EMPLOYEE CONCERNS

SPECIAL PROGRAM

VOLUME 5
WELDING CATEGORY

SUBCATEGORY REPORT 50400
WATTS BAR NUCLEAR PLANT

UPDATED

TVA

NUCLEAR POWER

TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

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

HISTORY OF REVISION

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

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.

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.

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)

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

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

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1.0 CHARACTERIZATION OF ISSUES

1.1 Introduction

A total of 390 welding related Employee Concerns were evaluated for effect on hardware and the welding program at Watts Bar Nuclear Plant (WBN). Of the 390 Employee Concerns, 379 were specific to WBN (3 specific to BLN, 3 specific to BFN, 3 specific to SQN, 2 non plant specific). The Employee Concerns were divided into 25 similar groups and were investigated by the Weld Project, Employee Response Team (ERT), and/or the Nuclear Safety Review Staff (NSRS). A comprehensive reinspection program was also performed by EG&G Idaho, Inc. to assess the weld quality of the safety related welds made during construction of WBN Unit 1. Each of the 25 groups was addressed by a Weld Project Evaluation Report which will be provided to the USNRC as a portion of the Weld Project effort.

The characterization of issues for this subcategory report was derived by arranging the 25 groups into 10 related issues. Nine of the ten related issues were then subdivided (when appropriate) according to the previously issued Weld Project Evaluation Reports.

1.2 Description of Issues

1.2.1 Welding Filler Material

1.2.2 Inspection

1.2.3 Welder Qualification, Continuity, Training, and Equipment

1.2.4 HVAC Duct Installation and Documentation

1.2.5 Base Metal Damage

1.2.6 Administrative Policy and Weld Repairs

1.2.7 Weld Sampling Program

1.2.8 Quality of Welds

1.2.9 Welding Inspection Program and Procedures

1.2.10 Other CATDs

2.0 METHODOLOGY

The procedure and specification histories of Watts Bar Nuclear Plant, from the beginning of construction to the present, were reviewed. These procedures and specifications were compared with the construction codes,

which were in effect during each phase of the plant construction, and operation history. The WBN Weld Program Review (DOE/ID-10152) conducted by the Department of Energy Weld Evaluation Project (DOE/WEP) and the WBN Construction Phase I (Draft) Welding Report were reviewed. Also reviewed were the Sequoyah and Browns Ferry Weld Project Evaluation Reports and the Nuclear Safety Review Staff (NSRS) and Employee Response Team (ERT) Investigation Reports. The expurgated text of the concerns were compared with the requirements defined in the TVA construction codes and the commitments made in the Topical Report, TVA-TR75-1A. A review was made of quality indicators such as USNRC Inspection Reports and TVA audit and deficiency reporting documents issued over the life of the plant. As appropriate to the issues, discussions were held with cognizant TVA Construction, Engineering, Quality and Craft Supervisory personnel.

3.0 ISSUES, FINDINGS, AND CONCLUSIONS

3.1 Welding Filler Material

Control of Welding Filler Material

In early 1982, the WBN procedure for control of welding filler material was revised to reflect the changes in the American Welding Society (AWS) Structural Welding Code D1.1. The former practices for controlling moisture absorption were replaced with new AWS rules which permitted TVA to perform certain moisture absorption tests that extended the atmospheric exposure times. These changes met all the requirements of AWS D1.1.

It is apparent that extending the issue duration for coated electrodes without the protection of portable ovens created the perception of program degradation. This perception was a result of not effectively communicating to the welders and other involved personnel the basis for the extended exposure time (i.e., implementation of the moisture absorption testing program).

The issue involving incorrect and falsified weld filler material documentation was factual. One instance was identified when weld filler material was issued using the white copy of the Welding Filler Material Requisition rather than the green copy specified by the governing procedure. Then, the material requisition was improperly corrected. This issue was previously addressed satisfactorily through NCR 4390.

The issue that TVA does not maintain traceability of filler materials in welds to heat or lot numbers is factual but does not represent a violation of commitment. TVA invokes an alternate American Society of Mechanical Engineers (ASME) code rule which permits the use of a control procedure to ensure that only specified materials are used.

Three concerns relate to administrative practices. The concerns are that the welders receive no evidence to verify that unused weld filler material and/or stub lengths are turned in. This creates the possibility of unwarranted disciplinary action.

These concerns have no welding related technical significance. They are addressed in Subcategory 70200, Work Rules.

No evidence was found to indicate a problem with control of filler material. Controls are in place to ensure that only qualified welders are issued welding materials. Isolated occurrences of procedure violations have occurred but these were addressed and corrected through existing programmatic controls. No evidence was found to indicate that any of these isolated occurrences caused hardware deficiencies or that welders were issued filler material for which they were not certified to use. TVA rules for control and accountability of filler material meet the requirements of ASME Section III, NB-4000 and AWS D1.1, Section 4.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-01-WBN.

Quality of Welding Filler Material

The concerns relate to the quality of coated electrodes at WBN and that they were repeatedly baked and/or overbaked.

All welding material that has been (or is presently being) used for permanent plant construction at WBN is purchased and tested in accordance with the requirements of ASME Sections II and III. Additionally, TVA requires the performance of operability tests beyond the code requirements for all electrodes not already having a satisfactory performance history with TVA.

TVA performed an investigation in 1982 of concerns over the quality of coated electrodes at WBN. An isolated problem with concentricity was identified with some Airco electrodes. These were removed from service and returned to the vendor.

The problem with broken and cracked flux on coated electrodes is attributed to handling practices, specifically, bending the rod in the electrode holder to facilitate maneuverability. A poor arc starting technique can cause the flux to crack or break. "Freezing" or "sticking" of the electrode to the weldment and the subsequent bending to free the rod can also contribute to flux damage.

Problems due to repeated baking and/or overbaking of electrodes were not identified. All coated electrodes at WBN are rebaked and stored in accordance with the manufacturer's recommendations and documented oven temperature logs are maintained to assure temperature parameters are not violated.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-12-WBN.

Unauthorized Use of E-6010 Electrodes

The concerns indicate that there was not an approved welding procedure to allow the use of E-6010 electrodes, and that the E-6010 electrodes may have been used on the Essential Raw Cooling Water (ERCW) System piping and the Turbine Building station sump.

A historical review of Construction Specification G-29M showed that there have been approved welding procedures allowing use of E-6010 electrodes in existence since March 1965.

A review of a number of welding material requisitions and field weld operation sheets for the ERCW system did not indicate that E-6010 electrodes were either issued or consumed during welding operations of the ERCW system. The weld operation sheets were prepared with two weld procedures. One procedure utilizes a backing ring and requires the use of E-7018 electrodes and the other procedure is an open butt procedure requiring the use of E-7010 electrodes. The Concerned Individual may have confused E-7010 electrodes with E-6010.

The station sump, located in the Turbine Building, is a non-safety related structure. The work performed with E-6010 electrodes was seal welding of temporary attachments to open ended non-safety related piping.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-42-WBN.

3.2 Inspection

Inspection of Welds Through Carbo-Zinc Primer

This issue evolved from a change to the process specification which allowed certain reinspections for weld configuration without removing the coating. The change did not (and was never intended to) allow initial acceptance inspection of coated welds. It also limited the reinspection of primed welds to attributes which would not be masked by a properly applied coating.

The intent of the inspection through primer was designed for reinspection of previously accepted welds. The limited reinspection of primed welds was within the authority of the Engineer and is not considered a departure from the requirements of the governing code. This may be evidenced by the current widespread use of Nuclear Construction Issues Group Standard NCIG-01, which provides for limited inspection of coated welds.

A review of the entire carbo-zinc issue shows that with the exception of three electrical supports, the welds inspected were a part of a sample reinspection program. The three items which were initially accepted after priming were cleaned and reinspected.

The manager's statement that he would fire inspectors identified as having inspected welds through paint is a Management and Personnel issue which is being addressed by the Office of the Inspector General under Subcategory 60200.

Two concerns state that there is no documentation to show which welds were inspected through carbo-zinc primer. One of the concerns states that TVA reports indicate that 100 to 150 welds were inspected after priming, but there "may have been thousands".

TVA did report that 100 to 150 welds may have been inspected through primer. It was unclear from the initial report whether these inspections were first line or reinspections. A review of the entire carbo-zinc issue shows that, with three exceptions, the welds in question were part of a sample reinspection program. The three items which were initially accepted after priming were cleaned and reinspected in accordance with the process specification.

The issue involving the AWS weld inspectors not understanding the "5 mil" coating thickness limit for inspection of primed welds evolved from an inspector being overheard to refer to mils (thickness) as milliamps (current flow).

The welding inspector was not authorized to perform coating thickness verification. It was required that the five mil thickness limit be verified by a protective coatings inspector, trained and certified to inspect coatings. Whether or not the welding inspector understood the methods or terminology used in verification of coatings thickness is not material to compliance with the specification.

The issue of craftsmen coating welds in order to make detection of defects more difficult has no potential to result in a hardware deficiency.

While it is possible that some craftsmen made such an attempt, it would not have been successful. TVA has never authorized initial acceptance inspection of coated welds. If presented for inspection, a coated weld would have been required to be cleaned in accordance with the process specification and implementing procedure.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-02-WBN.

Availability of Weld Inspection Tools

The concerns state that weld inspection tools were not issued to inspectors and/or craft personnel.

Some inspectors were issued a flashlight and a six inch scale in the 1970s era. Also, some inspectors were given a full complement of weld inspection type tools.

