

**EMPLOYEE  
CONCERNS  
SPECIAL PROGRAM**

**VOLUME 3  
OPERATIONS CATEGORY**

**SUBCATEGORY REPORT 30400  
CABLES AND CONDUIT**

**UPDATED**

890 2150406

**TVA  
NUCLEAR POWER**

8902150406 890206  
2006 0800



REPORT TYPE: Subcategory

REVISION NUMBER: 1

TITLE: Cables and Conduit

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REASON FOR REVISION:

- (1) Reformat to conform with revision 4 of ECTG Program Manual and incorporation of SRP comments and inclusion of final corrective action plans.

PREPARATION

PREPARED BY: W. T. Elliott, C. W. Touchstone, Eric G. Shewbridge

W. T. Elliott 5/11/87  
SIGNATURE DATE

(NOTE: Evaluators listed in Attachment I)

REVIEWS

PEER: [Signature] 5/12/87  
SIGNATURE DATE

TAS: <sup>wsk</sup> James E. Woody III 9/4/87  
SIGNATURE DATE

CONCURRENCES

_____	_____	CEG-H: <u>[Signature]</u>	<u>9/11/87</u>
_____	_____	SRP: <u>[Signature]</u>	<u>9-11-87</u>
SIGNATURE	DATE	SIGNATURE*	DATE

APPROVED BY: [Signature] 9/11/87  
ECSP MANAGER DATE

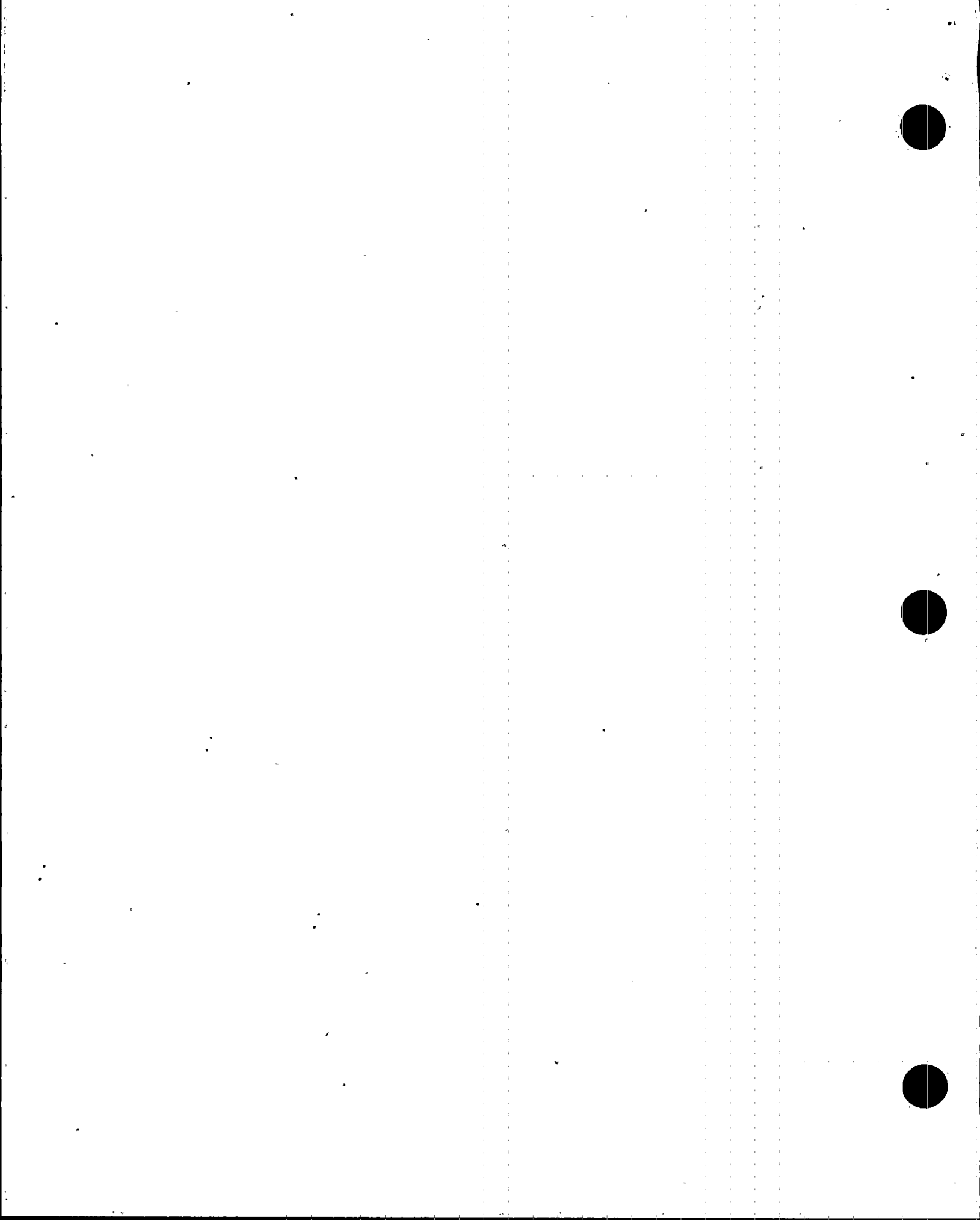
\*SRP Secretary signature denotes SRP concurrence are in files.



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

HISTORY OF REVISION

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



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Preface

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

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

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

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

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

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

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

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

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

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

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

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

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



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ECSP GLOSSARY OF REPORT TERMS\*

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

- Class A: Issue cannot be verified as factual
- Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)
- Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken
- Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation
- Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

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

concern (see "employee concern")

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

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

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

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

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

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

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

K-form (see "employee concern")

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

root cause the underlying reason for a problem.

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

Acronyms

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

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

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

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

## CABLES AND CONDUIT

## Subcategory Report 30400

## Executive Summary

I. SUMMARY OF ISSUES

The Cables and Conduit Subcategory is comprised of seven employee concerns that raised six issues about electrical hardware deficiencies and problems with the procedures for aspects of plant construction dealing with cable and conduit. Five of the six issues were substantiated at one or more nuclear sites and required corrective action as a result of an employee concerns evaluation. The two most significant issues substantiated and requiring corrective action dealt with the poor condition of electrical manholes at all nuclear sites and ONP noncompliance with the electrical aspects of construction specifications. Other issues substantiated and requiring corrective action included: (a) use of improperly qualified RTV coating, (b) improper use of steel fish tape in breaching electrical penetrations, and (c) the presence of loose conduit for a particular cable tray.

II. SUMMARY OF FINDINGS

Several conditions were found to exist in violation of design, construction, or operating requirements. Each of these conditions, called specific deficiencies, requires corrective measures:

1. Numerous deficiencies regarding the design and maintenance of electrical manholes were identified at all sites. A common problem with cables submerged in standing water was found which may cause "water treeing" of the cables. This condition involves the build-up of microscopic voids between the insulation and conductor and may result in insulation degradation and shorts.
2. At Watts Bar Nuclear Plant (WBN), Sequoyah Nuclear Plant (SQN), and Browns Ferry Nuclear Plant (BFN), there had been a lack of compliance with construction specification requirements for minimum cable bend radius.
3. At WBN and SQN, some deficiencies were identified in the content of procedures dealing with breaching. Quality controls on the breaching of electrical penetrations at WBN were inadequate to ensure that approved procedures and practices were followed.
4. At SQN, an isolated case was found where room temperature vulcanizer (RTV) coating of questionable quality had been applied to a junction box.

Corrective Action Tracking Documents (CATDs) were submitted to the various plants' line managers on these deficiencies as they were found.

### III. SUMMARY OF COLLECTIVE SIGNIFICANCE

This evaluation has revealed significant negative finding in two areas: technical adequacy and management effectiveness. The two most significant technical adequacy issues dealt with the poor condition of electrical manholes at all nuclear sites and ONP's noncompliance with construction specification requirements for minimum cable bend radius. With respect to the manhole issue, it was determined that nonloaded, energized voltage cable submerged beneath standing water may be subject to insulation degradation. This was identified as a potentially safety-related problem for all TVA nuclear sites. The second technical adequacy issue of exceeding minimum cable bend radius has the potential to invalidate the environmental qualification certification of installed safety-related cable. Problems in the area of management effectiveness need to be addressed as part of the ongoing overhaul of ONP's procedures and management systems.

### IV. SUMMARY OF ROOT CAUSE

After the element evaluations had been conducted, an independent review and analysis of the element findings was performed to search for symptoms of the root causes of deficiencies. These symptoms were: (a) lack of material control for consumables (RTV), (b) inadequate work controls (review and implementation of construction specifications), (c) inadequate configuration control (installation not equal to design specifications), (d) inadequate work control (electrical penetration breaching), (e) inadequate work control (penetration breaching devices), (f) inadequate initial design control, and (g) inadequate work controls (housekeeping).

A collective assessment of the root causes for these symptoms and the element-level findings led to the following subcategory-level root causes for deficiencies at all sites:

- (a) Various procedure problems, including inadequate procedural content, personnel error in using procedures, and lack of adequate processes to ensure that commitments are reflected in procedures. (All sites)
- (b) Inadequate processes for recognizing adverse trends in the condition of electrical manholes and therefore no actions are taken to preclude recurrence of problems. (All sites)
- (c) Judgement errors concerning water drainage were made by engineers and their supervisors with respect to initial design of electrical manholes. (All sites)
- (d) Acceptance criteria are inadequate to ensure satisfactory initial design of electrical manways. (All sites)



V. SUMMARY OF CORRECTIVE ACTIONCorrective Action At The Element Level

1. SQN committed to correct manhole sump pump deficiencies and determine adequacy of all Class 1E/CSSC medium and low voltage power cables routed through manholes before unit 2 restart. Additionally, SQN committed to completing the following after unit 1 start-up:
  - A. Evaluate all Class 1E/CSSC cables and splices for fitness of duty.
  - B. Determine root cause of manhole flooding.
  - C. Determine corrective action to prevent recurrence.

The above corrective action will also be initiated for WBN, BFN, and BLN as indicated in the corporate response to the issue of "water treeing" of submerged cable in manholes.

At WBN, a workplan completed all items identified in an NSRS report with the exception of AI-2.15 revised. AI-2.15 will be revised to include instructions identifying temporary cables installed in cable trays.

At BFN, procedures will be written to perform regular inspections of manhole sump pumps. General cleanup items will be accomplished on maintenance requests. Cables in manhole T will be replaced in cable trays per ECN P0287. A DCR will be issued to add a permanent sump pump in manhole T.

2. With regard to implementation of upper-tier documents, WBN has revised procedures (MAI-4, MAI-5) to include performance and documentation of bend radius inspections. The ECTG Construction CEG is tracking deficiencies associated with exceeding maximum pull tension (MPT), side wall pressure (SWP), and minimum bend radius at SQN, via CATD 10900-NPS-01.

At BFN, site controls will be established to identify and track upper-tier source documents/requirements and ensure their distribution and implementation at the appropriate levels. SCRs were generated to address cable bend radius and pull tension violations which may have occurred due to inadequate procedures.

3. Regarding breaching issues, WBN issued a deficiency report against plant procedures not requiring proper breaching tools. Affected procedures were revised and training provided for personnel involved with breaching of electrical penetrations and fire barriers.
4. At SQN, junction box 3190 was recoated with RTV 3140 on a work request.

Corrective Action at the Subcategory Level

Regarding the lack of corporate control over design and construction standards and maintenance activities, DNE has initiated the Specification Improvement Program (SIP), which will provide ONP with generic master specifications to cover construction, modifications and additions, and maintenance of TVA's nuclear plants.

The TVA corporate organization disagreed with the finding that there is a lack of corporate and plant control over the use of consumables. The response indicated that the loss of material traceability for RTV coating on one junction box appeared to be an isolated case and no action was found to be necessary since corporate and plant programs were adequate for controlling consumables. This response was accepted. However, this issue is being escalated to the Operations Category Report since the implementation of the corporate program for control of consumables is questionable based on negative findings in other Operations Subcategory Reports.

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1.0 CHARACTERIZATION OF ISSUES

1.1 Introduction

|R1

The seven concerns that comprise the Cables and Conduit Subcategory are characterized by electrical hardware deficiencies and problems with procedures related to electrical aspects of plant construction and modifications.

1.2 Description of Issues

|R1

The concerns were stated as perceived by concerned individuals (CIs) and were combined into four higher-order groups of related concerns called elements. In this section of the report, each element is presented with a brief overview of its issues.

1.2.1 Element 304.01 - Procedure Problems

Issue 304.01-1 - Office of Nuclear Power (ONP)  
Non-Compliance With Construction Specifications

|R1

IN-85-112-001

This is a broad based concern regarding ONP's compliance with construction specifications when making modifications and additions at Watts Bar Nuclear Plant (WBN). The CI gives an example of a new cable being pulled with no maximum pull tension or minimum bend radius specified. Because this particular example is given, this concern was characterized to deal only with problems related to ONP's compliance with electrical aspects of construction specifications.

Issue 304.01-2 - Improperly Qualified Coating Applied to  
Junction Boxes:

TAK-86-005

In this concern from Sequoyah Nuclear Plant (SQN), the CI thought that the Room Temperature Vulcanizer (RTV) coating applied to junction boxes under a Special Maintenance Instruction (SMI) may not have been properly qualified and may have been improperly applied to all junction boxes.

|R1

1.2.2 Element 304.02 - Electrical Penetrations Breached

Issue 304.02-1 - Use of Improper Tools to Breach Electrical  
Penetrations:

IN-85-207-002

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The CI reported that steel fish tape was used in lieu of the required wooden or fiberglass rods to breach penetration seals at WBN.

Issue 304.02-2 - Cable Pulled Through Previously Sealed Penetrations

IN-85-862-002

A CI stated that ONP personnel at WBN had pulled cable through penetrations after Division of Nuclear Construction (DNC) Quality Control (QC) personnel had signed off sealing of the penetration.

1.2.3 Element 304.03 - Cable Problems in Manholes

Issue 304.03-1 - Poor, Disorganized Condition of Electrical Manholes

IN-85-945-001  
QCP-10.35-8-13

One CI stated that electrical manholes at WBN are disorganized with cables having been spliced and not properly laced down. A CI also expressed concern about the condition of electrical manholes at Bellefonte Nuclear Plant (BLN).

1.2.4 Element 304.04 - Loose Conduit Problem

Issue 304.04-1 - Loose Conduit in WBN unit 1 Diesel Building

IN-85-465-002

A CI alleged that a conduit was loose where it entered the cable tray in the WBN unit 1 Diesel Building.

