplied by vendors, but was in compliance with the specifications given in the procurement documents. This resulted in problems encountered from non-bending quality tubing (hard) being utilized in bending operations. This was concluded to be the problem that the employee concerns referred to as "defective" material used during bending activities.

Considering the issue of cleanliness, the concerns associated with the improperly stored and rusty bending machines were valid at WBN, but not generic. Corrective action was taken by the responsible organization and was complete at the time of this investigation. The evaluation of the third concern addressed in this issue involving the use of teflon tape as an alternative pipe thread sealant considered teflon tape to be unapproved for use at the time the evaluation was performed. As a result of further analysis, DNE issued Engineering Requirements Specification number ER-WBN-EEB-001 revision 1, which allows the use of "teflon" film tape within

2.3 Summary of Findings (continued)

specific temperature, radiation and system application parameters. These parameters are established in General Construction Specification G-29, Volume IV, Process Specification 4.M.1.1 and DPM-N73 M2. For further evaluation, reference Operations SQN Element report number 309.01-SQN and CATD 30901-NPS-01.

The issues associated with the adequacy of venting, and the routing of instrumentation panel drain lines, were found to be not valid.

The Installation issue addressed a potential conflict of an instrumentation line and piping was found to be factual. No corrective action was deemed necessary at this time since the installation program addressed this type of condition and provided for a DNE evaluation of the installation.

2.4 Summary of Collective Significance

Collective Significance was concluded to exist generically only in the Bending Equipment/Material issue, as each site had experienced some problems with the control and storage of bending machines and the material used. This pattern of recurring problems reveals an area where establishment of an adequate program to control the storage and use of bending equipment was lacking; therefore, management effectiveness is involved.

The concerns addressing the copper tubing installations were not considered to be safety-related. The other issues had already been addressed through the existing controlling procedures and design specifications.

Consideration should be given to establishing a program to identify and correct recurring problems, perceived as either nonsafety-related or a product of defective work that will be replaced before inspection since these were concluded to be the areas where the problems had occurred and generic recognition or a corrective action program was not implemented. This is recommended to offer a possible improvement in the early identification of problems. The establishment of Quality Circles, which are now being instituted, and the DNQA formation of the Quality Improvement Section at each site should sufficiently address these areas of concern, provided the proper attention is given.

2.5 Summary of Causes

The cause of the problems identified in the Bending Equipment/Material issue, along with the control and use of instrumentation tubing bending machines, was attributed to inadequate site programs which establish proper storage methods for bending equipment and ensure that qualification of bending equipment is maintained. The lack of recurring problem recognition and the lack of a trend analysis program perpetuated the problem areas identified during the concern evaluation.

The cause of the material problems encountered was a result of inadequate DNE procurement specifications, which were not specific enough to prevent non-bending quality (ASTM B75 H80) material from being supplied by vendors.

The cause of the potential contamination of stainless steel tubing in the cleanliness issue was due to rusty, dusty, and greasy bending machines that were improperly maintained and stored.

2.6 Summary of Corrective Action

Corrective action is required at all sites for the Bending Equipment/Material issue to ensure bending operations are implementing design output requirements. Generically, corrective actions are required by DNC and ONP to establish consistent and effective guidance to all sites by way of establishing a program to control bending equipment, including storage, and copper tubing intended for bending applications. DNE is required to revise procurement specifications for copper tubing to clarify when bending-quality tubing is required, and to ensure no substitution is supplied unless uniquely identified.

Corporate Management has mandated changes to Site Construction and modifications procedures to establish control requirements for qualification and storage of bending equipment. The entire subject of control and storage of bending equipment will be addressed as part of the Specification Improvement Program.

Corporate Management will implement a revision to the specifications of copper tubing on applicable drawings and bills of materials. Each site will be required to provide their craft personnel with training in the discrimination and use of each type of copper tubing. Craft personnel will be instructed to contact their responsible DNC engineers when bending difficulties arise while forming bends in copper tubing.

2.6 Summary of Corrective Action (continued)

WBN changed QCP-3.11-2 section 7.15 to clarify ovality requirements for 1/2" ϕ and smaller tubing.

SQN has revised SSMU-5 to detail requirements for use, handling, and qualification of tube benders, in accordance with G-29 PS 4.M.2.1. Bending tools will receive periodic visual inspections. Damaged tools will be tagged as defective until verification of adequacy is determined.

DNC-BLN is to revise their QCP-4.6 to more clearly state a separation between the engineer associated with the physical installation of category 1(L) tubing and the engineer performing the inspection of the tubing. BLN will also establish a procedure to control the use of instrumentation tubing bending equipment.

Corporate DNC will perform and document copper tubing bending tests to supplement the existing test documentation to qualify the installed configurations at BLN. The additional tests of the copper bending process will include the use of three different bender manufacturers (one of which must be Imperial Eastman) making sample bends on representative sizes of available hard copper tubing (one of which must be 1/2"ϕ, .049 wall, hard drawn (H-80) temper tubing). Quality Control inspectors will monitor the tests and provide information as to the tubings' acceptability based on a liquid penetrant examination performed in the area of the bend for each sample. Segregation plans will be based on the results of the aforementioned tests. Personnel involved with the installation of copper tubing will be trained in the process of bending hard drawn copper.

3.0 EVALUATION PROCESS

3.1 General Methods of Evaluation

The general evaluation methodology consisted of compiling applicable standards, design specifications, drawings, and site implemented procedures. A review of requirements was undertaken to determine if the issues raised had ever been procedurally addressed.

Site NCR Logs were reviewed and potentially applicable NCR's were evaluated to determine if any previous documentation existed for the concern areas.

QTC files were reviewed and information was requested that would be pertinent to the issues.

3.1 General Methods of Evaluation (continued)

Discussions and plant observations with cognizant personnel were performed to determine the condition of the as-installed components.

Applicable work controlling documents were reviewed to determine if the issues raised were addressed and documented.

After the applicable criteria was established and all available historical information was obtained, the investigation was conducted to determine if the problem the employee reported was a factual concern. If the situation was found, the concern was concluded to be factual, whether or not a problem existed. If the situation the employee reported could not be substantiated, the concern was concluded to be not factual. The following section, Findings (4.0), will report if a problem existed and if the situation was factual. Corrective action will have been determined previously through the responsible organization, or included in the Corrective Action Section (7.0) as a result of the ECTG investigations.

3.2 Requirements or Criteria Established for Individual Issues

3.2.1 Bending Equipment/Material

General Construction Specification (G-Spec) G-29 Process Specification (PS) 4.M.2.1, Revision 7, Addenda 1, 2, 3 and American Society of Mechanical Engineers (ASME) Section III, Division 1, Sub-section NB, NC, and ND were reviewed to determine the acceptance criteria and methods used to qualify bends and/or bending equipment.

Site procedures at WBN, BFN, SQN, and BLN were reviewed to determine compliance with the above requirements.

Discussions were held with the craftsmen familiar with the particular benders used to fabricate the Radiation Monitoring System. A walkdown of this system was performed to determine the condition of the as-installed bends. The hand-made (TVA fabricated) benders used to form the Radiation Monitoring piping were located and inspected for any obvious physical damage.

3.2.1 Bending Equipment/Material (continued)

TVA Division of Nuclear Engineering (DNE) WBN drawing series 47W600 and bill of material series 47BM600 were reviewed and discussions were held with selected WBN Division of Nuclear Construction (DNC) inspection personnel in the Instrumentation Quality Control (IQC) unit. These discussions were held to determine the material specification required by DNE and the systems where copper tubing is specified for installation.

Various aspects of the bending program were discussed and a walkdown was performed with WBN DNC Instrumentation Engineering personnel to evaluate the adequacy of bending equipment used to bend copper tubing and the adequacy of the bends produced by craftsmen.

The DNC responses to the associated concerns (which were obtained from QTC files) were reviewed.