Discussions with inspection and engineering personnel indicated that inspection tools were site fabricated prior to 1980, and it was believed that a sufficient number had been fabricated to satisfy all requirements. The tools fabricated were fillet gauges, gap gauges, hi-low gauges and undercut gauges. As the science of welding inspection progressed, more sophisticated tools such as protractors and multipurposes gauges became commercially available, were procurred, and made available to the inspectors. Although the newer tools made weld inspections easier, it does not indicate any shortcomings with the site fabricated tools.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-04-WBN.

Certification and Training of Welding Inspectors

The major issues relating to visual welding inspectors were that the inspectors were not knowledgeable and were inadequately trained.

The concerns state that TVA should have union pipe welders as inspectors. There is no code or regulatory requirement for a welding inspector to be a welder. In the American Welding Society Certification Manual for Welding Inspectors, it is recognized that experience as a welder is of benefit to the inspector.

Several of the concerns state that the inspectors could, with two weeks to two months training, be allowed to inspect AWS welds. These concerns are partially factual, in that in 1980 and 1981 certain inspectors performed limited weld inspections after an accelerated training program.

From the beginning of construction until 1980, qualified and certified Nondestructive Examination (NDE) personnel performed all of the visual weld inspections at WBN. All of the inspections were performed to a clearly defined set of criteria. These personnel received training in visual inspection both at the site and the Training and Technology program, presented by Union Carbide Corporation at Oak Ridge, Tennessee. The Oak Ridge program was a one year (later reduced to six months) nondestructive examination training course which included training in visual examination of welds. The length of training at the site was principally dependent on the progress of the individual.

The Quality Assurance Topical Report, TVA-TR75-1A, Revision 2, issued in January 1979, committed TVA construction activities to USNRC Regulatory Guide 1.58, Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel, with certain exceptions. One of these exceptions was that NDE personnel would be certified in accordance with the guidelines of the American Society for Nondestructive Testing Recommended Practice SNT-TC-1A. At this time, the program for qualification of personnel in the traditional NDE processes was patterned after the guidelines of Recommended Practice SNT-TC-1A. Site certifications were issued at WBN on an individual implementing procedure basis.

In 1980, a decision was made to allow non NDE personnel to perform the final visual weld inspections on structural items. Some of the inspectors assigned to the Electrical, Mechanical, Instrumentation and Structural Engineering Units were provided a combination of classroom, on the job, and self study training in visual inspection of structural welds.

It is probable that this new inspection program forms the basis for most of the concerns relating to the length of training for welding inspectors. This was an accelerated qualification training program, which addressed only those inspection attributes related to final visual inspection of structural items. Discussion with the individual who presented this training and a review of a small sample of the inspectors' training files revealed that it was possible to qualify under this program in approximately two weeks.

It is important to note that these personnel were already qualified in the applicable inspection disciplines under the TVA ANSI N45.2.6 program. They were already familiar with the structures to be inspected, and with the associated drawings. Initially, they performed the final weld inspections as a function of their existing discipline certifications. (A separate certification was later established).

In comparison to the Weld Engineering Unit inspectors, these personnel may appear to have been insufficiently trained. It must be noted, however, that they were not required to perform any of the more complex preparatory or inprocess inspections, or to perform any inspections on pressure boundary welds. Also, at this time the major structural work had largely been completed. Their qualification was limited to final inspection of structural connections. The e connections were principally small fillet welds on supports.

The practices of using the non NDE personnel for final inspection of structural welds continued until late 1982.

Beginning in 1980, a series of Nonconforming Condition Reports (NCR) identified a significant problem with undersized socket and fillet welds. During this period, a massive fillet and socket weld reinspection took place at most nuclear power construction sites in the United States.

At Watts Bar, the apparent cause of the undersize fillet weld problem was documented in part to be inspector error. This is misleading, in that it was an industry wide problem which was not related to the competence of the inspectors. Prior to early 1980, fillet welds were typically verified as being nominally of the specified size, using various types of tools to spot measure the leg length. It was not expected that the inspector accurately measure each linear increment of the entire length of a fillet weld. Areas of a weld which appeared slightly under or over the specified size were not considered to be relevant. Additionally, an error in the process specification led to some undersized welds on socket welding flanges being accepted by the inspectors. It is therefore, to be expected that when measured with a "GO-NO-GO" tool such as the Fibre-Metal Fillet Gauge, many of the fillet and socket welds displayed areas of undersize. In September 1980, the Review and Evaluation of Office of Engineering Design and Construction (OEDC) Welding and NDE Program (QAE-2) was issued. This evaluation in part recommended that the welding inspectors receive structured training in certain areas of welding inspection. These areas included inprocess, visual inspection and surveillance activities.

In early 1981, an industry wide effort to clearly define and upgrade the training and qualifications of nuclear construction inspectors became highly visible. This effort was in part due to natural evolution and refinements as the utilities and construction companies adopted USNRC Regulatory Guide 1.58, Revision 1 and ANSI N45.2.6. (TVA committed to Regulatory Guide 1.58, Revision 0 in 1979, with some exceptions). The TVA efforts in this area paralleled the improvements being made throughout the industry.

In April 1981, in response to the evaluation report recommendation, Division of Construction QAP-2.3, Qualification, Training and Certification Requirements for Nondestructive Examination Personnel, Revision 5 established visual weld inspection as a separate area of NDE certification. Education, training, experience and examination requirements were specified, using the American Society of Nondestructive Testing Recommended Practice SNT-TC-1A as a guide.

Also at this time, completion of the Hartsville Nuclear Plant Quality Assurance Training Section program for visual inspection became mandatory for Bellefonte and Watts Bar welding inspectors.

It is probable that the high visibility of the new TVA programs induced the perception that this was a first time effort for visual inspection training and certification.

In September 1981, TVA issued quality control instruction WBNP-QCI-1.41, Qualifications, Training, and Certification Requirements of Visual Weld Inspectors. This instruction defined the experience, training, and examination requirements of inspectors. This instruction also proceduralized the existing practice of using non NDE inspectors for final inspections of structural welding.

A review was made of the Nonconforming Condition Reports (NCR) and the USNRC Inspection Reports issued from 1974 through 1985. Several NCRs addressed the previously discussed fillet weld problem. Other deficiencies in previously accepted hardware were also identified. These reports often showed the apparent cause as inspector error, but were actually the result of ambiguities or omissions in the design output or the implementing procedures. These errors did not show a trend or pattern to indicate a deficiency in the training and qualification program for welding inspectors.

Corrective Action Tracking Document (CATD) 50406-WBN-01 has been issued recommending that an overinspection program similar to that described in Bellefonte Quality Control Consistency Standard QC-CS-001 be implemented by the Division of Nuclear Quality Assurance for all TVA nuclear welding inspection activities.

This would provide a systematic approach to monitoring inspector performance and also provide early identification of programmatic or individual inspector problems. The recommendation is presented as a program enhancement rather than as a condition adverse to quality. The response to the CATD provides for the implementation of an over inspection program through the implementation of Quality Maintenance Instruction (QMI) 8.9.

One concern stated that personnel with no prior weld inspection experience were allowed to perform hanger welding inspections while still in the process of being trained. The nature of the on the job training method dictates that this concern is factual. It is not, however, a problem.

The material issue is whether or not a trainee performed documented quality acceptance inspections. One of the requirements for qualification of visual inspectors is on the job training (OJT). This OJT is defined, administered and verified in a variety of ways. One successful method for administering OJT is to require the trainee to conduct a visual inspection on a production weld or component. The trainee understands that this is not an acceptance inspection. It is a training exercise.

A review of the deficiency reporting history at Watts Bar revealed two instances where individuals performed documented visual weld inspections prior to being certified. In August 1981, a Nonconforming Condition Report showed that an inspector had accepted the pre-weld cleanliness for three welds prior to being certified to do so. Subsequent to performing these three inspections, the individual was certified to the applicable procedures.

In October 1982, an inspector was transferred from the TVA Yellow Creek Nuclear Plant to Watts Bar. Due to untimely communication between the site engineering units, the individual and his supervisor were unaware that his previous TVA certifications were no longer valid. This individual performed and documented quality inspections on several hangers before the problem was realized. All of his work was identified and reinspected by properly certified inspectors. This instance was documented on an NCR.

One of the concerns states that the certification tests for final weld inspectors "require excessive knowledge of welding processes, rod control, etc., as compared with the knowledge actually used in the performance of final weld inspection, which is separate from inspections/inspectors performing fitup, root, or intermediary pass inspection." The concerned individual believes that this can be used as a form of harassment by TVA against final weld inspectors. This concern is not factual.

Discussion with the Welding Quality Control Unit Supervisor revealed that in November 1982, TVA at Watts Bar discontinued the practice of issuing the limited certification for final visual inspections.

In April 1981, TVA incorporated into the QA program a uniform qualification and certification procedure for visual welding inspectors. This program was defined by a revision to a construction quality assurance procedure. Personnel certified under the existing (site) programs were required to complete the QAP-2.3 requirements prior to September 30, 1981.

The Construction Training Program Manual, Section III-2 later replaced QAP-2.3. Section III-2 is the current controlling document for certification of all Construction visual welding inspectors. (The Division of Nuclear Quality Assurance is in the process of preparing a certification program which will replace both the Construction and the Operations programs).

This series of program improvements resulted in a uniform, clearly defined training and certification program which qualifies the inspector to perform all facets of visual weld inspection. The required experience, training and examinations are preestablished minimum qualifications for certification. It is recognized that some of the inspectors will be assigned to areas where all of their skills are not utilized. This is to be expected when one uniform qualification system is emplaced in any field, and is not a form of harassment.