R1

R1

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## 2.0 EVALUATION PROCESS

### 2.1 General Methodology

The evaluation of this subcategory was conducted according to the Evaluation Plan for the Employee Concerns Task Group (ECTG) and the Evaluation Plan for the Operation Group. The concern case files were reviewed. Source documents were researched and interviews conducted in order to identify the requirements and criteria which applied to the issues raised by the concerns. The issues were evaluated against the identified requirements and criteria to determine findings. A collective significance analysis was conducted; causes were indicated for negative findings; and corrective action for the negative findings was initiated or determined to have already been initiated.

| R1

### 2.2 Specific Methodology

Applicable sections from the following baseline documents were reviewed: TVA NQAM and Topical Report; TVA General Construction Specifications; ANSI N18.7; National Electric Code; BFN QA Manual, Appendix B; Electrical Design Standard DS-E-13.5.1; BLN Design Criteria N4-50-D788. Numerous lower-tier implementing procedures such as Maintenance Instructions (MIs), Modification and Addition Instructions (MAIs), Administrative Instructions (AIs), and Standard Practices were also reviewed. Information relevant to the issues was also obtained from memorandums, deficiency reports, Nuclear Safety Review Staff (NSRS) investigation reports and other ECTG reports.

The evaluators conducted informal interviews with cognizant personnel either to verify document-based findings or to provide nondocument-based evaluation input. Interviews were conducted with cognizant personnel in the Division of Nuclear Construction (DNC), the Division of Nuclear Engineering (DNE), WBN Preoperational Testing, SQN Electrical Maintenance, and with an evaluator in the Employee Concerns Special Program's Construction Category Evaluation Group. Inspections of selected electrical manholes at SQN, BFN and BLN were also performed.

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### 3.0 FINDINGS

Generic applicability statements are included only for concerns which are classified as being potentially safety-related or safety-significant as denoted on attachment A.

#### 3.1 Element - 304.01 - Procedure Problems

Issue 304.01-1 - ONP Non-Compliance With Construction Specifications: | R1

##### WBN

The concern regarding lack of ONP compliance with construction specifications was substantiated with respect to minimum bend radius for new cables as given by the example in the concern. However, no safety-related deficiencies were identified. It was determined that ONP instructions for installing and inspecting cable terminations had not contained the inspection requirements for bend radius referenced in Construction Specification G-38, "Installing Insulated Cable Rated up to 15,000 Volts." Before the current evaluation, however, line management had already initiated corrective action. NCR W-290-P had been issued, stating that bend radius inspections had not been accomplished on all cables terminated using M&AIs 4 and 5 because these procedures had not contained the inspection requirement. The Engineering Report for the NCR had recommended that the following actions be taken:

- a. M&AI-4 and M&AI-5 be revised to include procedures for inspection of cable and conductor bend radius acceptability and provisions be made for documenting these inspections.
- b. All Class 1E cable terminated using M&AI-4 and M&AI-5 be inspected for minimum bend radius acceptability and documentation be provided for verifying this acceptance.
- c. Any Class 1E cable not meeting the requirements for minimum bend radius in Electrical Design Standard DS-E12.1.5 be reworked.

At the time of this report's writing, the revisions to M&AI-4 and M&AI-5 had been accomplished. No safety-related deficiencies were identified during the evaluation by the Operations CEG. However, the adequate closure of the NCR may identify safety-related issues. ESCP, Construction CEG, issued CATD 10900-WBN-01 to WBN to determine the status of the remaining open items in the engineering report. | R1

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SON

|R1

The issue regarding lack of ONP compliance with construction specifications was validated for SON by ECSP Construction CEG Report CO10900-SON. This evaluation (304.01) concurs with the findings and conclusions of that report. The construction report identified the root cause to be an inadequate upper-tier document (G-38, for pulling cable) which resulted in inadequate site procedures. The reason for the inadequacies was failure to recognize a need to monitor maximum pull tension (MPT) and side wall bearing pressure (SWP), and failure to adhere to manufacturer's minimum bend radius (MBR), limits.

The ECSP Construction CEG issued CATD-10900-NPS-01 to track the deficiency of exceeding SWP, MPT, and MBR.

BFN

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|R1  
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The concern regarding lack of ONP compliance with construction specifications in areas relating to electrical cable was substantiated at BFN, and safety-related issues were identified. It was determined that General Construction Specification G-4's requirements for maximum cable strain and for strain at a cable bend had never been fully implemented in BFN modifications procedures or electrical maintenance procedures. On January 15, 1986, General Construction Specification G-4 had been superseded at BFN by General Construction Specification G-38 which contained more restrictive requirements than G-4. Applicable implementing instructions still had not been upgraded, however and CATD 30401-BFN-03 was issued concerning this deficiency.

|R1  
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The new general construction specification initially had been made applicable only to modifications work but later had been determined by DNE to be applicable to all related work. A stopwork order had been issued in June, 1986 by the BFN site director for cable pulling activities. This order had remained in effect until the M&AI for cable pulling had been revised to incorporate the detailed requirements in G-38 for cable pull tension and bend radius. The M&AI had been revised and approved in September 1986 and a memorandum had been sent to all Electrical Section Supervisors requiring that the installation of all CSSC cables be done using the M&AI. Two other instructions dealing with cable pulling, a modifications instruction and an electrical maintenance instruction, had not yet been upgraded to the requirements of G-38 as of this evaluation. CATD 30401-BFN-02 was sent to BFN to address this deficiency.

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It was also determined that the requirements of Appendix B to the Construction Quality Assurance Manual have not been fully implemented in modifications or electrical maintenance instructions. There was no documented evidence that the modifications and electrical maintenance instructions had been verified to be equal to, or better than, the procedures in the Construction Quality Assurance Manual, Appendix B. CATD-30401-BFN-01 was issued to BFN Line Management concerning this deficiency.

A review of the NQAM and BFN Site Director Standard Practice 2.4 showed that there has been an inadequate program at BFN to incorporate design output documents and changes to upper-tier documents into lower-tier documents. Currently, revisions to general specifications are sent only to the Modifications section for incorporating into applicable implementing procedures. There is no provision to notify other sections such as Maintenance, Training, Fire Protection, and Performance Testing that may be affected by changes to general specifications. Also, Standard Practice 2.4 does not address standard drawings; therefore, no plant section is being officially informed of either the existence of standard drawings or of their revisions. CATD 30401-BFN-04 as sent to BFN concerning this deficiency.

BLN

The concern regarding lack of ONP compliance with construction specifications in areas relating to electrical cable was evaluated for generic applicability to BLN. The concern was not substantiated at BLN and no safety-related issues were identified. It was determined that BLN ONP personnel have not installed any electrical cable on any permanent plant equipment. Instead, DNC has handled all electrical cable installation associated with modifications and additions, even for systems already transferred to ONP. This has been done in accordance with the NQAM, which designates DNE and DNC with the responsibility for design, procurement, and construction activities applicable to modifications and additions before a plant is licensed.

Conclusion

This issue was found to be factual at WBN, however, the deficiencies were identified and corrective action was initiated by the plant before an employee concern evaluation. The issue was also factual at SQN and BFN; safety-related deficiencies were identified by employee concerns evaluations and corrective action was required. The issue was not substantiated at BLN.



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Issue 304.01-2 - Improperly Qualified Coating Applied to Junction Boxes

SON

The concern regarding the misapplication of RTV at SQN was substantiated, a potentially safety-related issue was identified. It was determined that the terminal blocks in junction box 3190, coated under the SMI identified in the concern, is required by the Environmental Qualification (EQ) binder to be coated with QA-RTV 3140. A review of the MR which had covered the work for junction box 3190 revealed that there had been inadequate material traceability regarding the RTV used in the work. The inadequate material traceability had been found subsequent to the work, and the RTV used to coat junction box 3190 had been marked "No QA." Therefore, the qualification of the terminal block coating was questionable. CATD 30401-SQN-01 was issued concerning this deficiency.

A review of three other work requests for coating a total of 23 terminal blocks with RTV 3140 showed proper material traceability. Also, an NSRS investigation had been conducted to address the material traceability practices of the Electrical Maintenance Toolroom. All corrective actions in response to the NSRS report were completed by the time of the current evaluation and were determined to be adequate.

Conclusion

The issue of improperly qualified RTV coating was found to be factual and corrective action was required. This issue is considered potentially safety-related.

Generic Applicability

This issue was evaluated as the site of concern (SQN) and was determined to be isolated to the specific installation specified in the concern, therefore, evaluations were not conducted at any other sites.

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3.2 Element 304.02 Electrical Penetrations Breached

Issue 304.02-1 - Use of improper tools to breach electrical penetrations:

The issue regarding use of steel fish tape to breach penetration seals was evaluated specifically at WBN and generically for SQN. The evaluation at these two plants showed that there is no upper-tier document forbidding the use of steel fish tape. It was determined that use of steel fish tape to breach electrical penetrations is a matter left to the judgment of the various plants' line managers. At WBN this practice is forbidden in all instances, but at SQN the use of steel fish tape is acceptable for breaching cable tray penetrations. Each plant's requirements are written in its own M&AI.

WBN

The concern regarding use of steel fish tape to breach electrical penetration seals was found to have been substantiated for WBN through a previous evaluation conducted by NSRS. The NSRS report, I-85-702-WBN, had determined that fish tape had apparently been used for breaching congested penetrations. This practice had been in violation of the ONP M&AI-14 which permitted use of wooden or fiberglass probes. However, no instances of cable damage resulting from the use of fish tape had been found.

NSRS had concluded that management controls on the breaching process had been inadequate to ensure that approved procedures and practices were being followed. In its report the NSRS had made the following recommendations with regard to improving management control over the breaching process:

- a. Review the breaching procedures and either revise the procedures to permit additional tools to be used or confirm the existing ones to be adequate.
- b. Instruct the crafts on the use of the established procedures.
- c. Require the breaching process to be observed by the QC inspectors and signed off accordingly.

In response to these recommendations, WBN line management had committed to revising the instructions as appropriate and to training the crafts. However, line management had not agreed that a QC inspector should be required to observe breaching. The response also had noted that WBN-DR-85-268 had been written to document the past use of fish tape. CATD 30402-WBN-02 was written for WBN to provide status of these corrective actions.

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During the current evaluation a procedural discrepancy was noted. It was found that the DNC procedure for breaching references applicable ONP instructions; however, the body of the procedure does not state specifically that the ONP instructions are to be used. CATD 30402-WBN-01 was issued for WBN addressed this discrepancy.

SQN

The concern regarding use of steel fish tape to breach electrical penetrations at WBN as evaluated for generic applicability to SQN. The concern was not substantiated because the applicable SQN M&AI allows for the use of a steel fish tape for breaching cable tray penetrations. For breaching of conduit seals, however, the M&AI requires use of a nonconductive probe. Site Electrical Modifications Section personnel were found to prefer use of a nonmetallic probe to breach all penetrations and seals where possible. It was determined that a steel fish tape is used only where space restrictions prohibit the use of longer, unflexible probe.

During the evaluation it was noted that M&AI-4, "Control, Power, and Signal Cables," did not reference M&AI-13, "Electrical Pressure Seal, Fire Stop Barrier, and Flame Retardant Cable Coating," and did not show any responsibility for the craft to be aware of the requirements of M&AI-13. CATD 30402-SQN-01 was issued concerning this discrepancy.

Conclusion

The issue was found to be factual at WBN and corrective action was required as the result of an NSRS evaluation. The issue was also found to be factual at SQN but not a problem since SQN site procedures allow this practice. However, a problem was noted at SQN in that M&AI-4 did not reference M&AI-13 and corrective action was required.

Generic Applicability

The results of evaluations at WBN and SQN identified no upper-tier documents prohibiting the use of steel fish tape. Further, no evidence of damage due to the use of steel fish tape was found. Although, WBN had revised procedures to prohibit the use of steel fish tape, no safety-related issues were identified which would warrant other site evaluations.

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Issue 304.02-2 - Cable pulled through previously sealed penetrations

WBN

The concern that WBN ONP personnel pull cable through penetrations previously sealed by DNC was not substantiated. It was found that there are procedures which preclude ONP from using existing conduit and cable trays during modification and maintenance activities. The applicable ONP M&AI for breaching was found to provide requirements that breached penetration seals be replaced in accordance with design requirements. Therefore, the activities identified are allowable by existing plant procedures and do not constitute a problem.

Conclusion

While the issue of pulling cable through previously sealed penetrations is factual, this is not a problem and requires no corrective action.

Generic Applicability

Since the condition described by the concern was found not to be a problem at WBN, further site evaluations were not necessary.

3.3 Element 304.03 Cable Problems in Manholes

Issue 304.03-1 - Poor, Disorganized Condition of Electrical Manholes

In the evaluation of electrical manholes at each of TVA's four nuclear sites, a common problem was found with standing water in the manholes. It was determined that the non-loaded, energized, level V voltage cables submerged beneath this standing water may be subject to a condition known as "water-treeing." This condition involves the buildup of microscopic voids between the insulation and conductor and may result in insulation degradation and shorts. This issue was identified as a potentially safety-related problem for all TVA nuclear sites.

CATD 30400-NPS-01 and CATD 30403-NPS-01 were issued to the TVA corporate organization concerning this matter.

WBN

The concern that electrical manholes at WBN are in a disorganized state had been substantiated in an NSRS investigation report (IN-85-945-001). The NSRS evaluator had observed general debris in

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Widespread problems were found with excessive water lying in electrical manholes and cable sumps. Two manhole covers were found to be below the surrounding grade, thus allowing drainage of water into the manholes. Several sump pumps were found inoperable, and the discharge piping from one sump pump had been disconnected. Sump pump controls and junction boxes were found to have been located below sump level and to have been flooded. Also, several manholes needed to be cleaned and to have debris removed. The cables in all manholes inspected were coated with mud and dirt. There was a lack of procedures governing housekeeping and preventive maintenance practices on electrical manholes and their associated sump pumps. CATD's 30403-SQN-01, 02, and 03 were sent to SQN concerning this issue.

BFN

The concern that electrical manholes at WBN are in a disorganized state was evaluated for generic applicability to BFN. The concern was substantiated, and potential safety-related issues were identified.

Documents were reviewed to determine the requirements for cable installation in manholes. Seven of the eleven electrical manholes identified on BFN drawings were inspected. This sample was believed to be adequate because it indicated several recurring problems and the need for better maintenance of all the manholes. Manholes C, D, E, F, G, H, and T were inspected. Manholes J and N (Dewatering and Hypochlorite Building) were not inspected.

Housekeeping and preventive maintenance practices on electrical manholes and three of their associated sump pumps (manholes E, F and G) were found to be inadequate. Manholes inspected during the evaluation were littered with cardboard boxes, rags, and rotten scaffold boards. Numerous cables were routed outside of trays in manhole T, and cable tray barriers and covers for separating 480-V and 4-kV cables were missing in manholes F, G and H. In addition, manhole T contained no provisions for a sump pump and had a corroded junction box terminal block. In manhole H, an exposed energized plug was found lying on a metal cable tray and had presented a severe electrical safety hazard. The unauthorized plug and wire were cut off and a lighting circuit wire was taped to eliminate the immediate hazard.

Surface water was collecting in manhole C because it is located in a low area and the manhole cover is lower than the surrounding asphalt. According to drawing 10N319-1,RA, the cover should be above grade. Three of six sump pumps checked were not operable, and their respective manholes were partially flooded. MR 740057 was initiated to repair E and F sump pumps; the sump pump in manhole G worked after the reset button was pressed.