NCR's taken from logs which appeared to be associated with instrumentation tubing bending or material problems were reviewed in detail. From these NCR's, the scope, corrective action, and implementation was reviewed for additional relevant information.

3.2.2 Cleanliness

DNE General Construction Specification (G-Spec) G-29, PS 4.M.4.1, Revision 4, was reviewed to determine the cleanliness requirements for austenitic stainless steel tubing. DNE process specification 4.M.1.1, Revision 9, was reviewed to determine the requirements for removing contamination. The requirements and intent of these specifications were discussed with the cognizant DNE personnel.

The DNC WBN response related to the cleaning of stainless steel tubing was obtained and reviewed.

The review of the DNC WBN response addressing the use of teflon tape was evaluated.

The Engineering Requirements Specification Number ER-WBN-EEB-001 was evaluated for teflon tape application restrictions.

3.2.3 Venting

Additional information was requested from the QTC file on this concern. The procedural requirements related to high point vents in instrumentation hydrostatic tests was the area of concern. The WBN site procedure, WBN QTC-3.13, Revision 5, was reviewed to determine the specific requirements related to venting of instrumentation tubing during hydrostatic testing. The completed documentation of the testing was reviewed to evaluate conformance to venting requirements.

Field observations of installed instrumentation tubing were conducted to determine overall placement of high point vents. Discussions were held with Instrumentation craft personnel to determine the position and effectiveness of high point vents.

3.2.4 Routing

A review of the TVA DNE drawings and Engineering Change Notice (ECN) 1726 was required to determine the reasoning behind sealing six of the floor drains in the raceway area of the WBN Reactor Building Units 1 and 2.

A review of NCR 5899, ECN 5432, and Work Plan 4967 was required to discover what was done when the sealed floor drains were inadvertently modified.

A field observation was conducted in the raceway area of the Reactor Building to verify that the six closed drains had been sealed and what routing had been taken for the instrument panel drains.

A cognizant WBN chemical engineer was interviewed concerning the use of open floor drains as instrument panel drains.

3.2.5 Installation

The DNE WBN criteria, Construction Specification N3E-885, Revision 1, was reviewed for separation parameters.

Instrument line isometric drawings detailing the locations for lines in the WBN Unit 2 South Valve Rooms were obtained.

The responsible system engineer for the instrumentation system involved was interviewed.

3.2.5 Installation (continued)

Documentation was researched to determine time periods of installation of instrumentation lines.

Reviewed the trend analysis at BLN to determine if improper tubing diameter installations had occurred.

Reviewed BLN site procedures BNP-QCP-4.3 and 4.6 to ensure the proper size of tubing was inspected and necessary inspections and verifications were required to detect tubing which is not installed per the latest design criteria.

4.0 FINDINGS

4.1 Findings on Bending Equipment/Material

4.1.1 Generic

Discussion

The TVA G-29 Process Specification (PS) 4.M.2.1, Revision 7, Addenda 1, 2, 3 for fabrication and qualification of pipe and tube bends was compared with Section III of the ASME Code, the governing requirements of Nuclear Plant Construction at WBN. The comparison indicated agreement related to acceptance criteria and methods allowed for qualifying individual bends and production bending processes. It was noted that tubing 1/2"ϕ and less is exempted in PS 4.M.2.1 from the eight percent maximum ovality allowed by ASME and is supported by DNE calculations. The requirements of the process specification are applicable to construction at other nuclear plant sites.

The review of the WBN site specific concerns was conducted and findings were evaluated for potential generic applicability. The site procedure was determined to contain contradictory requirements and a decision to review other respective site procedures was made. The site control methods for storage and use of bending equipment were determined inadequate and site reviews were deemed necessary.

Discussion (continued)

Implications from concerns that "Imperial" brand hand-held benders damage copper tubing or that copper material is defective resulted from the wording of the DNE procurement contracts. The contracts did not make a distinction between "hard" ASTM B75 H80 (non-bending quality) or bending quality copper tubing, consequently, bending attempts were performed utilizing hard copper tubing which resulted in cracks or breakage of the tubing. This situation was determined to be generically applicable to other TVA sites. It was discovered that Imperial Eastman hand held benders as shown in the manufacturers' catalog, were not listed as being acceptable for bending hard copper tubing.

The review of the WBN program for evaluation of the quality of installed bends revealed that an extensive evaluation had already been performed. DNE statistical analysis, along with logical reasoning, established acceptable criteria for unit 1 and unit 2 instrumentation tubing bends. The results of this evaluation concluded that installed tubing bends are acceptable for their intended service.

Conclusion

The review of the design output procedures determined these procedures to be adequate in the establishment of acceptance criteria and methods used to qualify bends and/or bending equipment. The subsequent review of the site procedures determined procedural inadequacies existed at each site. The review of each site's control program for the storage and use of bending equipment concluded some weaknesses existed in this area also. Those occurred because the program lacked adequate controls to ensure the qualification of bending machines and the maintenance of that qualification. The evaluations of the as-installed tubing bends at WBN formed justification for determining the quality of installed bends at other sites, since negative findings were not substantiated at WBN.

The review of the site programs determined that each site had experienced procurement problems in which receipt of "bending quality" tubing had not been ensured by the wording of the DNE contracts specifications.

4.1.2 Site Specific

Discussion

The findings and conclusions will be discussed for each site.

a. WBN

Site procedure WBN-QCP-3.13-5, Revision 2, was unclear and requires clarification for the qualifying processes of bending operations. Also, the exemption allowed by DNE calculations for ovality of tubing 1/2"ϕ and less is not addressed in the site procedure WBN QCP 3.11-2, Revision 7.

Discussions with Instrumentation craft personnel and DNC Instrumentation Inspection personnel indicated that the hand made (TVA fabricated) benders were deemed inadequate for producing quality bends when attempts were made to fabricate and install a portion of the unit 2 Radiation Monitoring System tubing. This had been reported to the responsible engineering personnel. The bender was repaired at the machine shop and requalified to produce acceptable bends. Bending deficiencies were documented on NCR 6276, Revision 3, and NCR 6275, Revision 2, to address the quality aspects of the as-installed bends in Unit 1 and Unit 2, including the Radiation Monitoring System.The location described in concern IN-85-740-003, describing damaged tubing, was investigated thoroughly to determine if damaged tubing was installed, or being stored for installation, in the Radiation Monitoring System. This investigation revealed no evidence which indicated that damaged tubing was installed or stored in this area. It was noted that a pipe storage rack and evidence of pipe work projects were present, and the potential for tubing to have been stored at this location was possible. Because of this, it was assumed that the concerned individual was reporting the location of stored rather than installed damaged tubing.

Additional field observations were made with DQA personnel to inspect Radiation Monitoring Stations for damage resulting from bending operations and the findings were consistent with the deficiencies documented on NCR's 6276, Revision 3 and 6275, Revision 2. No indications of

a. WBN (continued)

cracks, buckles, grooves, wrinkles, or bulges were discovered during the observations. Further review of NCR 6276 revealed that an extensive evaluation of the Unit 1 and Unit 2 instrument pipe and tubing fabrication and installation program had been performed. DNE established a bend sampling program for applicable bends in Unit 1 to establish criteria for an acceptable level of quality. The conditions considered affected by the inadequacies of control in the tube bending program were wall thickness reduction, ovality, acceptable bend contour and surface condition. A sampling program consisting of random selection of 200 bends for inspection included all applicable buildings and areas within the plant where bends exist. Results of the sampling program indicate statistical acceptance of the entire population of all Unit 1 instrument bends. Expansion of Unit 1 acceptance to include Unit 2 bends was determined to be a logical progression from existing information and data. Investigation determined initial bending processes in use during Unit 1 installation were generally uncontrolled by plant procedures but later procedures for the control of bending operations were implemented. In general, although no specific date exists when Unit 1 bending operations stopped and Unit 2 bending operations started, plant bend procedures were in effect for Unit 2. Therefore, Unit 1 bending operations may be generally viewed as worst-case bending operations. The same evaluation was determined valid for bending hardware and personnel, concluding that both Unit 1 and Unit 2 bends are acceptable for their intended service.