One concern addressed a report issued by the NSRS. The concern stated that the report contained numerous inaccuracies. This concern is factual. These inaccuracies, however, do not present a welding related technical problem.

It should be noted that the ERT found that while the NSRS report was misleading, it was not intentionally false or inaccurate.

The central issue of the NSRS Report was the qualification of the TVA welding inspectors and NDE personnel. The conclusions drawn by the NSRS investigation were valid, and have since been supported by the Welding Project evaluations. The NSRS report was misleading, however, in that the stated basis for the conclusions were not always applicable to the issues.

The evolution and training history of the TVA welding inspector is discussed above for Watts Bar, and in Weld Project Reports WP-06-BLN, WP-06-BFN, and WP-06-SQN for Bellefonte, Browns Ferry and Sequoyah, respectively. These evaluations support the conclusions drawn in NSRS Report I-85-14-NPS. The Welding Project Phase I Reports and the detailed WP evaluation reports will serve to resolve any misunderstandings which may have occurred due to inadequacies in the NSRS report.

One of the concerns states that the Topical Report has "bastardized" ANSI N45.2.6 regarding qualification of inspection/examination personnel. This concern is not factual.

It is important to note that the commitment made through the Quality Assurance Topical Report is to USNRC Regulatory Guide 1.58, Revision 1 rather than a direct commitment to ANSI N45.2.6.

All welding inspection and examination personnel are qualified and certified to an approved TVA program which defines the required education, training and work time experience. This program includes requirements for general written, specific written and practical examinations. These provisions are based on the key program elements described in Recommended Practice SNT-TC-1A.

Topical Report TVA-TR75-1A, Revision 2 first committed Watts Bar to Regulatory Guide 1.58 in January 1979. The exceptions taken by TVA in the commitment were ambiguously worded. The intent of these exceptions, however, has remained unchanged. TVA-TR75-1A, Revision 5 clarified these exceptions to include education, experience, training and capability demonstration. The current USNRC approved Topical Report is at Revision 9.

The TVA program for certification of weld inspection and examination personnel, with the exceptions taken through the Quality Assurance Topical Report, are not a degradation of ANSI N45.2.6. These exceptions are provided for by USNRC Generic Letter 81-01, which requires either commitment to Regulatory Guide 1.58 or submittal of an alternate plan. Topical Report TVA-TR75-1A, which has been approved by the USNRC, satisfies the requirements of Generic Letter 81-01.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-06-WBN.

<u>Performance of Preweld Inspections</u>

The issue raised by the concerns was that uncertified welder foremen are required by TVA to perform preweld inspections on structural steel installations for which they are directly responsible, which was perceived as a violation of ANSI N45.2.5 requirements.

The foreman is responsible to ensure that preweld requirements, including correct fitup, are met prior to weld out. Certified inspectors monitor each foreman at least bi-weekly to ensure that the foremen are properly performing the required activities. This issue has been evaluated by the NSRS, and determined not to be in violation of the Structural Welding Code or ANSI N45.2.5.

The issue resulted from an audit finding pertaining to fitup inspections at Bellefonte Nuclear Plant in September 1980. The finding in Quality Assurance Audit Report BN-W-80-08 was determined significant and reportable as a 10CFR50.55(e) condition. When reported to the USNRC, the condition was considered generic to all sites under construction.

In response to the audit finding, an extensive investigation and evaluation of AWS D1.1, ANSI N45.2.5, and TVA's commitment to ANSI N45.2.5 was performed to determine what corrective action, if any, was necessary. In the area of weld fitup inspections, it was determined that TVA had been overly conservative in their past interpretation and that an inprocess (surveillance) inspection by Quality Control would satisfy the requirements of AWS D1.1 and ANSI N45.2.5. TVA was in compliance with its commitment to ANSI N45.2.5.

Two concerns also raised the issue that the 050 notes (General Notes to drawing 47A050) allow fillet welds to be 100 percent oversized and craft to determine the length. Therefore, when a drawing requires two sides of square tubing to be welded and the welder welds the wrong two, he then welds the other sides thus making a weld that is not per the drawing.

The concern is factual in that Note 050 of the General Notes to Drawing 47A050-1N states in part "Unless otherwise noted on drawings, the weld sizes and lengths are minimum values....larger weld legs (max. 100% oversize) and longer of additional welds are acceptable". This does not, however, represent a problem because the General Notes to Drawing 47A050 are design documents.

The problem was that the site implementing procedure and the process specification provided for a lesser tolerance. This conflicting condition has been corrected.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-16-WBN.

Inaccurate/Inadequate Documentation

One concern states that the welds in the reactor domes may not have been inspected and accepted was determined to be not factual. Documentation is on file that shows they were inspected and accepted by Chicago Bridge and Iron Company.

One of the concerns stated that a lot of rework has been required due to lost documentation. This concern is factual in that there have been numerous Nonconforming Condition Reports initiated due to lost documentation. Some of the instances resulted in rework of the items and in some cases, the records were reconstructed from other supporting documentation.

Two of the concerns state that there was inadequate documentation of weld inspections, and that there was a lack of documentation and weld inspector numbers. In that no specific hardware or systems were referenced, these concerns could not be adequately evaluated to ascertain their factuality.

However, it may be noted that the documentation for a weld operation sheet received a final review, and prior to hydrostatic testing and ASME NA Code Stamp application (N-5), the system is verified as being complete with all required documentation being present.

The issue of insufficient, lost and incomplete documentation was investigated by the Department of Energy Weld Evaluation Project (DOE/WEP) in Group Closure Number 244.

The findings of DOE/WEP were taken from 21 other associated Group Closure Investigation results. Their conclusion was that the welds meet the applicable FSAR committed code and the associated components are, therefore, suitable-for-service.

Another concern states that no documentation exists for the surveillance program from December 1981 to present.

This statement is refuted by the fact that there are surveillance reports on file in the Document Control Unit for the time period referenced in the concern. These are reports on surveillance of welding activities as required by site procedures.

Another concern was that welds in the fire protection system were evaluated through a Nonconformance Report and accepted without supporting documentation. This is partially factual in that the welds were accepted by the DNE as stated. There was, however, supporting documentation available that enabled engineering to make the evaluation.

One concern that raised the issue of suspected falsification of weld documentation was investigated by the ERT and found to be not factual. Through ERT's investigation they found that weld records for four welds had inadvertently been used to document repairs on four different welds. However, the condition had been discovered at the time of occurrence and the weld records corrected.

Many of the suspected falsification concerns contained information that was too general in nature to adequately evaluate. However, the general issue of falsification of records is being investigated by the Office of the Inspector General under Subcategory 60300.

Another concern stated that there is a computer list that records the welder's identification number even though the welder did not perform the work; but may have only talked to field engineering.

The concern is not factual in that the Weld Monitoring Information System (WMIS) reflects the status of completed welds which is derived from the actual Welding Operations Sheets. A welder's ID is not entered on the Weld Operation Sheet unless he performs welding on the joint, therefore, a welder's ID would not appear on the computer list for a particular weld if he had not performed welding on it. The computerized WMIS is used primarily for maintaining an updated status of the welds at Watts Bar.

One concern raised the issue that Work Releases do not document welding in accordance with the Nuclear Quality Assurance Manual (NQAM).

The statement in the concern is factual. However, it does not represent a problem in that the Work Release is not designed for this purpose. A site implementing procedure describes how the Work Releases will be utilized.

The implementing procedure defines the Work Release as "A document used to authorize activities which have significant potential for affecting items that are not within the scope of the responsibility of the unit initiating the activity". Also, work releases are applicable to permanent welds that are not shown on DNE or contractor drawings and are not applicable to welds requiring fitup (inspection), or welds for which weld operation or weld assignment sheets have been issued.

The method of documenting welds on a work release is specifically delineated in site procedures, and does not violate the requirements of the NQAM.

Another issue raised was that the NDE inspectors can only write a Notification of Inspection (NOI) on inservice related defects; preservice related defects can only be identified by a Maintenance Request. The Nuclear Quality Assurance Manual requires a NOI be prepared for both preservice and inservice defects found during NDE examinations.

In discussions with cognizant TVA personnel it was stated that rejections for preservice NDE examinations at WBN are reported on a Notification of Indication as required by the NQAM.

It should be noted that at this time, only preservice work has been performed at Watts Bar.

An issue raised by the concerns was that there is a potential inadequacy in weld identification.

The governing codes do not directly address the identification of each weld. ASME Section III, NA-4000 requires, however, that process control checklists be used to ensure that processes, including welding, are controlled in accordance with the Code Rules, and that required operations, inspections and tests are performed. As a practical matter, identification of the welds is necessary to satisfy the record keeping and process control requirements.

Site implementing procedures establish the requirement for identification of ASME welds and give instructions for numbering the welds.

Discussion with cognizant TVA Weld Engineering personnel indicated that for ANSI B31.1 welds, the design drawing identifies the critical systems which require traceability and nondestructive examination. Based on the information presented in the design drawing, unique weld identification is assigned. A similar method is used for welds made under the rules of AWS D1.1.

However, the site implementing procedures do not contain instructions to define the circumstances under which ANSI B31.1 and AWS D1.1 welds require unique identification, nor do they define the responsibility for assignment of unique weld numbers.

CATD 50426-WBN-01 has been issued recommending that TVA clearly define the existing practices in the implementing procedures.