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During the course of the evaluation, other deficiencies were found which related to the concern being substantiated. First, it was determined that Electrical Maintenance Instruction (EMI)-58.1 dealing with CSSC cable installation allows for unrestricted routing of temporary cables outside of trays. This was thought to be a contributing factor in the excessive number of cables found lying outside of trays in one manhole. Second, very few taped splices found in manholes E, F, H, and T were found to have a legible tag to identify their respective cable numbers, and most taped splices had no tag. Finally, the manholes inspected were not well-labeled. CATD's 30403-BFN-01, 02, and 03 were issued to BFN concerning the above deficiencies.

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BLN

The concern that electrical manholes at WBN are in a disorganized state was evaluated for generic applicability to BLN. A second concern specific to BLN regarding the condition of manholes in the electrical cable trench to the Intake Pumping Station (IPS) was also evaluated. From inspections and personnel interviews, it was determined that there are widespread, continuing problems with water accumulation in cable pull manholes. Therefore, these concerns were substantiated, and safety-related issues were identified.

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Areas inspected included manhole number 2A2 (roadway, east of Reactor Building number 2) and the cable tunnel beneath the 500-KV switchyard. Other manholes were sealed with a bolted steel top over which a heavy concrete missile shield was installed and therefore, entry was not attempted.

In the areas inspected, dirt and mud were found on cables, trays, walls, and floors, and debris had accumulated in sump pump basins which could contribute to sump pump failures. Additionally, water lines were observed indicating previous flooded conditions and possible sump pump failures. At the time of inspection, the areas were found dry with neat and orderly cable trays, and operable sump pumps.

Construction engineers and managers were aware of water having been present in many manholes, often for prolonged periods. Furthermore, they expressed confidence that many sealed manholes presently contain standing water but were not confident about the reliability of electrical manhole sump pumps.

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There was no preventive maintenance or periodic housekeeping program for electrical manholes and associated sump pumps as described by Design Criteria N4-50-D788. These criteria define requirements to ensure Class 1E electrical cables are installed adequately to provide acceptable levels of operating reliability. The Design Criteria requires that all equipment necessary for plant safe shutdown in a flooded condition be located within waterproof structures, except the electrical cables installed in underground conduit banks between the D/G Building and the Intake Pumping Station. In Section 5, it further requires that each manhole, handhole or cable pull point be accessible for periodic visual inspection. CATD 30403-BLN-01 was issued to BLN concerning these deficiencies.

Conclusion

The issue of poor, disorganized condition of electrical manholes was found to be factual at WBN, SQN, BFN, and BLN and corrective action was required. The deficiencies identified are considered potentially safety-related.

3.4 Element 304.04 - Loose Conduit Problem

Issue 304.04-1 Loose Conduit in WBN Unit 1 Diesel Building

WBN

The concern that conduit is loose where it enters a particular cable tray in the WBN Diesel Building was found to have been substantiated through a previous evaluation conducted by NSRS. The conclusion of the NSRS report (I-85-227-WBN) had been that a unistrut-type clamp had been missing from one end of the conduit in question. The recommendation of the report had been to add a clamp to the free end of the conduit. In response to the report's recommendation, construction personnel had reinspected the conduit and had issued NCR 6324 to initiate the reinstallation and reinspection of the missing clamp. The current evaluation identified no safety-related issue and determined that no further corrective actions were necessary for this concern. It was determined that other issues related to conduit and cable trays are being addressed in the Construction CEG Report C019200.

Conclusion

This issue was found to be factual and corrective action was required as a result of an employee concern evaluation.

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Design/Construction Standards

For the third finding, it was determined that ONP instructions for installing and inspecting cable terminations had not contained the inspection requirements for bend radius as found in Construction Specification G-38. However, WBN line management had already initiated corrective action to address bend radius inspections before the current evaluation. Inadequate site procedures at SQN were determined to be a result of the failure of G-38 to recognize a need to monitor maximum pull tension (MPT) and side wall pressure (SWP), and failure of G-38 to require adherence to manufacturer's minimum bend radius limits.

5.0 ROOT CAUSE, PRELIMINARY ANALYSIS

Sections 3.0 and 4.0 discussed the specific findings for each of the element evaluations of this subcategory and their collective significance. This section presents the results of an independent review and analysis done on these specific element-level findings to identify the most frequently occurring and widespread root causes at the subcategory level. Patterns of recurring findings called symptoms were derived from the elements. These symptoms were tested for root causes, and the root causes for all elements were then analyzed collectively to identify which occurred most frequently and at the most sites. Details of the symptoms and root causes derived for each element are presented in Attachment D, "Summary of Symptoms and Root Causes."

A review and analysis of these symptoms and root causes taken collectively points to the following four significant root causes:

- (a) Various procedure problems, including inadequate procedural content, personnel error in using procedures, and lack of adequate processes to ensure that commitments are reflected in procedures. (All sites)
- (b) Inadequate processes for recognizing adverse trends in the condition of electrical manholes, and therefore there are no actions taken to preclude recurrence of problems. (All sites)
- (c) Judgment errors concerning water drainage were made by engineers and their supervisors with respect to initial design of electrical manholes. (All sites)
- (d) Acceptance criteria are inadequate to ensure satisfactory initial design of electrical manways. (All sites)

These four subcategory level root causes are supported by various findings at all TVA nuclear plants as discussed below.

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Procedure Problems

At SQN, the lack of material control for RTV was determined to be partially a result of insufficient training for personnel in the use of procedures. At BFN, a lack of controls to ensure commitments are reflected in procedures contributed in part to inadequate review and implementation of construction specifications and inadequate configuration control regarding cable pulling and installation. At SQN, BFN, and BLN, there are inadequate controls to ensure housekeeping commitments are reflected in electrical manhole preventive maintenance procedures. At SQN, a procedure (M&AI-4) was found to be incomplete by not providing adequate reference to a related procedure. Finally regarding procedures, personnel error was responsible in part for lack of material control (RTV) at SQN, and improper breaching methods at WBN.

|R1

Inadequate Recognition of Adverse Trends

For SQN, BFN, and BLN, there had been inadequate processes to recognize a need for work controls regarding preventive maintenance and housekeeping of electrical manholes. The results of this were recurring conditions of flooding, scattered debris, and improperly secured cables.

Errors in Judgment

At SQN, manhole covers had been located below grade and sump pump control boxes were located below sump level, thus resulting in flooding of these areas. At BFN, a manhole had no provisions for a sump pump.

Inadequate Acceptance Criteria

At SQN, BFN, and BLN, inadequate acceptance criteria in the initial design process resulted in inadequate design controls for electrical manways.

Corrective Action Tracking Documents (CATDs) were not issued specifically on these subcategory-level root causes. It was believed that corrective actions being taken already by line management as part of the commitments made in the Nuclear Performance Plan were helping to address these root causes. However, line management was expected to use the subcategory-level root cause information as an aid in preparing corrective action responses to subcategory-level CATDs that would preclude recurrence of the deficiency noted. The ECTG's process for judging the adequacy of line corrective action responses to subcategory-level CATDs included a determination of how well the applicable root causes were addressed by the response.

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The significant root causes for all subcategories in the operations category provided part of the input for determining programmatic areas of weakness at the category level and the associated causes. In the operations category report, these programmatic weaknesses and associated causes are presented along with a discussion of how they are being corrected through implementation of the Nuclear Performance Plan and other corrective action programs.

6.0 CORRECTIVE ACTION

6.1 Specific Deficiencies and Findings at the Element Level

6.1.1 Element 304.01 - Procedures Problems

SQL

CATD 30401-SQN-01 was sent to SQN line management recommending requalification of the coating for terminal blocks in junction box 3190. SQN line management responded stating: **COMPLETED**

"JB 3190 was recoated with BV-3140 by Work Request (WR) - B200741."

BFN

The following CATDs were issued to BFN line management:

- 30401-BFN-01 (R1) - Site instructions have not been verified as being equal to or better than Construction QA Manual procedures.
- 30401-BFN-02 (R1) - Cable installation procedures not in accordance with G-4 or G-38 prior to June 18, 1986.
- 30401-BFN-03 (R1) - Inadequate implementation of design output documents, i.e., G-specs.
- 30401-BFN-04 (R1) - Lack of corporate program to ensure implementation of design output documents listed in NQAM.

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The BFN line response states as follows:

30401-BFN-01 (R1)

"The Design Baseline and Verification Program will confirm that safety related systems and components are reconciled to their design basis. This will be accomplished through the following actions:

- a. Review of the documented commitments/requirements and licensing basis followed by a compilation of the design criteria into controlled documents
- b. Walkdown of the systems for functional requirements
- c. Issuance of unitized Configuration Control Drawings (CCDs) as replacements for the as-built drawings
- d. Comparison of the design drawings with the verified as-built data
- e. Evaluation of the systems for conformance with the design basis and documented in System Evaluation Reports (Systers)
- f. Reissuance of the CCDs as the verified single drawings of record

"In addition, the transitional design change control process has been implemented to maintain the configuration which the DBVP will regain. The transitional design change control process will be compatible with the permanent design change control process to be operational by December 1987. Both processes rely on the verified CCDs as the controlling documents for design, modifications, operations, and maintenance.

"The Specifications Improvement Program will also support maintaining the configuration of the plant. SIP will confirm that implementing documents contain necessary information to assure that the design basis is in accordance with the documents issued by the DBVP. The Master Specifications will be issued the first quarter of 1988. The Engineering Requirements Specifications issued date is being developed."

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30401-BFN-02 (R1)

"DNE to Resolve Significant Condition Reports SCRBFNEEB8716, RO and SCRBFNEEB8634, RO."

NOTE: SCRBFNEEB8716 identifies that cable pulling tension may have been violated since G-4 requirements were never fully implemented into modifications or maintenance procedures before June 26, 1986. SCRBFNEEB8634 identifies that manufacturer's limitations on cable bend radius may have been violated. This CATD will be resolved via resolution of these SCRs.

R1

30401-BFN-03 (R1)

1. "Procedures section to submit a revision to SDSP-2.4 to require all G-Spec revisions to be sent to all affected sections, and that Procedures section to assist in the determination of affected sections.
2. Procedures section to review all G-Specs to determine which ones state that they are applicable to BFN and provide a list of them to Document Control. Document Control to ensure that the latest revision of each has been addressed by SDSP-2.4 for source document implementation.
3. Design output documents applicable to BFN should be identified and controlled as a result of CAR 85-001, items 5 and 7 and ONP Standard 4.4.10. QA is requesting a plan and schedule for action on items 5 and 7.
4. Procedures section to revise SDSP-2.4 to address implementation of each type design output document identified as a result of ONP Standard 4.4.10."

R1

30401-BFN-04 (R1)

1. "An NQAM, Part I, Section 2.2 (ID-QAP-2.8), revision request was sent to the Chief, Quality Systems Branch, on February 26, 1987. It was written in response to CATD-30401-BFN-06, which was recalled and replaced by this CATD-30401-BFN-04 Rev. 1. The revision request mentions CAR 85-001. QA is requesting a plan and schedule for action on items 5 and 7 of the CAR.
2. DNQA revise NQAM as requested above.

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3. BFN implement NQAM revision.

CAR 85-001 items 5 and 7 are required for startup and scheduled for completion in May 1988."

6.1.2 Element 304.02- Electrical Penetrations Breached

WBN

Two CATDs were issued to WBN line management. CATD 30402-WBN-01 identified a deficiency in SOP-42, the DNC procedure for breaching. CATD 30402-WBN-02 requested the status of actions taken in response to recommendations made by NSRS in a previous evaluation. The WBN line response for 30402-WBN-01 is:

**TYPE WORK COMPLETED**  
"SOP 42 is to be deleted per CATD 10900-WBN-11. DNC does not do breaching as this is function performed by modifications. DNC makes requests for breaching per WBN-QCI-1.60 paragraph 6.1.7.3 per the procedure listed therein."

The WBN line response for 30402-WBN-02 is:

"WBN Instruction Change 85-878 was issued against MAI-14 Revision 5 on 12/17/85 which stated that a fish tape shall not be used to breach an electrical penetration and that a wooden or fiberglass rod can be substituted for the wooden nose tool. This instruction change was permanently added under revision 6 of MAI-14 dated 2/25/86. WB-DR-85-268 was written against plant procedures because they did not prohibit the use of fish tape when breaching electrical penetrations which could possibly damage the installed cables. The immediate and final corrective action taken for this DR was the issuance of IC-85-878. WB-DR-85-268 was closed by PQA on 12/31/85. Training of the above restrictions on the use of fish tapes when breaching electrical penetrations was performed and documented per WBN-QCI-1.11-1 Revision 2 on 1/22/86 for the Nuclear Services Branch craft and craft foreman involved in breaching of penetrations.

The corrective action initiated in response to I-85-702-WBN is complete.

IC-85-878 was incorporated into MAI-14 Revision 6 on 02-25-86.

Training was conducted on 01-09-86 and 01-13-86 on breaching of fire barriers in accordance with MAI-14. DR-85-268 was completed on 12-31-85 to restrict the use of fish tape. No further action required."

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SQL

CATD 30402-SQN-01 was sent to SQN line management noting that M&AI-4 did not reference M&AI-13 and did not show any responsibility for the craft to be aware of the requirements of M&AI-13. SQN line management responded stating:

"M&AI-4 was revised on 08-13-86 to incorporate the reference to M&AI-13." 3-4-88

6.1.3 Element 304.03 - Cable Problems In Manholes

|R1

NPS

In CATD 30403-NPS-01 which was sent to DNE-Electrical, TVA corporate management was requested to evaluate the potential for "water-treeing" to occur on cables in electrical manholes submerged in standing water. The corrective action response is:

"TVA will take corrective action for this CATD in two phases.

For the first phase the following actions will occur:

1. Sump pump deficiencies will be corrected in all Class 1E CSSC manholes and handholes except those used for cabling to the additional Diesel Generator Buildings. This will include sump pump power supplies, controls, and piping, and will be accomplished using applicable maintenance instructions (If the above cannot be accomplished prior to restart of SQN unit 2 it shall be acceptable to use temporary means to ensure the water level is maintained below the cables within the manhole/handhole).
2. Existing high potential and/or megger test results for all Class 1E/CSSC medium and low voltage power cables routed through the manholes and handholes will be obtained. If test results are not available tests will be performed in accordance to applicable site procedures or instructions. These test results will be evaluated to determine if the cables are adequate for their application. Any found to be inadequate will be replaced.

|R1

The second phase of the evaluation will include the following:

1. TVA will evaluate all Class 1E/CSSC cables and splices in all manholes/handholes for fitness of duty relative to past and future submergence with respect to manufacturer's test data.



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2. TVA will investigate and determine the root cause of known MH/HH flooding. This investigation will include as a minimum identification of and deficiencies in the following:
  - a. Sump, sump pump, and piping design and installation.
  - b. Reliable, automatic operation of sump pumps with controls and power connection protected from flooding.
  - c. Water-tightness of covers and gaskets.
  - d. Location of covers above grade.
  - e. Internal sealing to prevent excessive leakage.
3. TVA will determine corrective action to prevent recurrence which may include the addition of water level alarms and the incorporation of an upgraded Preventive Maintenance Program."