Discussions with instrumentation inspection personnel indicated that problems had been identified in Unit 2 of the Radiation Monitoring System relating to the improper bend radius of 1" o.d. and 1-1/2" o.d. tubing. The applicable drawings specified a minimum bend radius of 20 inches and NCR 6797, Revision 0 and NCR 6822, Revision 0, documented 14 inch radius installed bends for Unit 2. | R3 |

a. WBN (continued)

A review of the site program for the storage and use of bending equipment was performed by reviewing the craft control log. Four specific hand made benders were indicated to be located on Elevation 729 in the Turbine Building. Investigation revealed these benders were not at this location but had been moved during clean-up operations to an outside storage yard and subsequently damaged.

Implications that "Imperial" benders damage copper tubing, or that copper tubing is defective, was researched. A review of the "Imperial" catalog revealed that hand held benders are not suited for bending hard copper tubing. It is noted that DNC reports for the concerns for this issue were incorrect in indicating "Imperial" hand held benders were acceptable for bending hard copper tubing. The DNE original procurement specifications for copper tubing were inadequate by not specifying "Bending Quality" in the description given in the Bill of Materials. "Nonbending Quality" material was supplied by vendors, but was in compliance with the specifications given in the procurement documents.

There is no discernible difference in appearance between hard and soft copper. Difficulties were encountered during bending operations when "Nonbending Quality" material was used. Cracks and breakage were inadvertantly attributed to "bad material or benders." This interpretation was confirmed by DNE Codes and Standards personnel. Subsequent purchase orders, as noted in the bill of material, are of "Bending Quality" which indicates this condition was properly corrected by DNE and DNC. Observations made with Instrumentation Engineering and Quality Assurance personnel, and discussions with craftsmen performing bending operations, provided objective evidence that "Imperial" brand benders produced quality bends when used with Bending-Quality copper tubing.

Conclusion

The issue of Bending Equipment/Material, which involved perceived problems of damage to copper tubing and

Conclusion (continued)

1" o.d. and 1-1/2" o.d. stainless steel tubing, is valid. |R3

The WBN site procedure WBN-QCP 3.13-5, Revision 2, was unclear as to the qualifying process of bending operations and requires revision. In addition, the exclusion in site procedure WBN-QCP 3.11-2, Revision 7, of the exemption allowed by DNE for ovality of tubing 1/2"ϕ and less may cause unwarranted inspection rejections. (CATD 10700-WBN-01)

The concern that the TVA fabricated benders for 14" and 20" radius bends damage Radiation Monitoring tubing was determined to affect 1"ϕ o.d. and 1-1/2"ϕ o.d. stainless steel tubing. The bending deficiencies on the Radiation Monitoring System are adequately documented on NCR's 6276 Revision 3, 6275 Revision 2, 6797 Revision 0, and 6822 Revision 0, which include other unit 1 and unit 2 deficiencies on tubing bends. These NCR's accurately address previous problems with tubing deficiencies, resulting from problems with bending activities, except for addressing improper bend radii on installed unit 1 Radiation Monitoring Tubing. NCR W409-P was initiated on 05/09/86 to document this condition.

The review of the control program for the storage and use of bending equipment determined the program to be inadequate. Benders were not at the locations specified in the control log and present procedures do not specify the methods to use when bending equipment is determined to be no longer suitable for service.

Copper tubing material specifications were reviewed and revealed that the potential existed for hard copper tubing to have been acquired and subsequently utilized in bending attempts. Hard copper tubing is not "bending quality" and will break or crack when bending attempts are made. Therefore, since no reports of copper tubing ruptures during construction hydrostatic testing or system operations have been documented, it is concluded that defective hard copper tubing material is not installed. Copper tubing is subject to installation on non-QA (nonsafety-related) and non-essential control air systems, therefore, providing no safety functions.

Conclusion (continued)

Further observation of the use of "Imperial" hand held benders revealed acceptable bends are produced when the proper copper tubing material is used.

The conclusions reached by DNE for NCR 6276 states that the level of quality of installed Unit 1 and 2 instrument tubing bends is acceptable. A review of the sampling program revealed extensive inspections had been performed to establish criteria for an acceptable level of quality for approximately 14,991 total bends. The evaluation, except for the improper bend radii for Radiation Monitoring Tubing noted above, fully addresses the inadequacies of the instrument tube bending program and evaluates the quality of installed bends for both units.

b. BFN

Discussion

The problems potentially generic to BFN as a result of the WBN review on Bending Equipment were reviewed.

A review of the site implemented procedures used for bending operations was conducted, including the control program for the storage and use of benders. The potential that hard copper tubing may have been inadvertently used in bending operations was reviewed. Corrective Action Report (CAR) 85-081 had been generated questioning the qualification of a bender associated with a work plan.

Conclusion

A review of the site procedure, discussions with quality assurance personnel, and review of CAR 85-081 revealed the following: (1) no verification method was established to ensure qualified benders (suitable for the intended purpose) are selected prior to use, (2) no verification is performed which would detect damaged or defective equipment, (3) although not a design output requirement, no inventory or controls existed to detect or document where benders were used in order to identify suspect tubing should problems be encountered with a particular bender. It is concluded that the site program

Conclusion (continued)

is inadequate to ensure the maintenance of the qualification and control of bending machines through inspection activities. It should be noted that should a manufacturer change the design of a particular bender and the qualification is questioned, re-qualification is mandated per design output documents (i.e., GCS G-29).

The review of drawing 47BM600 sheet 3 of 7 Revision 0 specifies tubing to be seamless copper, hard, ASTM B88 or ASTM B75. Hard drawn (H-80) copper tubing is specified in ASTM B75 and is not bending quality. The material procurement specifications should be revised to add "Bending Quality" to the material description on all future purchase requests.

c. SQN

Discussion

The problems potentially generic to SQN as a result of the WBN review on Bending Equipment were reviewed.

The site implemented procedures for bending activities had been inadequate in that the requirements of the process specification were not implemented and resulted in issuance of CAR SQ-CAR-86-04-017, dated April 10, 1986. A review of the CAR indicated three non-compliances were documented which related to: (1) segregation of bending tools to be used exclusively on stainless steel material, (2) identification of bending equipment, (3) process qualification records could not be located. The corrective actions proposed by the site in response to the CAR provides explicit instructions for segregating bending equipment, but are deficient for qualifying existing benders and bending processes. It was also determined, through discussions with Quality Assurance personnel (Modifications and Additions) and Site Services personnel, that no control method was in place to detect defective bending equipment after initial qualification. In addition, controls had not been established to ensure the proper bending tools were selected given the particular task to be performed.
(CATD 10703-SQN-02), (CATD 10703-SQN-01)

Discussion (continued)

Discussions with site craft personnel revealed that difficulties had been encountered when bending attempts were made utilizing some copper tubing materials. Cracking or breakage of the tubing had occurred which required the remake of some bends. A review of the DNE procurement specification 47BM600 Revision 4, sheet 8 of 73 revealed that hard copper tubing could have been acquired, and subsequently used during bending operations. (CATD 10703-SQN-03)

Conclusion

The inadequacies of the site procedure had been documented on CAR SQ-CAR-86-04-017. Additional problems with the procedure exist in that no control methods have been established to detect damaged or defective bending equipment after qualification has been achieved and no assurance exists to mandate that the proper bending tool is selected for its intended use.