The method used to determine when welds made under the rules of ANSI B31.1 and AWS D1.1 are required to be uniquely identified should be specified. The documents used to record the unique weld numbers should be identified, and responsibility for assignment of unique weld identification should be defined. The recommendation is presented as a program enhancement rather than as a condition adverse to quality. The response to the CATD provides for enhancing the existing practices to comply with the recommendations.

One of the concerns related that excessive paperwork is required for piping welds which are to be examined by radiography, and that x-ray will detect any defects in the weld, making all intermediate inspections and hold points unnecessary. Additionally, this paperwork is often confusing to the craft worker, resulting in inadvertent bypassing of hold points and inspections which results in disciplinary action to the craft worker.

The portion of the concern dealing with disciplinary action is not material to the issue of welding quality and is not discussed further in this report.

The portion of the concern relating to excessive paperwork and that x-ray will detect any defect is not factual.

It should be noted, in respect to x-ray inspections, that while most defects can be detected by radiography, the test does have its limitations; laminations, fine cracks, and similar defects oriented perpendicular to the direction of radiation may not be detected. Consequently, to compensate for these limitations, additional inspections such as visual, liquid penetrant, magnetic particle, and/or other hold points are designated as required by the applicable code or specification, to ensure the quality of the weld meets the established acceptance criteria.

If a hold point should inadvertently be bypassed, it would be detected upon review of the document and would require appropriate action to correct the deficiency.

Complete details of the evaluation of these issues are discussed in Weld Project Evaluation Report WP-26-WBN.

Adequacy of TVA Performed Radiographic Examinations

These concerns deal with the adequacy of radiographic examinations performed by TVA in safety-related and non safety-related applications at the Watts Bar Nuclear Plant.

One of the concerns states that the radiographic film interpreter would not agitate the film and would not ensure that air bubbles were not present on the film; and that this individual's bad film developing technique caused radiographic artifacts (false indications of discontinuities) which were used to wrongly reject welds.

Discussion with cognizant TVA welding personnel revealed that two measures are taken at Watts Bar to reduce the incidence and effect of artifacts on radiographic film. All radiographic film is processed using a Kodak Model B film processor, which automatically provides the proper degree of agitation. This in turn helps to prevent uneven development caused by a uniform flow of developer across the film. The film is also agitated by the machine during fixing, to ensure uniform rapid fixation.

Additionally, TVA at Watts Bar uses a double film loading technique. This technique simultaneously exposes two separate films for each examination. This provides two radiographics for the weld being examined. The interpreter compares the two films during the evaluation. A weld discontinuity will appear as a like image on both of the films. A chemically caused artifact, such as that described in the employee concern, will not appear the same in both of the films. Thus, the interpreter can readily distinguish a discontinuity in the weldment from a processing blemish on the film.

It must also be noted that the presence of a chemical blemish which could mask or be confused with the image of any discontinuity in the object being radiographed would not result in the weld being rejected as stated in the concern. Rather the examination would be repeated.

The Department of Energy Weld Evaluation Project (DOE/WEP) reviewed the TVA radiographs for 3,064 safety-related welds. Their review shows that problems with radiographic technique, not associated with hardware deviant conditions, were identified in 56 radiographs. A cognizant DOE/WEP individual identified eight of these radiographs which were rejected for film artifacts. This is less than three tenths of one percent of the total number of films reviewed by DOE/WEP. Discussion with TVA engineering personnel revealed that the radiographs rejected for other than hardware problems were reevaluated by ASNT Level III examiners, and either accepted or the examinations were repeated.

Two of the concerns question the adequacy of the radiographic examinations performed by TVA.

One concern states that the radiographic technique may have been inadequate. The concerned individual gives an example which appears to take issue with longitudinal (pipe fabrication) welds appearing in the radiograph for a circumferential (field) weld. The concern is not factual, in that a film image of the intersection of a longitudinal and a circumferential weld does not indicate an inadequacy in the radiographer's technique. It was further revealed that the CI is now aware that this is not a problem, and no longer has a concern.

One of the concerns states that a weld was accepted by radiography, and subsequently rejected by radiography. The CI questions the adequacy of the initial examination.

Review of the Weld Operation Sheets and the NDE Evaluation Data Sheets, for the weld in question, showed the weld was originally accepted by radiography in December 1978. The weld was later cut out due to an engineering change notice. In May 1985, the weld was radiographed in process, when approximately one-third of the weld thickness had been deposited. The radiographic examination identified fusion defects, and the weld was again cut out. The joint was re-welded, and finally accepted by radiography in late May 1985.

One concern stated that radiography of welds revealed voids in a four inch carbon steel valve.

The concern is factual and TVA had previously identified, controlled, and corrected the problem through a nonconforming condition report in accordance with the approved quality assurance program.

It is important to note that the conclusions drawn herein are intended to address specific employee concerns, rather than the overall adequacy of the TVA radiographic examination program. Additional efforts, outside the scope of this evaluation, are ongoing to provide an overall evaluation. These efforts will ultimately lead to reevaluation of all of the TVA performed radiographic examinations.

Complete details of the evaluation of these issues are discussed in Weld Project Evaluation Report WP-33-WBN.

3.3 Welder Qualification, Continuity, Training, and Equipment

Welder Qualification Continuity

One issue raised by the concerns was that the welders' performance qualification continuity records were inaccurate, had been backdated, and had been falsified. Another related issue was that the continuity program was inadequate because there was no objective evidence to confirm actual process usage when welder's certification cards were updated.

Some problems were identified in the implementation of the welder qualification continuity program. However, the investigation performed by TVA's Office of General Counsel identified no acts of willful falsification. An in-depth review disclosed that a small number of welder's certifications had been improperly updated.

The basis for welder qualification continuity in the WBN program is demonstration of the welder having used the welding process previously qualified within a specified time limit of qualification. WBN uses verification of weld filler metal consumption as primary evidence of usage. Consumption of filler metal as a means of process usage verification is a widely used practice in the nuclear industry.

The site implementing procedure for qualification renewal also allowed welding process usage verification by direct observation of the QC staff or craft foreman. It did not, however, require maintenance of objective evidence to document the verification activity. The governing codes require process usage in the continued maintenance of certifications, however, they do not stipulate how it will be verified or documented.

By allowing an excessive number of welders, (not actively performing welding) to maintain their qualifications, the tracking system was strained and a few lapses in continuity occurred.

The qualification continuity program was found to meet TVA's commitments and only a few isolated instances of questionable qualification updates were found. The few instances where breaks in continuity were found were isolated and did not represent a programmatic breakdown. Additionally, follow-up reinspections of welds made by welders with questioned continuity lapses did not reveal hardware deficiencies.

WBN administered qualification renewal tests to all the welders, except those who had been initially qualified within the past ninety days. (These welders had not yet had their qualifications renewed, therefore, their qualifications were not in question). The renewal tests were administered in order to establish a new baseline for welder continuity. Additionally, the site implementing procedure was revised to enhance the documentation requirements for qualification renewals, and all personnel involved in qualification renewal were retrained in these new requirements. Also, within six months, the number of welders was reduced from over 500 to less than 200. This reduced size of the work force provided for better management control and better utilization of the remaining welders.

One of the concerns stated that a general foreman still maintained welder's certifications, even though he had not welded in over ten years.

This concern was investigated by the ERT and found to be not factual. Identity of the subject general foreman was known to ERT; thus, they were able to review the individual's records.

Another concern stated that welder recertifications had been falsified. This concern was also investigated by ERT and could not be substantiated. ERT was able to review the individual's records because his/her identity was known to them. ERT was unable to substantiate this concern, however, the general issue of falsification, or wrongdoing, is being addressed by the Office of the Inspector General under Subcategory 60300. It may be noted that the Office of General Counsel's investigation has to date revealed no acts of willful falsification.

One of the concerns stated that there was poor cooperation/sympathy by test shop personnel and that a test shop representative only allowed his personal friends' weld tests to "pass"; others "failed" the welding test even if their coupons were free of defects.

The supervisor is responsible for determining if the test coupon meets the applicable visual acceptance criteria before being subjected to a bend test or radiographic examination. He has the additional responsibility, through his observation of the welder, to determine if that welder possesses the skill necessary to produce

acceptable welds. But, beyond this, the weld must also pass either a guided bend test or a radiographic examination and be free of any defects in excess of those allowed by the applicable acceptance criteria.

For welders that pass the test, subjectivity is of less concern because in addition to the observations and visual examinations the coupon must also pass the guided bend test or the radiographic examination. Additionally, the radiograph is performed and evaluated by an individual other than the test shop supervisor. It can be seen from this that it would be extremely difficult and highly unlikely that favoritism could be used to pass a welder if they could not produce an acceptable weld.

Although highly unlikely, it would not be impossible for favoritism to be a motive for failing a welder prior to their coupons being subjected to a mechanical or radiographic test. That type of situation, though, however unlikely, has no significance from a weld quality standpoint.

Four of the concerns, stated that weld records were falsified by unauthorized access to the Weld Monitoring Information System (WMIS).

The concerns are factual in part in that a welding engineer used a quality control inspector's code to gain unauthorized access to the WMIS computer. It can be concluded that weld records would not have been falsified by this unauthorized access. Any deletion or modification of the information contained within the computer would not alter the welded components, or the welding operation sheets on which the fabrication and inspections are documented. Any changes that were made, or could have been made, would have no effect on the quality of the welds or their documentation.

Another concern states that welder qualifications are questionable as only visual inspection is required on hanger welds. These can be and are made to look good.