WBN

WBN line management was requested by way of CATD 30403-WBN-01 to provide the status on remaining corrective action associated with a previous NSRS investigation of electrical manholes. The WBN line response is:

~~"Workplan M5515-1 which worked on items identified by Employee Concern L-85-365 WBN's final review with all items complete except the electrical maintenance section has not yet revised AI-2.15. The revision to AI-2.15 is to include instructions identifying temporary cables installed in cable trays. At completion of revision to AI-2.15 workplan M5515-1 will be closed and sent to the vault."~~

SQN

CATDs 30403-SQN-01, 02, and 03 were sent to SQN line management in Electrical Maintenance and DNE noting that CSSC cables have been submerged in water with potentially adverse effects. The acceptable response received from Electrical Maintenance personnel at SQN was as follows:

30403-SQN-  
01 & 02

WORK PLAN COMPLETED  
DATE: 10-26-87

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"Electrical Maintenance will assign an engineer to (a) identify manholes to be PM'ed, (b) prioritize manhole list, CSSC first, (c) develop a PM to address problems, and (d) schedule and perform PM's (and initiate corrective actions as necessary)."

"Electrical Maintenance will accelerate the completion date of the portion of their assignment concerning level II Class 1E cables. We will target the completion of the development and performance of these PM's to August 31, 1987."

The acceptable response received from DNE personnel at SQN was as follows:

- "I. Correct sump pump deficiencies (including power supply, controls, and discharge piping) in all Class 1E/CSSC manholes (MH/HHs) except MH 41 (MH 41 is for the additional diesel generator.)
- II. Obtain the high potential and megger test results for all Class 1E/CSSC medium and low voltage power cables routed through the MH/HHs. If the test results are not available, perform the tests in accordance with MI-10.20. Evaluate the test results to determine if the Class 1E/CSSC cables are adequate for their application. Write work requests to replace inadequate cables."

"Note: Items I and II are required before unit 2 restart."

Long Term

- "III. Evaluate all Class 1E/CSSC cables and splices for fitness of duty relative to past and future sump experience with respect to manufacturer's test data.
- IV. Investigate and determine the root cause of MH/HH flooding. The investigation should identify any deficiencies in the following:
  - A. Sump, sump pump and piping design and installation.
  - B. Reliable, automatic operation of sump pumps with controls and power connection protected from flooding.

LONG TERM DATA COLLECTION COMPLETED  
DATE 12/27/87

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- C. Water-tightness of covers and gaskets.
- D. Location of covers above grade.
- E. Internal sealing to prevent excessive inleakage.
- V. Determine corrective action to prevent recurrence. The addition of water level alarms should be considered. The corrective action should also consider the effects of an accelerated Preventive Maintenance previously submitted and approved by ECTG Report 304.03 SQN 03-R1.

Justification for CAP 304.03 SQN 03 is as follows:

Only medium voltage cables that are energized and heavily loaded are subject to electro-chemical treeing. Since water will be removed by sump pumps before unit 2 restart, any cables failures will be rare and therefore accommodated by single failure criteria."

Note: Items III, IV, and V have an estimated completion of after U1 restart."

BFN

CATDs 30403-BFN-01, 02, and 03 were sent to Maintenance, DNE, and Modifications personnel at BFN to document the numerous deficiencies associated with electrical manholes. CATD 30403-BFN-02 to DNE noted problems in one manhole with respect to (a) missing cable tray barriers and covers, and (b) numerous cables being routed outside of cable trays. For the same manhole, CATD 30403-BFN-03 to BFN Modifications addressed (a) the need for a sump pump and (b) the presence of a corroded junction box terminal block. CATD 30403-BFN-01 to BFN Maintenance identified the lack of a formal manhole maintenance program as well as problems with manhole cleanliness, with manhole labeling, and with the electrical maintenance instruction for CSSC cable installation. The corrective action response from BFN management is as follows:

30403-BFN-01

1. "MRs will be written to correct the housekeeping problems identified as follows: (a) Item 1 - General cleanup; (b) Item 5 - Tape bare ends of cable (3/c #19) in MHT; (c) Item 7 - Replace broken splice connector in MHE; (d) Label manholes legibly - Item 9. This can be tracked by assignment No. 6018; expected completion date 3/30/87.

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2. Items 2 & 4 - EMSIL will be written to check MH sump pumps and issue BF-111 to perform inspection regularly. See assignment No. 6019. Expected completion date 4/30/87.
3. Item 3 - Regular check of sump pump will prevent flooding."

30403-BFN-02

"On workplan 8491 and ECN P0287, there were cables pulled into manhole T and abandoned. Also on the same workplan and ECN, cables were pulled into manhole T that were to be temporary cables but are now in place as permanent cables. These cables were routed outside the cable trays and therefore not properly installed.

Corrective action for cables being routed outside the cable trays in manhole T will be to create enough slack in the cables so that the cables can be put back in the trays. To accomplish this, two ribs must be cut out of the bottom of the trays which will create the necessary slack. Then the cables are to be placed in the cable trays and tied down neatly.

This modification will be done per ECN P0287. The additional scope for ECN P0287 and schedule for design will be determined by October 1, 1987. Also at that time, the cable trays' fill in manhole T will be evaluated. This work is not required for unit two cycle five restart.

Metal barriers and covers which were not installed in the trays shown for manholes F, G, H, and J to separate 480V and 4-KV cables are not required at this time because the 4-KV bus tie line cables have been abandoned. These cables were abandoned because they failed electrical tests and will not be used in the future. New 4-KV bus tie line cables are presently installed in a temporary overhead configuration. Should they ever be put in cable trays again, they will be in trays by themselves or have adequate metal barriers and covers for separation."

30403-BFN-03

"Temporary corrective maintenance has been initiated by Electrical Technical Section. Also, assignment 6019 has been issued to Lyle Knox and Rod Howell (ETS) to issue a DCR to add a permanent sump pump in manhole "T" and to replace the term strip with a water-proof splice."

REPORT TYPE: Subcategory

REVISION NUMBER: 1

TITLE: Cables and Conduit

PAGE 28 OF 30

BLN

CATD 30403-BLN-01 was issued to BLN line management noting the lack of a preventive maintenance or periodic inspection program for electrical manholes as described in Criteria Document N4-50-D788. The BLN line response is as follows:

"The subject CATD and related concern findings has been reviewed within the BLN site organizations, and we agree that the electrical manholes contain water, mud, debris, and inoperable sump pumps. BLN will add as a part of their preventive maintenance program a periodic inspection requirement. This will be completed by FY --1988. Additionally, in discussion with DNE, an NCR (NCR 5154, R0) has been formulated for a design re-evaluation delineating the problems associated with water accumulation inside the electrical manholes, sump pump failures, pump electrical outlet location, etc. This item will be entered into TROI for tracking through final corrective action."

6.1.4 Element 304.04 - Loose Conduit Problems

|R1

No further corrective action was required for this element. Corrective action identified by a previous evaluation had already been accomplished at the time of the current evaluation.

6.2 Negative Findings at Subcategory Level

CATDs 30400-NPS-01, 02, and 03 were sent to TVA corporate management to address the three subcategory-level findings of this subcategory, as presented in section 4.0 of this report. It appears that two of the subcategory-level negative findings are consistent with problems previously identified by TVA and already being addressed through implementation of the Nuclear Performance Plan. These two negative findings deal with procedures problems and with precluding recurrence of problems through trending and root cause analysis.

|R1

The corporate response to CATD-30400-NPS-01, which identified lack of control over design and maintenance activities associated with water in electrical manholes, states:

"DNE has initiated the Specification Improvement Program (SIP), which will provide ONP with generic master specifications to cover construction, modifications and additions, and maintenance of TVA's nuclear plants. The main scope of SIP (67 master specifications) will be complete by Dec. 1987, but will be added to as user needs are identified. EEB will assure compliance with SIP. The implementation of the master specs will prevent recurrence of the problems with water in electrical manholes at all sites."

|R1

REPORT TYPE: Subcategory

REVISION NUMBER: 1

TITLE: Cables and Conduit

PAGE 29 OF 30

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The TVA Corporate response to CATD-30400-NPS-02, which deals with lack of control of consumables, states as follows:

"We have concluded, based upon the information provided in ECSP Report Number 30400, that this appears to be an isolated case. In fact, this report states that in a review of 23 terminal blocks with RTV 3140 all showed proper material traceability. The report makes no mention of traceability problems with any other consumables. We do not agree with the statement that there is a "lack of corporate and plant control over the use of consumables." NQAM Part III, Section 2.3 and Sequoyah Standard Practice SQA 45, Revision 26, Paragraph 13.0 and 25.0 clearly describe the steps to be taken in controlling consumables from a corporate and plant level respectively. Therefore, except for appropriate training of the individuals involved in this instance, no further action is deemed necessary at this time."

R1

The above response was accepted because it was based on a single isolated incident of material traceability presented in this subcategory. The response showed that an adequate program is defined for corporate control of consumables. However, the adequacy of the implementation of the corporate program is still questionable based on the numerous examples from other Operations subcategory reports presented in Section 4.0 where there was a lack of control over QA Level II items. Because these examples fall outside the scope of this subcategory report, however, the question of implementation of the corporate QA Level II program is not being pursued further in this report. It is being escalated to the Operation Category report for further consideration.

R1

The response to CATD-30400-NPS-03 concerning the lack of control over design and construction standards and requirements and their use at the nuclear sites states:

"DNE has initiated the Specification Improvement Program (SIP), which will provide ONP with generic master specifications to cover construction, modifications and additions, and maintenance of TVA's nuclear plants. The main scope of SIP (67 master specifications) will be complete by Dec. 1987, but will be added to as user needs are identified. DNE has taken the position that installed cables are acceptable and the ongoing evaluation by each plant site will provide documentation to support the adequacy of installed cables. EEB will assure compliance with SIP."

R1

REPORT TYPE: Subcategory

REVISION NUMBER: 1

TITLE: Cables and Conduit

PAGE 30 OF 30

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7.0 ATTACHMENTS

- Attachment A - Subcategory Summary Table
- Attachment B - Listing of Concerns By Issue
- Attachment C - Checklist for Root Cause Analysis
- Attachment D - Summary of Symptoms and Root Causes
- Attachment E - Graph of Symptoms Versus Root Cause
- Attachment F - Bar Charts of Symptoms
- Attachment G - Bar Charts of Root Causes
- Attachment H - Corrective Action Tracking Documents (CATDs)
- Attachment I - List of Evaluators by Element/Plant

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| R1  
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ATTACHMENT A

Subcategory Summary Table

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  
 SUBCATEGORY: 304 PROCEDURE PROBLEMS

PAGE - 1  
 RUN TIME - 13:36:  
 RUN DATE - 04/24/81

CATEGORY: OP PLANT OPER. SUPPORT

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTI CAT - 01 SUBCAT - 31 SECTION/ISSUE	
					2	SAF	BL	SQ					WB
IN -85-112-00101 T50020	OP	30401	N	WBN	1	Y	Y	Y	Y		QTC	TVA NUCLEAR POWER DEPARTMENT IS NOT WORKING IN ACCORDANCE WITH CONSTRUCTION SPECIFICATIONS WHEN MAKING MODIFICATIONS AND ADDITIONS. EG NO MAXIMUM PULL TENSION IS SPECIFIED WHEN NUCLEAR POWER DEPARTMENT PULLS A NEW CABLE AND MINIMUM BEND RADIUS IS ALSO NOT SPECIFIED	3.1 304.01-1
IN -85-207-00201 T50157	OP	30402	N	WBN	1	N	N	Y	Y	I-85-702-WBN	QTC	CRAFTS ARE USING STEEL FISH TAPE IN LIEU OF FIBERGLASS OR WOOD RODS TO REACH PENETRATION SEALS. THIS MAY CAUSE DAMAGE TO EXISTING CABLES IN THE BREACHED PENETRATION. THIS PRACTICE OF USING STEEL FISH TAPES VIOLATES PROCEDURE MAT-14 AND CONST. MGMT. (KNOWN) MEMO OF APPROX. JULY 1984. CONSTR. DEPT. CONCERN. ADDITIONAL INFORMATION IN FILE, WITHHELD DUE TO CONFIDENTIALITY. NO FOLLOWUP REQUIRED.	3.2 304.02-1
IN -85-465-00201 T50041	OP	30404	N	WBN	1	N	N	N	Y	I-85-227-WBN	QTC	CONDUIT IS LOOSE WHERE IT ENTERS CABLE TRAY. DIESEL BUILDING, UNIT #1, ROOM 2B-B 1ST ELEV. (ENTER ROOM AND 20' FROM DOOR NEAR CEILING). THIS WAS REPORTED TWO WEEKS AGO BUT IS STILL UNCORRECTED.	3.4 304.04-1
IN -85-862-00201 T50226	OP	30402	N	WBN	1	N	N	N	Y		QTC	NUC POWER PERSONNEL PULLED CABLE THROUGH PENETRATIONS AFTER QC CIVIL CONSTRUCTION SIGNED OFF SEALING OF PENETRATION. THIS OCCURRED IN AUXILIARY REACTOR AND CONTROL BUILDINGS. UNITS 1 & 2. NUC POWER DEPT. CONCERN. CI DECLINED TO PROVIDE ADDITIONAL INFORMATION.	3.2 304.02-2

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

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  
 SUBCATEGORY: 304 CABLE PROBLEM IN MANHOLES