Procurement Specifications for copper tubing were found inadequate in that "bending quality" tubing was not clearly specified by DNE.

d. BLN

Discussion

A review of the site implemented procedure revealed compliance with the process specification. The scope of BNP-QCP-4.3, Revision 13, and BNP-QCP-4.6, Revision 2, are considered inadequate in that no clear distinction exists between essential and nonessential tubing installation criteria. Installation criteria, as established, is related to the seismic qualification of the structure where the tubing is installed rather than the importance of the tubing to nuclear safety. Further investigation determined that craft, engineering, and inspection personnel were applying the respective criteria adequately to essential (safety-related) and nonessential (nonsafety related) tubing. It was noted that seismic category 1(L) supports were inspected and documented by engineering personnel instead of QA personnel. (CATD 10700-BLN-01)

Discussion (continued)

A review of the control program for the segregation and proper use of the benders was performed. It was determined that controls were not established which would require bending equipment intended for stainless steel applications to be segregated, and precautions to the installer do not exist to ensure the proper bender is selected. (CATD 10700-BLN-02)

Control methods are not established to identify damaged or defective bending equipment. No recall of bending equipment is established for inventory or inspection purposes. The potential exists that lost or defective equipment may not be identified. Although not a design requirement, no controls or inventory systems are established to identify where a particular bender was used in order to locate suspect tubing should qualification of that particular bender be questioned. These provisions should be evaluated at the site for incorporation into the control program.

A review of the perceived condition that non-bending quality tubing may have been procured and not uniquely identified showed copper tubing was procurred per the requirements of TVA DNE drawing 5GM0900-I0-26 sheet 109 and 110, Revision 2. As a result of the procurement specifications, hard copper tubing ASTM B75 H-80 could have been acquired and used in bending operations. DNC recognized the deficiency for 1/4" ϕ tubing and reordered bending quality tubing as a result of difficulties encountered when making bends for past installations. Additional revised material specifications for 1/2" ϕ tubing could not be located. However, craft personnel stated the material was re-ordered and problems were no longer encountered.

Conclusion

The scope of the BLN site procedure BNP-QCP-4.3, Revision 13, should be revised to establish criteria to govern the safety-related requirements of the associated tubing, establishing a clear distinction between essential (safety-related) and nonessential

Conclusion (continued)

(nonsafety-related) tubing installation criteria. The criteria, although considered unclear in the procedure, was properly implemented. The concept of engineering inspection for seismic category 1(L) supports is not considered consistent with the established QA program at other sites and is questionable regarding it's adequacy.

The program review determined that the controls for the storage and use of bending equipment are inadequate.

Hard copper tubing may have been used, but, as a result of problems encountered, was replaced. However, BLN should investigate all copper tubing procurement specifications (specifically 1/2" ϕ) and verify that bending quality material is explicitly specified and utilized during bending activities.

4.2 Findings on Cleanliness

4.2.1 Generic

Discussion

No generic considerations were determined from investigation of this WBN specific concern.

Conclusion

Non-Applicable

4.2.2 Site Specific - WBN

Discussion

A review of the General Construction Specification G-29, PS 4.M.4.1, Revision 4, revealed surface cleanliness requirements for stainless steel tubing was adequate. The specification stated that reasonable caution should be exercised to preclude the contact of any other substance other than approved materials with stainless steel. Discussion with DNE personnel revealed contact with rust may be detrimental to stainless steel tubing. However, the condition could be corrected by the process described in G-29, PS 4.M.4.1, Revision 9, with prior DNE concurrence.

Discussion (continued)

A review of the WBN DNC response indicated the concern for inadequacies of storage facilities for bending equipment and the potential for stainless steel contamination was factual. The response stated that the benders were thoroughly cleaned before bending stainless steel. Also, the benders have been moved to the Turbine Building for maximum storage protection and the site procedure QCP 3.13-5 has been revised to include control and storage requirements for bending equipment. The implication in the DNC response that stainless steel pipe would not be contaminated if it came in contact with "rusty" surfaces is considered to be in error, since impingement may occur under these conditions. It is also noted that certain critical tubing is cleaned to remove surface contaminates before the systems are transferred to operations.

The review of the DNC response addressing the use of Teflon tape was evaluated . Division Procedure Manual (DPM) N73M2 restricts the use of teflon tape to a maximum temperature of 300°F and a maximum radiation dose of 10^4 RADS. The procedure also states that teflon tape is not for use on lines that re-enter the reactor system. The Engineering Requirements Specification Number ER-WBN-EEB-001, Revision 1, "Instrument and Instrument Line Installation and Inspection," reiterates DPM N73M2 restrictions for teflon tape applications.

Type TFE teflon tape is generally used in applications where the temperature is less than 400°F. When the temperature exceeds 400°F, the physical properties begin to change, thus allowing the possibility of leakage. Where radiation doses exceed 10^4 RADS, flourine is released from the tape which produces hydrofluoric acid. Under certain conditions the acid could increase the potential for general corrosion and stress corrosion cracking of stainless steel. This is undesirable. R3

Conclusion

Upper-tier specifications were adequate for determining the cleanliness requirements for stainless steel. The site procedure, due to a recent revision, is adequate to ensure proper control and storage requirements for bending equipment. The concern on inadequate storage facilities for bending machines and the potential for contamination of stainless steel tubing was factual. Rust was evident on bending machines and could have contaminated stainless steel tubing through contact. The DNC response showed action was completed to correct storage deficiencies and bending machines are cleaned before bending stainless steel. Although exception is taken to the implication in the response that stainless steel pipe would not be contaminated if it came in contact with "rusty" surfaces, this does not alter the conclusion in the report.

The employee's recommendation that the use of teflon tape should be allowed is valid under certain conditions. Control measures are necessary and adequate to prevent problems resulting from teflon tape's use in unapproved applications.

4.3 Findings on Venting

4.3.1 Generic

Discussion

No generic considerations were determined from investigation of this WBN specific concern.

Conclusion

Non-Applicable

4.3.2 Site Specific

Discussion

The perceived problem was that piping/tubing systems were not properly vented before hydrostatic testing, which may have altered test results.

Discussion (continued)

Additional information requested from QTC pertaining to this concern indicated the concern related to the lack of the use of high point vents during the instrumentation hydrostatic tests. WBN site procedure WBN QCT-3.13, Revision 5, was reviewed and venting considerations were included in the requirements. A sample review of the test documentation showed specifications for venting were contained. Venting was provided prior to testing in the valve line-up in each hydro package. Venting requirements were displayed on the appropriate drawings within the test package.

Field observations indicated high point vents were properly installed or that venting could be performed through the process piping system for the instrumentation line involved. Discussions with instrument craft personnel substantiated venting was properly performed. It was noted that some air could be introduced into the system during the performance of the test but this would not be detrimental to the validity of the test. In certain cases, subsequent venting would be performed during the testing to "bleed" off entrapped air.

Conclusion

This concern was not factual since reasonable assurance exists that adequate venting occurs as a procedural requirement and specifications exist which allow for venting before and during hydrostatic testing.

4.4 Findings on Routing

4.4.1 Generic

Discussion

No generic considerations were determined from investigation of this WBN specific concern.

Conclusion

Non-Applicable

4.4.2 Site Specific-WBN

Discussion

TVA DNE ECN 5432 was reviewed for the reasoning behind sealing of six of the Reactor Building raceway floor drains. The ECN required that the six floor drains in the raceway that were connected to the floor drain collector header inside the cranewall be capped. This capping would prevent any water inside the cranewall from getting out into the raceway during a LOCA through the interconnected floor drain system. The capping modification provided a "closed" system for the floor drains inside the cranewall that allowed for leakage detection for any leakage greater than one gallon per minute. Instrument panel drains were routed to the capped floor drains, the caps were drilled and the instrument drain pipes were routed into the drilled holes. This situation caused the generation of NCR 5899. The capped floor drains were repaired and the panel drain lines were correctly rerouted to open floor drains in the Reactor Building raceway area. Walkdowns verified this routing. Discussions with a WBN chemical engineer revealed no radiological problem with this routing.

Conclusion

This concern was not factual as the instrument panel drains were correctly routed to open floor drains. The concerned individual apparently felt that the panel drains were supposed to be routed into the closed drain system. This was an incorrect assumption.

4.5 Findings on Installation

4.5.1 Generic

Discussion

No generic considerations were determined from investigation of this concern.