This concern cannot be termed as factual; neither can it be classified as not factual because grinding on a weld (whether hanger or pipe) to bring it to an acceptable condition commensurate with the applicable acceptance criteria does not violate either the AWS, ASME, or ANSI codes. It also does not reflect unfavorably on the welder performance qualification program.

One concern states that there were no calibrated tong meters available to measure amperage during the construction wide welder recertification program.

In discussions with cognizant TVA personnel, they stated that calibrated tong meters were available during this time and were used to check the amperage. As stated in the discussions, most times a welder's amperage is checked while he/she has the hood down and is welding. The amperage could be checked and the welder would be completely unaware of it.

Another concern states that craft personnel who were certified welders at WBNP failed to pass the welding test at another nuclear utility. Concerned Individual feels that this indicates an inadequacy in TVA training/testing.

The problems that have been identified with welder performance qualifications were in the area of requalification continuity testing. No problems have been identified with the initial welder performance qualification program. As a result of Stop Work Order Number 25, the Office of Construction's Quality Assurance Branch, Welding Engineering Unit conducted an in-depth review of the initial welder qualification program as well as the qualification renewal program. They found that the program meets or exceeds the ASME and AWS code requirements.

The reason(s) for the welders not passing the welding qualification test at another nuclear utility is not known, however, they would have no significance to the performance qualification program at Watts Bar Nuclear Plant. Various reviews have shown the WBN program to be adequate and in full compliance with all applicable codes.

One concern states that a welder, whose certification had expired, was allowed to check out rod from the rod shack. Concerned Individual stated that this indicates the "new" welder recertification program still does not work.

This concern is factual in that the incident did occur, however, immediate corrective action was taken by the responsible departments to identify and control the condition. The issue control attendant had misread the welder qualification printout sheet. Welding quality control personnel contacted the welder and his/her foreman and found that the welder had not welded with the filler material. Additional investigation by ERT revealed that the subject welder had not welded since his certification expired.

Another issue was that the continuity program was perceived as not being in compliance with ASME Section IX or AWS D1.1 because the test coupon was only a one position test plate. The test that was used was not a violation of TVA's commitments. Both AWS and ASME Codes allow the practice of reestablishment of all previous qualification through the satisfactory passing of a one position test for each process for which the welder was qualified.

Two concerns stated that the recertification tests that were administered following Stop Work Order 25 were not in accordance with ASME Section IX requirements.

This issue arose in part due to the wording used in TVA's commitment letters to the NRC. In these letters, it was stated under the corrective action heading that "All initial welder certifications have been rescinded. . . (reference Attachment B for details)." Attachment B states "..... All welder certifications were revoked effective August 26, 1985, with the exception of 30 welders...."

The use of the words "rescind/revoke welder certifications" was questioned by the ERT personnel. They maintained that by using this wording the welders would be required to be initially qualified to position(s), material, and process just as if it was an initial qualification. They felt that a renewal qualification test would not be sufficient under these conditions. TVA's position was that the qualification maintenance of all welders with qualifications older than 90 days were in question and the assumption must be made that all had lapsed (i.e., had a period of 90 days without actual welding). In this case, the provisions of ASME Section IX and AWS D1.1 for renewal of welder qualification would apply.

Due to several concerns being raised TVA wrote another letter to the NRC. In this letter TVA clarified their intent on the use of the words "recind/revoke" along with other items relating to the original commitment letters.

These concerns are not valid in that TVA performed the renewal qualifications in accordance with the applicable provisions of the ASME Code. Although the exact wording in the commitment letter to the NRC raised some questions, the intent of the renewal program was being performed as allowed by Section IX of the ASME Code and AWS D1.1.

Another concern that was raised relative to the renewal qualification tests arose from the provision in the program to allow a single retest for welders who failed the first plate test. The NRC initially questioned the validity of TVA's interpretation of the general provisions of ASME Section IX, QW-321, however, this interpretation was substantiated by ASME Code Inquiry BC-85-560.

Two concerns questioned the adequacy of management control over the test coupons during the qualification renewal program.

These concerns were investigated by the ERT. This investigation revealed that the statement expressed in the concerns could not be substantiated.

During the course of the investigation, ERT interviewed WEU personnel and a random selection of welders who had passed and failed the tests. From these interviews they determined that surveillances were conducted by WEU personnel to assure welding parameters were kept during the renewal testing. They also found that the tests were conducted by test shop personnel to preclude welders welding coupons for another welder. The general consensus was that the tests were properly administered and they concluded that the implementation and/or controls were satisfactory.

Two concerns stated that welding has been performed by uncertified welders.

Both these concerns were investigated by ERT and found to be not factual. Through their review of the individual's records, ERT found that both welders had been properly certified to weld on the items at the time they were alleged to have been uncertified.

Four concerns relate to unfair management practices and have no technical significance related to quality. These are addressed under Management and Personnel Subcategory 60100 and Intimidation and Harassment Subcategory 70200 and not discussed further in this report.

One concern questioned the quality of welding due to a craft local's layoff/retention policy.

The quality of welding is not governed by the degree of experience of a welder. The applicable codes under which the welding is performed prescribe the acceptance criteria that dictates the quality of the weld. These criteria are contained in site implementing procedures and specifications and must be satisfied regardless of the welder's cumulative experience.

One concern stated that there was a lack of clear guidelines on pipe weld thickness limitations for welders certified to weld thin wall pipe (up to 3/4 inch). The CI also stated the welder certification program did not clearly establish limitations on welders. CI further stated that the lack of clarity only applied before restructuring of the weld program.

The concern, as stated, is not factual in that the performance qualification tests do have definite thickness limitations that a welder is qualified for. Each performance qualification test establishes a definite, clearcut limitation on the thickness of metal a welder is allowed to deposit. However, confusion can sometimes arise in the application of these limitations to a specific welded joint.

There have been isolated occurrences of welders performing welding beyond the limitations of their qualification tests and these have been identified on nonconformance reports. This, however, does not detract from the adequacy of the qualification program; it reflects only that the requirements have on occasion been misinterpreted. The qualification test limitations are mandated by ASME Section IX and each test has a definite thickness range for which a welder is qualified.

Another concern related that welders who had been passing x-ray welds for two years failed the recertification test twice. This indicated to the CI that a problem existed either in the test coupons, or in the radiographic process/film.

The test coupon had an included bevel angle of 45 degrees. Over 85 percent of the welders were steamfitters who had been accustomed to welding pipe with an included bevel of 75 degrees. This required some adjustment in the welder's technique and could have been a contributing factor in some of the failures.

A higher degree of anxiety could certainly have been present in the renewal testing that might not have been as prevalent in production welding. This could be especially true if a welder felt his/her job depended upon passing the test. Any problem, either mental or physical, that might have detracted from their total concentration could have affected the welder's performance.

The absolute reasons are not known at this point why a welder who had been passing x-ray welds would then fail their qualification renewal test. One does not correlate with the other. The failure of the renewal test does not constitute a specific reason to question the welder's ability to make welds that meet the applicable specification. This was clarified in ASME Code Inquiry BC-86-01, dated May 30, 1986. Any of the above reasons, either singly or in combination, could have adversely affected a welder's performance.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-03-WBN.

Welder Training and Experience

The issues addressed were that inexperienced/untrained personnel performed welding which caused a lot of rework, and that unqualified (uncertified) personnel performed welding.

The ASME and AWS codes do not quantify the experience required of a welder. Rather, these codes specify performance qualification testing as the vehicle for determining the welder's ability to produce sound welds. Although not mandated by the codes, WBN had an extensive welder training program in place from June 1974 until early 1983. The program was developed by TVA for the purpose of having a qualified labor pool from which craftsmen could be drawn who would be capable of performing quality work in a proficient manner. Before being allowed to perform production welding, they were required to pass the same performance qualification tests taken by journeymen welders, and required by the governing codes.

Investigation of one of the concerns involving uncertified steamfitters performing welding revealed that the issue was not factual and had been based on hearsay. The welders were found to have been properly certified.

Another concern involved welders who were certified to ASME Section IX and performed welding on AWS structural steel. This is not a violation of TVA's commitment. It is in accordance with the General Construction Specifications and the Structural Welding Code.

A third concern related to instrument panel drain fittings being welded by uncertified welders. The welders performed welding on fittings (thread-o-lets) whose outside diameters were less than the diameter limits for which the welders had been qualified. This was caused by a misinterpretation of the welders' diameter qualification limitations. The condition was addressed by a nonconformance report using existing programmatic controls. The hardware was dispositioned to use as is based on an ASME Code Interpretation.

Complete details of the evaluation of these issues are discussed in Weld Project Evaluation Report WP-07-WBN.

Suitability of Welding Equipment

The concerns stated that welding machines (grid banks) do not have suitable control settings and this causes porosity and pinholes in the welds.

The applicable codes and standards for welding do not mandate the type welding equipment to be used. They only require that the welding equipment be suitable for performing the particular welding operations for which they are used.

The issue of porosity and pinholes is symptomatic of poor welding technique. Using correct arc starting and welding techniques will effectively prevent these problems. Grid banks and multiple operator systems are suitable for use and have been used throughout the industry with a history of satisfactory performance. These machines have adequate current adjustment features that will produce current ranges required by the Watts Bar Detail Weld Procedures.

It may be noted that at other TVA sites most of the welder performance qualification tests have been conducted using the grid bank multiple operator type machines. The satisfactory results of welder qualification tests demonstrate the ability of these machines to produce acceptable welds and also the welder's capability to do so with them.