PAGE -  
 RUN TIME - 13:36  
 RUN DATE - 04/24

CATEGORY: OP PLANT OPER. SUPPORT

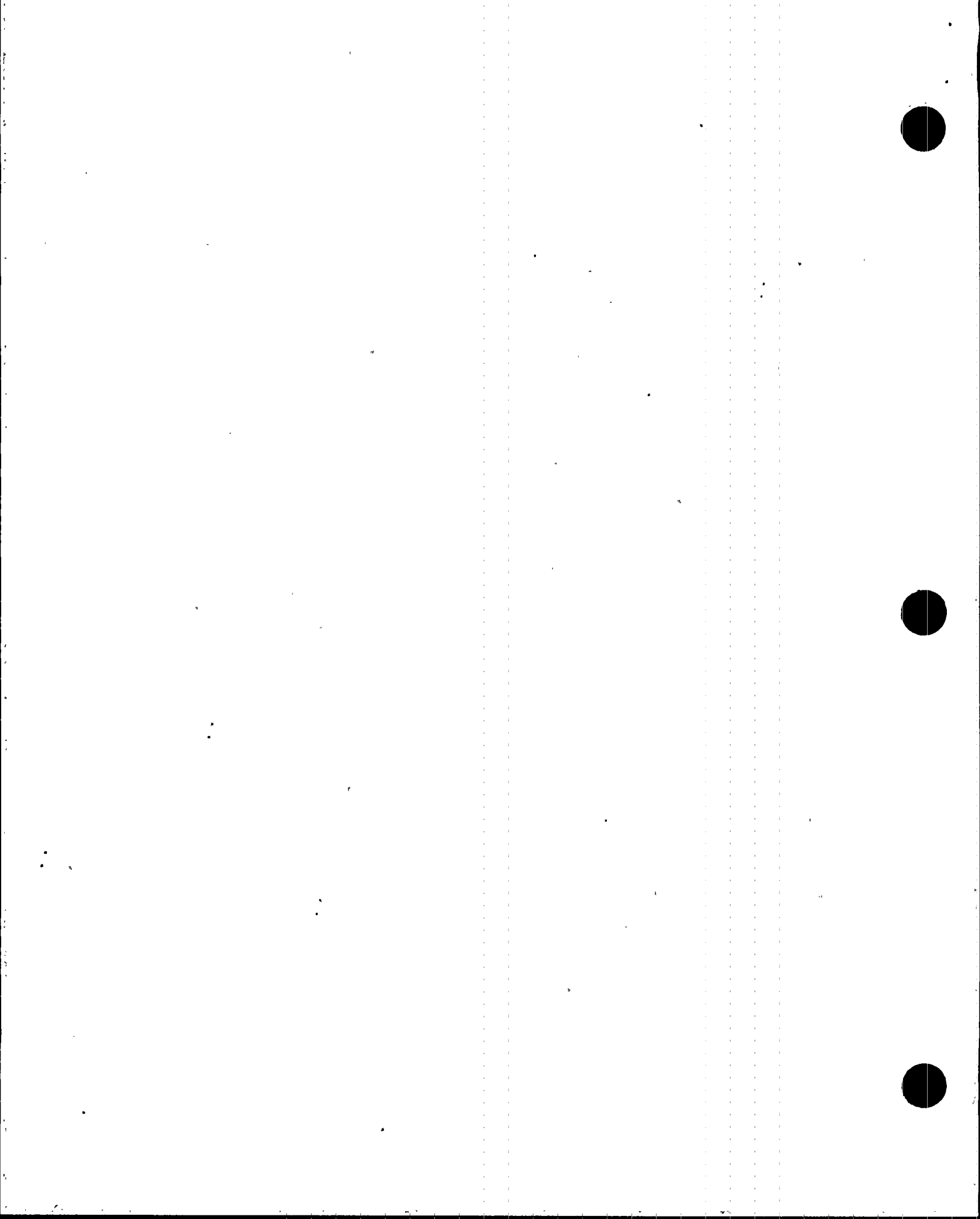
CONCERN NUMBER	CAT	SUB CAT	S H R PLT D LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECT CAT - SUBCAT - SECTION/ISS	
				2	SAF	RELATED	BF					BL
IN -85-945-00101 T50100	OP	30403	N WBH	1	Y	Y	Y	Y	I-85-362-WBH	QTC	ELECTRICAL MANHOLES ARE IN A VERY DISORGANIZED STATE. CABLES ARE LAYING OUT OF TRAYS WITH SEVERAL FEET OF SLACK DUE TO CABLES BEING SPLICED AND NOT LACED DOWN PROPERLY. EXAMPLES MAY BE FOUND IN THE MANHOLE NEXT TO THE "FAB" SHOP OR MANHOLES IN FRONT OF THE TURBINE BUILDING AND AUX. BUILDING ENTRANCE. CI HAS NO ADDITIONAL INFORMATION. NO FOLLOW UP REQUIRED.	3.3 304.03-1
QCP10.35-8-13 01	OP	30403	N BLN	1	Y	Y	Y	Y		OECP	CI EXPRESSED CONCERN ABOUT CONDITION OF MANHOLES IN ELECTRICAL CABLE TRENCH TO IPS.	3.3 304.03-1
TAK-86-005 01	OP	30401	N SQN	1	H	H	Y	H		OECP	RTV APPLIED TO JUNCTION BOXES ON SMI-0-360-0 MAY NOT HAVE BEEN PROPERLY APPLIED ON ALL JUNCTION BOXES. RTV USED WAS NOT QA LEVEL AND HAS EXCEEDED IT'S SHELF LIFE. EMPLOYEE STATED THAT SHELF LIFE WAS NOT A CONCERN AS HE HAS VERIFIED THAT THE RTV IN QUESTION WILL IN FACT SET UP PROPERLY.	3.1 304.01-2

7 CONCERNS FOR CATEGORY OP SUBCATEGORY 304

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

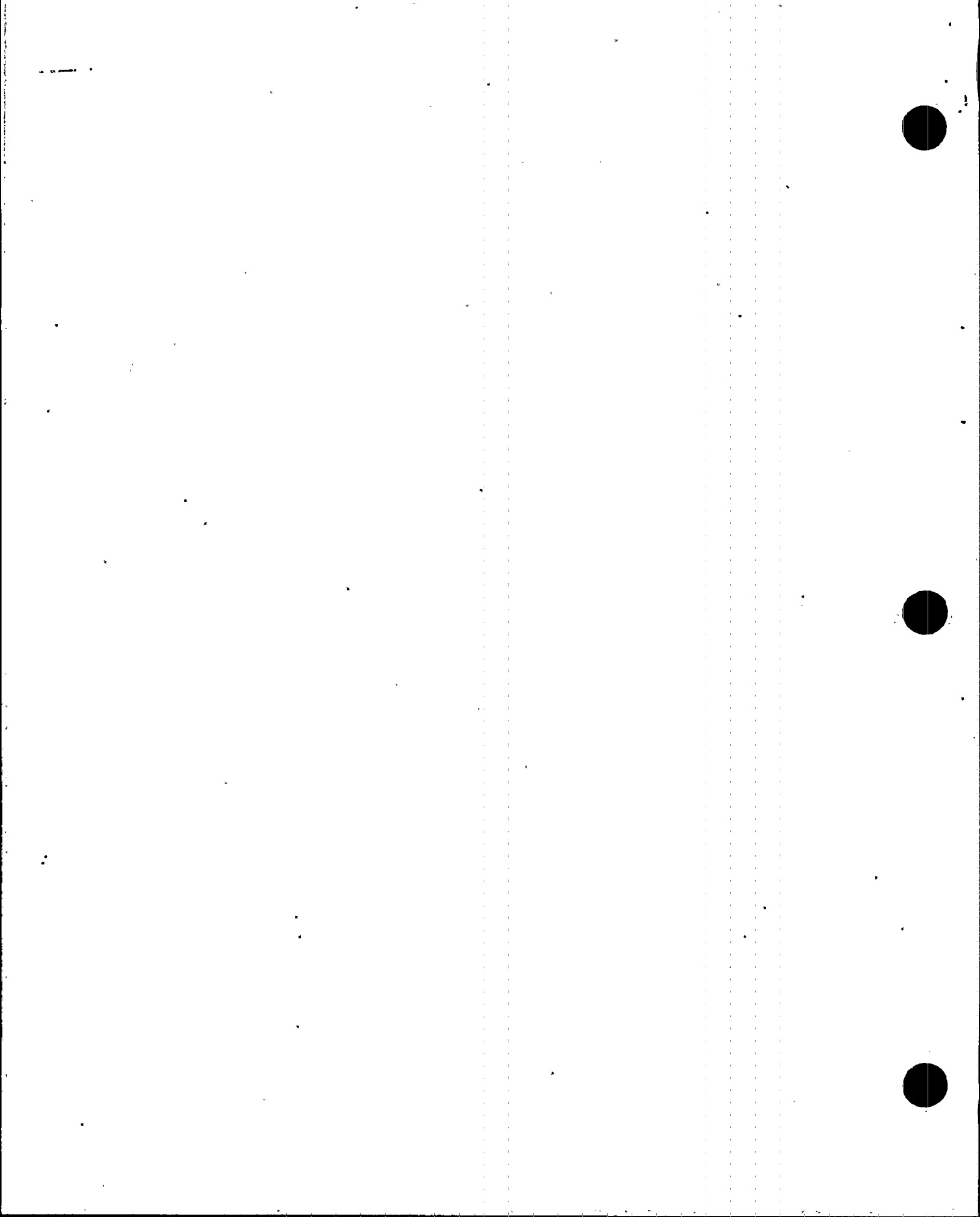






Attachment C  
Checklist for Root Cause Analysis

1. Procedure lacks specifics to perform task.
2. Personnel lack sufficient training in the applicability/use of procedure.
3. Lack of understanding regulatory requirements or commitments.
4. Lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes.
5. Inadequate communication within functional group.
6. Inadequate communication between functional groups.
7. Management Assumed Risk.
8. Procedures incomplete or failed to incorporate all technical requirements.
9. Error in judgment by qualified individual.
10. Unqualified individual performing the task.
11. Insufficient time to perform task.
12. Inadequate prerequisites defined to ensure satisfactory completion of task.
13. Personnel performed task knowingly in violation of procedure/process.
14. Personnel error in following procedures.
15. Failed to identify root cause of previous deficiencies.
16. Failed to take appropriate action to preclude reoccurrence.
17. Inadequate process to detect adverse trends.
18. Inadequate acceptance criteria defined to ensure satisfactory task completion.
19. Management attentiveness to trends.
20. Lack of accessibility to documentation.
21. Inadequate controls for review of results to ensure compliance with commitments.
22. Timeliness of changes to commitments or changes to licensing/regulatory requirements.
23. Isolated incident.
24. Random error.
25. Other - i.e., equipment related failure.





ATTACHMENT D

Page 1 of 2

Summary of Symptoms and Root Causes.

Element 304.01, Problems in Following Procedures Related to Electrical Aspects of Plant Construction

For Element 304.01, there was the potential for negative findings at the category level exhibited by the following symptoms: (a) lack of material control for consumables (RTV), (b) inadequate work controls (review and implementation of construction specifications), and (c) inadequate configuration control (installation is not equal to design specifications). The first symptom was identified for SQN, and the second and third symptoms appeared for BFN. As these symptoms were tested for root cause, the appropriate root causes and applicable plant sites were as follows:

|R1

- a. Personnel lack sufficient training in the applicability or use of procedures (SQN)
- b. Lack of understanding regulatory requirements or commitments (BFN)
- c. Lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes (BFN)
- d. Inadequate communication within functional group (DNC at BFN)
- e. Inadequate communication between functional groups (DNC and ONP at BFN)
- f. Unqualified individuals performing the task (i.e., individuals are performing the task who are unqualified to do the specific task of ensuring material traceability due to their lack of training (SQN))
- g. Personnel error in following procedures (SQN)
- h. Inadequate acceptance criteria defined to ensure satisfactory task completion. (BFN)

Element 304.02, Electrical Penetrations Breached

For Element 304.02, there was the potential for negative findings at the category level exhibited by the following symptoms: (a) inadequate work control (penetration breaching), and (b) inadequate work control (penetration breaching devices). The first symptom appeared in the evaluation for WBN, and the second symptom appeared in the evaluation for SQN. As these symptoms were tested for root cause, the appropriate root causes and applicable plant sites were as follows:

- a. Procedures incomplete or failed to incorporate all technical requirements (SQN)
- b. Personnel error in following procedures (WBN)
- c. Inadequate controls for review of results to ensure compliance with commitments (WBN)

ATTACHMENT D

Page 2 of 2

Element 304.03, Electrical Manholes

For Element 304.03, there was the potential for negative findings at the category level exhibited by the following symptoms: (a) inadequate initial design control, and (b) inadequate work controls (housekeeping). These symptoms were identified for SQN, BFN, and BLN. As these symptoms were tested for root cause, the appropriate root causes for each of the three plant sites were judged to be as follows:

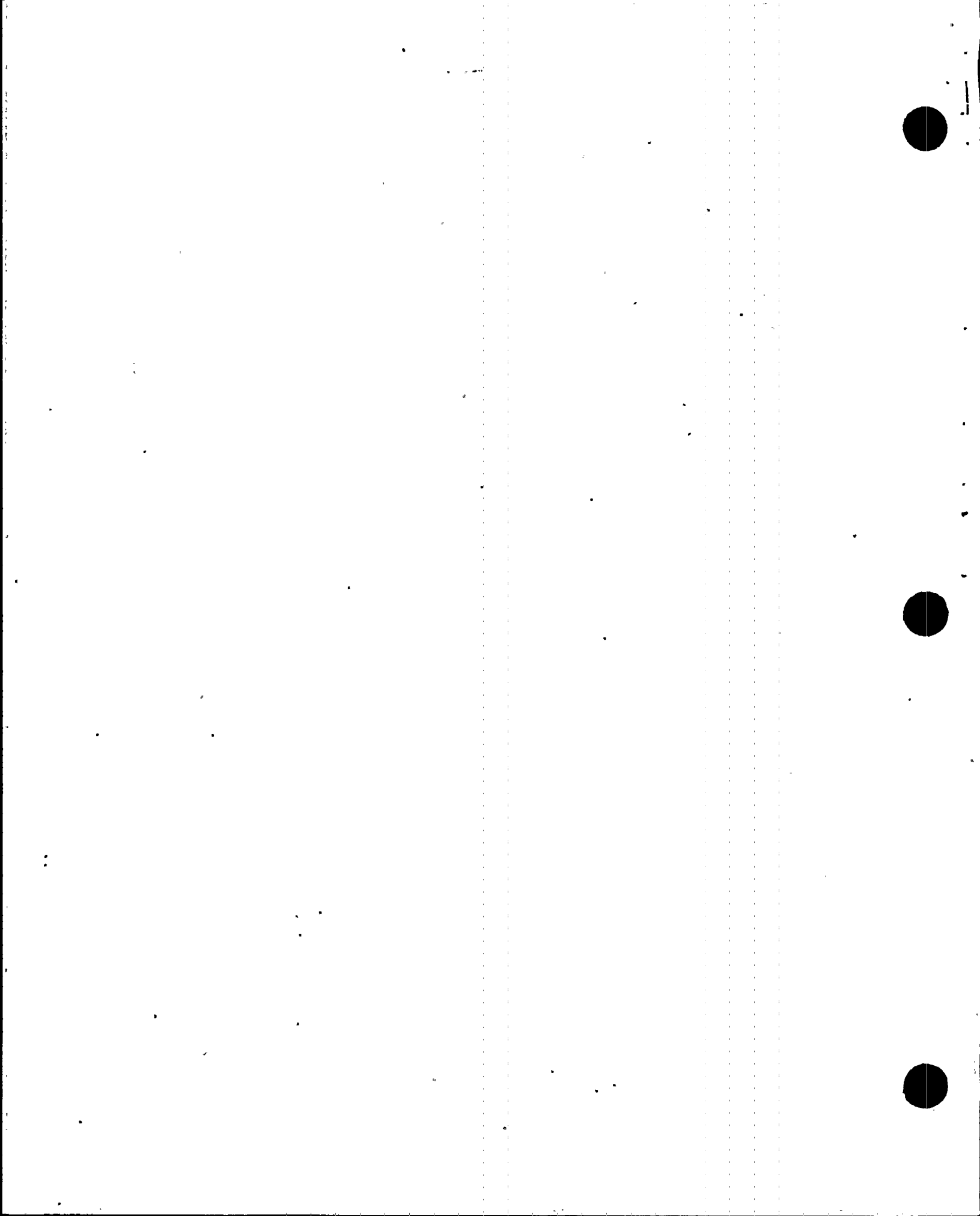
- a. Lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes
- b. Error in judgment by qualified individual
- c. Inadequate process to detect adverse trends
- d. Inadequate acceptance criteria defined to ensure satisfactory task completion

No symptoms for root cause analysis were identified in Element 304.04, Loose Conduit.