Conclusion

Non-Applicable

4.5.2 Site Specific-WBN

Discussion

The DNE criteria for separation distance for instrument lines, Construction Specification N3E-885, Revision 1, was reviewed for separation parameters. This specification was intended to provide guidance for the routing and separation of instrument lines to allow for process pipe movements, including potential pipe breaks. Instrument isometric drawings detailing the locations of instrument lines in the Unit 2 South Valve Room were obtained. A walkdown of the instrument lines in the Valve Room was performed, using N3E-885 for a guide to indicate if a conflict with piping existed. This walkdown revealed four situations where interference, or the potential for interference, exists.

In one case, an instrument line contacted piping, and in other cases the lines potentially entered the area of piping movement from thermal or seismic response. Documentation was researched and revealed installation of the instrument lines took place between November, 1984 and March, 1985. An interview with the responsible system engineer revealed he was aware of all four of the potential interference problems, and that the instrument line on contact with piping was scheduled for rerouting. It was also learned that the DNE Pipe Rupture Team will perform a complete system by system walkdown and evaluate each potential problem area for separation compliance with Specification N3E-885. Further investigation produced a memorandum (see Attachment B) expressing difficulty in installing instrument lines to the criteria of N3E-885. The memorandum states the specification is not a workable document and adherence to the separation requirements is impractical if not physically impossible. In addition, the memorandum concluded, the Unit 1 installation program adhered to N3E-885 very loosely, if at all, and with few exceptions the installation met the requirements of the DNE Pipe Rupture Team.

Conclusion

The concern pertaining to the issue of Installation has been determined to be factual. Using the DNE criteria for separation distance for instrument lines, four potential interferences were identified during a walkdown. Documentation revealed the lines were installed prior to the receipt of the employee's concern, providing credibility to the conclusion these interferences included the area of concern.

Conclusion (continued)

Discussions with the system engineer revealed the conflicts were known and, except for one case, would be evaluated by the DNE Pipe Rupture Team. The referenced memorandum expressed difficulty in utilizing the DNE criteria during installation, and questioned the need for adherence due to Unit 1 evaluations. This may explain the concerned employee's indication that the interference was known but installation was continued. The reference to rerouting the line later, if necessary, was probably referring to the DNE evaluation.

A review of N3E-885 shows the criteria was intended to provide "goals" for separation distances to minimize rework required during the final pipe rupture field evaluation. The specification states, in part, "failure to meet these requirements does not necessarily mean that pipe rupture requirements are violated . . . but . . . means further detailed evaluation must be made." The specification requires a field evaluation by DNE to determine acceptability or required rework of the installations.

It is concluded that the interference exists, the interference was probably known during installation, and the installation program requires later evaluation of instrumentation lines, therefore, the concern is factual and no corrective action is required at this time.

4.5.3 Site Specific - BLN

The concern XX-85-086-001 was specific to BLN and indicated inadequate controls methods may have resulted in tubing rework due to the frequent installation of the wrong tubing size. This evaluation addresses the technical aspect of the concern and the remaining portion will be discussed in the ECTG Management and Personnel Subcategory Report MP71700.

This evaluation was performed utilizing two possible interpretations of the term "wrong size." The first was a strict interpretation which indicated the wrong diameter tubing may have inadvertently been installed, and consequently required removal. A review of work controlling documents showed that they contain installation criteria pertaining to tubing size and are considered adequate to

4.5.3 Site-Specific-BLN (continued)

specify the proper tubing size for installation. Interviews conducted with craft, engineering, and inspection personnel did not reveal deficiencies related to this interpretation. A review of the inspection rejection trend reports supported this conclusion. The second interpretation was that "wrong size" was referring to dimensional and/or configuration discrepancies. Engineering and inspection personnel indicated major rework had been identified in this area. The cause of the rework resulted from two DNE Engineering Change Notices (ECN) Numbers 2500 and 1840, issued in 1983. Further review of the installation procedures revealed the necessary inspections, and verifications to ensure tubing is installed per the latest design criteria, was performed. No technical deficiency was noted since the situation resulted from changes in the design criteria.

Conclusion

The site specific concern at BLN was not technically factual. Although rework was encountered, no technical problem existed since the rework resulted from a criteria change issued by DNE.

5.0 COLLECTIVE SIGNIFICANCE

5.1 Significance of Each Issue

5.1.1 Bending Equipment/Material

The significance of this issue resulted from the program inadequacies discovered during review at each plant site. Each site had experienced some problems with the control and storage of bending machines and the material used. These recurring problems were perceived as either non-safety related or a product of defective work that would be replaced before inspection. The ineffectiveness of a program to react to problems encountered, and the resulting employee awareness, caused technical deficiencies in the bending of instrumentation tubing, control of bending machines, and the material used. The communication process and organizational structure available to identify and correct recurring quality-related problems needs strengthening so that the technical adequacy of the nuclear facility is ensured.

5.1.2 Cleanliness

The findings concluded that TVA had responded to the inadequate storage of bending machines and to the potential contamination of stainless steel. This action was complete and acceptable and indicates a positive response to reported problem areas.

The employee's recommendation to use teflon tape showed that management's effectiveness in communicating the design basis for not using teflon tape could have been enhanced by utilizing the Employee Involvement Program to pass information on to employees explaining why teflon tape was being restricted at WBN.

5.1.3 Venting

The findings substantiated TVA procedures and processes effectively addressed potential problems in this area.

5.1.4 Routing

Instrument panel drains were correctly routed to open floor drains. This investigation found a problem had existed and was properly documented and corrected.

5.1.5 Installation

Although installation interferences existed, DNE's specification provided criteria to address this type of situation. This specification provided as much flexibility during the construction installation as possible, while providing a full evaluation upon completion.

5.2 Collective Significance of the Subcategory

5.2.1 Generic

The significance of the issue on Bending Equipment/Material inadequacies results from the findings that each site had experienced similar problems with the control of bending machines and the material used, and no program is apparently in place to detect and correct this type of occurrence. The concerns pertaining to the copper tubing material and the existing copper tubing installations were deemed to be not safety-related.

5.2.1 Generic (continued)

Significance related to the issues on Cleanliness, Venting, Routing, and Installation was that TVA had responded with effective corrective action to address these situations.

6.0 CAUSE

6.1 Bending Equipment/Material

The cause of the problems associated with the control and use of instrumentation tubing bending equipment resulted from inadequate site programs established to ensure proper storage, control, and qualification of the equipment. The responsible organization is the Division of Nuclear Construction which should establish consistent and effective guidance for correction of this problem area in accordance with ONP's policy to provide centralized direction. Recurring problem identification and trend recognition were not emphasized in each project's program.

The cause of the perceived problems associated with defective copper tubing resulted from the attempts to bend non-bending quality copper tubing. The procurement specification implies, by not specifically requesting "Bending Quality," that hard-drawn tempers as specified in ASTM B75 satisfies the intention of the specifications. Tubing of this temper (H-80) is not bending quality and will break during bending operations.

6.2 Cleanliness

Non-Applicable

6.3 Venting

Non-Applicable

6.4 Routing

Non-Applicable

6.5 Installation

Non-Applicable

7.0 CORRECTIVE ACTION

7.1 Corrective Action Already Taken or Planned

Corrective actions established for the problems related to the Bending Equipment/Material and cleanliness issues are as follows:

7.1.1 Site Specific

7.1.1.1 WBN

a. The revision request prepared by Instrumentation Engineering Unit (IEU) personnel will clarify paragraph 6.2.6 in site procedure QCP 3.13-5 concerning the qualifying process of bending operations.

b. Nonconformances 6797 Revision 0, 6822 Revision 0, 6276 Revision 3 and 6175 Revision 2 were initiated by the site to document and correct problems encountered with the control, storage, qualification of bending machines, the improper bend radii and quality aspects of installed tubing. The scope of the NCRs does not adequately ensure, however, that the improper bend radii for Radiation Monitoring System on Unit 1 tubing is included. As a result of the review of this condition, NCR W409-P was initiated on 05/09/86 to correct the Unit 1 Radiation Monitoring tubing.

c. Corrective action has been completed for the issue of cleanliness to correct storage deficiencies and the potential for rust, dirt, and grease contamination on bending equipment. This included a revision to the site procedure to include control and storage requirements for bending equipment, and relocation of bending equipment to improved storage locations.