One concern raised the issue that all Gas Tungsten Arc Welding (GTAW) equipment should have remote switches for high frequency arc starting so that tungsten inclusions can be voided.

This is a feature that is convenient for the welder but is not necessary for the production of acceptable quality GTAW welds. Strike plates can be utilized for GTAW arc initiation and will effectively eliminate tungsten inclusions from the welds. This has been demonstrated based on successful welder qualification testing using these type machines and the history of satisfactory performance of similar equipment throughout the industry.

The issue that Process Specification 1.M.1.2 requires automatic hand or foot operated slope controls for GTAW welding is not factual.

This is recommended by P.S.1.M.1.2 and is to help eliminate a crater that might result when pulling off the weld in the center of it or the puddle. However, it is only a recommendation, not a requirement.

One of the issues raised by the concerns is that maintenance is not performed on the welding machines and some are old and in disrepair.

The age of a welding machine does not necessarily mean it cannot function properly. With proper care, the machines are designed to give extended satisfactory service. As with any type of equipment, welding machines are subject to occasional breakdowns. In discussion with cognizant TVA personnel, they stated that any reported problem with a machine is investigated and repairs made as needed. Additionally, if a welder has a problem with a welding machine, he has only to notify an electrician and the problem will be corrected.

Several concerns raised the issue that TVA should utilize the best equipment at their disposal; that good machines were taken out and lower quality machines placed instead.

As noted above, some personnel may not be aware that space limitations may dictate the use of smaller, less sophisticated machines. At the beginning of any construction project, space may not be a limiting factor and large machines can be utilized. Welders become accustomed to the convenience type features of these machines and when they must be replaced with the smaller type grid banks because of space requirements, there is normally some resentment on the part of the welders. Welders normally want to make the best welds of which they are capable and the larger machines require less effort on their part. The smaller, more compact grid bank requires more attention to detail but will still produce acceptable quality welds.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-13-WBN.

Welder Qualification

This issue involved welders who were tested at Muscle Shoals and may not have received the appropriate number of bend tests when qualified.

This was caused by a misinterpretation of ASME Section IX, due to the omission of Article QW-302.3 from the 1974 edition. The misinterpretation resulted in only two guided bend tests being performed for certain qualifications where four bend tests were required.

A review of the welders tested at Muscle Shoals for Sequoyah revealed that one welder (who was certified based on two guided bend tests) was transferred to Watts Bar. The welder in question was evaluated at Sequoyah through a Discrepancy Report. A review was performed by the Materials Engineering Section of the welder's certification files and his related work documents. This review did not identify any reasons to question his ability to make sound welds. NDE examinations performed under the related work documents did not indicate any specific reason to question the welder's ability to perform satisfactory out of position welds.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-24-WBN.

3.4 Heating Ventilation and Air Conditioning (HVAC) Duct Installation and Documentation

The issues related by the concerns are that safety related HVAC duct welds were not inspected prior to 1981 and inspection of the welds was deleted from the procedure without adequate justification.

Prior to August 1980, there was not a documented Quality Assurance program for the inspection and documentation of safety-related HVAC duct welds. This was identified in a TVA Quality Assurance audit in January 1980. Site implementing procedure WBN-QCP-4.27 was initiated to provide for inspection of these welds. In that approximately 95 percent of the ductwork had already been installed, with many of the welds inaccessible due to insulation, the procedure had a provision whereby the inaccessible welds could be accepted by a leak test in lieu of visual inspection. Subsequent revisions of the procedure deleted the visual weld inspection requirements and stated the leak test would be an acceptable alternative.

It was subsequently identified that a required analysis was not performed on the alternate acceptance criteria for its ability to verify the structural integrity of the duct welds. As a result of this, Stop Work Orders were issued in January 1987. Also initiated were Significant Condition Reports (SCRs) to document deficiencies identified in the safety-related HVAC weld inspection program and to establish the required corrective action.

A comprehensive program has been established to provide for reinspection, destructive testing, and engineering analysis of randomly selected welds to determine their structural adequacy. This program, when completed, will verify the seismic adequacy of the welded safety-related ductwork installed prior to December 29, 1986. Provision for the visual inspection of HVAC welds has been reinstated in the Construction Specification for, "quality assurance requirements for inspection of safety-related HVAC systems," for welds made after December 29, 1986.

CATD 50405-WBN-01 was issued to provide a tracking mechanism for the corrective actions outlined in the above referenced Significant Condition Reports.

One issue that was raised by the concerns was that the Emergency Gas Treatment (EGT) piping is installed too close to walls for adequate access for welding, therefore, the welds should be welded and inspected from the inside of the pipe.

The issue as stated in the concern is factual, however, the condition had already been recognized by construction as early as April 1980.

A Field Change Request was initiated by construction and approval obtained from DNE. This resulted in a drawing revision which allowed internal welding on duct joints when unable to make external welds due to obstructions.

The aforementioned reinspection currently being performed will verify the adequacy of welding from the inside, if not welded externally.

An issue that was raised by the concerns is that welding procedures were not made with sheet metal in mind because E-7018 rods were used where the heat range could not be used by procedure. This occurred between 1975-1980 in the welding of ducts and vents in Unit One.

It would appear that this issue is indicative of a problem with welder technique in that during this period there were applicable Detail Weld Procedures with adequate amperage ranges.

In discussion with cognizant TVA welding personnel, it was stated that during the early years a few welders did have problems performing HVAC welds, but they were sent back to the test shop to refine their welding techniques. This was a very small number and the problem was not attributable to the amperage range of the procedures; it was the individual welder's technique in electrode manipulation.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-05-WBN.

3.5 Base Metal Damage

The issues addressed by base metal damage are gouges and arc strikes on piping that are not repaired.

Investigation revealed that the gouge in a four inch carbon steel pipe of the Component Cooling System had been previously addressed on a NCR and was repaired in accordance with site implementing procedures.

Four concerns related to the same arc strike removal area on a ten inch stainless steel pipe of the Containment Spray System. The damaged area had been previously evaluated by DNE and found acceptable but a NCR was not initiated as required. A NCR was subsequently initiated with the evaluation results again being acceptable.

One concern referenced arc strikes on an 18 inch carbon steel pipe. Investigations conducted by DOE/WEP and engineering could not locate the referenced pipe. It was concluded that the pipe was a temporary line that had been installed for raw cooling water and had already been removed.

Another concern related that there was an arc strike two by 3/16 inches in a class C line of the Spent Fuel Pit System. DOE/WEP investigated the concern and found several arc strikes but none with dimensions of the magnitude referenced. The arc strikes were reported to TVA on a Deviation Report. These arc strikes were excavated and the areas evaluated and found to meet design minimum wall requirements.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-30-WBN.

3.6 Administrative Policy and Weld Repairs

Administrative Policy

The concerns relate to the issues of inadequate weld process and/or procedure and unnecessary delay of work by welding inspectors.

The issue of inadequate weld process and/or procedure involved excessive interpass temperature of stainless steel and improper application of preheat to carbon steel.

The U. S. Department of Energy Weld Evaluation Project (DOE/WEP) performed an engineering evaluation in part to address the excessive interpass temperature issue. This evaluation reviewed the effect of possible excessive heat input caused by elevated interpass temperature.

In the Group Closure Statement for this DOE/WEP Evaluation Group, it was concluded that if the interpass temperature was exceeded during the welding of various stainless steel materials there would be no degradation of the mechanical properties. It was also concluded that although there is some sensitization (a region of depleted chromium content) in all stainless steel welds, an elevated interpass temperature will not cause intergranular stress corrosion cracking (IGSCC). This is because the essential chemical environment which supports IGSCC is not present in pressurized water reactor systems. Watts Bar Units 1 and 2 are Westinghouse four loop pressurized water reactor systems.

The preheat issue related to an incident where the practice of leaving preheat blankets turned on overnight was discontinued and the blankets were turned on approximately a half hour prior to start of first shift.

Investigation revealed that there was no requirement for maintaining continuous preheat. For any required preheat, the material must be at least at the minimum specified temperature prior to the start of welding. It was the responsibility of the welder's foreman to ensure that this requirement was met. A surveillance program, including inprogress and completed work, was also in effect that required verification that each foreman was properly performing the required activity.

The investigation of the issue that welding inspectors caused a delay of work did not reveal a condition adverse to the quality of the hardware.

There was a short period of delays caused by personnel shortages, unexpected absences, construction schedule priority changes, and other unforeseen events during early 1985. This was for a period of approximately two to three months.

It is recognized that untimely response to calls for welding inspections is not in the best interest of productivity and efficient time management. Notwithstanding, there is no objective evidence to indicate that quality inspections were not performed as required, or that as a result of the welding inspectors' delays, any adverse condition exists to the hardware (i.e., deficient welds or material) at Watts Bar.

Six of these concerns, relating to disciplinary actions, engineering personnel qualification and harassment or intimidation are not technical welding issues. These issues are evaluated in the Management and Personnel and Office of the Inspector General Reports, and are not discussed further in this report.

Four concerns state that welders whose product is consistently substandard are allowed to retain their qualifications and continue welding.

All of the welders at Watts Bar Nuclear Plant are qualified by performance testing in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code and/or the American Welding Society Structural Welding Code. These codes and the site implementing procedure provide that a welder may be requalified when there is reason to question his performance.

There have been occasions where welders were required to requalify by performance testing due to substandard quality of their product. These welders may be identified through radiograph reviews, Quality Assurance or Engineering surveillance, and final inspection.