The analysis of the symptom and root causes for these elements is depicted graphically in Attachments E, F, and G. Attachment E is a plot of each element's symptoms versus the root causes pointed out by the symptom. Root cause numbers on the horizontal axis correspond to the 25 items on the "Checklist for Root Causes Analysis" found in Attachment C. Attachment F contains bar graphs showing the number of times each of the symptoms in the subcategory occurs for the various plants. Attachment G contains bar graphs showing the number of times each root cause appears in the subcategory for the various plants.

From a study of Attachments E and F it can be seen that inadequate work controls appear in four out of the subcategory's seven symptoms. Inadequate work controls were identified with respect to review and implementation of construction specifications, electrical penetration breaching practices, and electrical manhole housekeeping practices. Also, Attachments E and G show that there were four root causes that occurred at each of the same three plants: (a) lack of adequate system, process, or administrative controls to ensure commitments are reflected in procedures or processes, (b) error in judgment by qualified individual, (c) inadequate process to detect adverse trends, and (d) inadequate acceptance criteria defined to ensure satisfactory task completion. These four root causes appeared more frequently overall than any other root causes, as shown in Attachment G.

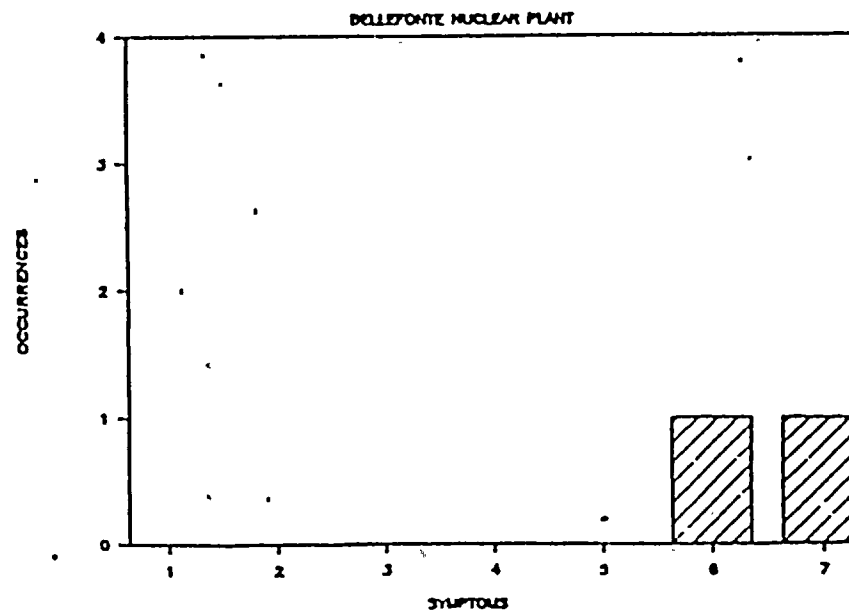
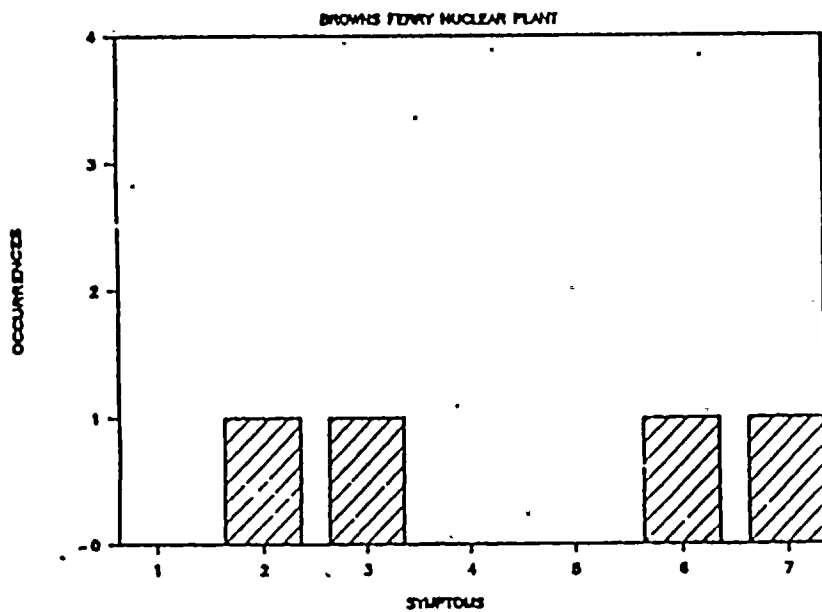
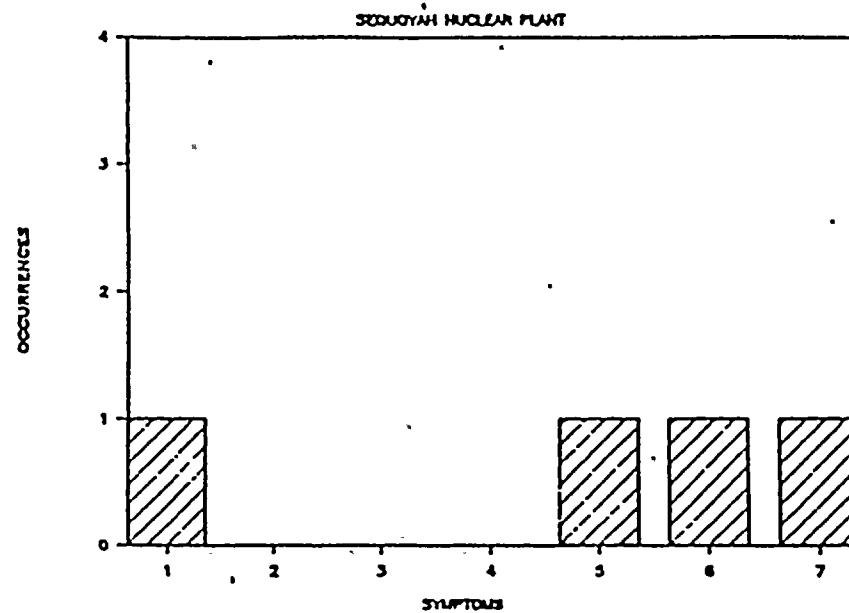
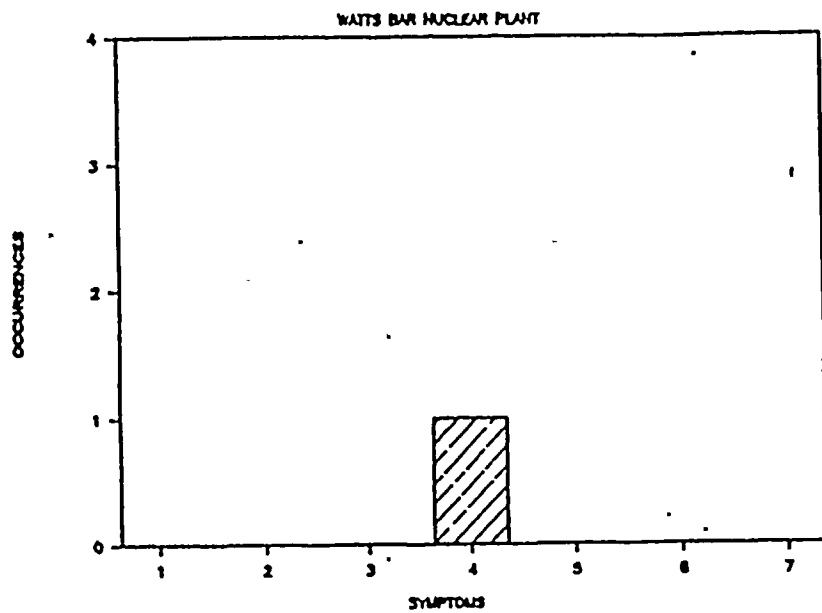