7.1.1.2 BFN

Corrective Action Report 85-081, noted in the Bending Equipment/Material issue, was previously generated to identify deficiencies associated with bender qualification and adequacy of Quality Assurance/Quality Control effectiveness.

7.1.1.3 SQN

Corrective Action Report SQ-CAR-86-04-017 was previously generated in the Bonding Equipment/Material issue, to identify deficiencies in the site implemented procedure requirements. Corrective action has been proposed by the site for CATD 10703-SQN-01 as follows: 1. Qualify old and new benders per P.S. 4.M.2.1. 2. color code benders to be used on stainless pipe and tubing. 3. Remove from use all bending shoes for the defective hydraulic benders. 4. Formally request assistance from site DNE to determine: a. Acceptability of corrective actions taken in accordance with CAR 86-04-017. b. Any additional corrective action required by DNE.

7.1.2 Generic

Non-Applicable

7.2 Corrective Action From CATD's

7.2.1 Site Specific

7.2.1.1 WBN

a. Finding: The Bonding Equipment/Material issue concluded in Section 4.1.2 that the exemption allowed by DNE calculations for ovality of tubing 1/2" ϕ and less is not addressed in the site procedure, and may cause unwarranted inspection rejections. |R3

Proposed Corrective Action: DNC WBN to address the ovality requirements for 1/2" ϕ and less diameter tubing in WBN-QCP 3.11-2. (CATD 10700-WBN-01)

WBN Line Management supplied the following as a Corrective Action Plan in response to CATD 10700-WBN-01: Upper-tier document TVA G-29M, (PS) 4.M.2.1 exempts tubing 1/2"Ø and less from ovality requirements. The site implementing procedure QCP 3.11-2, Revision 7, Section 7.15, Note 2 reflects this, in addition attachment B, note 7 was added to clarify ovality requirements on 1/2"Ø and smaller tubing.

7.2.1.2 BLN

a. Finding: The Bending Equipment/Material issue concluded in Section 4.1.2 that the scope of BNP-QCP-4.3 is unclear as to the criteria relating to the safety-related requirements of tubing. Also, the concept of engineering inspection and documentation is not considered consistent with the established QA program at other sites.

Proposed Corrective Action: Revise the scope of BNP-QCP 4.3 to establish a clear distinction between essential (safety-related) and nonessential (nonsafety-related) tubing installation criteria. Evaluate the adequacy of engineering inspection and documentation of seismic category 1(L) supports. (CATD 10700-BLN-01)

BLN Line Management has provided the following as a corrective action for CATD 10700-BLN-01: We do not agree that the described condition is a problem. The terms "essential" and "non-essential" deviate from the requirements of N4 50 D754, "Design Criteria for the Classification of Structures, Systems, and Components covered by the Bellefonte Nuclear Plant Quality Assurance Program". DNE has previously instructed DNC to use the terminology "seismic Category I" and "seismic Category I (L)" when making reference to the classification of instrument tubing. Since our procedures and design documents are now consistent in the use of this terminology, we recommend the scope of BNP-QCP 4.3 to remain as is. The issue of inspection and documentation of seismic Category I (L) tubing and supports was addressed by Deviation Report No. D04-S-84-4112-D01. A separate procedure BLN QCP-4.6 was developed by BLN and approved by DNE to address the inspection and documentation requirements of seismic Category I (L) tubing and supports. The procedure provides for an engineering inspection and the generation of a Life of Plant inspection record. Drawing 5GB0925-IO-57 was revised to provide the requirement for inspection of those lines and supports designated Category I (L) and, at the time specified that they would be inspected to QCP-4.6. Revision 6 of the same drawing removed the reference to the QCP.

7.2.1.2 BLN (continued)

Discussions with the project DNE personnel indicate a willingness on their behalf to accept an FCR to the above noted drawing to define the inspection requirements as currently understood. BLN will initiate an FCR by April 15, 1987. BLN will also revise QCP-4.6 to more clearly state a separation between the engineer associated with the physical installation and the engineer performing the inspection. The revision to QCP-4.6 shall be completed by July 15, 1987.

b. Finding: The bending Equipment/Material issue concluded in Section 4.1.2 that controls at BLN were inadequate by not requiring the segregation of bending equipment intended for stainless steel applications.

Proposed Corrective Action: DNC-BLN to "establish controls to ensure segregation of bending equipment intended for stainless steel applications and to ensure that the installer selects the proper bender." (CATD 10700-BLN-02)

Line Management supplied the following corrective action in answer to CATD 10700-BLN-02: A procedure will be established for the purpose of controlling the use of instrumentation tubing bending equipment. Included in this procedure will be instructions/precautions to the installer, control of individual bending equipment, and Quality Control verification of compliance to the procedure. This procedure will be submitted for approval by April 1, 1987.

7.2.1.3 SQN

a. Finding: No control methods or QA surveillance activities have been established to detect damaged or defective bending equipment after qualification has been achieved. Consequently, damaged or defective bending equipment may remain undetected. (CATD 10703-SQN-02)

7.2.1.3 SQN (continued)

Proposed Corrective Action: Line Management has provided the following: a revision to SSMU-5 has been issued detailing requirements for use, handling, and qualification of tube benders in accordance with G-29 PS 4.M.2.1. Bending tools will receive periodic visual inspections. Damaged tools will be tagged as defective until verification of adequacy is determined. Benders which cannot be proven acceptable will be destroyed.

7.2.2 Generic

All findings addressed in this section pertain to the Bending Equipment/Material issue as noted in Section 4.1.2.

a. Finding: Site procedures for the control and storage of bending equipment were concluded to have procedural inadequacies and/or some program weakness.

Proposed Corrective Action: DNC to establish consistent and effective guidance for Construction and Modifications to implement the requirements for a program for the control and storage of bending equipment. This program should establish controls to ensure the qualification of bending equipment and the maintenance of that qualification, and consider an inventory system to identify where a particular bender was used in order to locate suspect tubing should qualification of that bender be questioned. Establish controls to identify damaged, defective, or lost benders. (CATD 10700-NPS-03)

Corporate Management supplied the Corrective Action Plan for CATD 10700-NPS-03 as follows: for MODS Units: WBN M&AI-30 Revision 1 contains control requirements for qualification and storage of bending equipment. SQN established controls which require qualification of benders and segregation as required by CATD Nos. 10703-SQN-01 and 02. BFN M&AI-51 is being initiated to address a program for control and storage of bending equipment. This instruction will be completed by May 1, 1987. Const Units: WBN QCP 3.13-5 Revision 4 contains program for control and storage of bending equipment. BLN will complete a QCP by June 1, 1987 for controlling and storage of bending equipment.

7.2.2 Generic (continued)

In addition to the steps outlined above, the entire subject of control and storage of bending equipment will be addressed as part of the Specification Improvement Program. A technical performance procedure will be written to address the subject. Estimated completion by November 1, 1987.

b. Finding: Copper tubing is not properly segregated and controlled to preclude misapplication as related to bending quality (temper).