While it is possible that a welder whose performance should have led to requalification was not identified, it is improbable that an adverse hardware effect would have resulted. All safety-related welds at WBN are required to be inspected by volumetric or surface nondestructive examination, visual examination, or a combination of these processes. Any weld failing to meet the acceptance criteria would be identified and either reworked or evaluated for acceptability by the design organization.

One concern states that previously rejected hanger welds are frequently accepted by someone other than a supervisor or higher level (grade) personnel.

The concern does not state whether or not the welds in question are reworked before acceptance. In that specific welds or hangers are not identified, a records review to determine rework status is not possible. The material issue must be whether, at the time of acceptance, the welds meet the established acceptance criteria, and whether the individual who accepts them is properly qualified and certified.

There are a number of reasons for a second party reinspecting and accepting a previously rejected weld. The original inspector may not be readily available when, after rework, the weld is presented for inspection. Also, in the case of borderline or subjective evaluations, a more experienced inspector may be assigned to determine the acceptability of the item. In the latter case, prudent management practices would dictate that the original inspector would be informed of the action, and the basis for acceptance explained to him. If this were not done, it may be the underlying cause of the employee concern.

Complete details of the evaluation of these issues are discussed in Weld Project Evaluation Report WP-14-WBN.

Inadequate Weld Procedure

One employee concern stated that improper welding of dissimilar metals had occurred.

The specific issue was that stainless steel was welded to aluminum in the Sampling System without utilizing a di-electric teflon coated union.

This issue was investigated by NSRS and, as a result, no objective evidence of aluminum material (i.e., piping, tubing, fittings, or weld filler material) was detected.

Additionally, a review by NSRS of General Construction Specification G-29M identified no process which includes the use of di-electric couplings. All tubing supplied for use in vendor supplied components for the Sampling System in the Hot Sample Room is ASME SA-213, type 316, stainless steel.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-22-WBN.

Weld Repairs Not Meeting ASME Code Requirements

The issue involved is that TVA makes repairs to their nuclear plants which are not in accordance with ASME codes, such as overlays, patches, and even furmanite (sophisticated glue).

The part of the issue relating to TVA making repairs using viscous fluid sealing compound (furmanite) is addressed in Operations Subcategory Report 30800 and is not discussed further in this report.

Mechanical and welded patches are used to contain leaks during plant operation and are not intended as a substitute for permanent repairs. The permanent repairs are scheduled to be made at times deemed appropriate by operations personnel. The use of weld overlays is common throughout the industry, and is acceptable to the Nuclear Regulatory Commission (Reference NUREG-1061 and NUREG-0313, Revision 2, draft).

These type repairs have been used by TVA at Sequoyah and Browns Ferry Nuclear Plants, however, Watts Bar is currently still in the construction phase, not in operation. In discussions with cognizant TVA personnel, in both the construction and operations departments, they state that patches and/or weld overlays have not been used at Watts Bar.

Complete details of the evaluation of this issue are discussed in Weld Project Evaluation Report WP-25-WBN.

3.7 Weld Sampling Program

This report does not assess the validity of the WBN weld sampling program; it addresses specific hardware concerns that were raised as a result of weld sampling inspections. The programmatic aspect will be evaluated in QA Subcategory 80400.

One concern related that the embedded reactor cavity welds were accepted based on a sample program and that TVA has no idea of the quality of the welds, or even if they are there at all. The results of a previously performed sample inspection were applied by engineering to the welds for acceptance, however, there was already documentation existing that showed these welds were inspected and accepted prior to embedding in concrete.

Another concern stated that structural steel welds in the control building were accepted by weld sampling and the welds were not good. A sampling inspection of previously accepted structural steel welds was performed, primarily for size, length and location. The results of this inspection were applied to structural steel in all Category I buildings. These results were evaluated by DNE and the welds determined to be acceptable to perform their intended design function. The use of a sampling inspection to determine acceptability of a group of items is not a violation of applicable codes.

Another issue was that the weld sample program did not include groove welds and instrument support welds. The fact that these features were not specifically addressed does not violate any TVA commitments. The features to be checked are based on overall management and engineering judgment as to what is required to be sampled.

It was also stated that some welds were repaired prior to the sample inspection. In discussion with cognizant TVA personnel it was stated that to their knowledge no welds were repaired with the intent that they be used in the sample analysis. It is documented that some welds were deleted from the sample because they showed evidence of having been reworked, and DNE felt their inclusion in the analysis would bias the inspection results.

A concern stated that no documentation was generated for reinspection of welds that were required to be repaired. This is not factual in that an NCR, for example, verifies that the work was documented by the work plan and work package procedures.

Complete details of the evaluation of these issues are discussed in Weld Project Evaluation Report WP-41-WBN.

3.8 Quality of Welds

The concerns dealing with the quality of welds at WBN were divided into related groups and each group was addressed individually by the TVA Weld Project.

The reinspection of the hardware to verify weld quality was performed by the DOE/WEP. DOE/WEP reviewed the TVA weld program at WBN to assess its compliance with applicable codes, standards, and regulatory requirements. The implementation of the program as committed to in the FSAR and the TVA Topical Report, TVA-TR75-1A, was verified by evaluating Unit 1 safety-related welds and components and/or the associated weld records.

In the Weld Program Review DOE/ID-10152, DOE/WEP concluded that the WBN welding program met all required commitments and had been in place since the first safety-related weld was made.

The employee concerns were placed within three group classifications by DOE/WEP; for evaluation based upon the amount of detail provided with each concern.

Where the employee concerns identified a problem which could be isolated to a specific item or group of items, these items were placed in Specific Evaluation Groups. Evaluation plans were developed by DOE/WEP, and 100 percent of the items were inspected for the attributes applicable to the issues raised by the concerns. The examination methods were based on the nature of the concern. In some cases, nondestructive test methods were employed which exceeded the original inspection requirements.

Where the problems identified by the concern could not be isolated to specific items, but could be isolated to specific attributes or features, statistically based sample inspections were planned and performed in Special Evaluation Groups. In the Specific Groups, the nature and extent of examination was based on the issues raised by the concerns.

Additionally, DOE/WEP performed statistically valid sample examinations in all of the safety-related piping and structural weld populations except for heating, ventilating, and air conditioning ductwork welding. The ductwork was excluded from these samples because TVA had committed to a corrective action plan to reevaluate all of this welding. These General Plant Examination Groups included visual examination of all of the sample welds. Other nondestructive examination methods were also used where specified for the original installation of the sample items.

The significant deviant attributes identified during the reinspections were primarily size, length, and location of structural fillet welds. Significant attributes are defined as cracks, lack of fusion, lack of penetration, undercut, undersize weld, weld length, and weld location.

The DOE/WEP examination results were reported to TVA. Where deviant conditions were identified within the bounded scope of the examinations, TVA performed engineering analyses of the affected items. In most cases, the analyses showed the items to be suitable for service without correction. DOE/WEP reviewed and concurred with the suitability for service analyses. Where corrections were required, TVA committed to perform the necessary rework. The

corrective action plans were reviewed and concurred with by DOE/WEP. DOE/WEP also identified deviant conditions which were outside of the scope of the planned examinations. These conditions were reported to TVA via Independent Deviation Reports. TVA is responsible for evaluation of these conditions, and for any corrective actions necessary. DOE/WEP concurrence is not required. Thus far, none of these independent deviations has resulted in an unsuitable for service condition.

The weld quality concerns that were specifically related to Unit 1 were addressed by the individual Weld Project evaluations. These evaluations include discussions of the DOE/WEP examination results where applicable. In some cases, concerns that were common to Units 1 and 2, or were programmatic in nature were also resolved for Unit 2.

Twenty-two weld quality concerns require hardware reinspection in Unit 2. These reinspections have been deferred to the Unit 2 plant examinations.

Nine Corrective Action Tracking Documents (CATDs) were issued to track the results of the reinspection and/or evaluation effort that is to be performed in Unit 2 for weld quality. The CATDs are numbered consecutively from 50400-WBN-01 through 50400-WBN-10. Subsequent to the issue of the CATDs, a Weld Project evaluation allowed the closure of CATD 50400-WBN-06 3-9-88

Structural Welding in Main Steam Valve Rooms

Fifteen employee concerns questioned safety-related structural welding in the Main Steam Valve Rooms at Watts Bar Nuclear Plant. Fourteen of the subject concerns were previously investigated by the ERT and the DOE/WEP.

It is important to note that the conclusions drawn herein are intended to address the specific employee concerns, rather than the overall quality of welding in the Main Steam Valve Rooms. Additional efforts, outside the scope of this evaluation, are ongoing to provide an overall evaluation of weld quality. The results of these efforts will be reported in the Welding Project Phase II Report for the Watts Bar Nuclear Plant.

One of the concerns states that structural welds in the North and South Valve Rooms, Auxiliary Building 1, were rejected by radiography. The concern further states that after rework, the welds were accepted visually, rather than by radiography. The Welding Project concurs with the Nuclear Safety Review Staff (NSRS) in finding this concern not factual.

This issue was investigated by the NSRS in late 1985. NSRS states that the originally specified method of examination for the structural welds in the valve rooms was visual inspection. Additionally, no evidence could be found that any radiography had been performed on any of the welds in question.

Two concerns stated that ultrasonic testing may not have been performed on repairs to material and welds. The concerns, while factual, do not present a problem.

This issue was investigated in March 1986 by the ERT. The findings presented by ERT show that ultrasonic examination was not required for the original welds, and that the investigator could not locate any requirement to perform such tests on the repaired welds.