# OCCURRENCES VS SYMPTOMS

SUBCAT 304

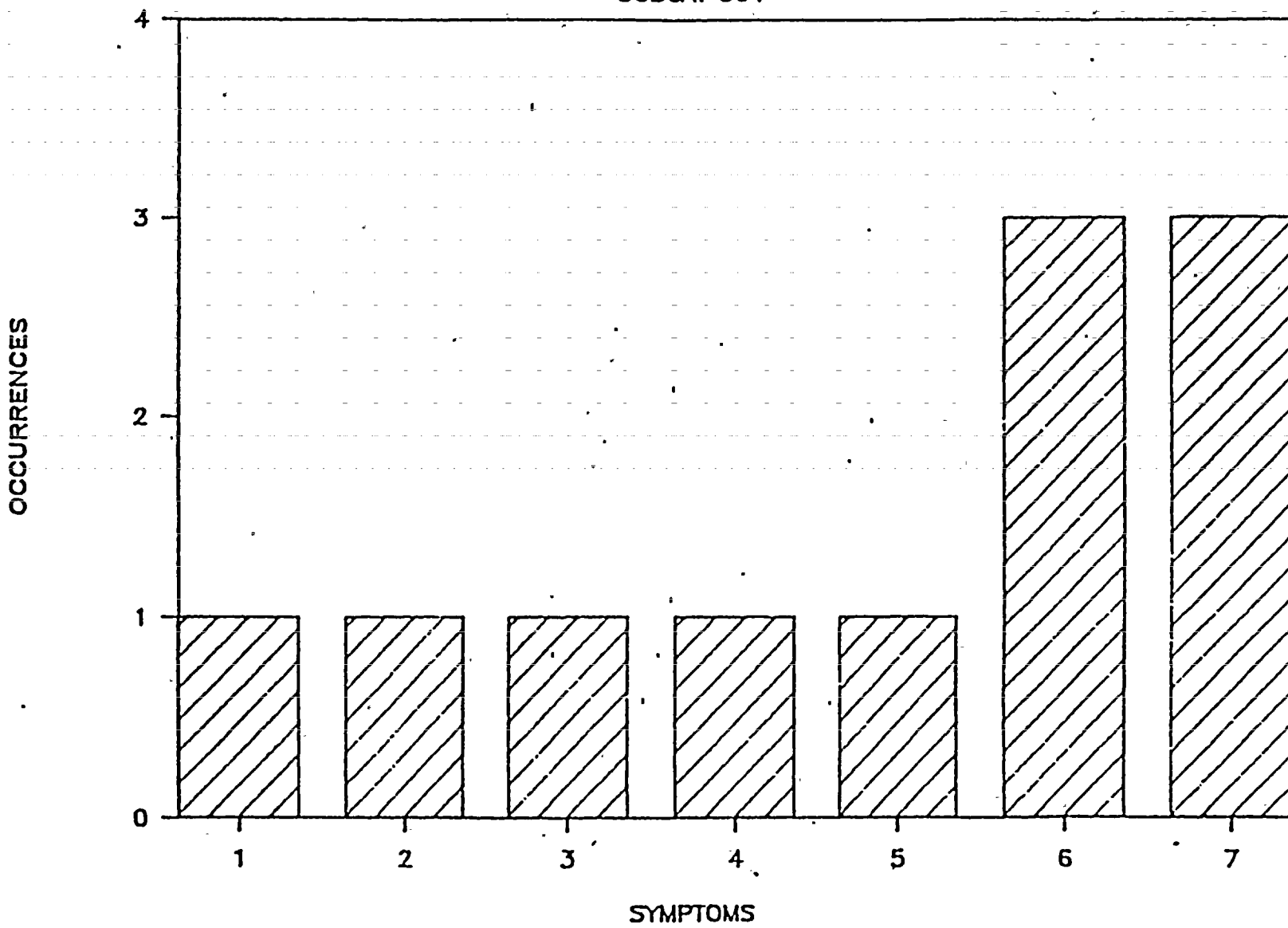
Revision 1



ATTACHMENT F  
PAGE 1 OF 2

# OCCURRENCES VS SYMPTOMS

SUBCAT 304

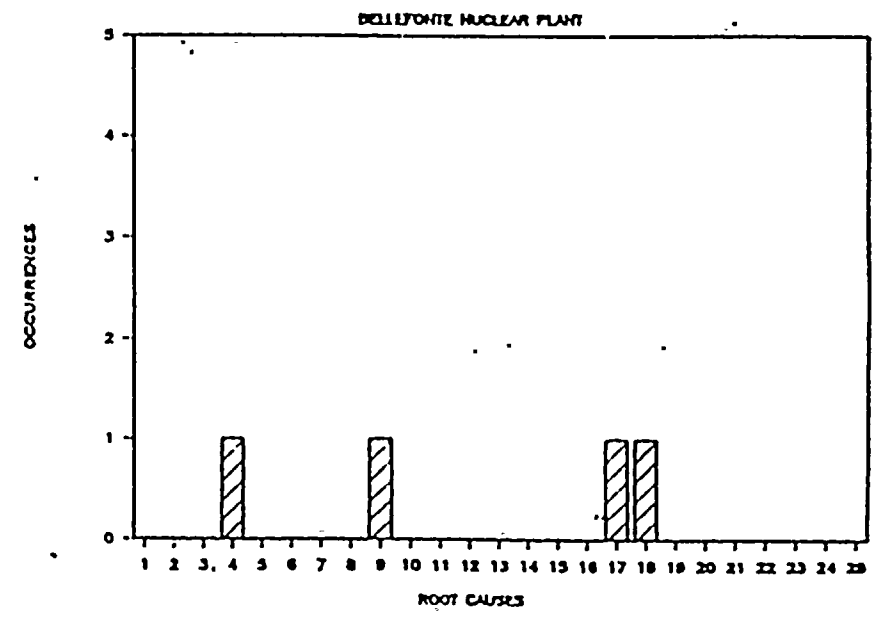
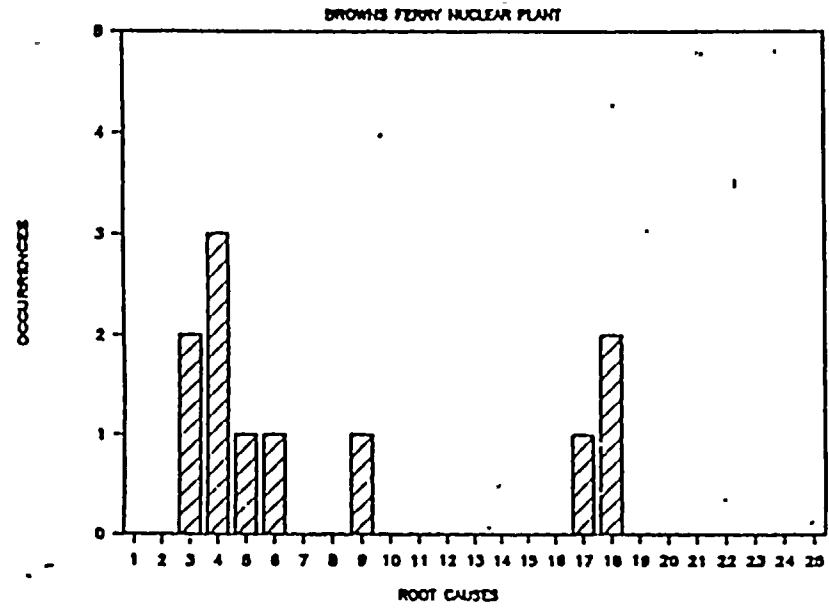
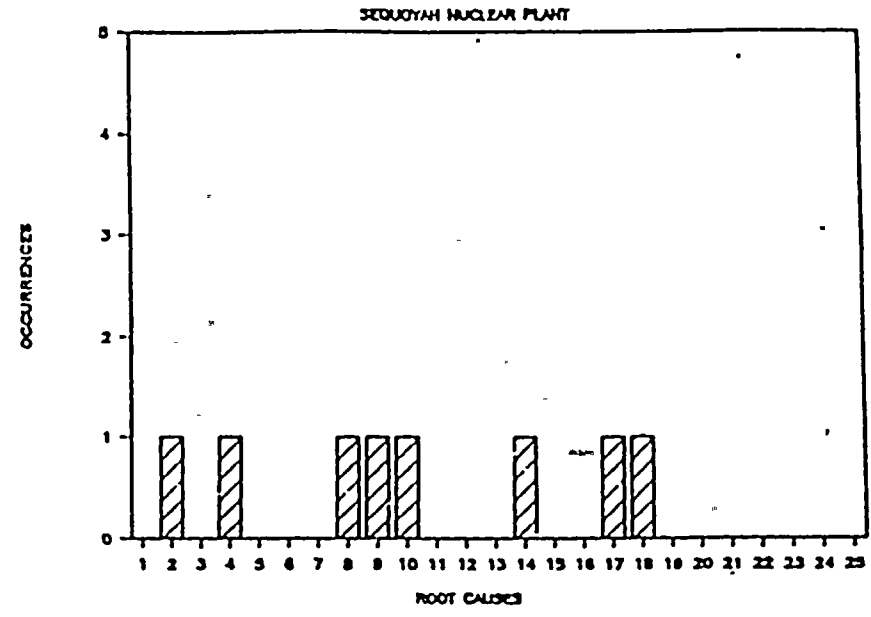
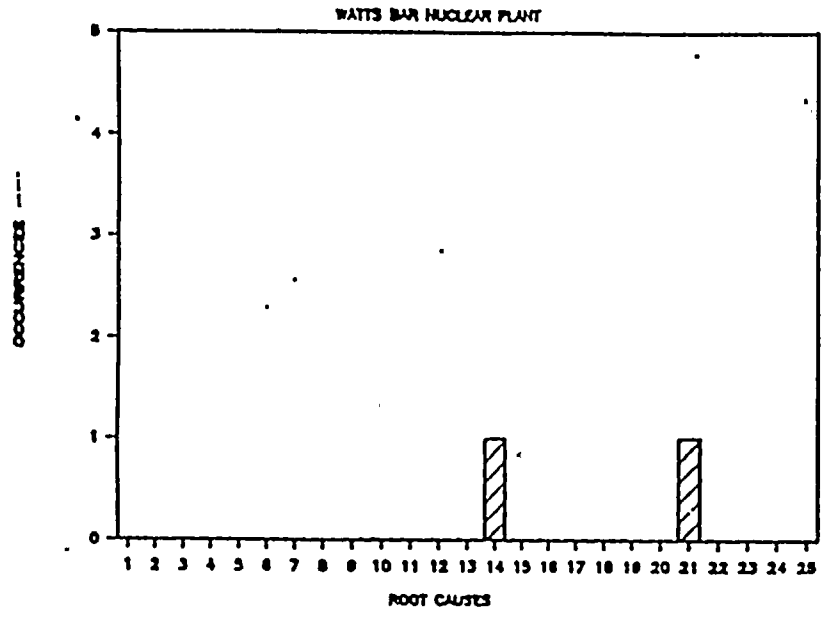


# OCCURRENCES VS ROOT CAUSES

SUBCAT 304

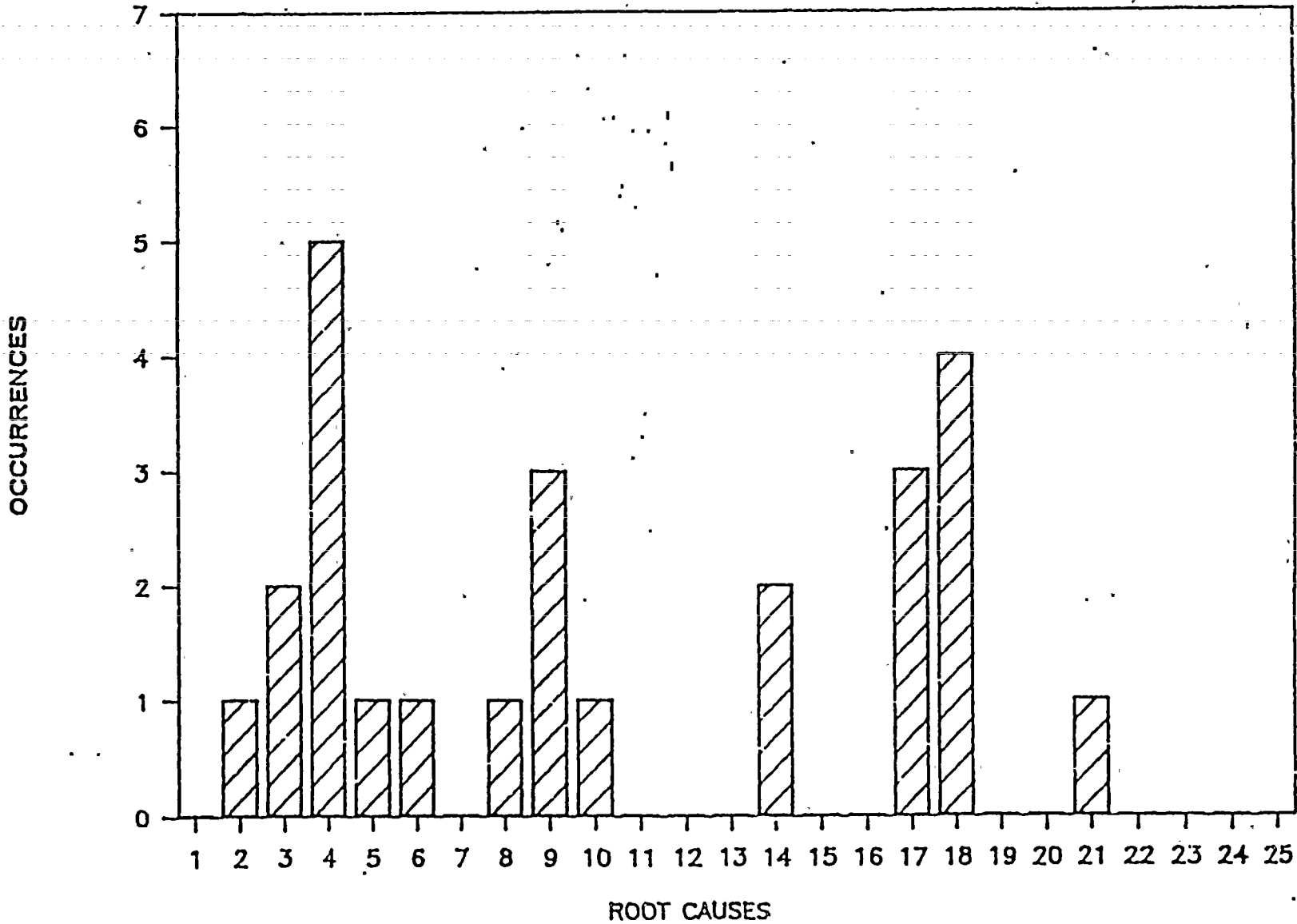
Revision 1

ATTACHMENT G  
PAGE 1 of 2



# OCCURRENCES VS ROOT CAUSES

SUBCAT 304





ATTACHMENT H  
CORRECTIVE ACTION TRACKING DOCUMENTS (CATDs)

<u>CATD NUMBER</u>	<u>CORRECTIVE ACTION PLAN</u> <u>APPROVED</u>	
30400-NPS-001	YES	
30400-NPS-002	YES	R1
30400-NPS-003	YES	
30401-SQN-01	YES	
30401-BFN-01 R1	YES	
30401-BFN-02 R1	YES	
30401-BFN-03 R1	YES	R1
30401-BFN-04 R1	YES	
30402-WBN-01	YES	
30402-WBN-02	YES	
30402-SQN-01	YES	
30403-NPS-01	YES	R1
30403-WBN-01	YES	
30403-SQN-01	YES	
30403-SQN-02	YES	
30403-SQN-03	YES	
30403-BFN-01	YES	
30403-BFN-02	YES	
30403-BFN-03	YES	
30403-BLN-01	YES	

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 30400

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30400-NPS-001
4. INITIATION DATE 02/06/87
5. RESPONSIBLE ORGANIZATION: TVA-Corporate
6. PROBLEM DESCRIPTION:  QR  NQR As noted in the Findings and Collective Significance Sections of Report 30400, there is a lack of corporate control over design and maintenance activities associated with water in electrical manholes at all sites.
7. PREPARED BY: NAME E. G. Shewbridge ENT  ATTACHMENTS DATE: 11-6-87
8. CONCURRENCE: CEG-H W. C. [unclear] DATE: 7-6-87
9. APPROVAL: ECTG PROGRAM MGR. [Signature] DATE: 4/10/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: see attached
11. PROPOSED BY: DIRECTOR/MGR: see attached  ATTACHMENTS DATE: —
12. CONCURRENCE: CEG-H: W. C. [unclear] DATE: 7-6-87  
SRP: [unclear] DATE: —  
[unclear] DATE: —  
ECTG PROGRAM MGR: [Signature] DATE: 4/10/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE

TITLE

DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 30400

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30400-NPS-002
4. INITIATION DATE 02/06/87
5. RESPONSIBLE ORGANIZATION: TVA-Corporate
6. PROBLEM DESCRIPTION:  QR  NQR As noted in the Findings and Collective Significance Sections of Report 30400, there is a lack of corporate and plant control over the use of consummables. Of particular interest is RTV, however, other materials i.e., Raychem, Teflon, etc., should be given consideration in the CATD disposition.

ATTACHMENTS

7. PREPARED BY: NAME E. G. Shewbridge *CWT* DATE: 1-6-87
8. CONCURRENCE: CEG-H W. R. [Signature] DATE: 4-6-87
9. APPROVAL: ECTG PROGRAM MGR. [Signature] DATE: 4/10/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: \_\_\_\_\_

\_\_\_\_\_  
Please refer to attachment  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR. [Signature] DATE: 5/29/87
12. CONCURRENCE: CEG-H: [Signature] DATE: 6/10/87  
SRP: \_\_\_\_\_ DATE: \_\_\_\_\_  
\_\_\_\_\_ DATE: \_\_\_\_\_  
\_\_\_\_\_ DATE: \_\_\_\_\_  
ECTG PROGRAM MGR: [Signature] DATE: 6/10/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 30400

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30400-NPS-003
4. INITIATION DATE 02/06/87
5. RESPONSIBLE ORGANIZATION: TVA-Corporate
6. PROBLEM DESCRIPTION:  QR  NQR As noted in the Findings and Collective Significance Sections of Report 30400, there is a lack of corporate control over design and construction standards and requirements and their use at the nuclear sites.
7. PREPARED BY: NAME E. G. Shewbridge *EW* DATE: 4-6-87
8. CONCURRENCE: CEG-H *J. K. [unclear]* DATE: 4-6-87
9. APPROVAL: ECTG PROGRAM MGR. *[Signature]* DATE: 4/11/87

ATTACHMENTS

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: see attached

ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: *see attached* DATE: \_\_\_\_\_
12. CONCURRENCE: CEG-H: *[Signature]* DATE: 3-16-87
- SRP: \_\_\_\_\_ DATE: \_\_\_\_\_
- \_\_\_\_\_ DATE: \_\_\_\_\_
- \_\_\_\_\_ DATE: \_\_\_\_\_
- ECTG PROGRAM MGR: *[Signature]* DATE: 7/11/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE

TITLE

DATE



ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 304.01-BFN

- 1. Immediate Corrective Action Required:  Yes  No
- 2. Stop Work Recommended:  Yes  No
- 3. CATD No. 30401-BFN-01 Rev. 1 4. INITIATION DATE 3/12/87
- 5. RESPONSIBLE ORGANIZATION: Site Director
- 6. PROBLEM DESCRIPTION:  QR  NQR Site instructions have not been verified as being equal to or better than the procedures in the Construction Quality Assurance Manual, appendix B.

Affected sections include: Electrical Modifications, Mechanical Modifications, Electrical Maintenance, Mechanical Maintenance, and possibly others.

- 7. PREPARED BY: NAME D. S. Bell for Dwight Thompson DATE: 3-12-87
- 8. CONCURRENCE: CEG-H W. J. ... DATE: 3-12-87
- 9. APPROVAL: ECTG PROGRAM MGR. [Signature] DATE: 3/12/87

ATTACHMENTS

CORRECTIVE ACTION

- 10. PROPOSED CORRECTIVE ACTION PLAN: see attached CAP

ATTACHMENTS

- 11. PROPOSED BY: DIRECTOR/MGR: R 33 870807 892 DATE: \_\_\_\_\_
- 12. CONCURRENCE: CEG-H: [Signature] DATE: 3/12/87
- SRP: \_\_\_\_\_ DATE: \_\_\_\_\_
- ECTG PROGRAM MGR: James R Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

- 13. Approved corrective actions have been verified as satisfactorily implemented.

\_\_\_\_\_  
SIGNATURE TITLE DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 304-01-BFN

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30401-BFN-04 Rev. 1 4. INITIATION DATE 3/12/87
5. RESPONSIBLE ORGANIZATION: DNQA
6. PROBLEM DESCRIPTION:  QR  NQR NQAM, part 1, section 2.2  
provides a list of design output documents and requires these  
documents to be implemented by Construction Procedures. No  
corporate program exists to ensure that these documents and  
revisions to them are implemented by the Nuclear Site Director.

ATTACHMENTS

7. PREPARED BY: NAME D.E. Smith for Dwight Thompson DATE: 3-12-87
8. CONCURRENCE: CEG-H W.R. Sogge DATE: 3-12-87
9. APPROVAL: ECTG PROGRAM MGR. J.B. Riddle for DATE: 3/13/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: See Attachment A.