Proposed Corrective Action: DNC, DNE and ONP to review the program and establish necessary controls to ensure copper tubing is properly segregated, as related to bending quality (temper), and controlled to preclude misapplication. (CATD 10700-NPS-02)

To supplement the pneumatic testing of installed tubing at Bellefonte Nuclear Plant, DNC will perform and document additional tests of the copper bending process which will include the use of three different bender manufacturers (one of which must be Imperial Eastman) making sample bends on representative sizes of available hard copper tubing (one of which must be 1/2 inch OD, .049 wall, hard drawn (H-80) temper tubing). Quality Control inspectors will monitor the tests and provide information as to the tubings' acceptability based on a liquid penetrant examination performed in the area of the bend for each sample. If the results are positive, DNC will insure that all craft personnel involved with the installation of copper are properly trained in the process of bending hard drawn copper and segregation will not be required. If the results are negative, each site will implement a program to segregate the hard drawn temper copper tubing and insure that it is not used for any installation other than straight runs. If in fact, segregation becomes necessary, the short term resolution will be implemented by memorandum to the Site DNC management and to the Site Directors. The long term DNC solution will be provided in Instrumentation and Mechanical Technical Performance Procedures.

In addition, if DNE, as a result of responding to CATD 10700-NPS-004, changes the specifications for copper tubing on the various Bill of Material, DNC will assure that future purchases are made to the new specifications. No further action will be required by DNC as all material is purchased to the latest revision of the applicable Bills of Material.

c. Finding: DNE contracts did not ensure that bending quality copper tubing was procurred.

Proposed Corrective Action: DNE to review procurement specifications for copper tubing. Specifications are to clarify if bending quality tubing (temper properties) is desired, and if so, prevent any substitution of non-bending quality tubing unless unique identification is utilized. (CATD 10700-NPS-04) (CATD 10703-SQN-03)

Corrective action supplied by Corporate Management is as follows for CATD 10700-NPS-04: By March 13, 1987, MEB will prepare a Memorandum for R. W. Cantrell's signature regarding the specification of hard drawn and annealed copper tubing, and the requirement for revision of the applicable drawings and bills of materials. This memorandum will be endorsed to DNC and each Site Director with a request for them to provide their craft personnel with training in the discrimination and use of each type of copper tubing. This CAP will answer CATD 10703-SQN-03 also.

Evaluate the existing stock of copper tubing at each site and provide disposition of non-bending quality tubing.

d. Finding: Nonbending quality copper tubing may have been procured and utilized in bending operations.

Proposed Corrective Action: DNC to advise craft personnel that non-bending quality tubing may be encountered and to proper action to take. (CATD 10700-NPS-01)

Corrective action supplied by Corporate Management for CATD 10700-NPS-01 is as follows: All craft personnel will be made aware that hard drawn copper tubing may exist at their locations and if they have problems forming bends, they are to notify the responsible DNC engineer. A memorandum will be sent to all sites to initiate and insure compliance with the craft training requirements noted above.

8.0 ATTACHMENTS

8.1 Attachment A, Subcategory Summary Table and List of Concerns

8.2 Attachment B, Reference Memorandum on Installation of Instrument Lines

8.3 Attachment C, List of Concerns by Issue

8.4 Attachment D, List of Evaluators

ATTACHMENT A

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

RUN TIME - 10:04:39
RUN DATE - 03/10/87

CATEGORY: CO CONSTRUCTION-PROCESS
SUBCATEGORY: 107 INST. TUBING

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAI RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION I CAT - CO SUBCAT - 107
IN -85-447-00101 I50034	CO	10700	N	HBN	1 N N N Y 2 NA NA NA SR	IN-85-447-001	QTC	PRIOR TO MARCH 1985 THE PIPE BENDING MACHINE WAS STORED IN A SHACK THAT LEAKED AND THE HEAD OF THE MACHINE W AS COATED WITH RUST. STAINLESS STEE L INSTRUMENTATION PIPE WAS BENT ON T HE MACHINE (NOW STORED IN TURBINE BL DG)	1.2.1, 3.2.1, 4.1, 5.1.1, 6.1, 7.1.1, 7.2.1.1
IN -85-532-00201 I50234	CO	1070	N	HBN	1 N N N Y 2 NA NA NA SR		QTC	DRAIN LINES IN REACTOR ARE ROUTED TO INCORRECT (NOT PER DESIGN) FLOOR DR AINS. THE ORIGINAL DESIGN CALLED FO R A "CLOSED" SYSTEM BY SEAL WELDING A PLATE OVER THE TOP OF THE DRAIN; N OW OPEN DRAINS ARE USED. CI DECLINE D TO PROVIDE INFORMATION. CONSTRUCT ION DEPARTMENT CONCERN. NO FOLLOW U P REQUIRED.	1.2.4, 3.2.4, 4.4, 5.1.4, 6.4, 7.1.1
IN -85-707-00201 I50070	CO	10700	N	HBN	1 Y Y Y Y 2 SR SR SR SR	IN-85-707-002	QTC	TUBING CRACKED WHEN BENT WITH HAND B ENDER. WAS LOCATED IN REACTOR BUILD ING 2, THROUGH HATCH, UP SPIRAL STAI RCASE, ON 1ST LANDING-3/8" COPPER TU BING. HAS BEEN REPLACED WITH ACCEPT ABLE TUBING. CRACKED TUBING HADN'T BEEN INSPECTED AT TIME THAT IT WAS D ISCOVERED AND FIXED. C/I HAS NO MOR E DETAIL. NOTE: C/I HAS NO MORE IN FORMATION. HE REPLACED CRACKED TUBI NG WHENEVER HE FOUND IT - KNOWS OF N O MORE.	1.2.1, 3.2.1, 4.1, 5.1.1, 6.1, 7.1.1.1, 7.2.1.1
IN -85-740-00201 I50199	CO	10700	N	HBN	1 Y Y Y Y 2 SR SR SR SR	IN-85-740-002	QTC	ALL HAND BENDERS ARE THE "IMPERIAL" BRAND, AND ALL BEND THE SAME. THESE BENDERS WORK OK FOR STAINLESS STEEL , BUT THEY CRACK AND "EGG SHAPE" COP PER TUBING. CI DECLINED TO PROVIDE FURTHER INFORMATION. CONSTRUCTION D EPT. CONCERN.	1.2.1, 3.2.1, 4.1, 5.1.1, 6.1, 7.1.1.1, 7.2.1.1