In 1983, a nonconforming condition report was issued to address deficient structural welds in the Main Steam Valve Rooms. These deficiencies included joint and weld configuration. In that many of the joints were designed for full or partial penetration welds, ultrasonic testing was used to verify that the as-constructed joint configurations met the design requirements. (The use of ultrasonics was not specified in the NCR disposition). It is possible that the concerned individuals misunderstood the examinations performed during resolution of the NCR to be a requirement for volumetric examination after weld repairs.

One concern stated that a weld which had been improperly made was accepted in a questionable manner. This part of the evaluation specifically addresses a concern that a weld was quality accepted with an improperly beveled member. The CI stated that the weld was rejected by the inspector on one shift, but that it was then accepted by the inspector on the following shift. This concern is factual. The issue has been addressed by the DOE/WEP and the TVA Weld Task Group. Upon obtaining additional details of the concern from the ERT, DOE/WEP learned that the CI had lodged a number of concerns relating to two specific structural welds.

In that some of the other concerns related to these two welds alleged that subsurface defects were present, DOE/WEP elected to perform visual and ultrasonic examinations on both of the welds.

One of the welds was found to be acceptable. The other weld visually displayed unacceptable profile; unacceptable weld type; and surface slag. The ultrasonic examination revealed a fusion defect. The results of these examinations were reported to the TVA Weld Task Group on a Deviation Report.

The Division of Nuclear Engineering, through its contractor, Sargent and Lundy, performed an analysis of the deviant weld and found it suitable for service. DOE/WEP reviewed the analysis and concurred with Sargent and Lundy.

One concern stated that due to poor quality of the welds on a pipe support, the concerned individual questioned the adequacy of the weld inspections, and felt that the inspection records were falsified by the inspector.

DOE/WEP investigated two concerns lodged by the same individual, and relating to the same pipe support. The details of the DOE/WEP investigation are discussed as the first of the five concerns discussed below.

Five employee concerns question the quality of welds in hangers, pipe whip restraints, and structural steel in the Main Steam Valve Rooms.

One of the concerns states that many of the welds on a hanger in the Unit 1 South Valve Room have unacceptable weld profiles. The CI did not know whether or not the welds had been replaced. This concern may have been factual. The support in question, however, has been reworked and the welds are acceptable.

DOE/WEP determined that the hanger involved with this concern is also the same hanger from which the document falsification issue noted above evolved. DOE/WEP, therefore, elected to investigate the two concerns simultaneously.

DOE/WEP reviewed the documentation for the hanger in question, and determined that at the time the CI noted the deficient welds, the hanger was being reworked. The hanger was QC accepted in June 1984. DOE/WEP visually examined the hanger welds and found them acceptable.

One concern relates to cracked whip restraint welds in the Unit 1 North Valve Room. The concern states that in 1983, there were several cracked welds, and that the CI was laid off before they were repaired.

The records for the welds in question were reviewed by DOE/WEP. These records showed that the welds were reworked and reinspected pursuant to two nonconforming condition reports. DOE/WEP determined that the repairs were performed after the concerned individual's termination date.

One concern states that material and welds in the Unit 1 Main Steam Valve Room have cracks and laminations. The concern further states that repairs may not have been performed. This concern was evaluated by DOE/WEP and found to be partially factual.

Additional information provided by ERT identified the welds. DOE/WEP visually examined the two welds in question. In that the concerns relating to these welds indicated a possibility of subsurface defects, DOE/WEP also elected to examine the welds ultrasonically. It should be noted that volumetric examination was not required for the construction of these welds.

One of the welds was partially inaccessible for visual examination. Ultrasonic examination showed this weld to be acceptable, and the weld geometry conformed with the design drawing. No further action was required for this weld. One of the welds was visually found to have an unacceptable profile, an unacceptable weld type, and surface slag. Ultrasonic examination revealed an area of lack of fusion. The DOE/WEP findings were reported to the TVA Weld Task Group on a Deviation Report. Sargent and Lundy analyzed the deviations and found the weld to be suitable for service. DOE/WEP concurred with the analysis.

One concern states that the structural steel in the Unit 1 South Valve Room has defective welds; that welds on a beam have carbon arc slag embedded in them; and that a beam is mislocated on an embedded plate. This concern is partially factual.

The concern was partially evaluated by ERT, and partially evaluated by DOE/WEP.

The first part of the concern, that structural steel welds in the Unit 1 South Valve Room have defective welds, was not addressed by ERT. In that specific welds were not identified by the CI, DOE/WEP elected to address the nonspecific part of the concern through the results of the statistically based general plant examinations of

civil welds. DOE/WEP also formed a special group in part to evaluate one of the other Valve Room concerns. In that this group was specifically directed toward evaluation of structural welds in the Unit 1 Valve Room, the results are also applicable to this employee concern.

DOE/WEP performed visual and ultrasonic examinations of 236 structural welds in the valve rooms. Forty-six of the welds required engineering evaluation to determine acceptability. The TVA analysis, with DOE/WEP concurrence, found the welds to be suitable for service.

The DOE/WEP problem analysis did not lead to an expansion of the sample. However, a recommendation was made that TVA perform additional evaluations of the valve room welds. The basis for this recommendation was to further develop the issue of potentially unacceptable deviations associated with these welds. TVA agreed to review the activities associated with construction of the valve rooms. This review will include an evaluation of the DOE/WEP inspection findings, TVA nonconforming condition reports, and the TVA evaluations of the employee concerns. DOE/WEP accepted the TVA response.

The second part of the concern, stating that welds on a beam contain slag inclusions, involves four specific welds. Two of the welds were examined by ERT. The welds were visually acceptable, but ultrasonic examination revealed rejectable indications. These welds are addressed on Corrective Action Tracking Document 50400-WBN-11. The corrective action plan calls for an engineering evaluation which may include but not be limited to stress calculations with defects considered; additional ultrasonic examinations; and further characterization of the weld indications.

Two of the welds were examined by DOE/WEP. One weld was partially inaccessible for visual examination. Ultrasonic examination showed the weld to be acceptable. The TVA suitability for service analysis took credit only for the visually accessible portion of the weld, and found the weld acceptable. DOE/WEP concurred with this analysis. DOE/WEP ultrasonic examination of the remaining weld produced acceptable results. Porosity was visually detected, and found by TVA not to affect suitability for service of the weld.

The third part of the concern states that a beam was mislocated on an embedded plate. ERT determined that the beam in question was installed correctly. This was further substantiated by a DOE/WEP investigation.

One concern states that a group of welds in the Unit 2 South Valve Room has lack of penetration due to fitups not matching perfectly.

This concern will be evaluated at a later date. The Unit 2 specific hardware related concerns will be resolved in concert with the Welding Project Phase II reinspections. The concern has been added to Corrective Action Tracking Document 50400-WBN-11.

Two of the concerns relate to drawing and specification requirements not being followed during repair of structural welds in the valve rooms. The individuals expressed concern that failure to adhere to the requirements may have caused stress in the welds and base materials.

One of the concerns states that the weld sequence during rework of the structural steel members in the valve rooms was not in accordance with the drawing; and that the welds may be overstressed due to "out of sequence welding". This concern is not factual.

Although the concern was investigated and substantiated by ERT, ERT based their position on details and notes shown on the design drawing and the TVA process specification for structural welding.

The notes and details on the drawing provide buttering information and the sequence in which the structures should be welded during fabrication. Note 2 states that these are suggested sequences and techniques.

Personnel from the Construction Superintendent's Office, the Civil Engineering Unit, and the Welding Engineering Unit correctly stated to the ERT investigator that weld sequencing was not applicable to the repair work performed on the structures.

Application of these techniques would necessarily require complete removal of the existing weldment, rather than removal and rewelding of localized discontinuities. The repairs in question were being performed to satisfy the disposition of a nonconforming condition report. Had the engineer's intent been to apply the weld sequencing and overlay or inlay welding techniques, this disposition could only have specified complete joint cutout and rewelding.

Discussion with the engineers who originally developed the TVA plans for stress mitigation in heavy weldments substantiated the fact that the weld sequencing and overlay or inlay welding techniques were intended for the original fabrication of the structures. These techniques were never intended to be applied to excavation and repair of deposited weld metal.

One of the concerns states that the process used for repair of the Main Steam Valve Room Restraints on the blowdown piping was not followed for preheat and interpass temperature during welding, causing stress on the materials and other welds. Factuality of the concern was not conclusively established, nor could it be conclusively disproved. There is, however, no indication of a hardware problem associated with failure to follow the temperature control requirements during the subject weld repairs.

ERT states that visual inspection on all elevations of the South Valve Room did not identify any cracks; that testimony of various welders confirmed that heat blankets were turned off between shifts; and that some welders were instructed not to be concerned with the preheat and interpass temperature requirements.

Maintenance of preheat during the structural weld repairs in the valve rooms, including the use of the electric resistance heaters was evaluated in relation to another employee concern. The results of this evaluation did not reveal a problem.

Three of the concerns relate to unauthorized and improper weld repairs being made to structural welds in the valve rooms. The concerns state that welders deposited cover passes of weld metal over discontinuities without excavating the defects.

DOE/WEP performed an engineering study to determine the effect of welding over cracks without excavating the defective material. Based on the type of welding being performed in the valve rooms, it was determined that two types of cracks were likely to exist.

A stress crack develops in a highly stressed weld joint configuration such as those made of the heavy sections in the valve rooms. This type of crack, if not removed, propagates up through the weld, and is readily detectable. DOE/WEP reviewed 35 steel inspection reports involving 195 welds. These welds were documented as acceptable.