ATTACHMENTS

11. PROPOSED BY: DIRECTOR MGR: J.R. Hall for DATE: 4-14-87
12. CONCURRENCE: CEG-H: W.R. Sogge DATE: 6-22-87  
SRP: \_\_\_\_\_ DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
ECTG PROGRAM MGR: James R. Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
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2978T









ECSP Corrective  
= Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No: 304.03-BFN

- 1. Immediate Corrective Action Required:  Yes  No
  - 2. Stop Work Recommended:  Yes  No
  - 3. CATD No. 30403-BFN-03
  - 4. INITIATION DATE 11/11/86
  - 5. RESPONSIBLE ORGANIZATION: Modifications - Browns Ferry
  - 6. PROBLEM DESCRIPTION:  QR  NQR The terminal strip in junction box 7118 in manhole T near the Central Alarm Station has been flooded and is severely corroded. The box was installed under incomplete ECN P0286. It contains cables for CCTV G,H, and J. The manhole needs a sump pump. The terminal strip should be replaced with a waterproof splice. An FCR against ECN P0286 could add a sump pump and remove the terminal strip.
- ATTACHMENTS
- 7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/11/86
  - 8. CONCURRENCE: CEG-H [Signature] DATE: 11-14-86
  - 9. APPROVAL: ECTG PROGRAM MGR. [Signature] DATE: 11-15-86

CORRECTIVE ACTION

- 10. PROPOSED CORRECTIVE ACTION PLAN: Temporary corrective maintenance has been initiated by Electrical Technical Section. Also, assignment 6019 has been issued to Lyle Knox and Rod Howell (ETS) to issue a DCR to add a permanent sump pump in manhole "T" and to replace the term strip with a water-proof splice.
- ATTACHMENTS
- 11. PROPOSED BY: DIRECTOR/MGR: [Signature] DATE: 2/13/87
  - 12. CONCURRENCE: CEG-H: [Signature] DATE: 3-10-87
  - SRP: \_\_\_\_\_ DATE: \_\_\_\_\_
  - \_\_\_\_\_ DATE: \_\_\_\_\_
  - \_\_\_\_\_ DATE: \_\_\_\_\_
  - ECTG PROGRAM MGR: James R. Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

- 13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE	TITLE	DATE
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244

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No: OP 304.03

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30403-BLM-01
4. INITIATION DATE 11-3-86
5. RESPONSIBLE ORGANIZATION: Construction
6. PROBLEM DESCRIPTION:  QR  NQR  
Cable pull manholes have water standing in bottom. No preventive maintenance or periodic inspection program exists at BLM as described by Design Criteria M4-50-D788, section 5, paragraph 1.

ATTACHMENTS

7. PREPARED BY: NAME John H. Myir DATE: 11-3-86
8. CONCURRENCE: CEG-H DRH Thomas J. Huth for WRL DATE: 11/24/86
9. APPROVAL: ECIG PROGRAM MGR. DW Stewart for DATE: 11-21-86

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: See attachment

ATTACHMENTS

11. PROPOSED BY: DIRECTOR/SGR Steve P. Kaulberg DATE: 2/27/87
12. CONCURRENCE: CEG-H: DRH DATE: 3-9-87  
SRP: N/A DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
DATE: \_\_\_\_\_  
ECIG PROGRAM MGR: DRH DATE: 7/13/87

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

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SIGNATURE TITLE DATE

ATTACHMENT A

1. Several dozen cables have been routed outside the cable trays in manhole T and there is inadequate slack to get the cables in the trays. A large number of cables are routed through manhole T, it may not be possible to put all the cables in trays. Except manhole T, about the only cables that are out of the trays are spare cables, pull wires, and sump pump power cables. In manhole H, a couple of cables cross trays on the inside edge of the tray, and one cable is out of the trays. In manhole E, some of the 4-kV bus tie cables follow the top edge of the cable tray.
2. The drawings for manholes F, G, H, and J show a metal barrier and cover in the trays to separate 480-V and 4-kV cables. These barriers and covers are not installed. It is doubtful they could be installed and still maintain sufficient bend radius on the 4-kV cables. The 4-kV bus tie line cables are abandoned anyway, so the barriers may not be needed.

- ✓ 1. Manholes need a general cleanup.
- ✓ 2. Sump pump routine checks are not adequate to ensure continued operation.
- ✓ 3. Manhole C is collecting surface water because the manhole is in a low area, and the cover is lower than the surrounding asphalt. According to the drawing 10N319-1 RA, the cover should be above grade.
- ✓ 4. Some of the sump pumps electrical supply cord plugs contain a circuit interrupting device that is causing nuisance trips. This tripping was observed in manholes E and G.
- ✓ 5. The ends of most spare and abandoned cables have not been taped per modifications and additions instruction (MAI)-13 or MAI-44. Numerous abandoned 4-kV bus tie cables are not taped. In manhole T, one 3-pair Number 19 AWG cable has the outer jacket removed, with one pair cut and the bare ends of the wire exposed.
6. Electrical Maintenance Instruction (EMI)-58.1, step 8.14 allows temporary cables to be placed outside of trays. It has no limitation as to the number of cables or location. This may have caused the excessive number of cables outside of trays in manhole T.
- ✓ 7. In manhole E, the bottom tray on the north side has a broken splice connector. One section of the tray is hanging down as a result.
8. Most splices observed used Raychem sleeves, which is suitable for the wet environment, especially the newer looking splices. A few older splices utilize tape. Over 50 splices were observed. Raychem was used on 17 of 18 4-kV splices in manhole E. Tape was observed on 3 small splices in manhole E. Two Raychem and one taped splice were observed in manhole F. Three taped splices were observed in manhole H. Raychem was on about 30 splices in manhole T. Raychem was not required in the original construction according to G-4 and BF-17. MAI-13 and EMI-58 have required Raychem in recent years.

Very few of the taped splices have a legible tag identifying the cable number. Most have no tag.

- ✓ 9. Manholes are not well labelled. Some are hard to locate because drawings are not to scale and measurements are not shown from nearby structures. The security strap across the top of the covers often covers the labelling that does exist. Manhole T is incorrectly labelled "MH N."

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No: 304.03-BFN

- 1. Immediate Corrective Action Required:  Yes  No
- 2. Stop Work Recommended:  Yes  No
- 3. CATD No. 30403-BFN-02
- 4. INITIATION DATE 11/11/86
- 5. RESPONSIBLE ORGANIZATION: Browns Ferry DNE
- 6. PROBLEM DESCRIPTION:  QR  ~~QR~~ WRC 5-9-87

SEE ATTACHMENT A

CATD updated to QR. BFN will be notified.

WRL 5-4-87

- 7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/11/86
- 8. CONCURRENCE: CEG-H W.P. Long DATE: 11-15-86
- 9. APPROVAL: ECTIG PROGRAM MGR. W.P. Long DATE: 11-15-86

ATTACHMENTS

CORRECTIVE ACTION

- 10. PROPOSED CORRECTIVE ACTION PLAN: \_\_\_\_\_

See Attachment B

- 11. PROPOSED BY: DIRECTOR/MGR: W.P. Long 8733 870205 857 DATE: 2-18-87
- 12. CONCURRENCE: CEG-H: W.P. Long DATE: 3-10-87
- SRP: W.P. Long DATE: 9-17-87
- ECTIG PROGRAM MGR: James R. Russell DATE: 8-14-87

ATTACHMENTS

WRL 6-25-87

VERIFICATION AND CLOSEOUT

- 13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE

TITLE

DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No: 304.03-BFN

- 1. Immediate Corrective Action Required:  Yes  No
- 2. Stop Work Recommended:  Yes  No
- 3. CATD No. 30403-BFN-01 4. INITIATION DATE 11/11/86
- 5. RESPONSIBLE ORGANIZATION: Browns Ferry Maintenance
- 6. PROBLEM DESCRIPTION:  QR  NQR WRL 5-4-87

SEE ATTACHMENT

CATD updated to QR. BFN will be notified.  
WRL 5-4-87

- 7. PREPARED BY: NAME Dwight B. Thompson (3592) DATE: 11/11/86
- 8. CONCURRENCE: CEG-H W.R. Long DATE: 11-14-86
- 9. APPROVAL: ECTG PROGRAM MGR. Dwight B. Thompson DATE: 11/19/86

CORRECTIVE ACTION

- 10. PROPOSED CORRECTIVE ACTION PLAN:
  - 1. MRs will be written to correct the housekeeping problems identified as follows:
    - (a) Item 1 - General cleanup; (b) Item 5 - Tape bare ends of cable (3/c #19) in MHT; (c) Item 7 - Replace broken splice connector in MRE; (d) Label manholes legibly - Item 9. This can be tracked by assignment No. 6018; expected completion date 3/30/87.
  - 2. Items 2 & 4 - EMSIL will be written to check MH sump pumps and issue BF-111 to perform inspection regularly. See assignment No. 6019. Expected completion date 4/30/87.
  - 3. Item 3 - Regular check of sump pump will prevent flooding.

- 11. PROPOSED BY: DIRECTOR/MGR. 33 870205 857 DATE: 2-18-87
- 12. CONCURRENCE: CEG-H: W.R. Long DATE: 3-10-87
- SRP: W.R. Long accept copy as original DATE: 8-13-87
- DATE: \_\_\_\_\_
- DATE: \_\_\_\_\_
- DATE: \_\_\_\_\_
- ECTG PROGRAM MGR: James F. Russell DATE: 8-14-87

VERIFICATION AND CLOSEOUT

- 13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE

TITLE

DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No.: 304.03-SQN R1

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30403 30404-SQN-03
4. INITIATION DATE 12/04/86
5. RESPONSIBLE ORGANIZATION: Division of Nuclear Engineering
6. PROBLEM DESCRIPTION:  QR  NQR Electrical manholes were found to contain submerged cables or evidence that cables had been submerged. Manholes inspected and interviews indicate that CSSC cables have been submerged. The resultant adverse affects to these cables need to be evaluated.

JFH  
1/14/87

- |    |  |                                      |
|----|--|--------------------------------------|
|    |  | <input type="checkbox"/> ATTACHMENTS |
| 7. | PREPARED BY: NAME <u>Thomas F. Huth</u>        | DATE: <u>12/04/86</u>                |
| 8. | CONCURRENCE: CEG-H <u>W.R. Sorensen</u>        | DATE: <u>12-5-86</u>                 |
| 9. | APPROVAL: ECTG PROGRAM MGR. <u>[Signature]</u> | DATE: <u>12-5-86</u>                 |

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: SEE THE CAP TRANSMITTED BY MEMORANDUM B25 870107 006 TRANSMITTED TO ECTG VIA 503 870109 807 REVISED CAP (503 87009 807 SUPERSEDED BY 503 87019 850)

JFH  
1/14/87

During close out process issue that a CAPD was initiated. Close out 01202 as one CATD. 3-30-87 WRL

WRL 3-20

- |     |   |                                      |
|-----|---|--------------------------------------|
|     |   | <input type="checkbox"/> ATTACHMENTS |
| 11. | PROPOSED BY: DIRECTOR/MGR: <u>W.R. Sorensen</u>   | DATE: <u>1-12-87</u>                 |
| 12. | CONCURRENCE: CEG-H: <u>Thomas J. Huth for WRL</u> | DATE: <u>1-14-87</u>                 |
|     | SRP: <u>[Signature]</u>                           | DATE: _____                          |
|     |   | DATE: _____                          |
|     |   | DATE: _____                          |
|     | ECTG PROGRAM MGR: <u>R. R. Villa for</u>          | DATE: <u>9/11/87</u>                 |

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE

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ECSP Corrective  
Action Tracking Document  
(CATD)

INITIATION

Applicable ECSP Report No: 304.03 SON R1

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30403 SON 01
4. INITIATION DATE 10-20-86
5. RESPONSIBLE ORGANIZATION: SON
6. PROBLEM DESCRIPTION:  QR  NQR Electrical manholes were found to contain submerged cables or evidence that cables had been submerged. Manholes inspected and interviews indicated that CSSC cables have been submerged.

7. PREPARED BY: NAME Paul Shepard DATE: 10-20-86
8. CONCURRENCE: CEG-H W.R. Long DATE: 10-24-86
9. APPROVAL: ECTG PROGRAM MGR. M. R. ... DATE: 10-27-86

ATTACHMENTS

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: 561124 561124 561124

BY MEMORANDUM 561124 561124 561124 561124 561124 561124 561124 561124 561124 561124

During close out of 01 & 02 as one CATD. WRL 3-50-87

**ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED  
DATE: 10-27-86 BY: [Signature]**

11. PROPOSED BY: DIRECTOR/MGR: H.B. ... DATE: 11-25-86
12. CONCURRENCE: CEG-H: [Signature] DATE: 12/5/86
- SRP: N/A DATE: \_\_\_\_\_
- ECTG PROGRAM MGR: [Signature] DATE: 9/11/87

ATTACHMENTS

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

\_\_\_\_\_  
SIGNATURE TITLE DATE

ECSP Corrective  
Action Tracking Document  
(CATD)

ACTION

Applicable ECSP Report No.: OP 304.03

1. Immediate Corrective Action Required:  Yes  No
2. Stop Work Recommended:  Yes  No
3. CATD No. 30403-NPS-01 4. INITIATION DATE 11-24-86
5. RESPONSIBLE ORGANIZATION: Division of Nuclear Engineering-Electrical
6. PROBLEM DESCRIPTION:  QR  NQR Problems were identified with standing water in electrical manholes at all sites. Although this is not considered safety-related, a potential safety issue may exist with regard to "water-treing" of insulation on level V voltage cables. CATD 30403-SQN-01 was written for DNE to address this issue at SQN; however, because this issue is generic, a response should be made applicable for all sites.

ATTACHMENTS

7. PREPARED BY: NAME G. D. Gardner DATE: 11-24-86
8. CONCURRENCE: CEG-[Signature] DATE: 12-7-86
9. APPROVAL: ECTG PROGRAM MGR. [Signature] DATE: 1-27-87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION PLAN: \_\_\_\_\_  
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ATTACHMENTS

11. PROPOSED BY: DIRECTOR/MGR: GT 41 870608 889 DATE: \_\_\_\_\_
12. CONCURRENCE: CEG-H: W.R. [Signature] DATE: 6-16-87
- SRP: \_\_\_\_\_ DATE: \_\_\_\_\_
- \_\_\_\_\_ DATE: \_\_\_\_\_
- \_\_\_\_\_ DATE: \_\_\_\_\_
- \_\_\_\_\_ DATE: \_\_\_\_\_
- ECTG PROGRAM MGR: [Signature] DATE: 6/16/87

Concurrence with R1, RO previously concurred with. NR-L

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

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SIGNATURE TITLE DATE





ATTACHMENT I

LIST OF EVALUATORS BY ELEMENT/PLANT

Element 304.01

WBN

B. Z. Meers

SQN

P. L. Shepherd  
B. Z. Meers

BFN

D. B. Thompson  
R. M. Gunnels

BLN

M. Stutz

Element 304.02

WBN

G. D. Gardner  
B. Z. Meers

SQN

P. L. Sheperd

Element 304.03

WBN

G. D. Gardner  
B. Z. Meers

SQN

P. L. Sheperd

BFN

D. B. Thompson

BLN

J. Muir

Element 304.04

WBN

B. Z. Meers