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

ATTACHMENT A

REFERENCE - ECPS132J-ECPS132C
FREQUENCY - REQUEST
ONP - ISSS - RHH

TENNESSEE VALLEY AUTHORITY
OFFICE OF NUCLEAR POWER
EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY

RUN TIME - 10:04:39
RUN DATE - 03/10/87

CATEGORY: CO CONSTRUCTION-PROCESS SUBCATEGORY: 107 INST. TUBING

REF. SECTION 8
CAT - CO
SUBCAT - 107

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ NB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	
IN -85-740-00301 T50199	CO	10700	N	HBN	1 N N N Y 2 NA NA NA SR		QIC	HAND MADE TUBING BENDERS USED TO BEND RADIATION MONITORING TUBING (1" AND 1 1/2") DAMAGE TUBING. BENDERS LOCATED 729' OF TURBINE BUILDING (14" AND 20" RADIUS). TUBING LOCATED IN ADDITIONAL EQUIPMENT BUILDING: GO IN CRANE BAY DOOR OF UNIT 2, TAKE RIGHT HAND DOOR, LOOK BEHIND WING WALL NEAR OR BEHIND SOME STAIRS. CONSTRUCTION DEPT. CONCERN. CI DECLINED TO PROVIDE FURTHER INFORMATION.	1.1.1, 3.1.1, 4.1 5.1.1, 6.1, 7.1.1, 7.2.1.1
IN -85-773-00201 T50081	CO	10700	N	HBN	1 Y Y Y Y 2 SR SR SR SR	IN-85-773-002	QIC	COPPER TUBING BREAKS OR SQUEEZES TOGETHER WHEN BENDING 90 . MATERIAL OR BENDER IS DEFECTIVE. NO MORE INFORMATION AVAILABLE.	1.2.1, 3.1.1, 4.1, 5.1.1, 6.1, 7.1.1, 7.2.1.1
IN -85-831-00101 T50086	CO	10700	N	HBN	1 Y Y Y Y 2 SR SR SR SR	IN-85-831-001	QIC	COPPER INSTRUMENTATION TUBING IS CONSISTENTLY "BREAKING" WHEN BENT USING THE MECHANICAL (HAND-OPERATED) BENDING TOOLS. BECAUSE OF THE CONSISTENCY AT WHICH THE "BREAKAGE" OCCURS, THERE IS A CONCERN THAT THE "GOOD" BENDS MAY VIOLATE MINIMUM WALL OR OTHERWISE WEAKEN THE COPPER TUBING. PROBLEM MAY BE THE CONDITION OF THE BENDING TOOLS. (NO SPECIFICS GIVEN)	1.2.1, 3.1.1, 4.1, 5.1.1, 6.1, 7.1.1, 7.2.1.1
IN -85-858-00101 T50136	CO	10700	S	HBN	1 N N N Y 2 NA NA NA SR	I-85-523-HBN	QIC	INSTRUMENTATION SEEMS MORE CONCERNED WITH QUANTITY RATHER THAN QUALITY WORKMANSHIP. EXAMPLE: INSTRUMENTATION LINE IN SOUTH VALVE ROOM HAD INTERFERENCE WITH 36" PIPE. CI BROUGHT THIS TO THE ATTENTION OF SUPERVISOR AND WAS TOLD NOT TO BE CONCERNED. PER CI, SUPERVISORY STAFF WANTED TO BUY-OFF THE SUPPORTS AND COULD RE-ROUTE THE LINE AFTERWARDS. LOCATION: UNIT 2, TIME: MARCH 1985. CI ALSO STATED THIS TYPE OF POOR WORKMANSHIP OCCURS CONSTANTLY. CONSTRUCTION DEPT CONCERN.	1.2.5, 3.2.5, 4 5.2, 5.1.5, 6.5
02	MP	71009	S	HBN	1 N N N N 2 NA NA NA NA				

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

CATEGORY: CO CONSTRUCTION-PROCESS SUBCATEGORY: 107 INST. TUBING

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ HB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION B CAT - CO SUBCAT - 107
IN -85-866-00201 T50245	CO	10700	N	HBN	1 N N N Y 2 NA NA NA SR		QIC	CI STATED PIPING SYSTEMS ARE NOT PROPERLY VENTED PRIOR TO HYDROSTATIC TESTING. THIS IS A GENERIC CONCERN. CI DECLINED TO PROVIDE ADDITIONAL INFORMATION. CONSTRUCTION DEPARTMENT CONCERN.	1.2.3, 3.2.3, 4.3.2, 5.1.3, 6.3
IN -86-289-00101 T50152	CO	10700	N	HBN	1 N N N Y 2 NA NA NA SR	IN-86-289-001	QIC	CI WOULD LIKE TO BE ABLE TO USE TEFLON TAPE ON PIPE FITTINGS INSTEAD OF PIPE DOPE (LOCK-TITE) WHEN WORKING ON INSTRUMENTATION LINES. CONSTR. DEPT. CONCERN. CI HAS NO ADDITIONAL INFORMATION. FOLLOWUP NOT REQUIRED.	1.2.2, 3.2.2, 4.2.2, 5.1.2, 6.2
WBN-86-052-00101	CO	10700	S	WBN	1 N N N Y 2 NA NA NA SR		NSRS	DURING THE EXIT INTERVIEW THE CI INDICATED THAT HE HAD OBSERVED HOMEMADE CARBON STEEL TUBE BENDERS BEING USED TO BEND STAINLESS STEEL TUBING. THE CI IS CONCERNED THAT THE TUBING MAY NOW BE SUBSTANDARD AND NEEDS TO BE REPLACED. ALSO, THE CI STATED THAT THE BENDER ON EL 708, UNIT 2 TURBINE BUILDING IR DIRTY AND GREASY.	1.2.1, 3.2.1, 4.1.2, 5.1.1, 6.1, 7.1.1, 7.2.1.1
02	CO	17300	S	WBN	1 N N N Y 2 NA NA NA SR				
XX -85-086-00101 T50146	CO	10700	S	BLN	1 N Y N N 2 NA SR NA NA		QIC	BELLEFONTE: THE "SIGNING" OF THE INSTRUMENTATION LINES AT BELLEFONTAE IS THE RESPONSIBILITY OF THE ELECTRICAL DEPT. AND THEY DO NOT HAVE SUFFICIENT EXPERTISE TO AACCURATELY DETERMINE THE PROPER SIZE OF THESE LINES. THIS CAUSES PROBLEMS AND A LOT OF REWORK DUE TO THE FREQUENT INSTALLATION OF THE WRONG SIZE LINE. CONST. DEPT. CONCERN. CI HAS NO FURTHER INFORMATION. NO FOLLOWUP REQUIRED.	1.2.5, 3.2.5, 4.3.3, 5.1.5, 6.5
02	MP	70601	S	BLN	1 N N N N 2 NA NA NA NA				

12 CONCERNS FOR CATEGORY CO SUBCATEGORY 107

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

UNITED STATES GOVERNMENT

ATTACHMENT "B" C24 8806260004
SUBCATAGORY 10700

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : M. L. Rayfield, Project Engineer, Watts Bar Engineering Project, 1-104 SB-K (3)

FROM : Guenter Wadewitz, Project Manager, Watts Bar Nuclear Plant NU CON

DATE : JUN 26 1986

SUBJECT: WATTS BAR NUCLEAR PLANT - ROUTING AND SEPARATING INSTRUMENT LINES IN THE VICINITY OF HIGH ENERGY PROCESS PIPING INSIDE AND OUTSIDE CONTAINMENT (CONSTRUCTION SPECIFICATION N3E-885)

An investigation into the field application of N3E-885 separation requirements has determined that this construction specification is not a "workable" document. For the majority of installations in the reactor building and main steam valve rooms, adherence to the separation requirements is impractical if not physically impossible.

The specification requires the use of "engineering judgement" in the consideration of "subsequent plausible pipe movements . . . assuming the formation of plastic hinges at credible locations." A telecon with Bobby J. Lancaster (DNE pipe rupture team) on June 25, 1986, confirmed that NU CON field engineering personnel are not qualified nor authorized to assume this responsibility without further DNE definition and instruction.

As stated in the foreword of the subject construction specification, "failure to meet these requirements does not necessarily mean that pipe rupture requirements are violated." Due to the fact that "it is not necessary that all instrument lines be protected from all potential pipe breaks," a DNE evaluation is required to determine the instrument lines which must be protected from a specific potential pipe break. Therefore, it is futile for NU CON to attempt to install instrument lines according to the separation requirements which may not be applicable to a specific instrument line installation.

In conclusion, it should be recognized that the unit 1 DNE pipe rupture field evaluation performed upon completion of instrument line installation resulted in minimal rework, generally requiring only the addition of supports and no piping rework. The unit 1 installation program adhered to N3E-885 very loosely, if at all, and the resulting installations, with very few exceptions, met the requirements of the pipe rupture team evaluation. This fact, in addition to the impracticality of NU CON adherence to the separation requirements, results in the request that DNE pipe rupture evaluation personnel assist NU CON in the initial routing of all safety related instrument lines if "up-front" identification of potential separation violations is both necessary and cost effective.

Guenter Wadewitz

JMC:DLD
cc: RIMS, MR4N72 A-C
R. A. Pedde, 9-169 SB-K

Principally prepared by John M. Campbell, extension 3468.

ATTACHMENT C

List of Concerns by Issue

Issue	Concerns
1.2.1 Bending Equipment/Material	IN-85-707-002 IN-85-740-002 IN-85-740-003 IN-85-773-002 IN-85-831-001
1.2.2 Cleanliness	WBN-86-052-001 IN-85-447-001 IN-86-289-001
1.2.3 Venting	IN-85-866-002
1.2.4 Routing	IN-85-532-002
1.2.5 Installation	IN-85-858-001
(BLN Specific)	XX-85-086-001

ATTACHMENT D

LIST OF EVALUATORS

Margaret E. Selweski, WBN

Henry W. Loftis, WBN, SQN, BFN, and BLN